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Witness: Erin Hutson

BEFORE THE WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

DOCKET NO. U-180680

TESTIMONY OF

ERIN HUTSON

LABORERS INTERNATIONAL UNION OF AMERICA

Exhibit EH-24

February 8, 2019

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

Final Report: Executive Summary
Case 13-M-0449

Presented to:

Public Service Commission
State of New York

Presented by:

The
Liberty Consulting Group

February 21, 2017

279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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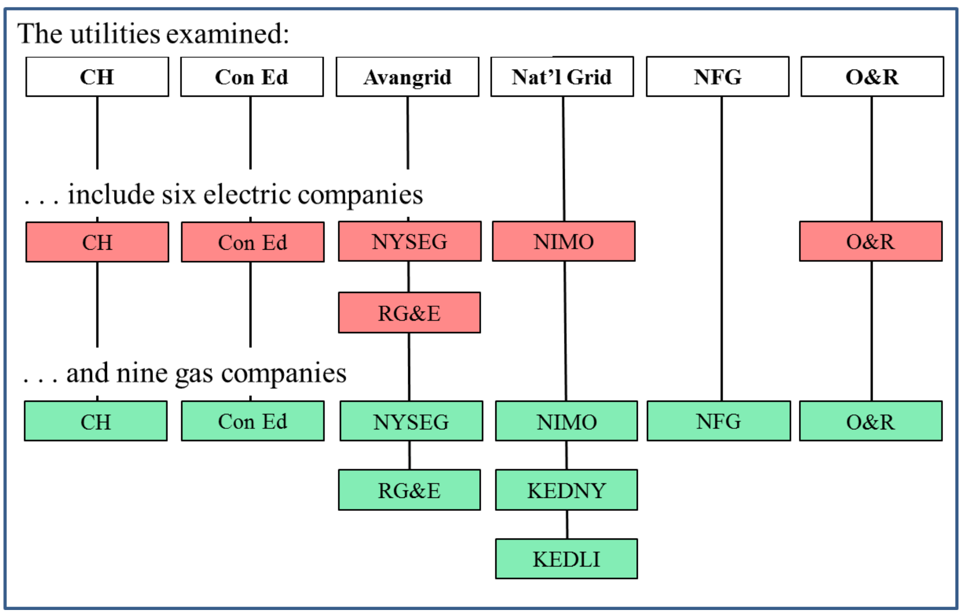
Chapters I: Introduction

A. Scope of the Study

This report describes the results of an operations audit by The Liberty Consulting Group (Liberty) of core-function staffing levels at the major New York State energy utilities. We addressed internal and contractor resources engaged in management, planning, facilitation, and execution of physical electric or gas work on network infrastructure that brings electricity and natural gas to customers. Our scope did not include customer-related activities (including meter reading), vegetation management, information technology, administrative and general (A&G), and security functions.

The entities within our scope (shown below) operate under a range of ownership structures, and include some of the country's and the world's largest utility holding companies:



We sought to determine whether these utilities maintained and were acting to continue to maintain staffing levels sufficient to ensure adequate, reliable, and safe service, while optimizing efficiency and cost effectiveness. This report discusses our approach and methods, and summarizes our observations at the statewide level. Companion reports for each of the six, top-level entities shown above address findings, conclusions, and recommendations applicable to each individually.

B. Study Work Structure

We structured our study along two basic lines of inquiry, which produced complementary functional study areas. The first examined the three fundamental activity areas that drive utility resourcing: resource planning, work management, and performance measurement. The second included examinations tailored to the three staffing resource types (internal straight-time, overtime, and contractors) that utilities use. We performed reviews of processes management must perform effectively to optimize staffing size and balance. That process review examined the involved organizations, resources, approaches, methods, systems, tools, processes, activities, monitoring, and controls, using well-defined evaluation criteria. We did so understanding that utility work has different characteristics, depending on the nature, amount, and recurrence. Two key parameters drive work: performance standards and infrastructure.

Our second line of inquiry, a series of quantitative reviews, employed multiple techniques, which we describe below.

We evaluated management performance under clear, consistent criteria. Nevertheless, we recognized that unique company circumstances make more than one way of structuring, performing, and measuring staffing-related activities effective. These criteria embody experience we have gained over thirty years in examining energy utility management performance and effectiveness in 40 North American jurisdictions. Our experience with New York utilities extends back twenty or more years in a variety of engagements prior to this one, and includes all but three of the 15 operations studied here. Our study team consisted of seasoned experts in gas and electric utility operations, with significant expertise with statistical and other data-based methods for analyzing utility performance. Our experts all had at least 30 years in the utility business.

C. Work and Worker Classifications

As is generally true in the industry, we found a variety of ways to classify employees functionally. Enabling comparisons among companies required a single set of logical categories. We began from the following breakdown of "core functions" critical to the delivery of reliable utility service:

- Electric Operations - - Distribution, Transmission, and Substations
  - Engineering (*e.g.*, including, planning, design, delivery, and asset management)
  - Field personnel (*e.g.*, line workers, mechanics, technicians, service personnel, construction services, power equipment operators)
  - Supervisors, managers, estimators, schedulers, dispatchers, and project managers
  - Quality Assurance and Quality Control
- Gas Operations - - Construction and Distribution
  - Engineers and construction personnel
  - Cost estimators, schedulers, project managers
  - Power equipment operators
  - Crew dispatchers
  - Service/field personnel
  - Quality Assurance and/ Quality Control.

After extensive interaction with the utilities, we established clear, comprehensive categorizations to populate a common database for quantitative assessments, trending data across the state and examining individual utilities in comparison with the statewide experience.

D. The "Super" Database

The performance of quantitative analyses of staffing for electric and gas operations functions required each company to extract and provide large amounts of data from multiple systems they used to capture costs, labor hours, and system attributes by function. We promoted significant participation by each company, to ensure effective communication of the detailed data requirements. We constructed a single database from which to perform quantitative analyses. We set a 10-year study period, consisting of the historical years of 2009-2013 and the forecasted years of 2015-2019. Our field work took place during 2014, making its combination of actual and forecasted data (structured in incompatible ways by the utilities) unusable for most study purposes. We understood the major effort needed to collect data about some 18,000 statewide, translate headcounts into full time equivalent personnel, assemble a variety of data points about them, and cover a period encompassing 10 years. The work produced an enormous number of data points, or "cells."

We eventually produced data sets to support quantitative analyses of staffing and its drivers at all 15 state operations. The effort, however, involved difficulties well beyond those we anticipated. Efforts to find a way to proceed to a useful conclusion required many months. The development of this super database, expected to be quite challenging initially, proved far more difficult than planned, eventually taking many more iterations and much more time than expected.

Our work with the companies included a pilot project, weekly phone calls, iterative development of templates detailing the content and structure of data required, on-site reviews, workshops to review model runs, and roundtable meetings to discuss data completeness and accuracy. Those efforts eventually succeeded in supporting comparative analysis among all but one operation. They also succeeded in providing a basis for comparing trends within given companies.

We were able to use the historical and forecasted data in a number of productive ways. The data gave us the ability to break staffing down into a wide range of functions for detailed examination, and to aggregate it for overall analysis. We related levels of work performed using internal straight time, internal overtime, and contractor resources to each other by creating an ability to express each in terms of number of equivalent full-time equivalent personnel numbers (FTEs). We quantitatively examined what proportions of capital, O&M and engineering each group performed. We separated resources by distribution, transmission and substations, engineering, and by special functions of interest (*e.g.*, pipe replacement).

We looked at how equivalent numbers of FTEs in a variety of categories trended across the historical period, and how management forecasted them to change for the future. We created what we termed a Reference Utility (a composite, generally reflecting the median of the attribute(s) involved) that permitted us to compare each company with the others we studied. We combined resource data with production units to produce composite measures of productivity, expressed both in dollars and hours required to produce equivalent units of production.

We constructed a model using the data provided. It correlated actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produced staffing level estimates for each utility, considering how the unique combination of attributes at each varied. The model provided a more sophisticated way to consider each utility's staffing levels, normalized for the unique infrastructure mix of each. The model provided an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure.

Chapter II: State Utility Characteristics

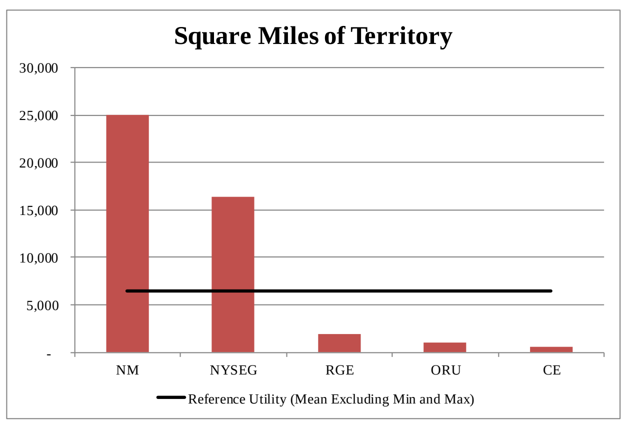
A. Summary

Given differences among the 15 operations we studied, it proved difficult to describe overall the attributes material to staffing. Nevertheless, we did make some overall observations that have staffing implications. The general observations we formed about these attributes are:

- The electric utilities consist of two large, one medium and three small operations, with the characterization of "small" applicable on either a state or national basis
- Most of the electric companies have relatively small service territories
- Electric utility customer densities do not vary widely, except for CECONY (in the extreme)
- Only two electric operations have a major transmission presence; the other four fall into the bottom quintile nationally
- The gas companies show more uniform distribution, but two can be considered very small
- Four gas companies have customer counts in the bottom quintile nationally
- The urban, denser gas companies have far higher investment per unit of infrastructure.

We termed attributes that might influence staffing levels as potential "hard drivers." These attributes (*e.g.*, number of customers) exist largely outside management control. We examined them as one of the "givens" that define relative size. We also examined what we termed "soft drivers," which are not "givens" and which do relate to performance. For example, a utility chooses what amount of gas mains to replace each year. That decision affects work amounts and therefore staffing requirements. Similarly, utilities experience varying degrees of productivity, which also influences staffing.

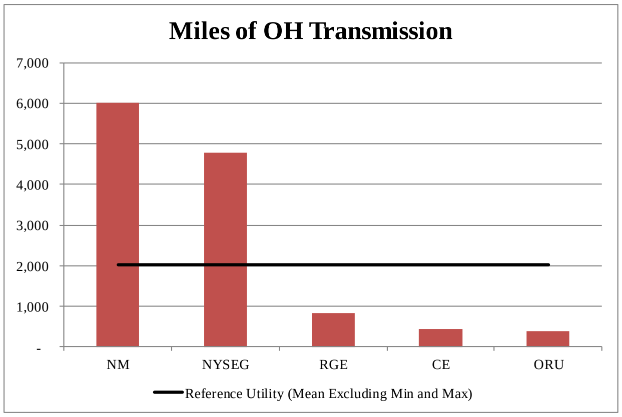
We recognized that one or two comparatively very large utilities would frequently dominate the data, complicating efforts to make meaningful statewide observations. We used a "Reference Utility" concept to adjust for this circumstance. We constructed this hypothetical utility operation to provide a common indicator of how individuals differ from the composite with respect to single or grouped attributes. The Reference Utility value for an attribute generally consisted of the mean value for all the state's operations, excluding the minimum and maximum in cases of particularly large variance. To illustrate by example, a utility with the same number of customers as the Reference Utility has a customer number value of 1.0, while one with 50 percent more has a corresponding value of 1.50.

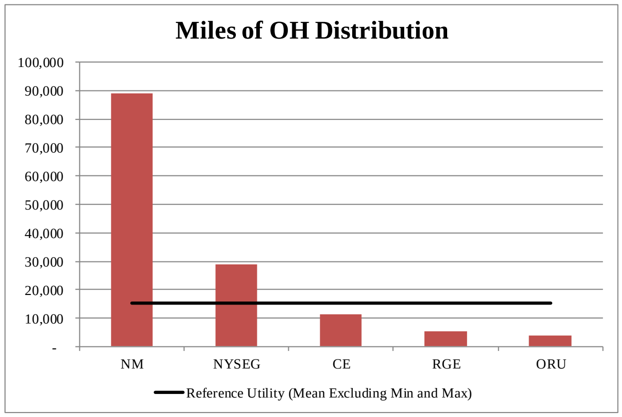


B. Electric Utility Attributes

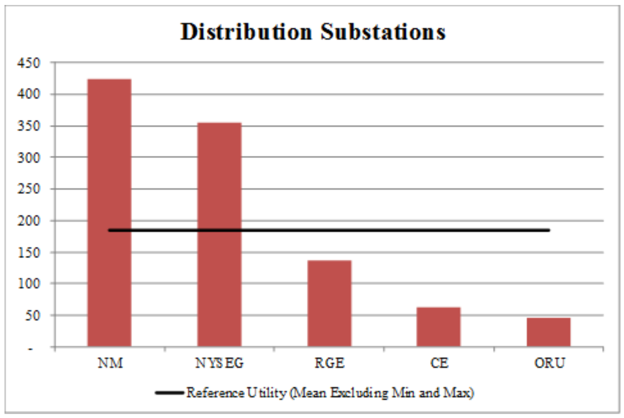
Service territory size and quantities derived from it (*e.g.*, customer density) should affect staffing. Sparse territories can increase travel times, and require more distribution facilities to maintain. The results show two geographically large service territories, with the rest relatively small.

Miles of lines help drive person-hours. One would expect to see (as the next charts show) the most influence on NIMO, which has more than seven times the Reference Utility's lines, therefore facing challenges beyond those of the smaller companies. Consistent with large and spread-out service territories, NIMO and NYSEG dominate in miles of overhead transmission lines. The four other electric companies have less than half as many miles of overhead transmission lines, compared to the Reference Utility value.

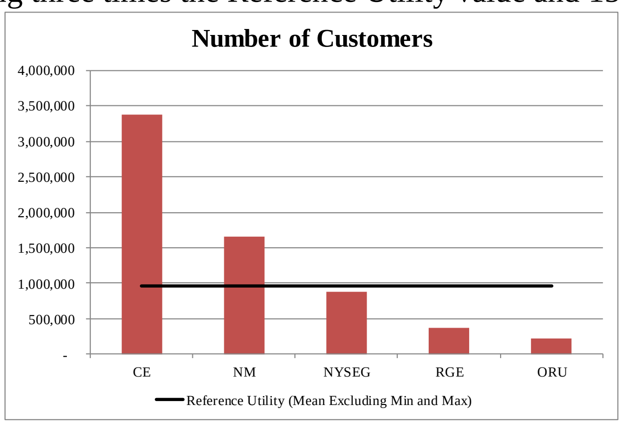




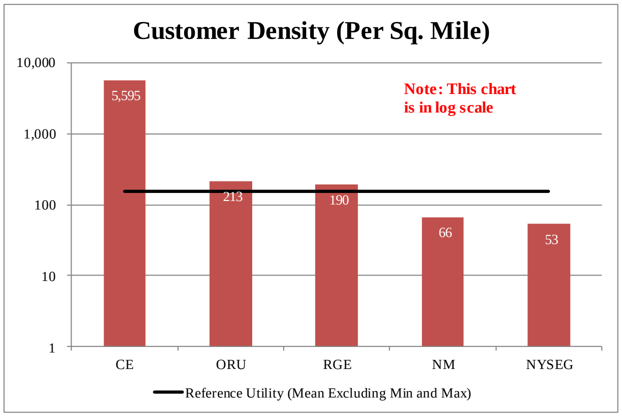
The number of substations (charted at right) generally mirrors the geographical measures, with NIMO and NYSEG dominating the group. These first four geographically related attributes, show the dichotomy of two geographically larger and three smaller utilities, and the relative impact on facilities like lines and substations.



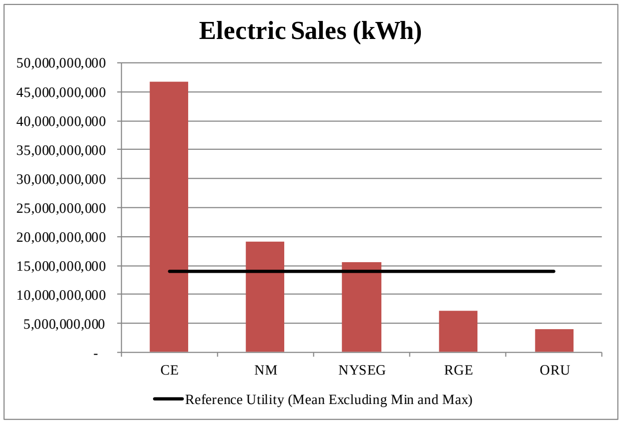
Moving on to non-geographically related parameters changes the relative positions of the utilities. CECONY becomes the dominant state utility. There exists a vast divergence in number of customers (shown at right), with CECONY having three times the Reference Utility value and 15 times the customers of the smallest. Nationally, utilities with less than 500,000 might be characterized as relatively small, lacking the size leverage that can produce staffing efficiencies. Our work, however, showed this not always to be the case.

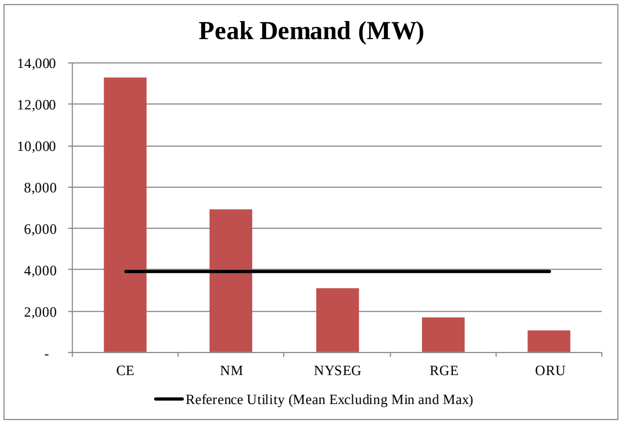


One would expect customer density (shown to the right) to have consequence as a staffing attribute. Density can produce efficiencies, but end up producing penalties at extremely high values, as work becomes logistically more difficult. CECONY, the state's outlier, surpasses its nearest rival by a factor of three. While much lower in density, geographically large NIMO and NYSEG still have values above the nation's least dense utilities, whose density can fall into the teens.

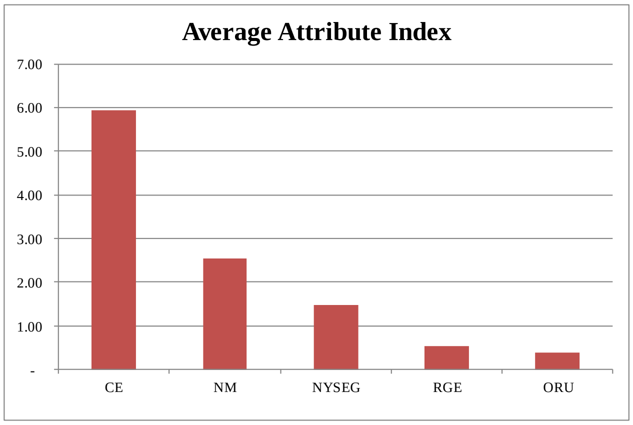


CECONY's density produces other differences, such as its comparatively very large amount of underground facilities, its network configurations, and the high costs of working in the metropolitan area. Peak system demand offers a typical indicator of utility size, although not likely to correlate highly with infrastructure-related staffing. Sales comparisons largely mirror the same pattern. On a national scale, the state utilities are not particularly large, again with the obvious exception of CECONY. Usage data, as the next two charts show, again indicates that several of the state utilities are relatively small.



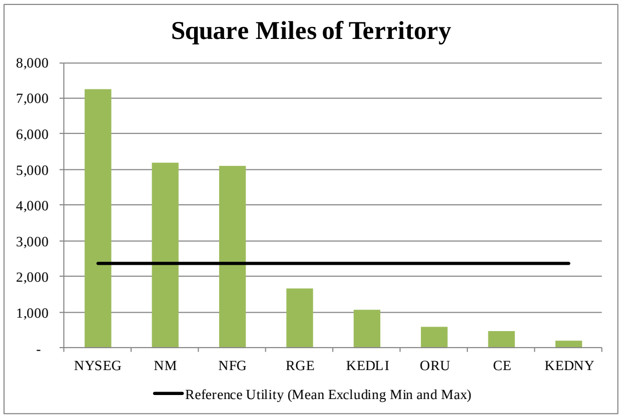


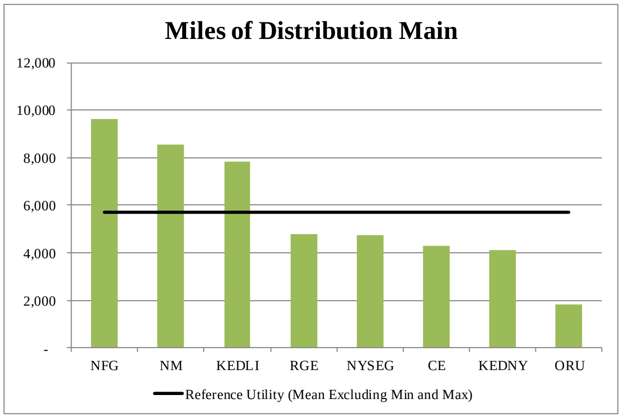
We combined all these attributes to provide a basis for comparing the electric operations using them all. This overall comparison, using the Reference Utility value, shows a similar pattern to those generally found when using individual attributes. This average attribute index, charted below, shows two large (CECONY and NIMO), one medium (NYSEG), and three utilities classifiable as small on both the state and national scales. Note that a utility with a measure of 1.5 would have a 50 percent higher value than the Reference Utility, after averaging the values of all the measured attributes.



C. Gas Utility Attributes

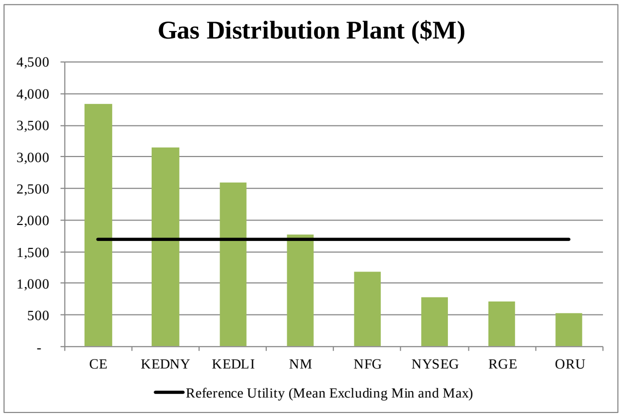
Using similar attribute types, we found the disparity among gas operations in hard drivers much less extreme than what the electric data showed. We observed a wide, but generally uniform distribution of service territory sizes, as the accompanying chart shows. Gas service territories are far smaller, with the gas Reference Utility value less than half the corresponding electric operations size.

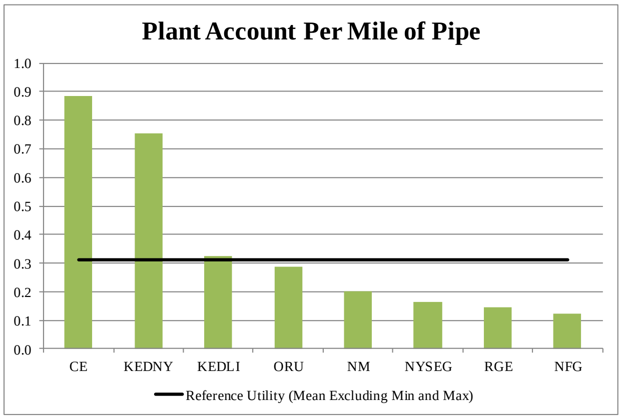




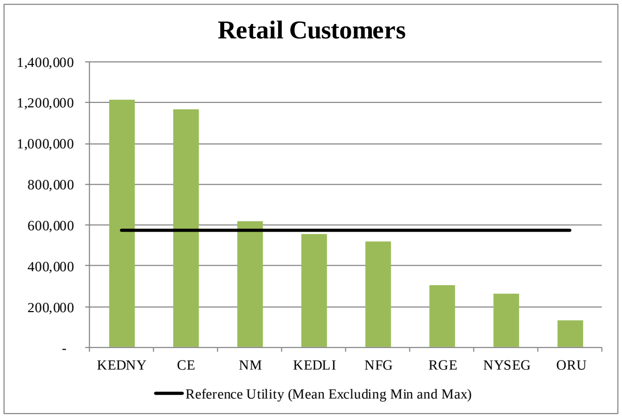
The preceding chart shows that infrastructure (specifically pipe) also exhibits a generally uniform distribution over a reasonably close range. The largest (NFG) has more than twice the Reference Utility value and four operations fall essentially at the median.

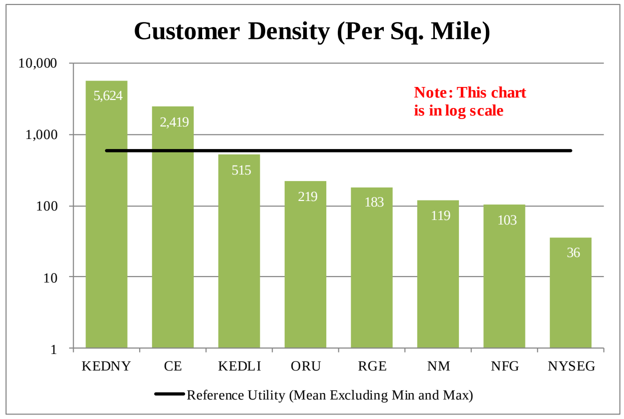
The next two charts show plant values. Most have distribution plant exceeding a billion-dollars, led by CECONY and KEDNY (both among the top 10 percent in the U.S). KEDLI and NIMO fall close behind. Using this attribute causes significant changes in utility rankings, compared to rankings by miles of pipe. CECONY moved from sixth to first, NFG from first to fifth, and KEDNY from seventh to second. We also compared on the basis of the amount of plant account per mile of pipe. On a comparable basis, the investment requirements of the heavily urban gas companies far exceed the others.



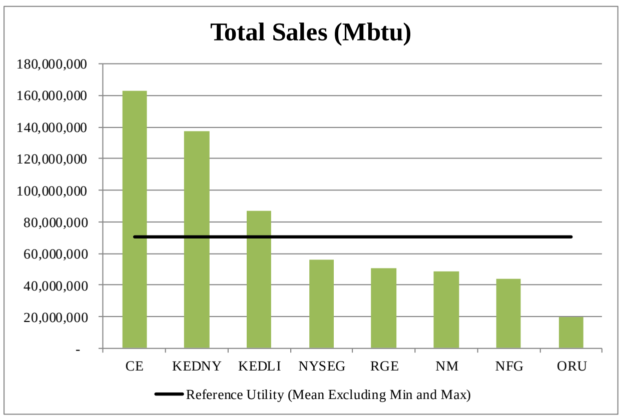


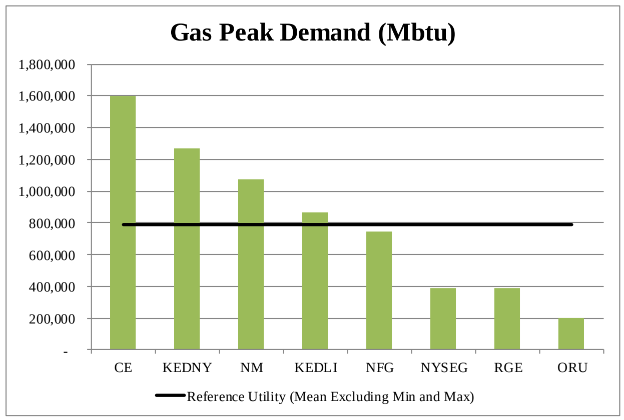
The next chart shows KEDNY and CECONY again dominating the four relatively small utilities, based on customer numbers. O&R, with its less than 100,000 customers falls in the smallest 20 percent of U.S. gas utilities. The state's top five all fall in the upper half nationally. Gas customer densities also vary by much less than their electric counterparts. However, two companies dominate, pushing seven of the nine below the Reference Utility value.



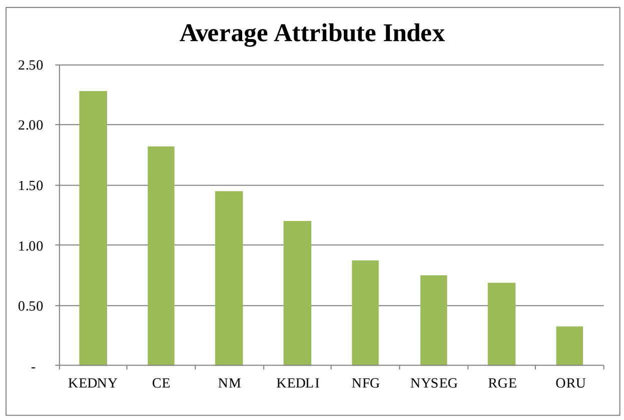


Rankings by sales and demand closely mirror each other, as the following charts show.





Comparisons using the average attribute index (shown to the right), again in contrast to its electric counterpart, shows a reasonable continuum. Despite several very small utilities, most of the operations exhibit attributes that spread over a reasonably consistent range.



Chapter III: The Staffing Model

A. Background

This study gave an opportunity for an in-depth, data-driven analysis of staffing of a somewhat sizeable population of utility operations operating in a single state. We applied multiple quantitative, analytical approaches to provide insight into staffing adequacy. Development of New York specific quantitative models to compare staffing levels across the state, comprised one of those approaches. Model development offered a means to standardize and compare staffing costs and hours, while accounting for wide variations and differences in factors likely to affect staffing. The comparative view provided by the models gave our team the ability to look across companies and historical time horizons to review performance compared to peers, and provide quantitatively based insights into staffing.

We captured data in identically categorized ways from each utility. We developed models from management-provided data, which we vetted as best we could, recognizing that significant reliance needed to be placed on management to extract large sets of data from many systems. We worked extensively with each study participant's management to make our data structure and content clear, and to work through the "translation" challenges identified.

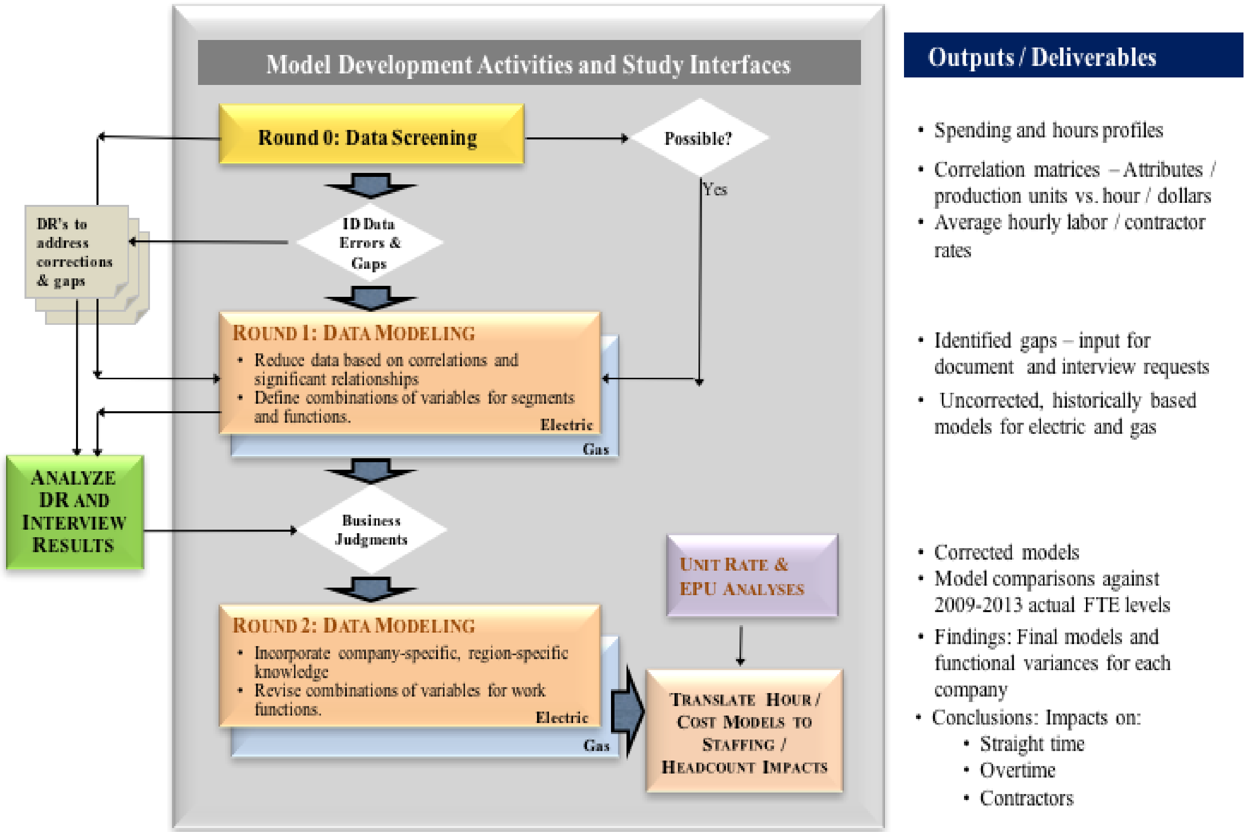
Our models correlated actual staffing levels to key infrastructure attributes and work characteristics. We used the models to produce staffing level estimates. These staffing estimates let us compare how individual utility staffing levels varied internally and relative to others. The models provided an objective yardstick for identifying large variances in staffing levels. Those variances provided one of the bases used to identify staffing issues and concerns.

We designed our models to account for company differences. Therefore, development required significant up-front work to determine a large set of variables, system attributes and work activities. Our efforts produced a wide array of variables from which the modeling effort could draw.

B. Approach to Model Development

The process for constructing models followed a typical development process, integrated with other study efforts. The following flow chart depicts the step-by-step process we used for model development. Model development used five major steps performed in tandem with expert interviews and qualitative assessments involving management of the operations we studied.

Model Development Flow



We began with data screening to determine the base accuracy, robustness, and sufficiency of the data for modeling. This effort involved production of summary statistics and simple correlations for the data provided. We also assessed and evaluated the impacts of statistical outliers. Our focus then turned to identifying data errors and gaps for correction. For example, where data was easily sourced (*e.g.*, from publicly available alternatives or reports to the commission), we could make corrections outright. However, for attributes or values where quality data was scarce or the most robust data source was spotty, the team investigated alternative sources. We often discussed preliminary results, analyses, and data issues with utility management. Therefore, the companies had multiple opportunities to correct their data, resulting in multiple model revisions and iterations.

Our data modeling phase included a series of statistical calculations using the data provided and corrected. We eliminated variables that did not change in the same manner as costs or hours data. We further filtered the initial set of variables for each functional model to minimize the effects of multicollinearity, which occurs when multiple independent variables in a model show high correlation, meaning that one variable can be linearly predicted from the others with a high degree of accuracy. We ultimately examined tens of thousands of combinations of the independent variables against the dependent variables. We used this screening to generate rank-ordered lists of variable combinations that had the most explanatory power.

This approach increases a model's explanatory power. That benefit becomes important here, given the small size of the data set (due to the number of New York electric and gas operations included).

We also generated a sample of un-scrubbed candidate models. We made these un-scrubbed model runs before correction of all data issues or applying business judgement.

Applying that business judgment then became an important part of the statistical filtering process. We reviewed a series of candidate models with our functional experts conducting the process reviews. They examined initial results for intuitive "sense," using industry experience and knowledge gained in reviewing staffing-related processes at the states' utilities. Their review also considered the effects of combining single variables into derived ones having multiple dimensions. Iterative business-judgement checking ensured that early models and their results proved logical, given our experts' knowledge of the business. The pure statistical properties of the underlying data thus did not alone determine whether to consider each independent variable for final modeling.

We proceeded to a second round of data modeling, combining the outputs from the first round with the feedback on variables and data corrections to develop a final group of candidate models. Our experts reviewed these candidate models. Here, we also incorporated and tested company-specific and regional knowledge, in order to determine if it provided any additional explanatory value. We produced a selection of models for each function. Our business experts scrutinized the results, in order to identify those best for use in translating costs and hours into headcount and staffing impacts. A custom-built calculation engine compared estimates against actuals for functional costs and hours for each company. This approach allowed our experts to undertake a granular review of model results to identify and investigate differences. Ultimately, this process let our experts select the model for each electric and gas function that provided both statistically significant results and consistent estimates for costs and hours across all companies in the study.

C. Final Models

We used the final model for each function (capital, O&M, and engineering) as chosen by business and functional experts, to screen variances and to translate forecasted costs into estimates of hours and FTEs. We identified companies exhibiting high variances for more detailed functional analysis. We observed that historical cost profiles and model estimates from both the cost models and hours models demonstrated similar dynamics, characteristics, and trends, and in most cases, even highly similar variables. However, hours models had a notable shortcoming; *i.e.*, the utilities could not provide their forecasts denominated in hours. We decided to proceed using costs. The final step in the modeling process converted the cost estimate outputs from each of these functional models into FTE estimates, for use in comparing compare historical company staffing levels in each function against model estimates.

Our model development process produced nine separate models - - one for each functional area modeled for electric and gas operations. Each model offers an equation representing the mathematical relationship between costs, the dependent variable, and the independent variables (system attributes and work activities). The model development process we used allowed us to develop models with high levels of statistical significance.

We prepared a five-year average (2009-2013) number of FTEs, derived from model estimates compared to the five-year average actual FTEs for capital, O&M, and engineering. We used model estimates to inform our experts and augment other analyses (for example, FTEs per unit rate and equivalent production unit (EPU) productivity), as they assessed staffing. Given that the purpose of these models was to provide a screening mechanism to identify where individual company staffing costs for a functional area were significantly different from other companies we studied, we are confident that we constructed a useful tool for this study. Our confidence in the models is based on the methods we used to create them. The models comprise combinations of variables that are statistically significant, have common sense relationships to the underlying structure of the business, and are consistent with our experts' understanding of the business itself.

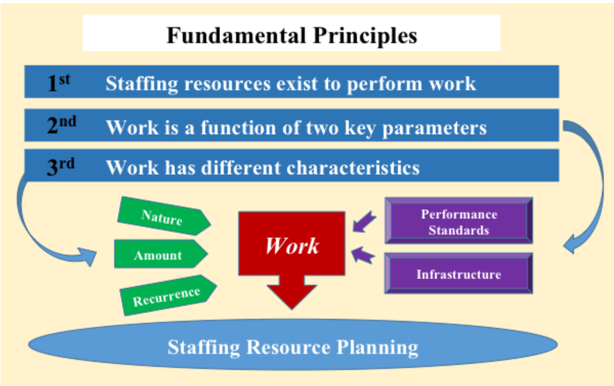
Chapter IV: Total Staffing - Resource Planning

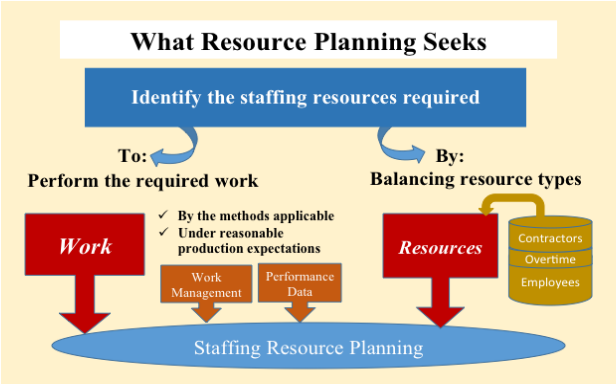
A. Background

The 2013 electric distribution costs we considered amounted to $3 billion - - $1.6 billion for capital, $1.1 billion for O&M, and $200 million for engineering. The 2013 natural gas operations we studied spent a total of $1.4 billion in 2013 - - $900 million for capital, $400 million for O&M, and the remaining amount for engineering. Labor costs for this work amounted to just over half (55 percent) of the totals. Other cost components consisted of costs for materials, vehicles, and corporate indirect charges (*e.g.*, information technology, facilities, and administrative and support functions, for example, human resources).

Utilities generally use annual planning and budgeting processes to identify capital and O&M work, develop budgets, and assess needed staffing resources objectives. Resource planning should define the future workload for each organizational unit, and associate it with needed internal and contracted resources, in order to ensure sufficient personnel to support infrastructure maintenance, development, and expansion. We examined each company's processes for developing resource plans to support adequate staffing.

State utility planning practices varied widely, from those with significant resource planning support staffs to those with decentralized planning in various operations groups, sometimes with minimal staff support, analytical capabilities, and reliance on local management's knowledge of work requirements. Industry resource planning has become more sophisticated and data-driven. More robust financial, operational, and planning systems have been accompanied by resource planning methods and tools that define future workloads quantitatively, and more fully optimize the staffing resource mix. We used fundamental principles to guide our work, as the next charts illustrate. Resource planning should form part of a continuous cycle that develops each year's resource plan as part of the annual planning and budgeting cycle. and is informed by complimentary processes.





B. Evaluation Criteria

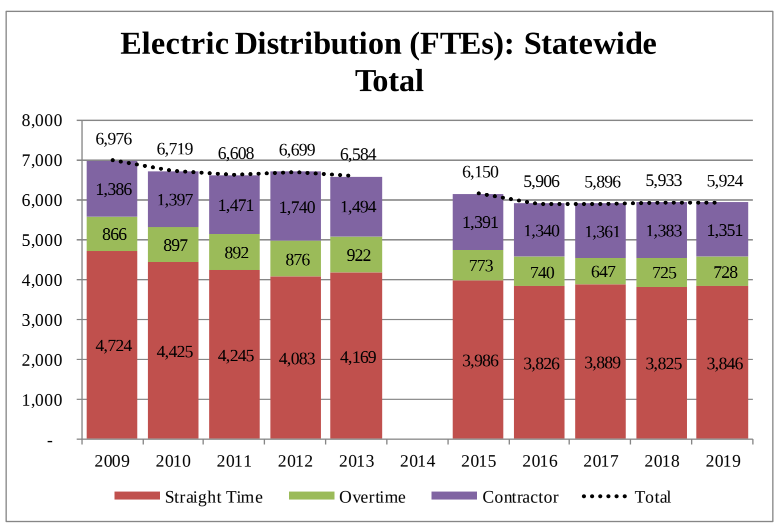
We applied five overall criteria (supported by more detailed components) in evaluating resource planning as an element in optimizing staffing:

- The organization for coordinating and supporting manpower resource planning should be treated as a specialized activity, with dedicated resources.
- Complete and accurate information about units of work performed and costs by work function, by region, and by staff resource type should be available.
- Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.
- Overtime use should comprise a formal part of the process of identifying required resources and rely on an analytically supportable method for determining optimum levels for each work function.
- Contractor use should comprise a formal part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

C. Total Statewide Electric Resources

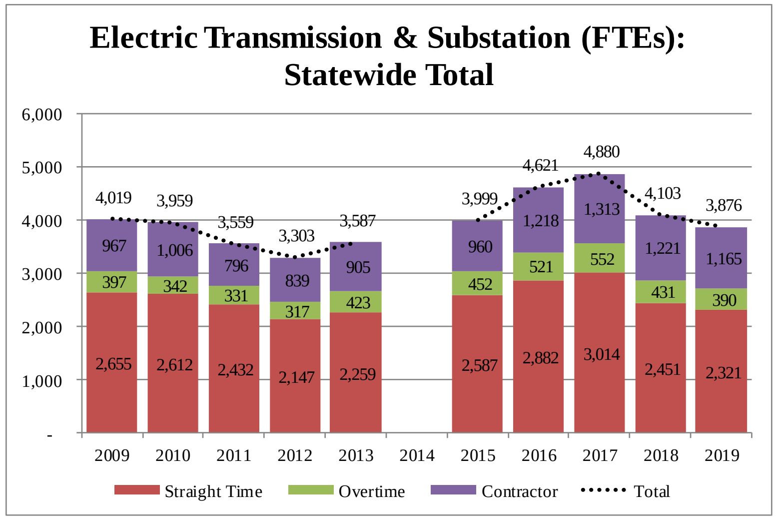
Forecast data provided by each company came from five-year expenditure forecasts approved during 2014 annual budget processes. We translated costs into FTEs for straight time, overtime, and contractors using unit rate data ($/hour) from each company's last year of historical data, escalated for inflation. The next table shows changes in the total statewide FTEs applied to electric distribution work from 2013 through 2019.We did not include data for 2014, during which we performed study field work. The companies reported data on incompatible bases for 2014, which at the time required a combination of actual year-to-date and forecasted data.

The data showed steady decline in distribution work (primarily capital and engineering) through 2013. Major 2011 and 2012 storms, however, did bring an increase in O&M FTEs. The overall historical decline came entirely from internal resources, which fell by 12 percent, while overtime and contractors remained steady (except for 2012 -- the year of Superstorm Sandy). After another drop from 2013 levels, forecasted distribution requirements remained stable through 2019. The reduction from 2013 shows in FTEs for all three resource types. We found projected O&M levels unrealistic, showing much lower FTEs than any historical year. The much smaller level of internal FTEs for distribution work could produce unsustainable overtime levels for emergency response work.



Forecasts showed increasing reliance on contractors for distribution work - - moving from the historical rate of 20 percent to 25 percent. Most planned to reduce historical overtime levels.

For transmission and substation work, overall applied FTEs decreased steadily until 2012, reversing in 2013 to show an increase lasting through 2017. By 2019 reductions in levels brought forecasted FTEs to a level approaching those of 2009. Internal straight time FTEs experienced most of the drop, but contractor levels fell as well. The larger increase in contractor use, relative to internal resources, observable beginning in 2012 typified peaks in substation construction activity. Overall, the state's electric companies projected a small shift to contractors (measured by the Reference Utility value) in transmission/substation work (from 36 percent of the resource mix to 40 percent). All but one of the five conformed to this pattern.



Combining statewide distribution and electric transmission and substations discussed above produced several observations:

- Overall applied FTEs decreased substantially between 2009 and 2013 historical period; the drop of 825 FTEs from a 2009 level of more than 10,000, amounted to eight percent.
- Forecasts through 2019 showed continued decreases in distribution FTEs, but continuing increases in transmission and substation FTEs
- Despite significant year-to-year variations, forecasts showed total FTEs remaining within a few percentage points of 2013 FTE levels into the future.
- Forecasts showed reduced reliance on overtime and a modest increase in contractor usage, with a net gain of about 120 contractor FTEs (about seven percent compared with 2009 levels).

We employed two other forms of quantitative comparisons of staffing levels: (a) ratios of staff to key system attributes, and (b) five-year average FTE levels compared to estimates from the staffing model. We used the last year of actual historical data available (2013) for our ratio analysis, comparing FTEs per customer, per overhead line mile, per unit sales, and per substation, as applicable. We also combined these ratios into one measure for all attributes combined. This last, all-attributes measure roughly gauges total FTEs as a function of a utility's size.

Summarizing the results of the ratio analysis at the statewide level:

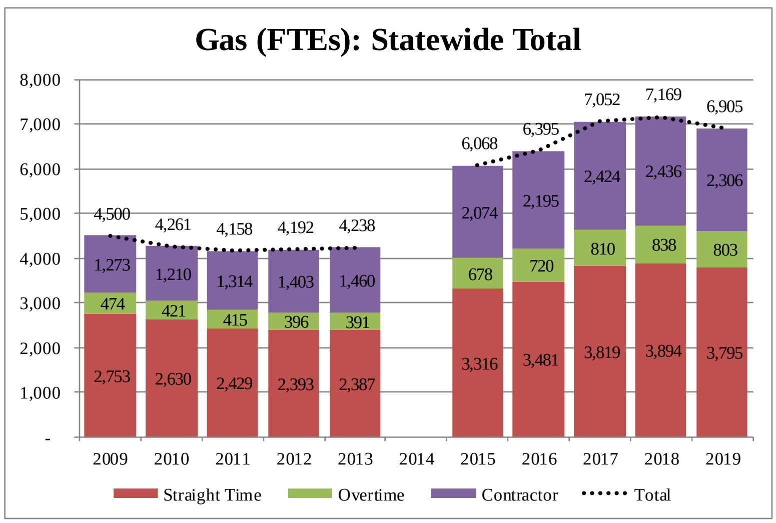
- A wide variation (generally exceeding 50 percent for each attribute) existed among the utilities for both distribution and for transmission/substation work
- Considering all attributes, the range narrowed (to 40 percent) but remained large.

- One extremely large outlier in FTEs per OH line mile resulted from the extremely high percentage of that utility's underground facilities.

Our model produced a narrower range of results. Electric distribution five-year average actual staffing levels fell within 15 percent of FTE model estimates for all but four of 15 functional categories assessed. We pursued the four cases in other quantitative and qualitative analyses, producing conclusions specific to the utility involved. We also modeled substation O&M, transmission O&M, and engineering functions. We could not develop meaningful models for substation capital and transmission capital because of volatility in year-to-year expenditures and the availability of only five years of data precluded development of a statistically valid model. Where we could develop a meaningful model, we found a strong level of consistency between most companies' actual FTE staffing levels and the model's FTE staffing estimates, for all but two of the functional categories assessed. We pursued those cases using other forms of analysis as well.

D. Total Statewide Natural Gas Resources

We received and translated the same types of gas operations data as for electric operations, recognizing the functional differences. We produced FTEs engaged in gas operations in a similar manner. Total 2013 expenditures for gas operations amounted to $750 million - - $476 million capital, $230 million O&M, and $43 million engineering, with labor comprising 55 percent. The chart shows historical and forecasted staffing resources for gas operations functions.



Statewide FTEs declined steadily from 2009 (when they totaled 4,500) to 2013 by six percent. Internal FTEs (straight time and overtime) declined much more (by 13 and 17 percent respectively), while contractor FTEs rose by about 15 percent. These historical declines came primarily from O&M decreases (down by 12 percent through 2013).

Forecasts showed a substantial increase, peaking in 2018, driven largely by accelerating pipe replacement programs. Major increases in all three resource types contributed to the vastly larger number of FTEs. O&M forecasts also showed FTEs higher than those of 2013 levels, but never returning to 2009-2010 levels - - raising a concern with respect to maintaining leak-related service levels. Apart from the staffing impetus from accelerated pipe replacement, some utilities, particularly from downstate, anticipated capital work increases due to greater new business work. Two major concerns arise from these forecasts of vast resource additions (a net addition of about 3,000 FTEs over three years):

- How realistic it is to accommodate such a large increase in so short a time
- With straight time and overtime levels already greatly stressed to meet capital requirements, and with forecasted O&M FTEs below historical levels, higher than expected O&M work requirements could push overtime to unsustainable levels.

Examining the projected gas staffing resource mix showed the historical increase in relative reliance on contractors continuing through 2019. Forecasts showed the Reference Utility value for contractor work share increasing from 30 to 33 percent. All but one utility forecasted an increased contractor share of work. Pipe replacement forecasts drove straight time and overtime FTEs significantly above historical levels, but projected contractor FTE rose at an even faster rate.

The same ratio analysis we applied to electric resources showed a very wide dispersal in gas FTEs per attribute (as much as 80 percent). Those exhibiting the highest FTEs per mile of main had significantly more compact, dense service territories. The models showed a much smaller spread of values than we saw for electric operations. Gas five-year average actual staffing levels for 21 of the 24 functional categories assessed fell within 15 percent of model estimates - - a fairly small range for such a group. In the three other cases, we examined (in the relevant individual company reports) these variances against other quantitative and qualitative analyses.

E. Statewide Total Staffing Observations and Conclusions

1. Quantitative

For total electric distribution, transmission, and substation resources we determined that:

- Overall FTEs decreased substantially, by eight percent through 2013.
- Forecasts showed continued distribution declines (400 FTEs), but continuing increases in transmission and substation FTEs, producing 2013 and 2019 levels within a few percentage points of each other.
- Overall, forecasts showed reduced reliance on overtime and a modest increase in contractor use shares, with an increase of about 500 contractor FTEs between 2013 and 2019.
- Our quantitative analyses found variances in a small number of individual cases, which we examined further for the companies involved.

For total statewide natural gas resources, we determined that:

- By 2013, total FTEs fell six percent from 2009's 4,500+ level. Internal FTEs fell steadily (366 straight time FTEs; 83 overtime FTEs), while contractor FTEs increased by 187.
- Forecasts showed continuation of the trend toward higher reliance on contractors (from 30 percent in 2013 to 33 percent in 2019). Forecasts showed increases in internal FTEs, but contractor resources showed a higher growth rate.
- Forecasts showed vast increases in FTEs, peaking in 2018 at levels well over 60 percent higher than 2013 levels, driven largely by accelerating pipeline replacement programs. By 2018, workload was projected at 2,931 FTE higher than 2013 staffing levels. Forecasts showed substantial addition in all three resource types.
- We have significant concern about the ability to acquire and make effective use of so many additional resources in so short a time.
- We also have concern about the potential for resource shortages on O&M work. Already forecasted to be lower than historical levels, the potential for unexpected growth in O&M work could generate unsustainable overtime levels, as capital work competes for resources.

- Our quantitative analyses found no reason to question staffing adequacy broadly, but a number of variances we observed led us to examine the reasons in connection with our review of individual utilities.

2. Process-Based

1. The state utilities' consistent use of data-driven, often sophisticated approaches to the resource planning process were generally appropriate.
2. The gas operations of several utilities lag their electric counterparts in maturity of approach to resource planning, but these companies were making progress in closing the gap. We found existing implementation plans sound in closing the gap in resource planning capabilities.
3. Resource planning processes for identifying and understanding overall workload, including reliance on cost data as a measure of contractor work load, did not generally optimize the process of balancing resources. Consequently, we generally recommended enhancements in the companies' resource planning process to include developing quantitative FTE or person-hour estimates for forecasted contractor workloads.

Chapter V: Internal Staffing

A. Background

The planning for internal staff took place in connection with the total resource planning discussed in the preceding section. Moreover, much of the quantitative data and trend information addressed in that chapter applied generally to internal resources as well. While there was overlap, this section focuses on the internal staffing portion of total staffing. Internal staff represents the non-contractor resource contingent, craft and salaried employees, employed to execute core business functions. No "one size fits all" list of what should constitute core functions exists, but management must nevertheless apply sound, objective rationales and supporting processes in creating and using internal resources. Our process-based review of internal staffing examined long term planning processes, practices, procedures, tools, and systems employed to ensure the necessary levels of internal staff.

Staff complements reflect a complex interplay of factors, including those related to economics, customer demand, technological change, core and critical skill set needs, regulatory requirements and constraints, daily operational demands, safety, regulatory concerns, and corporate goals and objectives. In practice, however, many companies' staff complements, or the balance of internal, overtime, and contractor FTEs largely reflect a continuation of recent company trends.

Utilities have not often been subject to dramatic or rapid change. Nevertheless, simplistic processes do not produce optimum internal staff levels. Management must pursue ongoing examination of current and future work load, monitoring of new technologies and their potential impacts, with a keen awareness of internal and external demographic trends.

The concept of "available hours" has great significance in assessing internal resource requirements. One can calculate equivalent FTEs by dividing total hours needed (or worked) by hours available for work. Allowance for non-productive time has significant implications for productivity. New York's utilities do not have identical average available hours for internal staff. Available hours span an almost 10 percent range (from 1,650 to 1,810).

The state utilities were not exempt from the "graying" workforce phenomenon, but the data did not show a significant surge in retirements statewide. Nevertheless, the data did show the need for action to accommodate expected attrition. Current sources of technological and regulatory change further underscore the need to secure and retain younger, highly skilled staff comfortable with new technologies and business models. Staffing decisions need to rest on data and analyses.

The 2013 internal staffing expenditures for electric operations functions totaled $2.3 billion - - $1,210 million for capital, $900 million for O&M, and $180 million for engineering. The 2013 costs for gas operations functions totaled $803 million - - $400 million for capital, $300 million for O&M, and $70 million for engineering.

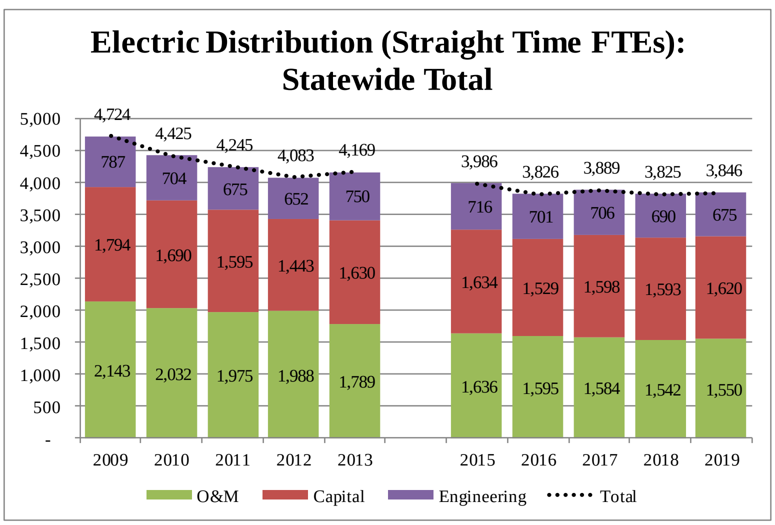
B. Evaluation Criteria

We evaluated internal staffing using the following criteria:

- There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.
- Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.
- There should exist sufficient sources of complete, accurate staffing information by region and by function.
- Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.
- Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.
- Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

C. Statewide Internal Electric Resources

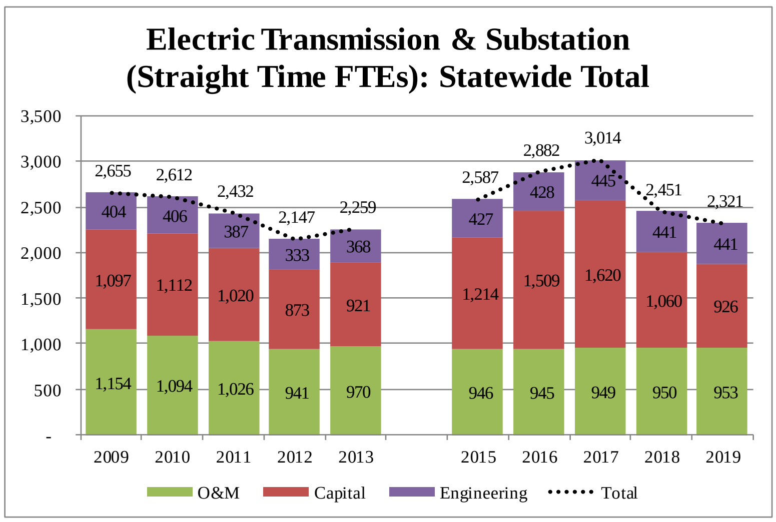
The next chart shows statewide historical and forecasted straight time staffing levels for electric distribution functions. Straight time FTE levels for electric distribution consistently decreased through 2012, with a small 2013 recovery. FTEs for capital, O&M, and engineering all decreased. Counting a small 2013 increase, a net decline equivalent to 12 percent occurred in the 2009-2013 period. Forecasts showed continuation of the drop in straight time electric



distribution activities FTEs by about another eight percent from 2013 levels. O&M work accounted for the biggest share of the projected decline.

Straight time as a share of the whole resource mix fell historically (from over 80 to less than 70 percent), while its share of capital work (about 60 percent) remained essentially the same. The 2012 drop in straight time O&M to below 60 percent was likely driven by efforts to recover from the effects of Superstorm Sandy. Forecasts showed no overall recovery in internal O&M, which remained flat at less than 70 percent through 2019. Forecasts showed increased reliance on contractors (the Reference Utility value moved from 20 to 25 percent). Forecasted overtime levels statewide showed a drop in percentage, with all but one company accommodating it through increasing contractor use.

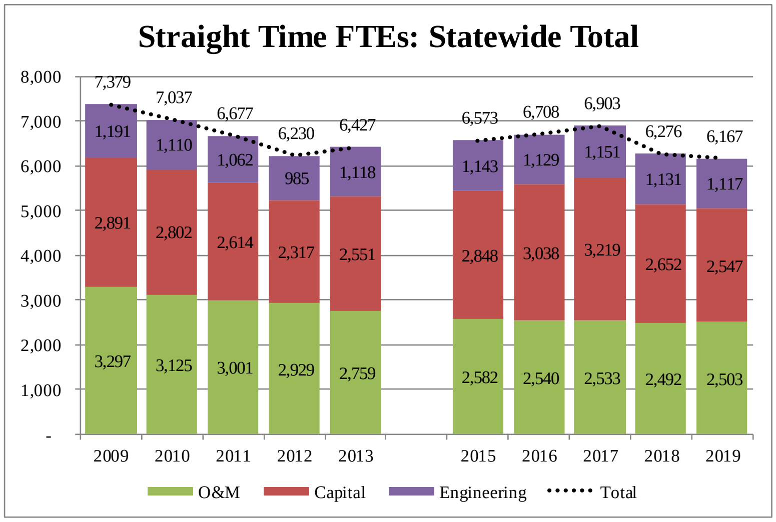
The next chart shows staffing levels for electric transmission and substations functions. Transmission and substation straight time workload declined significantly through 2012, as did distribution levels. A roughly 110 FTE increase occurred in 2013, with forecasts showing continuing, substantial increases 2017. Capital work absorbed these forecasted increases, as forecasted O&M FTEs fell back to 2012 levels following 2013, remaining there through 2019.



Straight time FTEs for capital work varied significantly, from a low of 873 in 2012 to a forecasted high of 1,620 in 2017. Engineering FTEs mirrored this pattern of variability. The pattern typifies the "lumpy" nature of capital additions for transmission and substations. As was true for electric distribution, stable percentages held for straight time capital FTEs, following a drop in 2010. They showed a level of approximately 35 percent of overall resources through 2019. Straight time FTEs for O&M work fell from a peak of about 90 percent in 2010, reaching 80 percent in 2013 and remaining there based on forecasts through 2019.

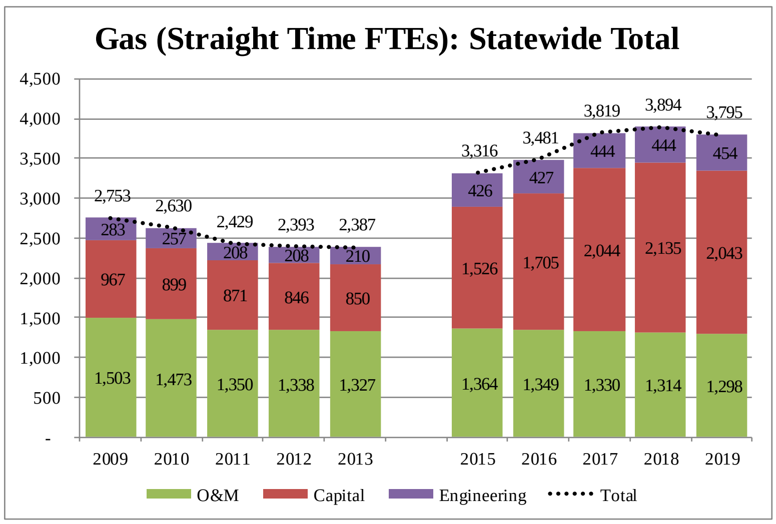
Comparing statewide 2013 and 2019 data show decreasing reliance on straight time resources, and an accompanying increase in reliance on contractor resources. The Reference Utility contractor use value increased from 36 percent to 40 percent of the total resource mix between 2013 and 2019, with straight time resources decreasing from 56 to 53 percent.

The accompanying chart combines staffing resources for electric distribution, transmission, and substation work activities. It shows that combined use of straight time FTEs decreased by 950 of 10,000+FTEs through 2013. Forecasts projected continued decreases in O&M. Forecasted 2019 straight time FTEs were 260 FTEs below 2013 levels. Forecasts also showed a statewide reduction in the percentage of straight time resources and an increase in the percentage of contractor FTEs.



D. Statewide Internal Natural Gas Resources

The following chart shows statewide historical and forecasted straight time staffing levels for natural gas functions we examined. Through 2013, straight time FTE levels consistently decreased, dropping by 366, spread across all types of work. Forecasted straight time FTEs showed substantial increases, peaking in 2018. Accelerated pipeline replacement programs drove most of a great projected increase that exceeded 60 percent. Forecasts for O&M straight time FTEs did not vary much. Across the whole study period, the drop was much greater (about 200 FTEs). In addition to pipe replacement as a capital work driver, some companies (particularly those downstate) also expected substantial new business work.



Forecasts showed a flat trend (just below 80 percent) in use of straight time FTEs for O&M work. Projections showed a reduction in straight time capital work FTEs (from 45 to 50 percent historically to 40 percent), reflecting the unprecedented increase accelerated pipeline replacement work, rather than changes in resource mix strategy.

E. Statewide Internal Staffing Observations and Conclusions

1. *Quantitative*

For statewide internal electric distribution and transmission and substation resources we determined that:

- Internal distribution and transmission/substations FTEs declined by close to 1,000 FTEs (more than 10 percent).
- Forecasts showed increases through 2017, peaking at 6,903 - - still well under 2009 levels of 7,379. Forecasts showed a further large drop to 6,167 in 2019, almost all in distribution.
- Overtime and contractor resources absorb some of the decrease, but we have concern about ensuring that continuing decreases in O&M FTEs will not lead to infrastructure decline or performance degradation.
- Generally, forecasts showed reduced straight time resources and modest increases in the contractor share of FTEs.

For statewide internal natural gas resources, we determined that:

- Overall FTEs fell by about six percent through 2013, with internal straight time FTES falling much more substantially (13 percent).
- 2013 straight time levels were lower than in 2009 (eight percent of the 4,500+ FTEs of total 2009 gas staffing resources).
- Forecasts showed substantial, equal increases in straight time FTEs (59 percent) and contractors (58 percent), peaking in 2018, dominated by accelerated pipeline replacement.
- We question the validity of resource drops following 2018 forecasted level; replacement programs extend to the range of 20 years, making it far from clear that resource levels can be expected to drop in high production years (the "sweet spot") of replacement programs.
- The forecasted increase for straight time FTEs (63 percent) was very aggressive, calling into question the viability of effectively accomplishing and supporting the increase.
- The size of that increase, considering the number of added contractor resources, underscores concern about ensuring access to sufficient resources for gas capital work.
- Very large forecasted increases in contractor FTEs over a period when gas operators throughout the region will also be ramping up resource needs, further demonstrate the difficulty of the overall staffing challenge that pipe replacement needs will continue to present.
- Increasing resource levels by this magnitude over such a short period, and the need to sustain them for a long time thereafter (should replacement efforts continue across the multi-decade durations contemplated) pose a great, and perhaps unprecedented industry challenge for management of New York's gas distribution utilities.

2. *Process-Based*

The companies generally showed a sound, comprehensive understanding of how coming work requirements related to and differed from those of the past. We found universal awareness of existing resource levels, how and where they were deployed, and what implications future changes in work might have. The state's utilities faced high rates of retirement eligibility, requiring close focus on critical skill sets. With one exception, the state's operations had systematic methods for determining where and to what degree they face significant levels of retirement. Approaches to training and development of existing resources appropriately addressed the technical and broader developmental issues needed to ensure appropriate growth in the capabilities of in-house resources.

Our specific statewide conclusions with respect to internal staffing processes are:

- The companies generally employed well-developed specifications of work requirements. We observed only one case of an essentially static view of internal staffing needs.
- The companies demonstrated strong knowledge and understanding of where and how resources were being deployed, and of how that deployment conformed to plans. This result conforms to what we see almost universally in the electric and natural gas industry, but nevertheless contributes to effective resource planning and management.
- Managing losses through retirement will remain here, as for the industry, a major challenge, but trends in tenure and work-force age, with some exceptions, are encouraging.
    - We found generally sufficient attention to the question of the "graying" workforce. We do, however, have a concern in one respect. Expansion of pipe replacement programs will increase widespread demand for skilled resources. All state gas operations need to ensure that Human Resources personnel work closely with line management to bring attention at the individual work group or worker type levels, by assessing likely increases in market demand, assessing where their current staff ages or numbers indicate problems, and tailoring responsive plans.
    - Two common risks that an aging work force brings do not appear generally in the New York data. First, data generally shows stable or slightly decreasing ages, despite growth in retirement eligibility. Second, the data also show that, with one exception, average tenure did not drop significantly through 2013.
    - We found two exceptions: (a) one company relies more strongly on depth of senior experience than on a centralized approach, increasing risks of loss of such experience; it needs to develop plans to ensure institutional knowledge transfer through well-defined means, and (b) one company could not report information demonstrating a comprehensive approach to identifying and addressing areas where it may face critical resource gaps in the areas we studied.
- Statewide, resource recruitment, training, and development focused appropriately on areas and types of people needed to ensure that internal staffing needs can continue to be met.

Chapter IV: Overtime

A. Background

Overtime contributes much less to costs than do straight time and contractor resources, but managing it effectively still contributes to optimizing staffing. Overtime levels of the operations we studied varied widely - - from nearly zero to what appear to be excessive levels. No single "right" answer exists to the question of optimum overtime levels. A simplistic 10-15 percent level has commonly applied, but good reasons exist for variances.

Two forms of overtime exist: "casual" and "planned." Casual overtime is generally very short-term in nature and responsive to perturbations in the supply of labor and the unexpected emergence of new demands. Management plans overtime when it serves longer term needs. The utilities emphasized the difficulty that emergencies pose in controlling overtime levels. The degree to which emergencies drive overtime, however, is a matter for analysis. Our review indicated that even generous allowances for emergencies left some companies with very high levels.

Overtime typically commands premium wage rates, with "time and a half" a prevalent level, increasing for higher levels of overtime or for work at certain times. Straight time and overtime hours do not have the same payroll adders, however (*e.g.*, employee benefits, vacations, insurance and retirement benefits, federal and state payroll taxes). These adders can approach 100 percent. Many of them are not additive for overtime. For example, if the adders on overtime are 35 percent, then the loaded costs of straight time and overtime hours become almost equivalent.

The applicable adders differ among the state's utilities, but the resulting, directly measured hourly rates vary narrowly - - across a range of ±15 percent. However, overtime brings other impacts that can affect costs, such as reduced productivity, fatigue, safety, and longer-term employee dissatisfaction. Productivity impacts become substantial as overtime levels rise above 20 percent on a sustained basis. Sometimes much reduced productivity makes sense, for example in a situation of widespread outages, where management may view any level of contribution to restoration as "worth the price."

B. The "Control Zone" Concept

We see the role of overtime as providing a fine-tuning capability around the chosen level of internal staffing. Overtime provides "a relief valve." Contracting, by contrast, predominantly fills the need for broad adjustments to internal staffing, not for fine-tuning them. Given that role, it becomes better to look at overtime in terms of a "control zone" around the budgeted level and not as a single absolute value. If overtime throughout the year stays within the control zone, then one can conclude generally that the fine-tuning objective has been met. If overtime strays outside the control zone for a significant amount of time, then overtime has not met its fine-tuning mission.

The control zone approach requires an appropriate setting of the zone, whose dimensions will vary according to the specific needs and characteristics of the operation involved. An established zone will identify a range around a budgeted value. Our examinations of the processes at the New York utilities did not find formal, structured, analytical approaches generally in place. Some exhibited levels of overtime that, at least on the surface, were discomforting. Sustained overtime exceeding 20 percent raises serious questions for us.

All the operations we studied employed some sort of process to determine the "right" amount of overtime. We consider it correct to question any standard above about 15 percent. More importantly, whatever optimum value a utility selects should become but the starting point for establishing a control zone having clear dimensions. The critical element becomes defining the zone's width. Too wide a zone precludes effective control; too narrow a zone diminishes value by giving too little room for inevitable variances. The historical distribution of overtime could provide a good starting point in defining the zone. One could apply a standard that 80 percent of the time intervals in a year (about 40 weeks) should exhibit overtime data falling within the control zone. One could from there establish the lower end of the range at five or so percent less. The acceptability of this range can be judged by two measures; it is ineffective if: (a) the historical average is inappropriately high or (b) the width of the zone is inappropriately large. Considering these two attributes is necessary to ensure that the zone can serve effectively as a fine-tuning mechanism to accommodate variations in workload and availability of internal personnel.

C. Evaluation Criteria

We evaluated each utility's use of overtime against criteria that flow from the principles discussed above:

- There should exist an analytically supportable method for determining optimum levels of overtime.
- Overtime planning and use should consider the relationship between amounts of overtime use and productivity and costs.
- Overtime determinations should be uniquely applied to differing work functions and types.
- Overtime use considerations should occur as a formal part of processes for identifying required resources.
- Overtime use should conform to assumptions used for determining resource requirements.

D. Statewide Electric Overtime Resource Levels

Four of the five state electric operations had sustained (five-year historical average) electric distribution overtime levels above 15 percent. Even the Reference Utility value exceeded 20 percent. Remarkably, two utilities had levels of 30 and 40 percent. Levels would remain high enough to cause concern even after accounting for emergencies, frequently cited as a major overtime driver. The two operations with the highest historic levels demonstrated, in essence, a permanent 52 - 56-hour work week sustained over five years. Such high levels provide a very strong indication of understaffing, which also makes it more likely that productivity issues existed as well. The transmission/substations pattern raised less concern, but the issue remained. Three utilities, including the Reference Utility, exceeded 15 percent over the five years.

Median overtime levels of more than 20 percent have persisted in distribution for many years, and spiked much higher in 2013. Forecasts showed a drop in the Reference Utility value to 15-20 percent. Those values remained high, and did not generate high confidence in their attainability. We commonly found projections of lower overtime accompanied by projections of no increase in internal resources. Transmission/substations overtime forecasts were problematic. Actual levels rose through 2013, and forecasts placed them at even higher levels.

E. Statewide Natural Gas Overtime Resource Levels

The gas operations made wide-ranging use of overtime, but at lower overall levels than their electric counterparts. Two high-end outliers used more than 25 percent overtime, with two at less than 10 percent. The Reference Utility value of 16 percent was not low, and unlikely to decline. Overtime for the Reference Utility did not change year-over-year historically, and remained flat according to forecasts. We found gas overtime forecasts more credible. No operations forecasted major declines, and those anticipating moderate declines appeared to have a reasonable basis.

F. Statewide Overtime Observations and Conclusions

1. Process-Based

1. For the most part, we found the group of utilities less aware of the importance of overtime; they do not apply the same level of planning and analysis to overtime, often treating it as an expenditure largely outside management control.

2. All operations had established overtime targets (from about 5 percent to 25 percent). These targets generally did not reflect the results of a structured process for setting them. The more common practice was acceptance of the historical level of overtime as a satisfactory basis for targeting future levels.
3. We did not see strong efforts to reconcile year-end actual overtime performance to current or coming budgets. Measuring and monitoring of overtime at the functional level was generally an area of weakness. Some even had difficulties in providing valid overtime information.
4. Management at all the operations had the experience and the ability to analyze overtime options on a real-time basis.
5. None of the operations fully met our two most significant overtime evaluation criteria; *i.e.*, employment of an analytically supportable method for determining optimum levels of overtime, and the consideration of the interrelationship among overtime, cost, and productivity in overtime decision-making.
6. A "control zone" approach to the management of overtime might be a more effective control scheme for some utilities, failing a better approach among the operations we studied.

2. Quantitative

1. Average workweeks exceeding 48 hours in electric and 46 in gas, on a seemingly permanent sustained basis, does not seem reasonable.
2. Wide disparity existed in how the state's utilities chose to use overtime, with some levels appearing excessive. Without substantial analytical work observed in seeking to define an optimum range for overtime, the rates of use by some operations simply were not self-validating.
3. The very high levels of overtime experienced by some indicate merit in improving the approach to overtime. We found a reasonably strong linkage between the adequacy of internal staffing levels and the use of overtime; declining trends in internal staff levels were often accompanied by rising levels of overtime, and vice-versa.

Chapter VII: Contractor Use

A. Background

Significant differences exist between employees and contractors as resources. Contractor rates already include adders that the contractor must pay to its resources. Seeking an equivalent effective labor cost for employees requires consideration of those adders and other costs. Management must judge equivalency after accounting for those costs already built into contractor fees for service. Work quality comprises a factor in choosing between contractors and employees. Utilities commonly determine that certain work activities have sufficient importance to warrant reserving their performance for internal staff. Practice varies widely and differing reasons. We did not see indication among the operations we examined of patterned overuse of or arbitrary designations.

Generally, there should exist no inherent quality bias in favor of or against employee versus contractor use. The general approach should look at quality difference risk, determine what it would take to manage it effectively, decide whether mitigation of the risk is sufficient, and consider the costs in providing mitigation when deciding what resource types to use. Factors driving contractor/employee choice include:

- *Workload*: by far the largest driver, with utilities generally staffing for base load work and using contractors for swing work (*e.g.*, winter month constraints on construction work, major storm response, construction of large new facilities.
- *Schedule Considerations*: time constraints often requiring added resources.
- *Specialized Skill Sets*: producing immediate, but not ongoing needs.
- *Lower-Skill, Repetitive, High Volume Work*: frequently requiring narrow, relatively low level of training or skills.
- *Opportunistic Cost Savings*: on occasions presenting one-off contracting as an option.
- *Bargaining Unit Considerations*: for example, a labor-agreement provision requiring overtime for employees when contractors are present.

Utilities use various pricing methods, matched to particular types of underlying work tasks:

- "Lump-Sum" and "Fixed Price" firm, fixed amounts for a defined scope of work, often used for large, complicated projects (*e.g.*, new substations and transmission lines).
- Unit Prices fixing the price for specified units of work, finding common use on high-volume work with readily measurable work units (prevalent for distribution work).
- Time and Equipment pricing offering rates by employee/equipment types, generally used for work of unclear scope or repetitive, unvarying activities (*e.g.*, street light repair).
- Cost Plus Pricing, with actual cost invoicing after completion (generally very limited).

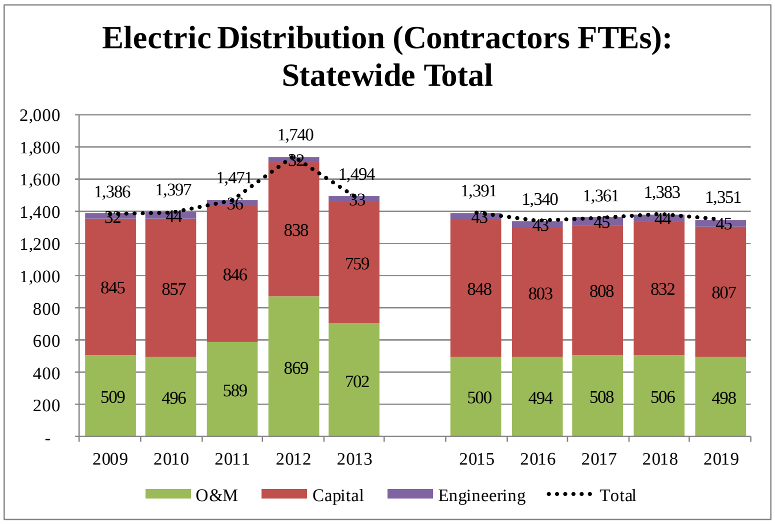
The 2013 contractor expenditures for the electric operations functions totaled $640 million - - $436 million for capital work, $186 million for O&M work, and $18 million for engineering work. The 2013 contractor expenditures for the gas operations functions totaled $550 million - - $469 million for capital work, $70 million for O&M work, and $11 million for engineering work.

B. Evaluation Criteria

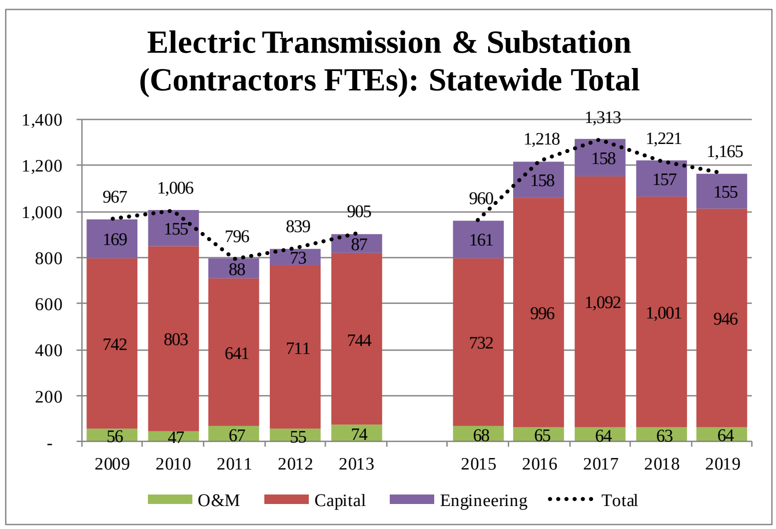
We applied the following criteria in evaluating contractor use.

- The level of contractor use and types of contractors retained should be supported by a strategy that considers factors including work volume, quality, timeliness, and costs.
- There should exist a data-driven understanding of comparative costs of contractor and internal resources, and a qualitative rationale supporting contractor use.
- Management should retain a sufficiently broad base of firms under contract, pre-qualified for work regularly performed by or contemplated for contractors.
- Where contractor (gas only) resources to meet anticipated future needs are limited, management should work to promote development of a skilled pool of resources.
- Contractor strategy should be supported by appropriate contractor management processes.

C. Statewide Contractor Electric Resource Levels



The accompanying chart shows contractor staffing resources for electric distribution functions. A dramatic O&M increase following Superstorm Sandy caused a spike in contractor FTEs. Otherwise, historical and forecasted levels showed consistent O&M FTEs. The ratio of contractor to internal FTEs showed increased use of electric distribution contractor FTEs, whose share of O&M increased by 13 percent between 2010 and 2011, and was forecasted to increase through 2019. Compared with 2013 levels, forecasted 2019 data showed increased reliance on external resources, with the contractor Reference Utility share increasing from 20 to 25 percent of the resource mix. Most state electric operations projected reduced overtime by increasing the percentage of contractor FTEs (four companies) or straight time FTEs (one company). By 2019, most companies forecasted a move into the 20 to 25 percent range for contractors, with one expecting an increase to 45 percent.

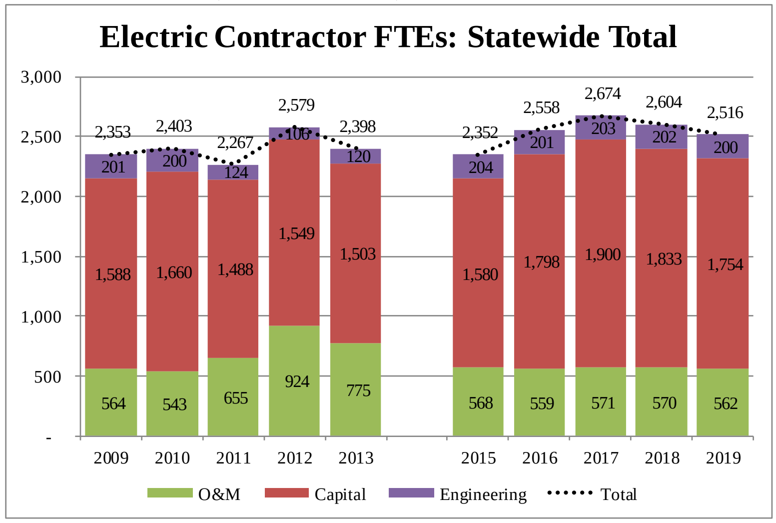


The accompanying chart shows contractor staffing resources for electric transmission and substations. FTEs declined dramatically through 2011, as contractor distribution FTEs increased. The coincidence in the shifts shows the ability to move contractor resources among work types. Following 2011, and continuing under forecasts, transmission and substation contractors showed gains through 2017. Contractor O&M and engineering FTEs showed stability between 2009 and 2019. Contractor FTEs for capital work showed significant variance historically and as forecasted. This pattern typifies transmission and substation construction programs, where the number and sizes facilities under construction in any given year prove highly variable.

As a share of the whole staffing resource mix, O&M FTEs rose moderately, but still only reached six percent on a forecasted basis. Contractor FTEs as a percentage of capital work also increased by about 10 percent through 2013, with forecasts showing them steady at levels at just below 60 percent (marginally below their 2013 levels). Comparing the 2013 to 2019 data showed an increase in contractor FTEs from 36 to 40 percent of the total resource mix. Utilities expected to reduce overtime by increasing either the percentage of contractor resources (four companies) or by increasing straight time resources (one company). By 2019, most companies forecast moving to the 25 to 40 percent range for contractors, with one expected to increase to 73 percent.

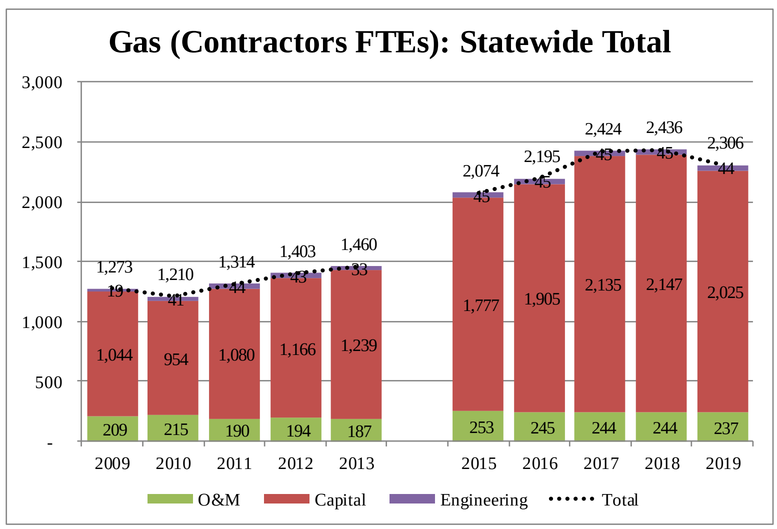
The accompanying table shows combined distribution, transmission, and substation work:

- Overall contractor FTEs increased modestly through 2013 (45 FTEs, or two percent)
- Forecasts showed an increase of 118 contractor FTEs (five percent above 2013 levels)
- Forecasts showed reduced overtime but increased contractor percentages, with an increase of contractor FTEs to 2,600 between 2013 and 2019.



D. Statewide Contractor Natural Gas Resource Levels

The following chart shows contractor FTEs for gas operations functions for the period 2009-2019. Contractor FTE levels increased by 187 through 2013, with forecasts showing a substantial further increase, peaking in 2018, driven predominately by accelerating pipeline replacement programs. Forecasts showed 2018 total contractor FTEs approaching almost 1,000 higher than 2013 levels of 1,460. Forecasted O&M contractor FTEs also increased (by 50 FTEs). New business work contributed to forecasted capital FTE increases, especially among downstate utilities. The data create significant concern, as we addressed in discussing total resources earlier, that the strain on the pool of available resources will prove very challenging.



In comparing contractor and internal FTE resource shares of work, we observed a small historical decrease in the contractor share of O&M (12 to 10 percent). Forecasts showed this percentage returning to 12 percent. The percentage of capital work performed by contractors increased from 42 to 50 percent historically, and forecasts showed it increasing further, to about 58 percent. All but one of the state's operations forecasted increased relative use of contractor FTEs. Straight time and overtime FTEs also increased on an absolute basis, but not as fast as contractor FTEs.

E. Statewide Contractor Use Observations and Conclusions

1. Quantitative

For statewide electric contractor use we determined that:

- Overall electric contractor FTEs decreased substantially through 2013, with 2013 FTE levels down by 800 FTEs, or eight percent of the statewide total of 10,000+ FTEs.
- Forecasts projected continued decreases in distribution workload (about 400 FTEs) and continued increases in transmission and substation workload (about 250-600 FTEs).
- The combination of these two types of workloads produced significant year-to-year variations, but projected electric business FTEs statewide remained within a few percentage points of 2013 FTE levels.
- Forecasts showed reduced reliance on overtime and a modestly increased relative percentage of contractors.
- On an absolute basis, forecasts showed an increase of roughly 100 (from 2,400 to 2,516) in contractor FTEs, as compared with 2013 levels.

For statewide electric contractor use we determined that:

- Overall combined gas FTEs (straight time, overtime, and contactor) decreased modestly through 2013, with 2013 levels six percent lower than those of 2009.
- As internal FTEs (straight time and overtime) dropped steadily (by 366 and 83 FTEs, respectively), contractor FTEs increased by 187 FTEs.
- Forecasted FTEs showed a substantial contractor increase, beginning in 2015 and peaking in 2018, driven largely by accelerating pipeline replacement programs.
- Projected 2018 total gas workload was 2,931 FTE higher than 2013 levels, with the nearly 70 percent increase spread among all types of staffing resources - - 1,450 straight time, 420 overtime, and 960 contractor FTEs.
- Forecasts showed higher reliance on contractors in the future, increasing from 30 percent of the resource mix in 2013 to 33 percent by 2019.
- The pattern forecast by all but one of the state's nine gas operations increased the relative use of contractor resources.
- While forecasts showed overall FTEs for straight time and overtime increasing significantly above historical FTE levels, contractor FTEs showed a faster increase.
- The substantial forecasted increase in contractor FTEs creates substantial concern because of the companion increases forecasted for internal resources and the competition among utilities throughout for pipe replacement resources.
- Achieving these increased contractor levels in such a short period of time will be difficult, given severely competing demands on the resource pool.

2. Process-Based

1. New York electric and gas utilities' contracting strategies, approaches for maintaining qualified resource pools for contractors, and contractor management processes were, for the most part, appropriate.

2. New York gas utilities were not paying sufficient attention to the challenge of expanding the available contractor resource pool required to meet the near-term challenge of significantly ramping up contractor resources to support accelerated pipe replacement programs. We have concern that the inability to expand contractor resources quickly will slow the progress of the planned pipe replacement efforts and place additional strains on internal staffing resources, especially overtime levels. Consequently, we generally recommended that New York gas utilities explore methods and approaches to increasing contractor resource pools beyond current levels to meet the demands of accelerating the pipe replacement program.
3. A few New York gas companies had begun some efforts to pursue these goals including relationship discussions with contractors, extending contract terms to five years, and limited cooperative training with local schools. It is imperative that each company recognize these challenges and develop plans to significantly increase the size of qualified labor to staff both contractor and internal staff requirements.
4. Program and project approaches, organizations, staffing, systems, tools, processes and oversight sufficient to support business-as-usual will not adequately serve the staffing needs of accelerated main replacement programs.
5. The electric and gas utilities were not making regular use of ongoing, structured analyses of contractor use effectiveness at the functional level. They should develop ongoing data-driven methods for comparing the equivalent cost of each in accomplishing different work types. Consequently, we generally recommended enhancement in the capability to conduct ongoing, data-analysis to evaluate trade-offs between contractors and internal staff.

Chapter VIII: Main Replacement Programs

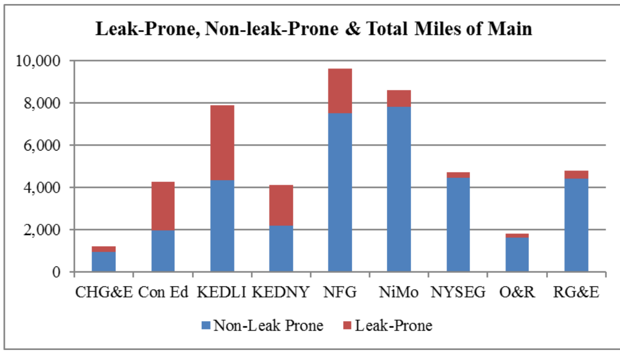
A. Background

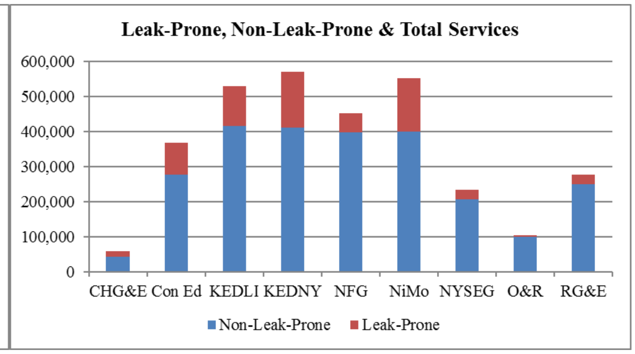
Thousands of miles of high-risk pipe remain in operation, with New York facing, as the accompanying chart shows, a proportionately high percentage of that mileage. The start of the 21st century found many utilities conducting loosely defined programs that would have left much leak-prone pipe in the ground for many decades. We now see the growing introduction of *accelerated main replacement programs* that contemplate much shorter periods. This Commission established a statewide goal for utilities, on average, to complete their replacement of leak prone pipe within 20 years.

Percent of Leak-Prone Pipe

Pipe Type	US	New York	
Miles	*Miles*	*Miles*	*Percent*
All Types	1,255,257	48,051.7	3.8%
Cast Iron	30,904	4,254	13.8%
Bare Steel	56,879	7,407	13.0%

The next charts show the great magnitude of the challenge facing the state, using 2013 data. CECONY, KEDLI, KEDNY, and NFG had more than 1,000 miles of leak-prone pipe - - some of them several times that many. The state's number of leak-prone services was also remarkable, with several utilities having more than 100,000. Our examination of replacement rate forecasts in this study indicated the earliest of the company completion dates at 2022 and the latest at 2046.





Given the vast magnitude of the programs facing many of the state's natural gas companies, we found it unusual, and from our perspective unacceptable, that many utilities appeared to treat such huge programs in a "business-as-usual" fashion, adding to concern about whether adequate, efficiently applied staffing will be put in place and managed effectively.

Our examination of productivity in selected gas functions, addressed below, adds to the concern. The very large disparity in productivity we found among the utilities appeared too large to attribute solely to the physical characteristics of the systems. Those differences in productivity underscore the need for close attention to ensuring effective execution of program and project management approaches, organizations, resources, systems, and tools. New York gas customers will bear responsibility for many billions of dollars in replacement costs, making the staffing, productivity, and other challenges involved matters of first priority.

B. Conclusions

1. Pipe Replacement programs, despite their long-term, high cost nature, were generally managed as routine projects. We did not find a dedicated program- (and associated project-) management approach or structure. The lack of a true program approach (supported by organizations, resources, systems, tools, controls, and oversight) will tend to drive up costs and slow progress. Each utility's program should have a staffing plan, a reporting and analysis program, comprehensive production and productivity measurements, and separate project management for larger companies, or specific assignments for smaller companies.

2. It was difficult to reconcile pipe replacement data and the ability to report replacement information was inconsistent. Utilities must file with PHMSA an annual report listing, among other things, the compositions of their transmission and distribution systems by material. Comparing changes in year-over-year inventory reported to PHMSA with the data provided by managements in this study exhibited significant discrepancies at some companies. Consideration should be given to requiring annual reconciliations of pipe replacement quantities reported to the Commission and PHMSA.

3. Many of the gas operations we studied exhibited gaps in tracking of pipe replacement performance, including applied staffing and productivity. The utilities' reporting systems were, for the most part, not up to that task. They typically captured production and cost data separately, did not combine the two on a project or aggregate basis, and did not segregate pipe replacement from other construction activities.

4. The connection of long-term staffing plans to rate case cycles obscured a view of future requirements, and could serve to misdirect staffing optimization if relied upon by those responsible for planning. We found the credibility of future staffing plans questionable. No utility could point to a long-term plan, either filed with the Commission or for internal use, addressing overall pipe replacement efforts programmatically over the total duration of the required efforts to eliminate all high-risk pipe.
5. Cooperation and sharing of knowledge about pipe replacement programs among utilities was minimal. There did not appear to be any significant sharing of experiences and best practices among New York utilities or between New York and non-New York utilities. The state's utilities should create a mechanism for cooperation, moderated by Commission staff if needed to overcome initial management reluctance.
6. Based on then-current staffing projections, the state's gas utilities faced significant risks of shortages in trained and qualified employees and contractors. The ramping up of programs in New York and surrounding states will further increase demand for skilled field workers, as well as engineering and technical staff. Most of the utilities seemed aware of this threat, and were taking some actions, but the magnitude of the problem required more aggressive actions.

Chapter IX: Quality of Service

A. Background

New York utilities annually report a series of service quality measures to the Commission. The latest reports available when we performed study field work address the year 2014. We looked at how reliability, as those reports address it, changed over our historical period, seeking to determine whether any correlation existed between changes in applied resources and changes in the results as reported to the Commission. We also looked at how quality measures trended, even where they remained above floor levels (which they did, with few exceptions). In cases where data suggested a connection between staffing and quality, again particularly where declining trends existed, we examined management's forecasts of staffing resources from a reliability perspective.

For electric operations, we chose not to use SAIFI (System Average Interruption Frequency Index) - - measuring the average number (frequency) of interruptions customers experience. Outage frequency consequences of staffing curtailment delays of perhaps many years make it impossible to connect staffing changes and outages over short durations. We used CAIDI (Customer Average Interruption Duration Index). It sums all the durations of all customer outages (usually across a period of a year), and divides that sum by the number of customer interruptions experienced.

For gas operations, we selected leak response times and leak backlogs. The gas utilities have widely varying customer densities, territorial dispersions, and approaches to leak repairs. We relied more on internal trends (*i.e.*, comparing the company's performance to itself year over year).

B. Findings and Conclusions

Three electric operations showed steady or improving CAIDI performance, giving no service-quality basis for questioning staffing. Two showed contemporaneous declines in CAIDI performance and O&M staffing. We found management attention needed to determine possible connections, and whether forecasts of future applied O&M FTEs appeared responsive.

The data were more mixed for gas operations. Some historical declines were followed with increases in forecasted applied FTEs. In other cases, the changes were small, and would have raised no concerns in the absence of staffing drops. In others, 2014 data showed marked improvements, but we nevertheless examined whether staffing forecasts gave confidence that such improvements would be sustainable. Statewide performance (measured by the Reference Utility) in response times showed remarkably little change overall.

Chapter X: Productivity

A. Background

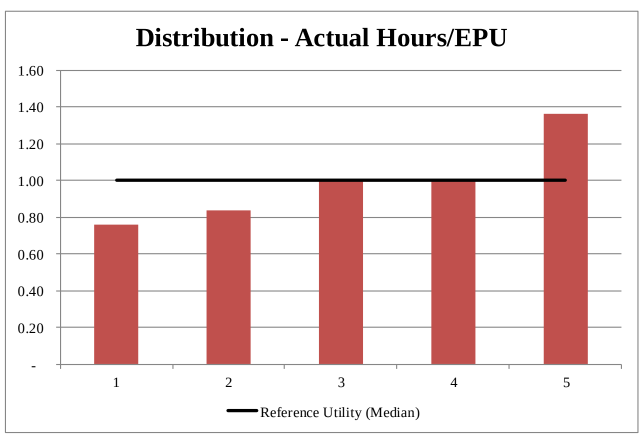
Comparative analysis of productivity, generally through benchmarking studies, has been regularly attempted, but may be known as much for the methodological questions it has raised as for the confidence inspired by its results. We attempted such analysis here, given the advantage of a contained population of utilities operating under a number of common parameters and the ability to generate a common set of data for each. We applied three essential concepts in this analysis:

- **New York normalized unit rates (NYNURs or 9ers):** parameters describing cost, production, and productivity, normalized to facilitate comparisons.
- **Equivalent production units (EPUs):** a common measure of production to permit comparisons of dissimilar commodities and functions.
- **The Reference Utility:** a hypothetical utility having characteristics common to the New York utility population, based on use of the median of data values for a range of attributes.

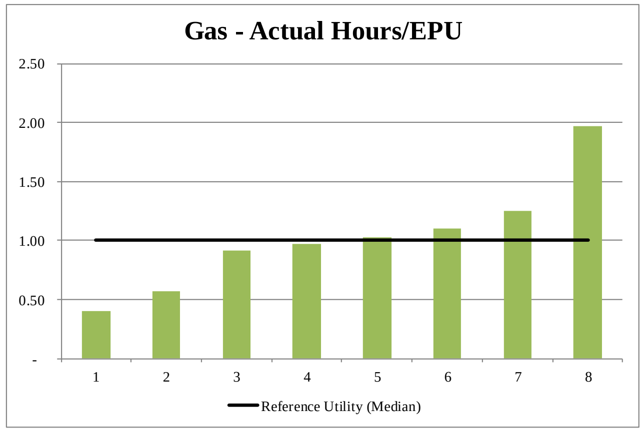
We found that the state's utilities generally did not collect data required for complete analysis of production and productivity. Data limitations allowed us only to analyze half of the hours and costs of the functions and activities we studied. We could only derive useful results for distribution work on the electric operations side. We established composite hourly labor rates, finding them to vary more than we expected. Our productivity work provides indicators of where to look for potential productivity improvements, but not conclusive determinations of productivity effectiveness. In general, we found contractor costs higher than internal costs, but not by a large amount.

B. Observations

Our EPU method allowed different commodities and units to be measured on a common, additive basis. Converting all to a common hours basis enabled us to combine disparate production quantities. The accompanying chart shows the significant variation we saw in productivity among the electric operations, but the spread proved interesting, amounting to about 60 percent, which shows that varying productivity has material cost significance.



Our analysis can only show *relative* performance among the five. The comparative results provide a reference point, but not a definitive answer.



The spread of gas productivity results was even greater, as the accompanying chart shows. Variability in electrical results was significant, but gas results have a greater spread, with the high exceeding the low by a factor of more than four. There exist reasons to justify some of the spread (*e.g.*, upstate versus downstate, high versus low customer density). Nevertheless, the gap points to the value of continuing Commission attention to productivity, particularly given the many billions in costs that main replacement programs will bring over a sustained time period. No one should expect all utilities to perform equally here, given their unique challenges, but variations in the magnitude we observed point to the staffing challenges in the years ahead and, for other purposes show that continuing attention to work effectiveness and efficiency can have major consequence for customers. A focused statewide effort to assure optimum productivity at all the companies is in order.

C. Conclusions

1. The lack of consistent collection and reporting of production quantities and associated hours limited the ability of utilities to understand their performance. We therefore generally recommended that the utilities improve internal systems and processes to: (a) define production quantities in all functions or groupings of functions, (b) collect that data routinely, and (c) collect the associated hours and costs. Staff may wish to consider the applicability of the 9ers concept to its monitoring and oversight of utility performance (see the next conclusion).
2. The 9ers concept has (subject to resolution of data issues) validity as a tool for the comparative analysis. The utilities should examine the 9ers concept for internal applications. Staff may wish to consider requiring certain data, such as that collected in this study, and distributing the Reference Utility data to the utilities for their internal analyses.
3. Very large variances exist in physical productivity of the gas utilities, pointing to the need for close examination of work efficiency and effectiveness in relation to staffing. Such a large disparity is unlikely to be fully explained by unique factors outside management control. Efficiency differences were so wide that even small changes could produce large savings.

Chapter XI: Reforming the Energy Vision

A. Background

Reforming the Energy Vision (REV) represents a comprehensive and transformative initiative that aims to align New York's electric industry practices and regulatory model with technological advances in information management and power generation and distribution. The REV initiative proposes redesign of electric markets and regulatory practices and grid modernization to better meet 21st century challenges. Distribution level functions required include: (a) market operations, (b) grid operations, and (c) integrated system planning with modifications to enable the DSP market development. The Commission has required REV-related filings in 2016.

The state's electric utilities were in the midst of process changes that will significantly transform the industry in New York. We examined each utility's approach to addressing how the companies have, or are planning to, address REV's impacts on utility staff levels, skills, and capabilities. The state's utilities have identified areas that raise potential new or increased staffing needs, including:

- Program management and leadership
- Data analytics
- Business development
- Technology specialists (*e.g.*, AMI, data exchange, cyber security)
- Instrumentation, controls, and communication
- Grid Operation
- Customer service.

B. Evaluation Criteria

We addressed utility REV related activities and plans using the following staffing related criteria:

1. Have organizational changes been made to respond to the REV initiative and are they adequate for the current stage of REV?
2. Have studies or assessments been completed by the utilities to determine expected REV staffing requirements?
3. If completed, are there any significant, actionable results?
4. Does REV thinking and planning on staffing permeate the organization?
5. Have REV related training needs been identified, planned, or begun?

C. Conclusions

1. None of the companies had made REV-related changes to operations staffing in the areas we have examined; CECONY and ORU were the only companies to have made significant organizational changes to address REV. Management at all companies considered it too early to gauge and plan for REV-related staffing changes in the 2009-2019 horizon of our study. None had made such changes, but CECONY created (and ORU has access to) a very large Distributed Resource Integration group under executive leadership. All, except Central Hudson and NFG appeared to have examined REV and other major sources of industry structural or technological change in a reasonably focused manner.
2. Some studies of REV's impacts had been performed, but none addressed staffing implications. None of the state's utilities had identified specific areas or work activities whose staffing requirements will be affected by REV through the 2019 end of our study period.
3. None had identified or initiated training or development needs associated with REV or similar initiatives. Not having yet identified needs for staffing changes, none had a basis for doing so.

All the operations we studied (save NFG) need to undertake scenario studies of the impact of REV and other similar type changes, to better prepare for multiple possible eventualities.

Chapter XII: Workforce Management and Performance Measurement

A. Background

Workforce management ("WFM") has become increasingly important in optimizing the efficiency and effectiveness of human resources. Current conceptions of WFM at large enterprises contemplate a broad range of systems, processes, and activities to optimize work effectiveness and efficiency. Automation and integration have become increasingly more sophisticated and prevalent. Even smaller companies unable to justify the large expenses of more sophisticated approaches and systems need to address the central elements of workforce management. WFM encompasses efforts to manage performance, forecast and schedule work and resources, budget labor, quantitatively analyze the time and the schedule of work activities, and track the workforce. Managers need to define and regularly use means for measuring outputs (work units accomplished) relative to resource inputs (productivity, or efficiency). Measuring production requires first that the utility define applicable units at a suitable level of detail.

B. Evaluation Criteria

We formed our conclusions using the following criteria:

- The systems and tools used to support workforce management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.
- Comprehensive, adequate documentation of the work management processes, systems, and tools should exist, and be supported by appropriate training.
- Management should have and regularly employ well-defined processes for the short-and long-term planning and scheduling of capital and O&M work.
- Management should apply an appropriate approach, resources, and methods to program and project management.
- Systems and tools should capture and enable the analysis of data respecting all types of staffing resources.
- There should exist an appropriate approach to and organization for Quality Assurance and Control.
- Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness in resource use and balancing.

C. Conclusions

Our conclusions here address more routine work elements, with pipe replacement's special circumstances addressed in the Statewide Main Replacement chapter.

1. With some exceptions, workforce management approaches, systems, and tools generally supported effective staffing. Where management audit recommendations addressed particular gaps, we found approved plans for responding to them. We also found a few other gaps already subject to specific improvement initiatives.
2. Only one operation had a mature, systematic, comprehensive approach to performance measurement. Half the remainder used a system of key performance indicators (KPIs) for high-level measurement, but not at a level effective for use for staff resource planning on a comprehensive basis. The other half were in in the process of implementing KPI systems.

3. We recommended as a first priority, for all but one operation, development of detailed performance measures for pipe replacement. For those same operations, we recommended development and execution of plans for capturing work unit measurements more comprehensively in all areas that we studied.
4. The common need for enhanced performance measurement raises what may be a useful opportunity for the Commission as well. Utilities have developed their own systems for cost and production data collection. They tend not to be broadly comparable. With a need for statewide improvement generally, comparability may be an option, if common efforts are undertaken to define units and how to measure them. This information may give Commission staff a strong tool for comparing and analyzing data among companies. We identified a list of measures and the experience of the single state utility with a high level of performance in this area as starting points.

Company Reports: Summary of Individual Utility Findings, Conclusions, Recommendations, and Best Practices

A. Background

The executive summary of the statewide report describes the nature, scope, and methods of our examination of staffing at New York's electric and gas utilities. It also provides substantial background information about these utilities collectively and individually. We invite attention first to that executive summary, in order to place in context what we summarize here. Specifically, we provide here a list of utility-specific findings, observations, conclusions, and recommendations in those cases where our conclusions suggested the potential for improvement in optimizing staffing.

Our work also disclosed a number of best practices at many of the utilities we examined. We summarize those here as well.

Given the confidential nature of much of the information about the utilities at the individual level, our final version of this summary will be split into a separate document for each of the individual utilities.

B. Avangrid

1. Quantitative Observations and Conclusions

1. Size-based attributes place Avangrid electric operations roughly third and fourth, with staffing generally corresponding in relative ranking; ***NYSEG*** is comparatively very low in customer density, while ***RG&E*** approaches the Reference Utility value.
2. For gas operations, ***NYSEG*** is not by far the lowest in density, but also has a particularly high level of discontinuity. ***RG&E*** lies well below the Reference Utility, but in the middle of the pack, because the high density of the downstate gas operations dominates.
3. ***NYSEG*** electric distribution FTEs fell in 2010, and then remained stable through approximately 2013, but O&M FTEs fell by a very significant 30 percent through 2013; forecasts showed a significant drop by 2015, with increases bringing internal FTEs to about 2013 levels by about 2019.
4. Forecasted ***NYSEG*** contractor FTEs more than doubled by 2019.

5. ***RG&E*** electric distribution FTEs began and ended the 2009-2013 period at roughly the same overall totals, but with a shift away from O&M and toward capital work.
6. From 2009 to 2013 ***RG&E*** internal resources dropped by about a quarter, with most picked up by contractors.
7. Total forecasted ***RG&E*** distribution FTEs showed a 10 percent reduction, with O&M work accounts the whole reduction; forecasts show internal ***RG&E*** resources at about two-thirds of the 2013 levels, and at closer to half of the 2009 levels, with contractors becoming roughly equivalent to internal resources in number.
8. ***NYSEG*** and ***RG&E*** CAIDI performance remained within the standard, with NYSEG improving and RG&E stable, despite O&M FTE reductions.
9. On balance, ***NYSEG*** and ***RG&E*** electric and gas staffing appears reasonable
10. Nevertheless, forecasts of required ***RG&E*** electric O&M resources appear anomalous and distribution engineering FTEs appear too low at ***RG&E*** and too high at ***NYSEG***, raising questions of adequacy or cost allocation.
11. Measures of workforce efficiency indicate that both are efficient in comparison to their peers.
12. ***NYSEG*** and ***RG&E*** have planned and managed overtime effectively on (a) an absolute basis, (b) in comparison to their peers, and (c) versus internal targets; ***NYSEG*** overtime levels have been especially well contained.
13. The 30 percent target for electric contracting (as a percentage of total FTEs) was not consistent with the current staffing plans.
14. ***RG&E*** electric contracts more work on a percentage basis than other state electric utilities, and is planning to widen that gap in the years ahead.

2. *Quantitative Recommendations*

1. Review comparative distribution engineering staffing at ***NYSEG*** and ***RG&E*** and determine the optimum level at each company, assure adequate cost allocations, and (c) justify lower ***RG&E*** electric O&M forecasts.
2. Determine the optimum level of contracting at each company, replace the 30 percent target as appropriate, and (c) adopt measures to manage to the new level.
3. Evaluate the relatively high levels of contracting in ***RG&E*** electric and, if such levels are deemed appropriate, explain why ***RG&E***’s circumstances differ to this degree from the other state companies.

3. *Resource Planning Conclusions*

1. The Avangrid utilities used a sophisticated approach to resource planning and its processes.
2. Planning processes for identifying overall workload, including reliance on cost data as a measure of contractor work load, did not optimize the process of balancing resources.
3. Avangrid was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use.

4. *Resource Planning Recommendations*

1. Enhance resource planning processes to include a more complete understanding of total workload, including expanded measures of contractor work load to include FTE- or person-hour based values.

2. Include in resource plans data driven analyses to evaluate the trade-offs for overtime, contractors, and internal staff.

5. Work Force Management and Performance Measurement Conclusions

1. Management employed a work management approach, systems, processes, and tools that appropriately supported staffing optimization, and work management system documentation and training were appropriate.
2. ***NYSEG*** and ***RG&E*** electric and gas operations employed an effective approach, structure, and resources for project management, performed scheduling effectively, and used appropriate program and project performance monitoring.
3. ***NYSEG*** and ***RG&E*** electric and gas operations appropriately located and addressed the roles of quality assurance and control.
4. ***NYSEG*** and ***RG&E*** performance measurement were comparatively strong, but did not fully support staff optimization.

6. Work Force Management and Performance Measurement Recommendations

1. Develop and employ comprehensive performance measures for pipe replacement and use the information to plan for resources required to complete replacement timely and efficiently.
2. Improve performance measurement across the electric and gas functions.

7. Internal Staffing Conclusions

1. ***NYSEG*** and ***RG&E*** had comprehensive and sufficiently detailed forecasts of work requirements to identify likely resource requirements.
2. Capital and O&M work forecasts had an adequate factual and analytical foundation to support staffing projections and management had a source of complete and accurate information about staffing by region and by function.
3. Forecasts existed of likely losses through attrition and retirement of internal resources and attrition forecasts were consistent with experience; management had a sufficient grasp on likely skills and experience gaps.
4. Training and development programs were sufficiently robust to provide adequate support for long term staff requirements, but some key performance indicators are lacking.

8. Internal Staffing Recommendations

1. Particularly for ***NYSEG***, address the availability of sufficient numbers of seasoned gas salaried employees to serve in mentoring and similar roles for an internal staffing complement forecasted to expand greatly.
2. Develop key performance indicators that measure the effectiveness of efforts to achieve staffing targets and assign accountability to appropriate individuals.

9. Overtime Use Conclusions

1. ***NYSEG*** and ***RG&E*** provided a significant level of planning, monitoring, and oversight to the management of overtime and have demonstrated good analytical capabilities, but did not use analytically supportable methods for determining optimum levels of overtime.

2. Management did not routinely consider the interrelationships among overtime, cost, and productivity in overtime decision-making, or overtime planning and analysis at the functional level.
3. Overtime use was a formal part of the process of identifying required resources, and conformed to assumptions used for determining resource requirements.
4. Management considered overtime as an element of the resource stack, and plans its use on a basis integrated with the other resource elements.
5. Overall management of overtime was sound, featuring good performance versus aggressive targets and consistent results that are among the best in New York.

10. Overtime Use Recommendations

1. Seek more analytically supported methods for determining optimum overtime levels.
2. Adopt an approach ensuring that it includes all relevant factors in its decision-making vis-à-vis overtime.

11. Contractor Use Conclusions

1. The combined ***NYSEG*** and ***RG&E*** contractor/internal mix goal for electric work did not support an informed, balanced contracting strategy.
2. Use of contracted services in gas operations was generally consistent with industry practice.
3. The use of time and equipment rates for distribution line contractors did not tend to optimize cost performance.
4. ***RG&E***'s lack of a strong in-house core of distribution engineering was anomalous.
5. Management employed a reasonable number of electric contractors.
6. The ***NYSEG*** and ***RG&E*** base of contractors for gas construction was adequate for current circumstances, but management has not taken steps to increase the number of resources available to support its construction program.
7. Management did not have a contractor oversight organization in place for electric or for gas operations.
8. ***NYSEG*** and ***RG&E*** did not link gas contractor compensation to performance.

12. Contractor Use Recommendations

1. Disaggregate the combined ***NYSEG*** and ***RG&E*** contractor/internal mix goal for electric work.
2. Solicit unit pricing for distribution line contracts.
3. Comprehensively and formally analyze the costs and benefits of expanded in-house, core distribution engineering expertise.
4. Develop and implement plans that fully support pipe replacement resource needs.
5. Implement a centralized contractor oversight organization.
6. Pursue an incentive/disincentive system linking gas contractor compensation to performance.

C. CECONY Summary

1. Quantitative Observations and Conclusions

Electric

1. CECONY's small service territory and very high customer numbers combine to give it a customer density perhaps two orders of magnitude above a more typical utility. That density,

combined with unique electric infrastructure consequences (*e.g.*, a proportionately very high percentage of underground lines and a proportionately much smaller number of substations), produces for CECONY unique defining characteristics.

2. Despite these factors CECONY lies at the median in overhead distribution miles; with most of those lines in Staten Island and Westchester, CECONY looks in many respects like two very distinct electric operations.
3. Measured against all size-related attributes, CECONY's electric operations are more than six times larger than the Reference Utility and more than double the next largest operation.
4. CECONY also provides gas service over a small footprint in a densely populated area, giving it a very high customer density.
5. Electric distribution FTEs dropped (by almost 10 percent) historically through 2013 (more so through 2011), affecting all resource types, but most significantly pronounced in internal versus contractor FTEs.
6. While all distribution resources were declining, there had been a slight shift away from reliance on contractors in the resource mix; transmission/substations work showed an increased use of contractors but at the expense of overtime, not internal straight-time FTEs.
7. The magnitude of the decline calls attention to staffing sufficiency, given its coincidence with a decline in CAIDI performance (an increase in restoration times).
8. Management forecasted a significant, sustained reduction in total electric distribution staffing through 2019, affecting affect both internal and contractor resources (but the latter significantly more so).
9. The split nature of CECONY's territory produces separate electric reliability standard for overhead and underground networks. The latter have the advantage of making customer interruptions far less frequent but take longer to correct.
10. Material reductions in electric distribution resources generally corresponded to declining CAIDI performance. Through 2014, network CAIDI performance declined by 25 percent and radial performance by five percent.
11. The lowest productivity, despite very competitive hourly labor rates left CECONY with the poorest productivity, measured by cost per earned production unit.
12. Plans to contain distribution overtime in the future are positive, but: (a) may not be practical in light of declining staff, and (b) nevertheless remain in the 20 percent range; given already-high levels of overtime in transmission/substations, forecasts of further increases are problematic.

<u>Gas</u>

1. Natural gas FTEs witnessed the same large drop seen on the electric side through 2011, all in internal resources, as contractor FTEs remained generally the same. Driven by contractor growth, total 2013 FTEs had returned to 2009 levels, while internal FTEs continued to fall.
2. These changes occurred during a period of declining performance as measured by leak backlogs and leak response times.
3. Management forecasted a large total FTE increase peaking in 2015, and then steadily declining through 2019 (when total FTEs would return to a level within two percent of 2009 FTEs).
4. CECONY had by far the highest leak backlog at the end of 2014, experiencing a large spike that year. Management planned to materially increase leak repair resources, with steady moderation following an expected 2015 peak.

5. From both physical and cost perspectives, CECONY gas productivity measured out as the most unfavorable in the state (more than twice the level of the gas Reference Utility). Composite gas labor rates were high as well.
6. Past staffing changes as well as forecasts were unusual and did not demonstrate a logical pattern.
7. CECONY's use of contractors, as a percent of the resource mix, was well above that of the other state gas utilities and, although forecasted to decline somewhat, still were about twice that of the others.
8. The main replacement challenges faced by CECONY, which has the highest percentage of leak-prone pipe, and which operates in an extremely population-dense environment, did not seem consistent with 2014-vintage forecasts of decreased staffing between 2015 and 2019.
9. Given already high levels of overtime in Gas, the forecasted increases were problematic.

2. *Quantitative Recommendations*

1. Establish the relationship of (a) declining staff, (b) CAIDI performance data, and (c) increasing overtime and, if appropriate, balance and optimize them.
2. Determine why productivity in electric distribution and substation and in gas work compares unfavorably to the other utilities, and, if appropriate, develop a plan to improve productivity.
3. Reevaluate plans to reduce electric distribution overtime with a specific focus on the conflicting role of decreasing staffing and the possibility of targets more aggressive than the planned 20 percent.
4. Re-evaluate plans for transmission/substation overtime of 25 percent, with the intent of identifying opportunities for substantial reductions.
5. For gas, provide a logical year-over-year sequence of staffing, assure adequate focus on main replacements, and provide a stable staffing strategy that permits effective workforce planning, including optimization of productivity, overtime, and other key staffing-related factors.
6. Determine the reasons why its productivity in gas work compares unfavorably, to the extreme in some cases and, if appropriate, develop a plan to improve productivity.
7. Examine the use of contractors in gas operations to assure that its comparative high use is optimum.
8. Re-evaluate future plans for gas overtime of 25-30 percent.

3. *Resource Planning Conclusions*

1. CECONY led the state in its approach to and its processes for resource planning.
2. Gas operations lagged electric operations in the maturity of its approach to resource planning, but was making appropriate progress in closing the gap.
3. Like the state's other utilities, CECONY's reliance on cost data as a measure of contractor work load did not serve to optimize the process of balancing resources.
4. CECONY was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use.
5. CECONY could not separate historical information between overtime and straight time.

4. *Resource Planning Recommendations*

1. Expand measures of contractor work load to include FTE- or person-hour based values.

2. Incorporate data driven analyses that help management evaluate the trade-offs for overtime, contractors, and internal staff at the functional/work group level.
3. Continue to aggressively enhance gas operations' resource planning tools and methods.
4. Confirm that the historical inability to separate overtime and straight time has been eliminated.

5. Work Force Management and Performance Measurement Conclusions

1. CECONY employed an effective electric operations work management approach, systems, processes, and tools; its plans for bringing gas operations to a comparable state should, if implemented timely and effectively, prove similarly successful.
2. Electric operations performed scheduling effectively, but gas operations failure to do so for capital work scheduling was not optimum.
3. Electric operations monitored program and project performance effectively; gas operations was poised to do so, but awaited augmentation of its capabilities as part of its development of its new WMS.
4. Electric operations employed an effective approach, structure, and resources for project management, but gas operations needed to complete plans to enhance project management.
5. Documentation and training were appropriate in the case of electric operations, but gas operations had not taken a similarly comprehensive approach.
6. Both electric and gas operations appropriately located and addressed the roles of quality assurance and control.
7. CECONY occupied the leading position among the state utilities we studied with respect to performance measurement.

6. Work Force Management and Performance Measurement Recommendations

1. Establish comprehensive detailed plans, and set firm, detailed schedules to complete the upgrade of its Work Management System for Gas Operations.
2. Centralize as many gas operations scheduling functions as possible, including all capital work.
3. Identify gas operations documentation and training needs that match plans for its new work management system.

7. Internal Staffing Conclusions

1. CECONY had detailed forecasts of work requirements sufficiently detailed to identify likely resource requirements.
2. CECONY's capital and O&M work forecasts had an adequate factual and analytical foundation to support staffing projections.
3. CECONY had adequate sources to provide complete and accurate information about staffing by region and by function.
4. Appropriate forecasts existed of likely losses through attrition and retirement of internal resources by function, region, and work type, but the drop in tenure among gas salaried staff merits attention.
5. Training and development programs were sufficiently robust to provide adequate support for long-term staff requirements, but lack key performance indicators in one area.

8. Internal Staffing Recommendations

1. Address the availability of sufficient numbers of seasoned gas salaried employees to serve in mentoring and similar roles for an internal staffing complement forecasted to expand greatly.
2. Develop key performance indicators that measure the effectiveness of its efforts to achieve staffing targets, and assign accountability to the appropriate individuals.

9. Overtime Use Conclusions

1. Management provided a significant level of planning, monitoring, and oversight to the management of overtime, and had sound analytical capabilities.
2. Management did not employ an analytically supportable method for determining optimum levels of overtime. CECONY routinely considered the interrelationship among overtime, productivity, and costs, in its decision-making related to overtime, but not quantitatively.
3. Management applied overtime planning and analysis at the functional level.
4. Management adequately considered overtime in its resource planning and budgeting functions.
5. Recent overtime levels, which were perhaps borderline, were nonetheless trending upward and projected to grow substantially more in the future.
6. Management appropriately considered overtime as an element of the resource stack, and planned its use on an integrated basis with the other resource elements.
7. Future plans for electric distribution, calling for lower staffing while at the same time reducing the percentage of overtime, were counterintuitive.

10. Overtime Use Recommendations

1. Develop more analytically supported methods for determining optimum overtime levels.
2. Includes all relevant factors in its decision-making vis-à-vis overtime.
3. Define an optimum level of overtime, presumably well below that projected at the current time, and implement control schemes to manage within that value or range.
4. Review electric distribution plans that assume substantial decreases in both staffing and overtime, which does not seem reasonable.

11. Contractor Use Conclusions

1. In electric operations, CECONY supported its level of contractor use and the types of contractors through consistent strategy and execution, and employed a reasonable number of electric contractors.
2. In electric operations, CECONY employed a strong contractor work performance organization, and used sound performance evaluation procedures.
3. Use of contracted services in gas operations was generally consistent with industry practice and management used a broad base of contractors for gas construction.
4. Management had taken some steps to increase the number of resources that will be required to support its construction program.
5. Gas operations used an effective support structure for its contract operations.

12. Contractor Use Recommendations

1. Conduct a structured evaluation of the costs and benefits of bringing electric overhead line contractor oversight under the central contractor management organization.

2. Refine and expand plans for increasing internal staffing, the contractor base, or both to meet the needs of the future pipe replacement program.

D. Orange & Rockland Summary

1. Quantitative Observations and Conclusions

1. ORU's comparatively very small electric service territory can provide some advantages about distribution staffing; the Company has the smallest quantity of overhead distribution lines.
2. Its several hundred thousand customer count makes it the state's smallest, but the small territory gives it a higher ranking in customer density.
3. ORU is also comparatively small in gas territory size and customers as well, but ranks in the middle when measured by customer density.
4. Straight time electric FTEs remained stable through 2013, with variations in workload picked up by increased use of overtime and contractors.
5. Forecasted distribution levels produced two reasons for concern: (a) O&M resources at more than 100 FTEs lower than those of any historical year, and (b) overtime levels that do not appear credible.
6. An 80 percent increase in engineering FTEs for distribution occurred through 2013, with forecasted levels remaining between 60 to 77 FTEs.
7. ORU performed well as measured by CAIDI, having, except for 2010, the state's best values – and values that remained very consistent in recent years.
8. Despite a comparatively high composite hourly labor rate, our measurements of ORU electric productivity showed it more cost efficient than most.
9. Gas FTEs also remained very stable through 2013, with modest increases in capital work primarily met by contractor resources.
10. Forecasts showed increases in O&M and capital FTEs, with maintenance (including emergency response to leaks, leak surveillance and follow-up, and distribution system maintenance) the biggest driver of increased straight-time FTEs. Pipe replacement served as the principal driver of forecasted contractor FTE increases.
11. Historically, gas engineering FTEs were also consistently low. Forecasts showed substantial increases, but still left ORU with a very high ratio of field to engineering staff.
12. Leak response times have improved, starting from levels that were close to the Reference Utility value in 2010 and 2011. The backlog of potentially hazardous leaks, already comparatively low, fell to zero in 2014.
13. Gas physical productivity was about 25 percent worse than the Reference Utility value, but a comparatively low composite hourly cost (unlike that of ORU's electric cost) reduced the gap somewhat.
14. ORU was an outlier in terms of high dependence on overtime in electric operations. Gas overtime is high but not to the same extreme; forecasted overtime reductions to more normal levels were hard to square with a corresponding lack of planned increases in internal FTEs.
15. Management made the least use of contractors among the state electric utilities, although not to the extreme, while gas contracting was in line with industry patterns.

2. Quantitative Recommendations

1. Analyze distribution staffing (including engineering), versus the other state utilities identifying the appropriateness of its relatively high levels.

2. With gas productivity levels moderately weaker versus the other utilities, determine the reasons for such deviations, and identify opportunities for improvement.
3. To the extent high overtime issues in distribution have not yet been resolved: (a) determine optimal levels, (b) develop plans to achieve those optimal levels, and (c) take steps to manage to those levels.
4. Conduct a structured re-evaluation and report on the role of internal staffing in long-term plans, particularly as internal staffing will help attain optimal overtime targets.

3. Resource Planning Conclusions

1. Management used state-of-the art approaches in its processes for resource planning.
2. Gas operations lagged electric operations in the maturity of its approach to resource planning, but was making appropriate progress in closing the gap.
3. Like the state's other utilities, reliance on cost data as a measure of contractor work load did not serve to optimize the process of balancing resources.
4. Management was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use at the functional level.

4. Resource Planning Recommendations

1. Expand measures of contractor work load to include FTE- or person-hour based values.
2. Include in resource plans data driven analyses that help management evaluate the trade-offs for overtime, contractors, and internal staff at the functional and work group levels.
3. Set a firm completion date for execution of plans to enhance gas operations' resource planning methods and tools, and aggressively implement them according to that schedule.

5. Work Force Management and Performance Measurement Conclusions

1. ORU employed a work management approach, systems, processes, and tools that appropriately support staffing optimization.
2. Work management system documentation and training were appropriate.
3. Electric and gas operations employ an effective approach, structure, and resources for project management, and management performed electric and gas operations scheduling effectively.
4. Management used methods that support effective monitoring of electric and gas operations program and project performance.
5. Electric and gas operations appropriately located and addressed the roles of quality assurance and control.
6. For the most part, Management did not monitor and measure levels of work performed in relation to resource inputs at a work unit level.

6. Work Force Management and Performance Measurement Recommendations

1. Develop training materials for both its processes and tools, for use by persons new to relevant positions.
2. Develop performance measures for replacement and installation of pipe.
3. Capture work unit measurements using the data capabilities of its existing data systems.

7. Internal Staffing Conclusions

1. Management detailed forecasts of medium- and longer-term capital and O&M work requirements; they were comprehensive enough to identify likely resource requirements over those time frames.
2. Capital and O&M work forecasts had an adequate factual and analytical foundation to support staffing projections.
3. Management had a source of complete and accurate information about staffing by region and by function.
4. Management had access to reasonable forecasts of likely losses through attrition and retirement of internal resources by function, region, and work type.
5. Management demonstrated a sound and comprehensive understanding of areas where losses in key (or in mere numbers of) personnel have affected and are most likely to most significantly affect work performance.
6. Training and development programs were sufficiently robust to provide adequate support for long term staff requirements, but certain performance indicators were lacking.

8. Internal Staffing Recommendations

1. Develop key performance indicators that measure the effectiveness of efforts to achieve staffing targets and assign accountability to the appropriate individuals.

9. Overtime Use Conclusions

1. Management provided a significant level of planning, monitoring, and oversight to the management of overtime, and demonstrated sound analytical capabilities.
2. Management did not employ an analytically supportable method for determining optimum levels of overtime or routinely measure the interrelationships among overtime, cost, and productivity in decision-making related to overtime.
3. Management did not apply overtime planning and analysis at the functional level.
4. Management adequately considered overtime in resource planning and budgeting functions.
5. Management appropriately considered overtime as an element of the resource stack, and appropriately planned its use on an integrated basis with the other resource elements.

10. Overtime Use Recommendations

1. Develop a more analytical process to determine the optimum levels of overtime.
2. Include all relevant factors in its decision-making vis-à-vis overtime.
3. Expand the use of functional planning, budgeting, and monitoring in the realm of overtime.

11. Contractor Use Conclusions

1. Overall, the level of contractor use and the types of contractors were fully supported by consistent strategy and execution and management had a firm data-driven understanding and a good qualitative rationale supporting the use of contractors.
2. Management had a strong contractor oversight organization in place and it employed robust contractor evaluation procedures.
3. The bargaining unit overtime rule negatively affected comparative costs of using contractors.
4. The ramp-up in pipe replacement activity among the Downstate companies and the Northeast is likely to affect both ORU's costs and availability of contractors.

12. Contractor Use Recommendations

1. Implement plans for increasing resources to need to support pipe replacement.

E. National Fuel Gas Summary

1. Quantitative Observations and Conclusions

1. Workers appear to have the state's highest number of hours available to work (as a percentage of total work hours) - - six percent better than average.
2. Total staffing was just below the statewide average, consistent with its relative size
3. Total staffing experienced little change through 2013.
4. Forecasts showed contractor use growing 13 percent, with straight-time resources flat and overtime use continuing at remarkably low levels across all 10 years of our study period.
5. The nine percent growth in total resources from 2009 through 2019 comes essentially entirely from growth in contractor use.
6. Capital work was stable through 2013, with O&M work growing by three percent.
7. Forecasted workload grows about 10 percent in both capital and O&M.
8. Modest forecasted increase in capital is consistent with forecasted increase in pipe replacement
9. Forecasted increases in O&M suggest rebalancing to address O&M needs.
10. NFG historically had by far the highest backlog of leaks, but achieved remarkable improvement in 2014; however, 60-minute window response rate fell notably, taking NFG for the first time below the Reference Utility value.
11. With a low relative number of FTEs (per both our ratio analysis and model results) and performance issues, it is appropriate to question sufficiency of O&M FTEs to address leak response and backlogs.
12. Forecasts showed internal resource shift to FTEs to leak repair and surveillance functions and moderate growth in contractor use for leak surveillance - - positive, but suggests need for attention to sustaining improved levels.
13. Historical and forecasted contractor work shares similar to Reference Utility, but internal resources much more weighted to straight time versus overtime.
14. With the best physical productivity and lowest composite hourly labor rate, unit costs beat the Reference Utility value several times over.
15. Contracting percentages are comparatively low, but growing, at rates consistent with the rest of the state's gas operations.

2. Resource Planning Conclusions

1. While decentralized, the approach to resource planning and its processes for developing and reviewing resource plans were generally appropriate.
2. Processes for identifying and understanding overall workload, including reliance on cost data as a measure of contractor work load, did not optimize the process of balancing resources.
3. NFG was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use.

3. Resource Planning Recommendations

1. Enhance resource planning processes to include total workload, including expanding measures of contractor work load to include FTE- or person-hour based values.

2. Include in resource plans data driven analyses for evaluating trade-offs among overtime, contractors, and internal staff.

4. Work Force Management and Performance Measurement Conclusions

1. Work force management processes warranted improvement in systems, documentation and training, scheduling, project management, and performance monitoring in order to support resource optimization fully.
2. NFG took a formal approach to quality assurance and control, and provided a structure that supports its independence.
3. NFG did not apply performance measures to work load projections and performance, incorporate a structured analysis of performance measurements into the decision-making process on staffing, or maintain a fully comprehensive set of performance measures to determine production and productivity levels.

5. Work Force Management and Performance Measurement Recommendations

1. Expeditiously address those recommendations of its last management audit, in the areas of work management approach, systems, tools, documentation, and training, scheduling, project and program scheduling, management, and reporting.
2. Develop detailed performance measures for replacement and installation of pipe, in order to support its ability to optimize resources over the long term.
3. Develop, in the context of current efforts to address its Work Management System, a plan for instituting performance measures on a corporate-wide basis.

6. Internal Staffing Conclusions

1. A reasonably comprehensive and detailed forecast of medium- and longer-term capital and O&M work requirements existed.
2. Management had access to sources of complete and accurate information about staffing.
3. Forecasts of likely losses through attrition and retirement of internal resources existed, but high levels of attrition highlight the need for focused attention.
4. Training and development programs provided adequate support for staff requirements.

7. Internal Staffing Recommendations

1. NFG should conduct a bottoms-up staffing planning exercise at the next opportunity when it can do so as part of its annual planning cycle.
2. Reassess management's conclusion that pending retirements do not create potential gaps in key resources, and develop plans for ensuring the ability to provide the knowledge transfer on which it depends.

8. Overtime Use Conclusions

1. Management did not find value in using overtime at the far greater levels typical of the state and the industry.
2. Management did not employ an analytically supportable method for determining optimum overtime or routinely consider the interrelationships among overtime, cost, and productivity.
3. Management adequately considered overtime in resource planning and budgeting functions.
4. Management consistently contained overtime to planned and budgeted levels.

9. Overtime Use Recommendations

1. Conduct data-driven analysis to verify that its minimal overtime use does not cause it to lose opportunities for optimizing resources.

10. Contractor Use Conclusions

1. Contracted services were generally consistent with industry practice and management applied appropriate qualitative rationales for contracting for those services.
2. Management used a broad base of construction contractors and reasonable contract durations.
3. Management had taken some steps to increase the number of resources required to support its construction program.
4. An effective support structure existed for contract operations.
5. Contractor compensation was not linked strongly to performance.

11. Contractor Use Recommendations

1. Recognizing that some steps have been taken, develop and implement plans to increase resources to satisfy the needs of the pipe replacement program, whose mileage rate was set to increase by about 25 percent.

F. National Grid Summary

1. Quantitative Observations and Conclusions

1. ***NIMO*** has, by far, the largest service territory, its territorial dispersion also produces by far the most miles of overhead distribution lines, and significantly greater numbers of transmission and substation facilities.
2. Size-based attributes make ***NIMO*** the second largest electric company; its total staffing corresponds to that size ranking.
3. In terms of gas operations, ***NIMO*** has the second largest service territory and very low customer density; ***KEDLI*** operates within a small urban and suburban territory making it customer density very high; ***KEDNY***’s 1.2 million retail customers are the state’s largest and it serves by far the smallest footprint, producing a customer density 11 times that of the closest comparator.
4. Major data management problems following the transition to SAP have handicapped management’s ability to monitor and effectively manage staffing.
5. Total electric distribution FTEs changed very little throughout the 10-year study period; however, straight time FTEs decreased by 107 between 2009 and 2011. CAIDI performance deteriorated coincidentally with a ***NIMO*** reduction in straight time FTEs from 1,313 FTE to 1,209. Despite some improvement, 2014 durations still exceeded those of 2009.
6. A forecasted reduction in electric distribution O&M FTEs left fewer remaining employees to work higher sustained levels of overtime, while contractor FTEs increased significantly, largely on increased future capital work.
7. Indications of staffing insufficiency at ***NIMO*** (electric and gas), when combined with projected declines in O&M, raise concerns going forward.
8. Our productivity analysis showed ***NIMO*** electric within a reasonable range of the Reference Utility value, despite having the state’s highest electric composite hourly labor rate.

9. Between 2009 and 2011 total gas FTEs decreased by 12 percent. Forecasts showed a continued, significant drop in O&M FTEs, in contrast to large expected increases for capital work.
10. ***NIMO*** leak response time declined historically, as measured against all three established time windows. Although remaining comparably low, backlogged leaks also grew steadily. ***KEDLI*** and ***KEDNY*** also experienced declining performance, albeit not the forecasted O&M FTE reductions of ***NIMO***. All in all, however, the data point to reasons for concern about staffing at the National Grid operations.
11. The vast staffing increases that ***KEDLI*** and ***KEDNY*** propose, largely in connection with pipe replacement acceleration, raise major questions of achievability.
12. It is not clear that needed plans, processes and systems are in place to effectively implement and manage the vast capital workload that lies ahead for ***KEDNY*** and ***KEDLI***.
13. Overtime in electric distribution at ***NIMO*** and in gas at ***KEDLI*** and ***KEDNY***, already very high on an historical basis is forecasted to increase even further.
14. Dependence on contractors was generally in line with the other utilities and, although forecasts showed the number of contractors increasing in the future, their relative mix will stay about the same.
15. Historical gas engineering staffing levels at ***KEDLI*** and to a lesser extent ***KEDNY*** did not appear sufficient, but significant forecasted increases in engineering staffing appear to respond to this gap.

2. Quantitative Recommendations

1. ***NIMO*** management should evaluate current understaffing with the intent, if appropriate, to revise its plans for future O&M staffing.
2. ***KEDLI*** and ***KEDNY*** should also ensure that modest O&M resource increases will prove sufficient.
3. ***KEDLI*** and ***KEDNY*** should develop aggressive comprehensive plans for resources required, especially for main replacement work.
4. Given very large workforce and workload expansion, ***KEDLI*** and ***KEDNY*** should implement changes in organization, program and project management approaches, processes and systems.
5. With high past levels of overtime and still higher projections at ***NIMO***, ***KEDLI*** and ***KEDNY***, management should determine optimum overtime levels, and implement plans to manage overtime at resulting, reduced levels.

3. Resource Planning Conclusions

1. National Grid had the least effective resource planning processes, tools, and capabilities among the larger utilities, but was taking significant steps to improve.
2. Gas operations lagged electric operations in tools and approach to resource planning, but was making appropriate progress toward closing the gap.
3. Reliance on cost data as a measure of contractor work load does not optimize the process of balancing resources.
4. We did not find regular use of structured analyses of the effectiveness of overtime and contractor use.

4. Resource Planning Recommendations

1. Improve resource planning, focusing on development of information and tools to support data-driven development of resource plans.
2. Aggressively enhance gas operations' resource planning tools and methods.
3. Plan and track contractor work load using FTE- or person-hour based values.
4. Conduct regular, data driven processes for evaluating trade-offs among overtime, contractors, and internal staff.

5. Work Force Management and Performance Measurement Conclusions

1. Performance data capture gaps existed at all three National Grid state utilities.
2. Work management system documentation was not complete and training material was outdated.
3. All three utilities used effective project management, performed scheduling effectively, and used appropriate reporting mechanisms to inform management about project progress.
4. Quality Assurance and Quality Control were located appropriately at all three utilities.

6. Work Force Management and Performance Measurement Recommendations

1. Close already recognized work management system gaps effectively and promptly.
2. Create for all three companies documentation fully outlining work management processes, and update training material to reflect current processes and tools.
3. As a first priority, develop and employ for all three companies comprehensive performance measures for replacement and installation of pipe.
4. Improve performance measurement at all three utilities.

7. Internal Staffing Conclusions

1. The National Grid operating companies had reasonably comprehensive forecasts of medium- and longer-term capital and O&M work requirements to identify likely resource requirements, but the magnitude of forecasted resource needs will require extraordinary efforts.
2. Capital and O&M work forecasts had a factual and analytical foundation to support staffing projections, but were not yet rebuilt to replace all of the capabilities lost during the transition to SAP.
3. Management had sources of complete and accurate information about staffing by region and by function.
4. Management did not have, but was rebuilding, the capability to produce forecasts of likely losses through attrition and retirement of internal resources.
5. Management had a sound understanding of areas where losses in key personnel had most significantly affected work performance.
6. Training and development programs provided generally adequate support for long term staff requirements, but the large growth in forecasted internal resources at KEDLI and KEDNY require close monitoring and control.

8. Internal Staffing Recommendations

1. Re-examine and augment as necessary structures for resource recruitment, training and development, in order to ensure that they will have the capacity to support expansion of internal gas FTEs by more than double those of historical levels.

2. Rebuild capabilities in areas affecting long term internal staffing, such as capturing and analyzing workload data and preparing productivity analyses.
3. Rebuild its workforce planning capabilities, in order to provide credible support to long term internal staffing projections
4. Re-examine and augment where necessary training and development programs and capabilities, in order to ensure that they can effectively address the training of hundreds of new gas internal staff over the next few years.

9. Overtime Use Conclusions

1. Management provided a significant level of planning, monitoring, and oversight to the management of overtime, and demonstrated acceptable analytical capabilities, but did not employ an analytically supportable method for determining optimum overtime levels.
2. Management did not routinely consider the interrelationships among overtime, cost, and productivity.
3. Management did not apply overtime planning and analysis at the functional level.
4. Management adequately considered overtime in its resource planning and budgeting functions.
5. Excessive overtime levels in ***NIMO*** electric and in the ***KEDLI*** and ***KEDNY*** gas utilities were projected to become worse in the years ahead.
6. Management had been unable to manage overtime to budgeted levels.
7. Management appropriately considered overtime as an element of the resource stack, and planned its use on an integrated basis with the other resource elements.

10. Overtime Use Recommendations

1. Develop a more analytical process to determine the optimum level of overtime.
2. Develop and include all relevant factors in its decision-making on overtime.
3. Expand the use of functional planning, budgeting, and monitoring for overtime.
4. Re-evaluate current plans that call for substantial increases in its already too high overtime levels.
5. Plan and manage overtime within a reasonable control zone.

11. Contractor Use Conclusions

1. All the gas operations made appropriate use of contracted services on an historical basis; with practices generally conforming to industry practice.
2. The great increase that gas operations, particularly ***KEDNY*** and ***KEDLI*** face, calls for significant changes in historical practice.
3. The massive pipe replacement program that the National Grid gas operations face requires planning not yet in place at the time of our field work.
4. The gas operations structure for managing contractor operations did not include a number of activities that support performance optimization.
5. ***NIMO*** applied an overall sound strategy for determining where to use electric contractors, but contracting of some low-value work remains to be executed.
6. ***NIMO*** retained access to a sufficient number of electric contractors, and employed a sound organization and effective methods for overseeing electrical contractors.

12. Contractor Use Recommendations

1. Promptly develop and implement plans for increasing the massive added resources required to meet the needs of its pipe replacement program.
2. Return to the use of a formal contractor review and evaluation process and evaluate the use of contractor incentive provisions.
3. Continue to move towards contracting out overhead ***NIMO*** line inspections.
4. Begin to compare contractor versus internal costs on a more rigorous, regular basis in all operations.

G. Central Hudson Summary

1. Resource Planning Conclusions

1. Management's decentralized approach and robust planning information and tools produced an appropriate overall approach to resource planning.
2. Management was not making use of its extensive information on internal and contractor hour and expenditure data to perform ongoing, structured analyses of the effectiveness of overtime and contractor use.

2. Resource Planning Recommendations

1. Conduct regular, data driven evaluations of the trade-offs among overtime, contractors, and internal staff as part of the resource planning process.

3. Work Force Management and Performance Measurement Conclusions

1. Management's approach to work force management, which depended largely on manual processes and the closeness of its management to work in the field, served generally well in supporting staffing needs.
2. Scheduling similarly lacked the formality and structure seen in larger New York utilities, but no gaps existed justifying significantly enhanced systems and tools.
3. Management's approaches to program and project performance monitoring were generally appropriate to the scale and nature of its operations as a small utility, but lacked a clear means for ensuring effective use of performance data.
4. Central Hudson's size made its methods of program and project management suitable.
5. With respect to quality assurance and quality control, Central Hudson's small size may not call for a separate organization, but the lack of an independent source of examination did not comport with needs.
6. Management captured data in a number of categories relevant to developing measures of work units performed in relation to resource inputs, but not in a manner supporting the ability to identify and balance staffing requirements.
7. Over time, the way that Fortis does and can support Central Hudson operations (with centrally developed approaches, systems, and tools) bears scrutiny.

4. Work Force Management and Performance Measurement Recommendations

1. The Quality Inspection process should produce independence in the performance of work inspections.
2. Develop and use work measurements to identify and plan for future resource needs.

3. Develop performance measures for replacement and installation of pipe.
4. Develop and implement a plan for instituting performance measures on a broader basis.

5. Internal Staffing Conclusions

1. Management had a sufficiently detailed forecasts of work requirements; they were comprehensive enough to identify likely resource requirements.
2. Management had a source of information that provided complete and accurate data information about staffing by region.
3. Management was not able to report information that would demonstrate a comprehensive approach to and understanding of areas where it may face critical resource shortages.
4. The decentralized approach to training and development reflected the small size of the Company; however, management was not sufficiently active in promoting alliances to meet staffing needs, and lacked some elements that would promote better measurement of training, development, and recruitment effectiveness.

6. Internal Staffing Recommendations

1. Standardize, through the Human Resources department, development of attrition and retirement forecasts throughout the Company.
2. Aggressively seek out and establish outside training and recruiting alliances, and use clear, objective measures for regularly assessing effectiveness in meeting clear, firm training and recruitment goals.
3. Formalize and execute plans to enhance HRIS capabilities.

7. Overtime Use Conclusions

1. Management provided a significant level of planning, monitoring, and oversight to the management of overtime, and has demonstrated good analytical capabilities.
2. Management did not employ an analytically supportable method for determining optimum levels of overtime.
3. Management did not routinely consider the interrelationships among overtime, cost, and productivity in its decision-making related to overtime.
4. Management did not apply overtime planning and analysis at the functional level.
5. Management adequately considered overtime in its resource planning and budgeting functions.
6. Management was successful in holding overtime to planned and budgeted levels.
7. Management appropriately considered overtime as an element of the resource mix, and planned its use on an integrated basis with the other resource elements.

8. Overtime Use Recommendations

1. Develop a more analytical process to determine the optimum level of overtime.
2. Include all relevant factors in its decision-making regarding overtime planning and use.
3. Expand the use of functional planning, budgeting, and monitoring regarding overtime.
4. Expand its efforts to manage overtime within a reasonable control zone.

9. Contractor Use Conclusions

1. The level of electric operations contractor use and the types of contractors were supported by consistent strategy and execution.

2. Management had a data-driven understanding and a good qualitative rationale supporting the use of contractors.
3. The approach to managing contractors was effective.
4. Management used a sufficiently broad number of contract firms in electric operations.
5. Management's use in gas operations of contracted services was generally consistent with industry practice.
6. Management used appropriate qualitative rationales for identifying what gas services to contract.
7. Management used a sufficiently broad base of contractors for gas construction, but has generally limited contracts to short terms.
8. Management took steps to increase the number of resources that will be required to support its gas capital program.
9. Central Hudson had an effective support structure for its gas contract operations.
10. Central Hudson's incentive/penalty mechanism for construction contracts was notable.

10. Contractor Use Recommendations

1. Extend the term of construction contracts with contractors.

H. Best Practice Summary

As described in the individual company reports, the following lists the best practices we observed among the state's utilities.

- Avangrid
  - Employs comprehensive, clear, easy to use training and documentation with respect to work management.
  - Use of VEMO software comprises best-in-class system for tracking attrition-related information.
  - Good performance versus aggressive targets and consistent results reflect a best state practice.
- CECONY
  - Work Management systems, processes, tools, and structure electric operations are best-in-state.
  - Use of VEMO software comprises best-in-class system for tracking attrition-related information.
  - Broad participation in industry groups and participation with educational institutions to promote recruitment, training, and development reflect best practice.
- ORU
  - Uses Key Performance Indicators to measure management training performance reflects best practice.
  - Use of VEMO software comprises best-in-class system for tracking attrition-related information.
- National Grid
  - Use a quantitative, multivariate tool to gauge complexity, for use in identifying level of project management required reflects best state practice.

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

Final Statewide Report
Case 13-M-0449

Presented to:

Public Service Commission
State of New York

Presented by:

The
Liberty Consulting Group

February 21, 2017

279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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Chapter I: Introduction

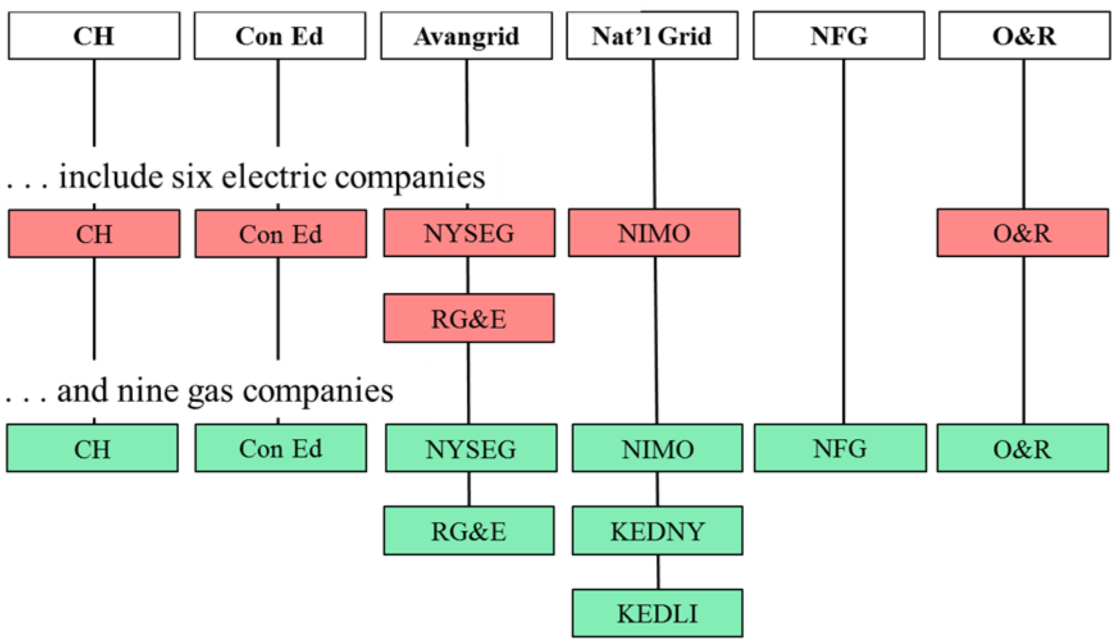
A. Scope of the Study

1. Background

This report describes the result of an operations audit by The Liberty Consulting Group (Liberty) of core-function staffing levels at the major New York State energy utilities. We performed this study for the New York State Public Service Commission. The core staffing included the resources associated with operating the network infrastructure that brings electricity and natural gas to customers. Our work addressed the internal and contractor resources engaged in management, planning, facilitation, or execution of physical electric or gas work. Our scope did not include resources engaged in customer-related (including meter reading), vegetation management, information technology, administrative and general (A&G), and security functions.

The entities within the scope of this audit operate under a range of ownership structures, and include some of the country's and the world's largest utility holding companies:

Figure I.1: The Utilities Examined



Our study sought to determine whether the state's large electric and gas utilities have maintained employee staffing levels sufficient to ensure adequate, reliable, and safe service, while optimizing efficiency and cost effectiveness. We also examined whether their forecasts of required staffing resources existing at the time of our field work placed them in a position to continue doing so. We also sought to identify improvement opportunities in the structure and processes (as planned and as executed) by which the utilities determined and managed internal and external staffing.

This report discusses our study approach and methods, and summarizes our observations at a statewide level. Companion reports (one each for Consolidated Edison Company of New York (CECONY), Orange & Rockland Utilities (ORU), the New York Avangrid companies (New York State Electric and Gas Company and Rochester Gas and Electric Company (NYSEG and RG&E)), the New York National Grid companies (Niagara Mohawk Company (NiMo), KEDNY and KEDLI) Central Hudson Gas and Electric Company (Central Hudson), and National Fuel Gas Distribution Company (NFG) follow. These reports also discuss the more particular areas of interest the Commission asked this study to address:

- Extent of and reasons for reductions in internal resources over recent years
- Extent of and reasons for growth in contracted resources
- Review of five-year trends in internal/external resources
- Examination of current levels of and expected trends in internal/external resources
- Areas of potential impact on reliability and safety
- Adequacy of staffing levels
- Use of benchmarking
- Use of work management systems and tools
- Comparison to best practices
- Changes over time in the levels of "institutional knowledge" and experience
- Succession planning, recruitment, and training and development
- Ability to retain control over work effectiveness, efficiency, quality, and schedule
- Methods and procedures used to determine when/how/to what extent to use outside resources
- Potential models for optimizing internal/external resource balance
- Positioning to support the five core policy outcomes of 14-M-0101, which address:
    - Enhanced customer knowledge and tools to support total energy bill management
    - Market animation and leverage of ratepayer contributions
    - System wide efficiency
    - Fuel and resource diversity
    - System reliability and resiliency.

B. Study Work Structure

We structured our study along two basic lines of inquiry, which produced complementary functional study areas. The first consisted of an examination of the three basic activity areas that drive utility resourcing: resource planning, work management, and performance measurement. The second included examinations specifically tailored to the three staffing resource types (internal straight-time, overtime, and contractors) that utilities use to deliver service.

1. Resource Activity Process Reviews

We performed a "process" related review of each of the three areas of resourcing activities. Management must perform all three effectively, if it is to optimize staffing resource size and balance, while delivering quality service. That process review examined the involved organizations, resources, approaches, methods, systems, tools, processes, activities, monitoring, and controls, using a set of well-defined evaluation criteria.

Utility field work has different characteristics, depending on the nature, amount, and recurrence of the work at hand. Two key parameters drive this work: performance standards and infrastructure. Thus, the three resource types on hand to perform this work must be balanced through an overall resource planning process. Each of these drivers involve characteristics that should play a key role in staffing decisions.

Effective work management reduces the staffing required to perform the same levels of work quality, or produces more work from the same levels of staffing. Work should occur according to defined approaches, methods, systems, and tools. Sound work management also promotes strong work quality. Performance data informs expectations about the work rates that can be expected from given amounts and balances of resources. The value of reasonable performance expectations makes performance measurement key to effective resourcing.

Modern work management systems enhance the ability to produce comprehensive, accurate performance data. Thus, overall work management, and the use of performance data, should offer key inputs of effective resource planning.

The resource planning process seeks to identify the staffing resources required to perform the work required, and to do so under reasonable production expectations, all while balancing the three resource types: internal staff, contractors, and overtime.

2. Resource Type Reviews

Our review of the three resource activity areas (internal straight-time, overtime, and contractors) included both process-based and quantitative reviews. Here too, our process reviews used clear, consistent evaluation criteria, similarly developed and closely integrated with those used for our resource activity process reviews. Our quantitative analyses used a number of techniques. Our separate reports for each New York utility operation studied provide the results of these quantitative reviews separately for each of the three resource types. In our report chapters addressing overall resource planning, we provide quantitative results on a combined basis (all three resource types included).

3. Evaluation Criteria

Our study evaluated management performance in each of the operations we studied under clear, consistent criteria. We applied the same criteria to each operation. Nevertheless, we performed our work recognizing that unique company circumstances make more than one way of structuring, performing, and measuring staffing-related activities effective. These criteria (clearly stated and used in this statewide report and in our evaluations of the individual utility operations) embody the experience we have gained over nearly thirty years in examining energy utility management performance and effectiveness in some 40 North American jurisdictions.

Our experience with New York utilities is especially long, extending back twenty or more years in a variety of engagements that have included (before this one) all but 3 of the 15 operations studied here. The Liberty team that performed the study and applied these criteria consisted of seasoned experts in both gas and electric utility operations. They also included significant expertise in using statistical and other data-based methods in analyzing utility performance. Our experts all had at least 30 years in the utility business.

4. *Work and Worker Classifications*

As is generally true in the industry, we found in this study a variety of ways of classifying employees functionally. Enabling comparisons among the companies required a means to establish a single set of logical categories into which it would prove feasible to sort the personnel of each operation.

We undertook two parallel efforts in providing a common basis for addressing staffing across the 15 operations we studied. We did so in pursuit of a common way to: (a) categorize staffing by function, and (b) develop a common way of categorizing craft worker and supervisory personnel who performed those functions.

Given the scope of our study, we began from the following breakdown of "core functions" critical to the delivery of reliable utility service:

- Electric Operations- (Distribution, Transmission, and Substations)
    - Engineering (*e.g.*, including, planning, design, delivery, and asset management)
    - Field personnel (*e.g.*, line workers, mechanics, technicians, service personnel, construction services, power equipment operators)
    - Supervisors, managers, cost estimators, schedulers, crew dispatchers and project managers
    - Quality Assurance and Quality Control
- Gas Operations
    - Construction and distribution
    - Engineers and construction personnel (*e.g.*, planning, design, delivery, and asset management)
    - Cost estimators, schedulers, project managers
    - Power equipment operators
    - Crew dispatchers
    - Service/field personnel
    - Quality Assurance and/ Quality Control.

After extensive interaction and discussions with the utilities (as described in section five below) we established the following categorizations for developing a common database from which we would draw what we needed for a series of quantitative assessments, trending data internally for individual companies, for the state as a whole, and for individual utilities in comparison with the statewide experience.

Figure I.2: Study Work Functions

Study Work Functions: Electric Transmission, Substation, and Distribution

Transmission	T&S Engineering	Distribution
OH Transmission Construction (Capital)	Transmission Engineering & Planning	OH Construction – New Customer Additions (Capital)
OH Transmission Maintenance	Substation Engineering & Planning	OH Construction – Renewals & Replacements (Capital)
Underground Transmission Construction (Capital)	T&S Engineering Support	OH Construction – Major Projects (Capital)
Underground Transmission Maintenance	Communications Design	OH Construction – Relocations & Public Additions (Capital)
		OH Maintenance (O&M)
Substations	**Distribution Engineering**	OH Trouble (O&M)
Substation Construction (Capital)	Distribution Engineering & Planning	URD Construction (Capital)
Substation Maintenance	Distribution Area Engineering	URD Maintenance (O&M)
Substation Operations	Distribution Eng. Support	URD Trouble (O&M)
Relay & Instrumentation Testing & Maintenance		UG Construction
Communications Test & Maintenance		UG Maintenance
Metering and Meter Shop		UG Trouble
		Meter Shop

Study Work Functions: Gas Transmission & Distribution

Gas Transmission & Distribution
Construction – New Customer Additions (Capital)
Construction – Gas System Additions (Capital)
Construction – Main Renewals & Replacement (Capital)
Construction – Services Renewals and Replacements (Capital)
Construction – Relocations & Public Additions (Capital)
Leak Response (O&M)
Distribution System Inspection & Maintenance (O&M)
Gas Field Operations - Instrument & Regulators (O&M)
Meter Shop
Gas Engineering (Plan & Design)
Gas Engineering Support

5. The "Super" Database

The objectives of this study included the performance of quantitative analyses of the adequacy of staffing for electric distribution, electric transmission and substation, and gas operations functions at the utility operations examined. Meeting this objective required each company to extract and provide large amounts of data from the accounting, budgeting, and operational systems they used to capture costs, labor hours, and system attributes for the key functions that comprised the subject areas of our study. To that end, Liberty structured the study to promote significant participation of each of the companies. This approach was designed to ensure that the detailed data requirements needed to perform our analyses would be effectively communicated to management of the companies.

We constructed a single database from which to perform our quantitative analyses. We worked iteratively with management at each company to secure from their systems data for development of a complete and commonly categorized set of information. We set a 10-year study period, consisting of five historical years (2009-2013) and five forecasted years (2015-2019). Our field work took place during 2014. We understood from the outset that it would take a major effort to collect data about as many as 11,000 electric and 7,000 gas workers statewide, expressed on the basis of full time equivalent personnel. Compounding the challenges imposed by these very large numbers was the need to collect a variety of data points about them, and to so for a period encompassing 10 years. We produced an enormous number of data points, or "cells."

We eventually produced a data set to support a number of quantitative analyses of staffing and its drivers at all of the 15 state electric and gas operations we studied, except for those of one company. The effort, however, involved difficulties well beyond those we anticipated and for which we had planned. Efforts to find a way to proceed to a useful conclusion required many months.

We founded our quantitative analyses on a very broad and comprehensive database, developed through extensive interaction with management at each of the utility operations. The development of that database, expected to be quite challenging initially, proved far more difficult as our work proceeded. It eventually took many iterations and much more time than expected to get a statewide database that was reasonably accurate, complete, and consistently structured among the many operations involved. Liberty's work with the study participants included weekly phone calls, the provision of templates detailing the content and structure of data required, on-site reviews, workshops to review model runs, and roundtable meetings to discuss data completeness and accuracy.

Those efforts eventually succeeded to the level required to support comparative analysis among all but one of the operations we studied. They also succeeded in providing a basis for comparing trends within given companies. We examined trended company staffing across an historical period (2009-2013). We also collected data for 2014, but, having to do so mid-year produced a mixture of actual and forecast data that we could not amalgamate on a basis that would support comparisons among the state's operations. Our extensive work with management at operations across the state also produced reasonably extensive and comparable forecast data for 2015 through 2019.

6. Quantitative Analytical Techniques

We were able to use the historical and forecasted data in a number of ways illustrated in the companion (individual company) reports to this one. The data gave us the ability to break staffing down into a wide range of functions for detailed examination and to aggregate it for overall analysis. We related levels of work performed through the use of internal straight time, internal overtime, and contractor resource to each other by creating an ability to express each in terms of number of equivalent full-time equivalent personnel numbers (FTEs). We were able to quantitatively examine what proportions of capital, O&M and engineering were performed by each group. We were able to separate resources in each by distribution, transmission and substations, and engineering. For special purposes (*e.g.*, pipe replacement or new customer additions) we could pull the detailed information from the database.

We looked at how equivalent numbers of FTEs in a variety of categories trended across the historical period, and how management forecasted them to change for the future, as we sought out indicated staff drivers. We created what we termed a Reference Utility (a composite, often reflecting the median of the attribute(s) involved) that permitted us to compare each company with the others we studied. We combined resource data with production units to produce composite measures of productivity expressed in both dollars and hours required to produce equivalent units of production.

We constructed a model using the data provided by all the state's utilities in the study. It correlates actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produced staffing level estimates, broken down by capital, O&M and engineering for each utility. The estimates considered how the utility's unique combination of attributes vary with staffing levels compared to how the other state utilities' staffing levels vary for the same combination of attributes. The model provided a more sophisticated way to consider each utility's staffing levels normalized for each utility's unique mix of infrastructure. The model provided an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Variances with model estimates provided one of the bases used to question issues and perform analyses of staffing.

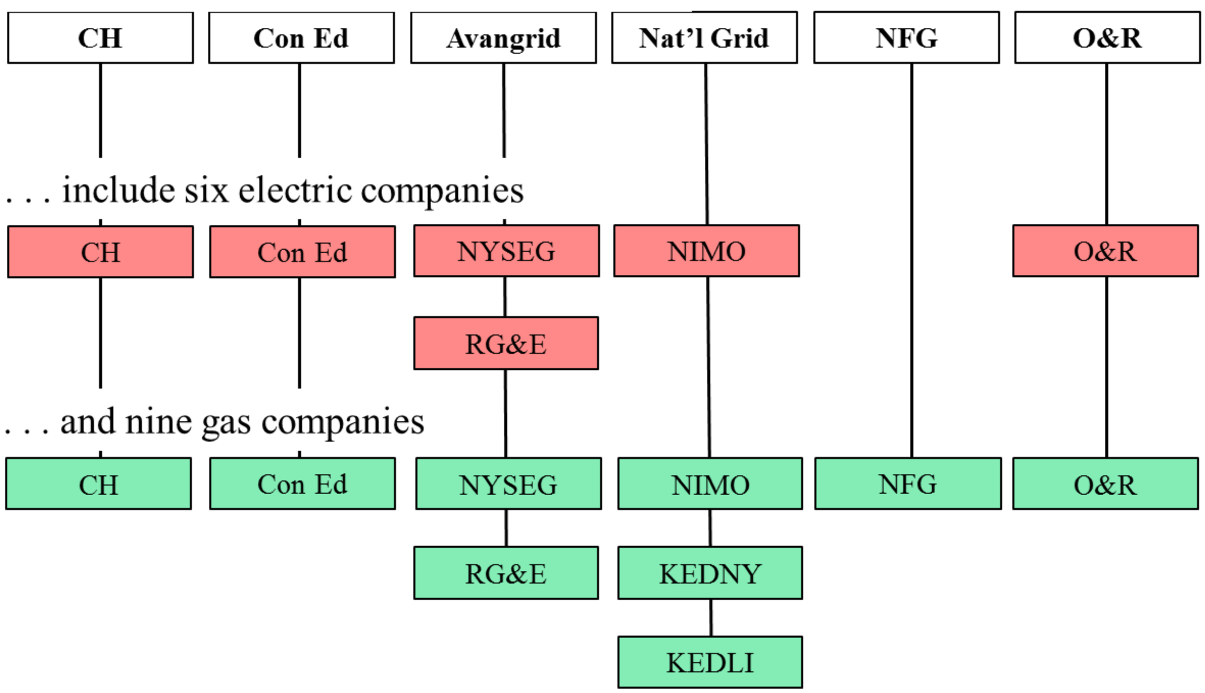
We discuss below the uses and results of our various quantitative techniques. The super database ended up providing the capability to perform a range of quantitative analyses. They included the concepts of “Reference Utility,” “9ers” (a way to combine productivity data for multiple work activities), and the model.

Chapter II: The Utilities

A The Utility Operations We Studied

The utility operations we studied span a wide range in their attributes material to staffing. This report chapter provides an overall description of that range of attributes, and offers general comparisons intended to provide a context for our subsequent analyses. This chapter's discussion and comparison of the basic attributes of each utility operation we studied provides background for the findings, conclusions, and recommendations we formed in the six individual reports that discuss each operation in detail. Those reports cover the six electric and the nine gas operations we examined. The next illustration lists them.

Figure II.1: Six Utility Reports



B. Summary of Observations

Given their differences, it is difficult to attempt an overall description of the electric and gas business in the state, in terms of attributes material to staffing. At the risk of over-generalization, however, a number of overall observations arose from examining data about attributes we examined. We identified those attributes as those most likely to affect staffing in ways that could be expressed in quantitative dimensions and values. We then collected from management, and in a few cases publicly available sources, the data to do so, in order to support the quantitative lines of inquiry and analyses we performed.

The general observations we formed about these attributes are:

- The state's electric utilities can be characterized as two large, one medium and three small operations, with the characterization of "small" applicable on both state and national comparative bases.
- From a geographical perspective, most of the electric companies have relatively small service territories.
- Customer density among the electric companies does not vary in the extreme, with the notable exception of CECONY.
- Only two of the electric operations in our study have a major overhead transmission presence, with the other four lying in the bottom quintile on a national scale.
- The characteristics of the gas companies show a more uniform distribution than do the electric counterparts, although two or three can be considered very small.
- Four gas companies have customer counts in the bottom quintile on a national basis.
- Investment per unit infrastructure is far higher for the urban, as opposed to the remaining, less dense gas utilities.

C. Electric Operating Companies

We chose to treat CECONY and O&R as two different operations, recognizing that a distinct operational separation exists between the two. We made the opposite decision in the case of Avangrid. NYSEG and RG&E also operate separately, but tie much more closely together operationally than do CECONY and O&R. We discuss the companies as separate entities.

In comparing the utilities, we chose attributes that might have some impact on staffing levels. These attributes might be termed as potential "hard drivers" of staffing. We define those drivers to include staff-affecting characteristics that exist largely outside management control. For example, the number of customers a utility has surely influences required staffing, but that parameter arises from the environment in which the utility operates. The number of customers represents neither a performance statistic nor a value that management can influence. We address it as a hard driver to help clarify the "givens" that define a utility's relative size in the industry. We consider that knowledge important to understanding relative staffing requirements.

In contrast to "hard drivers" of staffing, we also examined what we termed "soft drivers." These factors do not represent "givens" and they do relate to performance. For example, a utility chooses what amount of gas mains it will replace each year. That decision surely affects staffing requirements. Similarly, utilities experience varying degrees of productivity, which also influences staffing requirements. We discuss these soft drivers in the individual utility reports, limiting this chapter's discussion to the hard drivers, or attributes that tend to define the operating environments of the various companies.

D. New York Electric Utility Characteristics

In comparing data, analysts look for: (a) many data points, and (2) a somewhat uniform distribution of that data. These factors support confidence in the data and the expectation that quantified relationships among entities for a given attribute can be determined. Unfortunately, we entered the study of New York electric utilities with access only to six data points. We later lost access to one of those initial data points, after determining through extended work and iteration, that Central Hudson could not provide sufficiently reliable data regarding its staffing numbers. We also began under the further limitation that the quantities associated with one or two very large utilities would complicate the search for relationships even more. The dominance of the one or the two large utilities for each parameter made it all the more important to understand those attributes up front, in order to inform our study of performance data suitably.

Below we discuss the dominance of NIMO and NYSEG in attributes associated with physical size, such as square miles of territory, miles of overhead lines, and number of substations. CECONY and, to a lesser extent, NIMO dominate attributes associated with revenue and number of customers.

E. The Reference Utility

One of the methods we employed to better understand how the utilities relate to each other employed was a concept we termed the “Reference Utility.” That term and a great deal of quantitative analysis surrounding it appear frequently throughout this report and the six other reports, each addressing an individual company. The term refers to a hypothetical utility operation (either electric or gas) that shares the characteristics of a composite of New York utilities. The use of the Reference Utility provided a common indicator for how the various utilities differ from the composite. For example, if a utility has the same number of customers as the Reference Utility, we can express the value of that utility’s number of customers as 1.0. If another utility has 50 percent more customers, we can state its customer count as 1.50. This approach provides a quantitative expression of the relative position of any of the operations we studied in comparison with others. It also provides a dimensionless variable that supports other useful calculations.

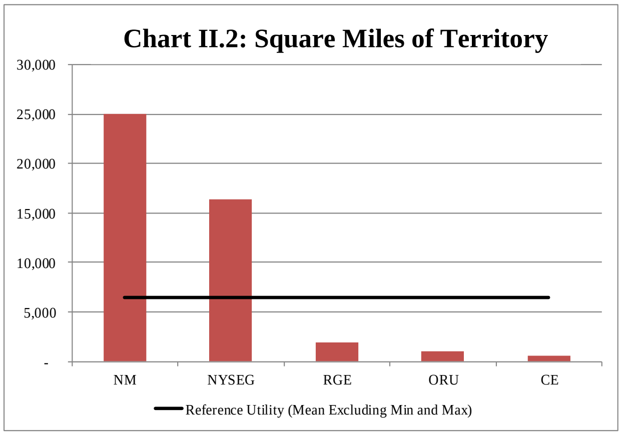
The composite representations of the electrical data often were dominated by one or two very large utilities accompanied by four utilities smaller and in some cases much smaller. Using a median rather than an average was preferred in such cases. We also took one further step, and calculated the average by first ignoring the largest and smallest values. That approach seemed better than both the simple average and the median. For purposes of this chapter’s review of basic attributes, we generally defined the electric Reference Utility as the median or average, excluding the minimum and maximum value.

F. Specific Electric Attributes

A number of attributes, detailed below, are likely to influence electric operations staffing in some way.

1. Service Area

The size of a utility’s service territory, and quantities derived from it (such as customer density) should have some impact on staffing. Sparse service territories likely experience higher costs, as employees require greater travel times, with resources spread over a greater area. The larger service territory can also require more distribution facilities, producing higher maintenance demands.



New York has two large utilities from a geographical perspective, with the rest being relatively small. One of the two is NIMO. Although very large in comparison to the other state utilities, NIMO's service territory is not especially large on a national basis. At least a dozen other U.S. utilities exceed it in square miles.

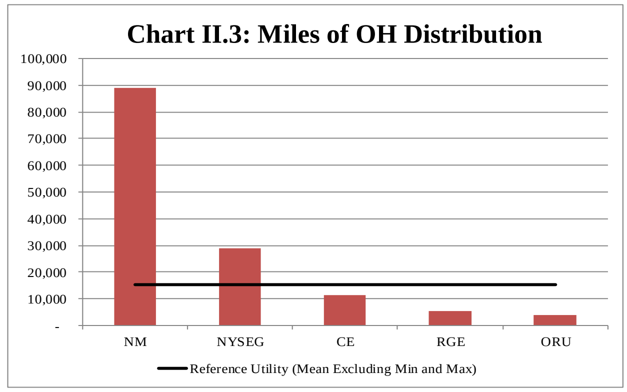


Chart II.3: Miles of OH Distribution

2. Distribution Lines

Miles of distribution lines should be a driver of distribution person-hours. One would expect to see the most influence on NIMO, which has more than seven times the Reference Utility's lines, hence facing faces challenges beyond those of the smaller distribution companies.

3. Transmission Lines

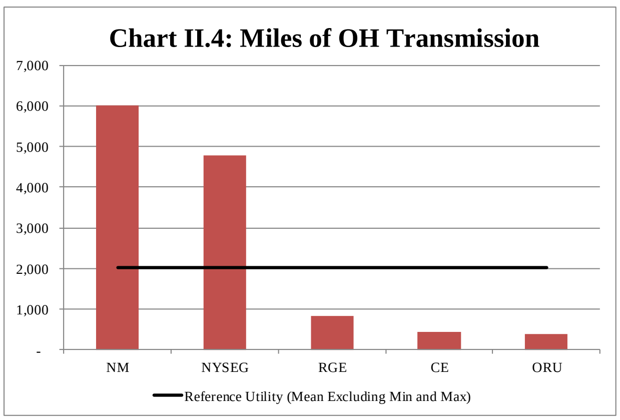


Chart II.4: Miles of OH Transmission

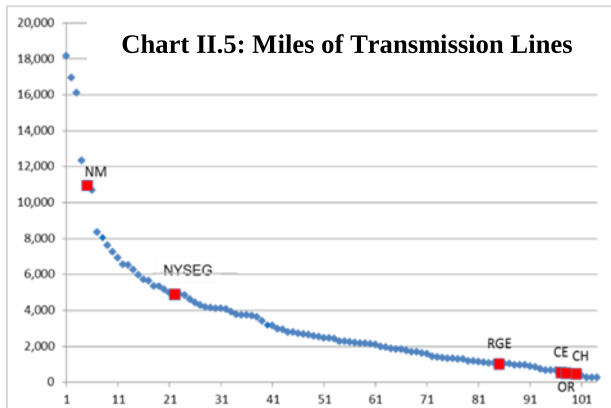


Chart II.5: Miles of Transmission Lines

Consistent with their large and spread-out service territories, NIMO and NYSEG dominate in miles of overhead transmission lines. The four other electric companies have less than half as many miles of overhead transmission lines, compared to the Reference Utility value. On a national scale, the two larger state companies fall in the top 20 percent while the four smaller transmission companies find themselves in the lowest 20 percent. Only two utilities have a major transmission presence in New York.

4. Substations

The number of substations generally mirrors the geographical measures, with NIMO and NYSEG dominating the group. The three geographically smaller companies have less than half the substations of the Reference Utility, and about a sixth of the two largest area companies.

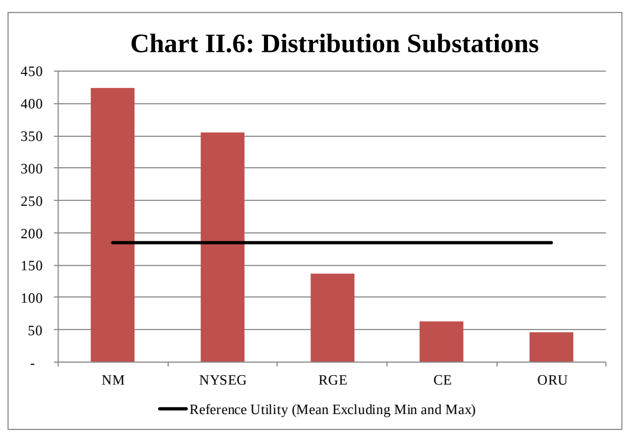
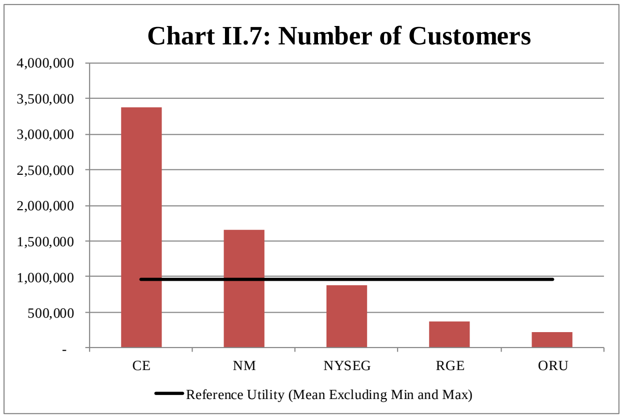


Chart II.6: Distribution Substations

These first four parameters define the geographically related attributes, creating a clear picture of two geographically larger and three smaller utilities. The relative impact on facilities like lines and substations is clear. We emphasize the large nature of the differences, because we consider that aspect material to comparative analysis. Ordinarily, from a statistical analysis perspective, a continuum of data is preferable, but instead we found ourselves with two "buckets" of utilities that have roughly equal geography-related characteristics.

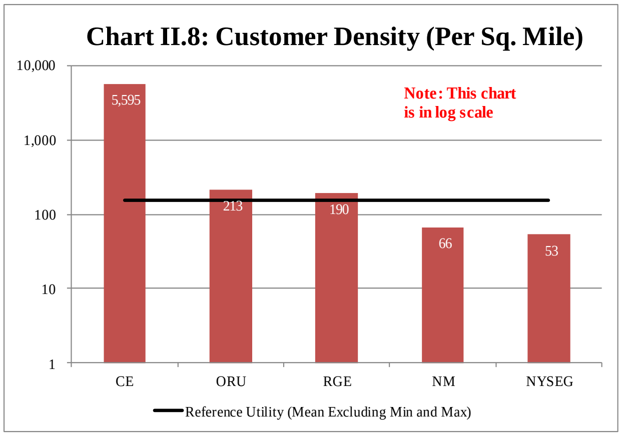
5. Customers

Moving to other than the geographically related parameters changes the relative positions of the utilities. CECONY moves now to the forefront as the largest utility in the state. CECONY remains one of the largest utilities in the country, despite the rise in rank of other utilities due to mergers. The divergence among the state utilities in number of customers is of interest - - the largest utility has 15 times the customers of the smallest.



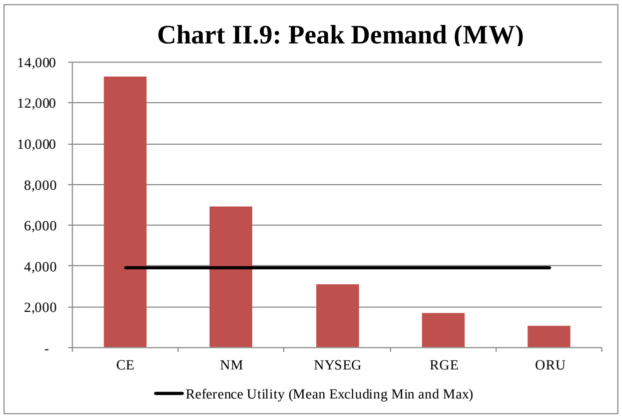
On a national scale, utilities with less than about 500 thousand customers might be characterized as relatively small. From a staffing perspective, they may not be able to achieve as many efficiencies as a larger scale company, but as we will see in our detailed analyses, that is not always the case.

An offshoot of customer count, customer density reflects the number of customers per square mile of service territory. Intuitively, one would expect density to form an especially important attribute, which can drive staffing, and many other performance parameters. It is likely that staffing efficiencies should exist for denser service territories, but it also appears likely that those efficiencies can turn to penalties when very high densities begin to make work logistically more difficult and expensive.



In this category, CECONY is the expected outlier (so much so that a logarithmic scale was necessary to depict its relationship to the other operations). CECONY is the most customer-dense utility in the U.S., surpassing its nearest rival by a factor of three. The median for customer density is about 100 customers per square mile. Therefore, the geographically large state utilities, NIMO and NYSEG, have low customer densities. They are still denser than what one might call the nation's "frontier" utilities, in which customer density can fall into the teens.

It is no surprise that CECONY is exceptional in terms of density, presenting great complications in drawing reasonable comparisons. That peculiarly high density leads to other unusual differences, such as the number of underground facilities, network configurations, high costs of any kind of work in the metropolitan New York City area, and difficulty in coordinating its work with other agencies. The uniqueness of work circumstances complicates direct comparisons with operations not facing the same challenges.

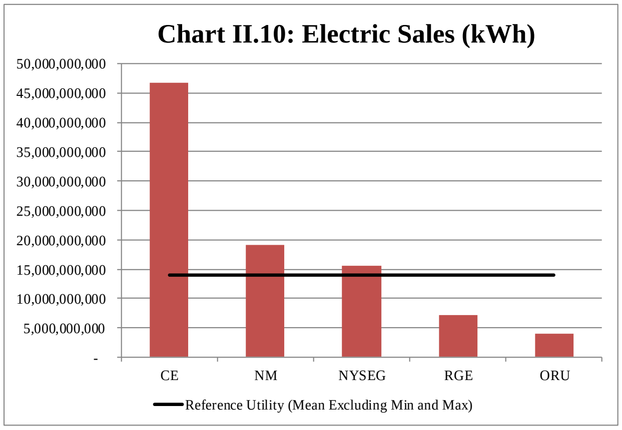


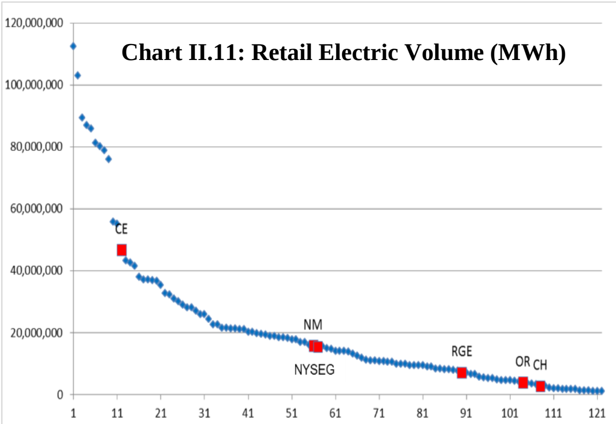
6. Peak Demand

Peak system demand offers a typical indicator of utility size, although one might expect any link to T&D staffing to be indirect at best. Here we see the same pattern as the customer profile among the state utilities.

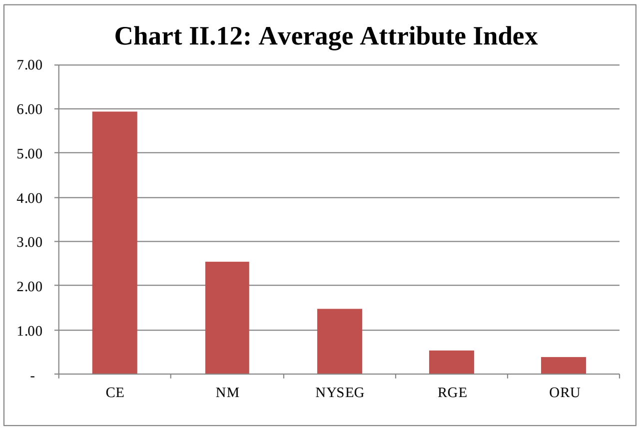
7. Sales

Retail sales comparisons largely mirror those using demand as the measure. From a sales perspective, the state's utilities are not particularly large on a national scale with the obvious exception of CECONY. Five of the six state utilities lie at the national median or lower and three fall into the bottom quartile. Now having a reasonably complete picture, we can observe that several of the state utilities are relatively small, and lack the economies of scale enjoyed by others in the U.S., including CECONY, NIMO, and NYSE&G in New York.





8. Electric Summary



We calculated an average of how each utility compares with Reference Utility values in all of the major attributes we have discussed. This combined measure is somewhat arbitrary, and should not be rigidly applied. On the other hand, it provides a consistent result, and summarizes the relative positions of the utilities well. The patterns we saw in each attribute show consistently in the summary results. It remains accurate to characterize the state electric operating companies as two large (NIMO and CECONY), one medium (NYSEG) and three small utilities, where "small" is applicable on either a state scale or a national scale. For calculating the electric Reference Utility attributes, we used the median or average excluding the minimum and the maximum. A utility with a measure of 1.5 would have a 50 percent higher value than the Reference Utility, for that particular attribute. We also sought a measure of size based on *all* attributes. Averaging each of these atrribute-specific values provides a rough indicator of a utility's overall size versus the other utilities. We call this the "average of all attributes index."

Distinctions in these attribute values should be noted when examining staffing strategies and levels, because the attributes that comprise this average have an impact on staffing, and can be considered staffing drivers generally outside the control of management.

G. Gas Operating Companies

The nine operations into which we divided the natural gas portion of our study include three from National Grid and two from Avangrid.

H. Specific Gas Attributes

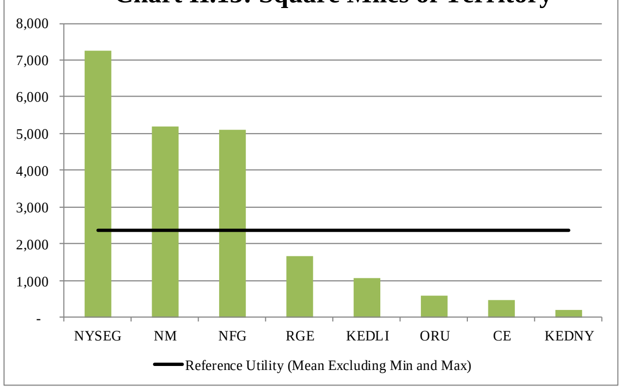
We examined the same type of attributes we used in gauging electric operations. Most of these attributes reflect hard drivers of staffing, giving them value in framing our subsequent analyses.

The disparity among gas operations in these attributes is not nearly as extreme as the electric data evidenced. Nevertheless, some outliers caused us to use the same approach in defining the Reference Utility for purposes of this chapter; *i.e.*, the median or average of the data, excluding the minimum and maximum points. This was not so pressing a need for the gas operations; nevertheless, it did serve to present a more useful picture.

1. Service Territory Size

We observed a wide and generally more uniform distribution of service territory sizes among the gas utilities. The service territories are far smaller than the corresponding electric territories, with the gas Reference Utility less than half the size of the electric Reference Utility value. The urban utilities are especially small geographically, with KEDNY (Brooklyn) and CECONY very small versus the Reference Utility. NYSEG, NIMO, and NFG are substantial in size, each having more than twice the area of the Reference Utility value.

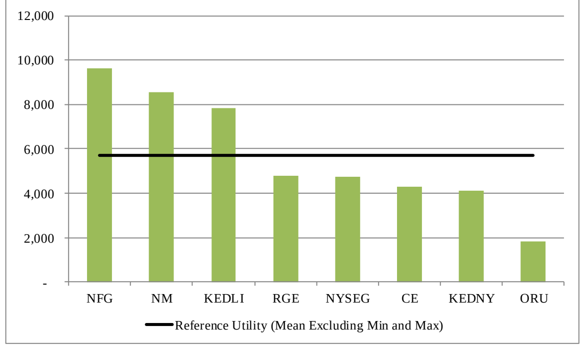
Chart II.13: Square Miles of Territory



2. *Miles of Pipe*

In terms of infrastructure, particularly pipe, we again found a generally uniform distribution over a reasonably close range. The largest (NFG) is still less than twice the Reference Utility value. Four of the nine fall essentially right on the median, suggesting this likely driver of staffing may prove particularly beneficial in our analyses.

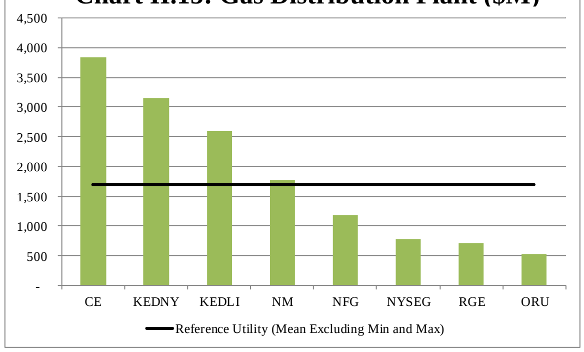
Chart II.14: Miles of Distribution Main



3. *Distribution Plant*

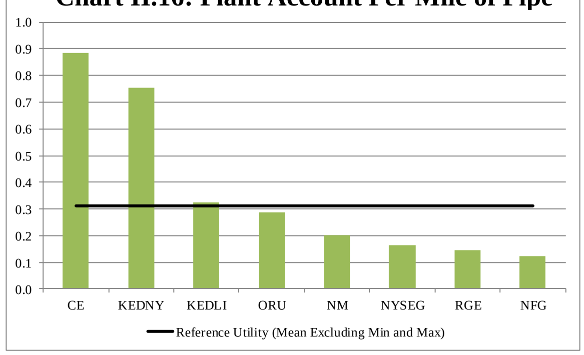
Most of the gas companies have over a billion-dollars in utility plant, led by CECONY and KEDNY. They both fall in the top 10 percent for size in the U.S. KEDLI and NIMO do not fall far behind. Interestingly, distribution plant account, although a measure of infrastructure, exhibits a very different structure than do miles of pipe. Extreme changes in rank occur for some utilities. CECONY moves from 6th to 1st, NFG from 1st to 5th, and KEDNY from 7th to 2nd. These differences prompted another perspective, this time based on the amount of plant account per unit infrastructure (in this case, pipe).

Chart II.15: Gas Distribution Plant ($M)



It becomes clear that on a comparable basis, the investment requirements of the heavily urban gas companies far exceed the others, thereby biasing the data significantly.

Chart II.16: Plant Account Per Mile of Pipe



4. *Customers*

Chart II.17: Retail Gas Customers

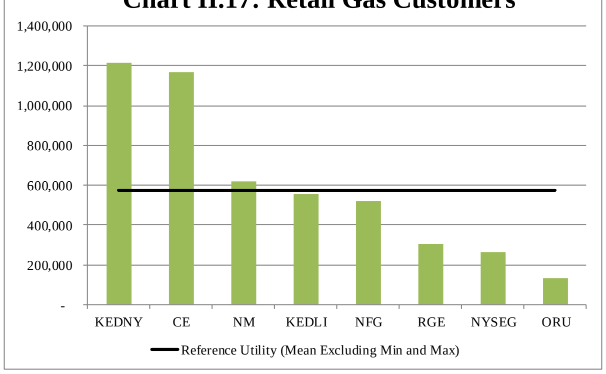
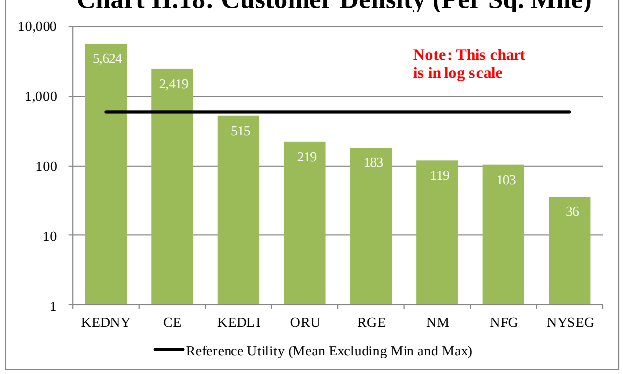


Chart II.18: Customer Density (Per Sq. Mile)

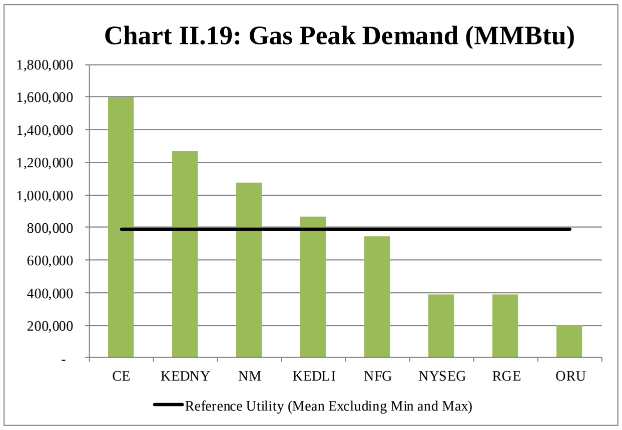


In terms of customers, KEDNY and CECONY again dominate four relatively small utilities, including CH and O&R, with their less than 100,000 customers each. Those customer counts place them in the smallest 20 percent of gas utilities in the U.S. The top five state gas companies all lie among the upper half in the U.S. in terms of size of customer base.

Customer densities for gas operations show less extreme variation than did their electric counterparts. There, CECONY was about 40 times the Reference Utility value. The low end illustrates unusual results, with seven of the nine state gas companies falling below the Reference Utility value.

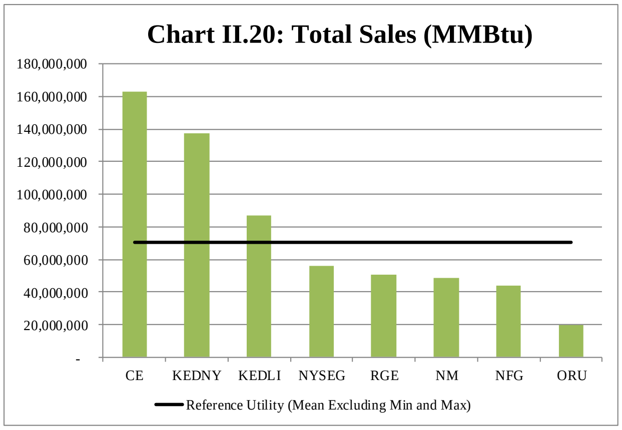
5. Peak Demand

Rankings by demand and number of customers closely mirror each other.



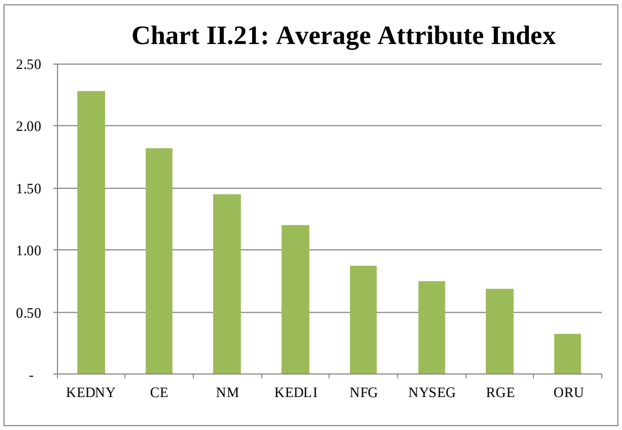
6. Sales

The same proved true for sales, where rankings mirrored number of customers and demand.



7. Gas Summary

As for the electric comparison, we prepared a simple average of how each utility relates to the Reference Utility value for each of our major categories. The electric chart illustrated three medium or large utilities and three small utilities. The gas profile, by contrast shows a continuum. There remain two or three very small utilities, but most of the gas utility attributes spread over a reasonably consistent range.



Chapter III: Staffing Model

This study created a unique opportunity to conduct an in-depth, data-driven analysis of staffing of a somewhat sizeable population of utility operations operating in a single state. Liberty applied a number of quantitative, analytical approaches to provide insight into staffing adequacy. The approach we describe in this chapter, development of New York specific quantitative models to compare staffing levels across the state, comprised one of those approaches.

A. Defining a "Model"

Models offer simplified representations of real-world relationships among observed characteristics, values, and events. Modeling makes simplification inevitable, because of the inherent complexity of those relationships in the context relevant to our study. Nevertheless, simplification is intentional, serving to focus attention on particular aspects considered most important for a given model's application.

The term *model* refers to a quantitative method, system, or approach that applies statistical, economic, financial, or mathematical techniques and assumptions to process input data into quantitative estimates. A model consists of three components:

- An information input component, which delivers assumptions and data to the model
- A processing component, which transforms inputs into estimates
- A reporting component, which translates the estimates into useful business information.

For this study, development of models offered a means to standardize and compare staffing costs and hours, while taking into account the wide variations and differences in factors likely to influence staffing levels and composition. Models provided a way to account for variations in characteristics that likely affect staffing requirements. Such variations, to list just two examples, include territory size and numbers of customers served. Modeling also allowed us to investigate the significance of variables with potential statistical and underlying operations influence - - variables that may not have been otherwise evident.

We constructed the models to inform Liberty's experts, and to augment other analyses by quantitatively examining key business characteristics and other significant descriptive data for the companies included in the study. The resulting comparative view provided by the models gave our team the ability to look across companies and historical time horizons to review performance in comparison with peers, and to provide quantitatively based insights into staffing effectiveness.

B. Model Design Considerations

We designed our study approach to support capture of the data relevant to utility capital, O&M, and engineering work requirements. We developed plans and tools to support gathering data in identically categorized ways from each of the utilities. We developed models from this extensive, management-provided data, which we vetted as best we could, recognizing that significant reliance needed to be placed on management to extract large sets of data from systems that did not always structure the data in the form requested. We worked extensively with each study participant's management to make our data structure and content clear, and to work through the challenges they identified in "translating" from their categorizations. As much as we could, we sought to structure our data classifications in ways that appeared to us reasonably similar to how we would expect utilities to keep and sort data for operations purposes.

Typical of most models that employ multivariate regression, our models correlated actual staffing levels (the dependent variable) to key infrastructure attributes and work characteristics (the independent variables). We used the models to produce staffing level estimates, broken down by capital, O&M, and engineering, for each utility. These staffing estimates let us compare how each individual utility's staffing levels (for its unique combination of attributes and characteristics) varied relative to other New York utilities' staffing levels. The models provided a mathematically sophisticated way to view each utility's staffing levels, normalized for its unique mix of infrastructure and work activity. The models provided an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure and work activity. Those variances provided one of the bases used to identify staffing issues and concerns, augmenting our other analyses of staffing.

Effective model development necessarily begins with a clear purpose in mind. A focus on purpose ensures that model development is aligned with its intended use, and that any assumptions made in the development are generally fit for the intended purposes. Design, theory, logic of the model, and its underlying methods need to be appropriate and generally supported by research and sound business practices. We chose, for the reasons addressed below, multivariate linear regression as this study's general method for constructing models.

For this study, in particular, the horizontal view (looking across data from all utilities) and statistical modeling of the relationship between costs in dollars or hours against structural factors proved useful. Examples of those factors include number of customers, miles of transmission or distribution line, miles of gas main, or energy sold. Examining work activity production factors allowed us to take into account (normalize) a multitude of factors that cannot be measured easily, *e.g.*, differences in geographic locale, staff capabilities, company-size, complexity of operations, and maintenance philosophies. This normalization allows for a quantitative view of what companies do effectively, where expending resources (in dollars or hours) generates greater returns, and where companies may be considered to be out of sync with others' staffing levels for individual work functions.

Multivariate linear regression promoted Ease of Interpretation. Such regression supplies a mathematical method that attempts to model the relationship between two or more independent, explanatory variables and a dependent, response variable, by fitting a linear equation to observed data. The resulting linear equation describes the expected, or mean, response based on the values of the explanatory variables. Multivariate linear regression offers a commonly used way to perform comparative, horizontal analysis. Furthermore, understanding the effects of changes in explanatory variables on the dependent variable becomes straightforward and intuitive for people familiar with the environment being modeled. This important consideration allowed Liberty's experts to participate in the model development process.

The approach we employed also produces Reasonable Development Costs. Given wide use of multivariate regression in a multitude of industries, a number of available packages allow for the development of multiple linear regression models, both as standalone solutions (*e.g.*, SAS, SPSS, and R) and as part of existing business productivity software (*e.g.*, Microsoft Excel and SQL). Moreover, after developing an equation, testing or implementation can occur in separate systems with like data.

Multivariate linear regression also provided Ease in Handling Large Data Sets. Performing such regression, at its most basic, only requires data organized in simple flat files. These files can be prepared easily in spreadsheet applications such as MS Excel, or in more production-capable environments such as MS Access and SQL. Reasonably modest effort is required to connect the "pipes" to construct models and to format data. This advantage makes our solution ideal for the rapid development and deployment our study contemplated.

We designed our models to account for company differences. Therefore, development required significant up front work, which we undertook to determine a large set of variables, both costs and hours, as well as system attributes and work activities (called "production quantities"). Our efforts produced a wide array of variables from which the modeling effort could draw for quantitative information. We also computed a supplementary set of derived variables, using arithmetic combinations of a number of the system attribute and production quantity variables. Use of derived variables allowed additional information and second-order relationships to be explored in the modeling effort, using one variable where two or three might otherwise be required. The table below shows summary information for the independent variable sets used as part of the model development effort.

Table III.1: Modeling Variables Summary

Type	**Number of Variables Considered**		
	Production Quantity	System Attribute	Derived
Electric	21	43	41
Gas	16	39	13

Using the data, we developed cost and hour models for distinct functional components necessary to engineer, build, operate, and maintain, the electric and gas infrastructure that our study addressed. The table below provides a high level overview of the nine models developed for capital, operations and maintenance (O&M), and engineering functions within electric distribution, electric transmission and substation (T&S) and gas operations, as defined by the scope of our study.

Table III.2: Models Developed for Electric and Gas Functions

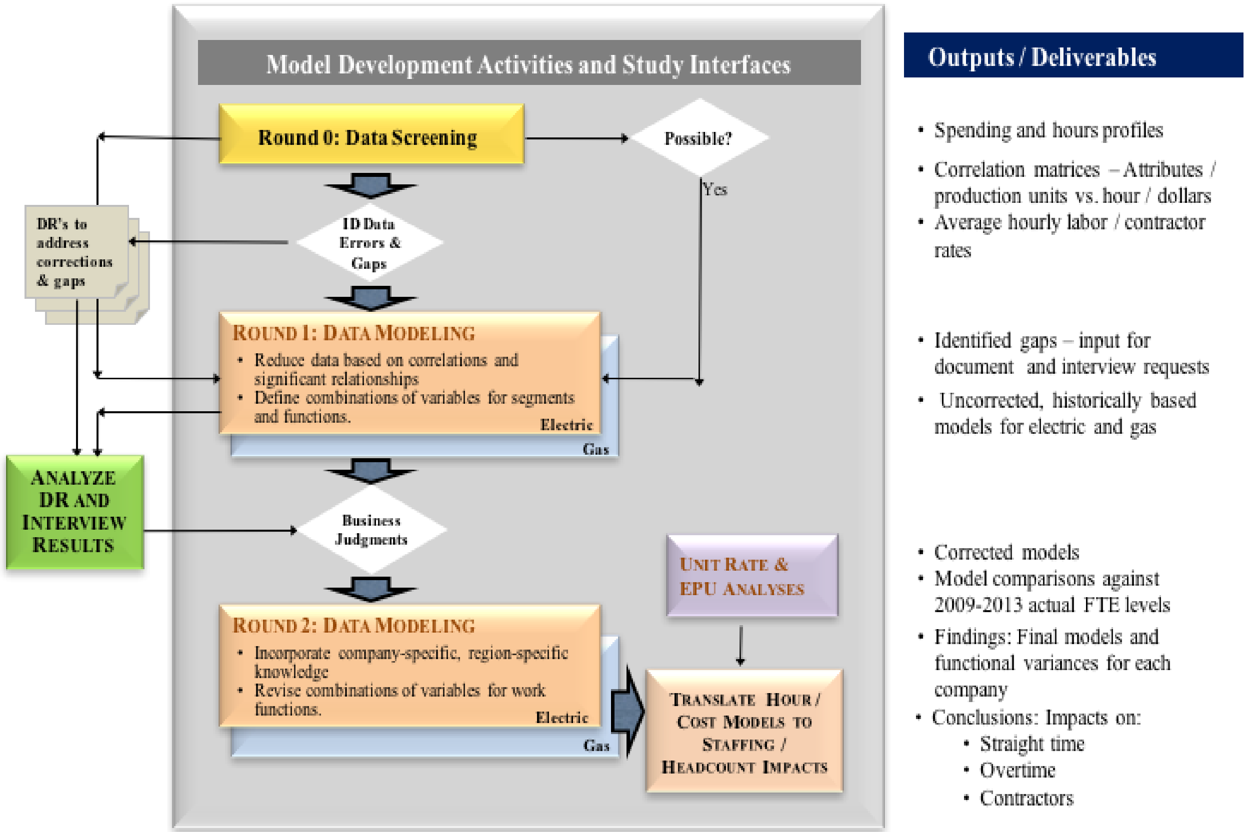
Function	**Capital Work**	**O&M Work**	**Engineering**
Electric Distribution	X	X	X
Electric Substation		X	X
Electric Transmission		X	
Gas	X	X	X

We could not develop meaningful models for Substation Capital and Transmission Capital. Expenditure changes from year-to-year in these two categories proved too volatile to allow development of statistically valid models using only five years of data for the New York utilities. We did not find such volatility surprising, given the "lumpiness" in capital spending that typifies the industry in these two categories.

C. Approach to Model Development

The process for constructing models for costs and hours associated with functional components followed a typical model development process. We integrated that development process with our other study efforts and analyses. The following flow chart depicts the step-by-step process we used for model development. Data requests (identified in the chart as DRs) formed a principal means for securing information from the utilities.

Figure III.3: Model Development Steps for Electric and Gas Functions



The model development approach used five major steps that we performed in tandem with expert interviews and qualitative assessments involving management of the operations we studied. The next subsections describe the details of activities performed as part of each of these major steps.

1. Round 0: Data Screening

We performed data screening to determine the robustness and sufficiency of the data for modeling. This effort involved production of summary statistics and simple correlations for the data provided. That exercise served two important purposes:

- Ensuring the data was physically correct by performing basic data screening (*e.g.*, no negative values for hours), which identified where it needed cleansing
- Providing a basis for subsequent variable selection as part of model development.

We also assessed and evaluated the impacts of statistical outliers within the data as part of this early effort. These initial steps enabled an early determination of whether the data contained enough information (simple relationships between independent and dependent variables) to produce likely success in constructing multivariate regression models in subsequent Round 1 modeling.

2. Identify Data Errors & Gaps

This step formed an integral part of correcting or mitigating data errors identified during Round 0 data reviews. We identified data errors and gaps for correction, based on the nature of remediation and the materiality of the data error or gap. For example, where data was easily sourced (*e.g.*, from publicly available alternatives or reports to the commission), we could make corrections outright. However, for attributes or values where quality data was scarce or the most robust data source was spotty, the team investigated alternative sources. The preceding chart shows this activity as a single step, but we actually performed this exercise multiple times throughout the study (including after Round 1 and Round 2 modeling).

As we got further into model specification, and began using models to estimate results, our methods for identifying data inconsistencies and errors became increasingly sophisticated. We often discussed and reviewed preliminary results and analyses with utility management, identifying key areas where their data was inconsistent, or in some cases, missing. Therefore, the companies had multiple opportunities to correct their data, resulting in multiple iterations of using corrected data to construct revised models during both the Round 1 and Round 2 modeling steps described below.

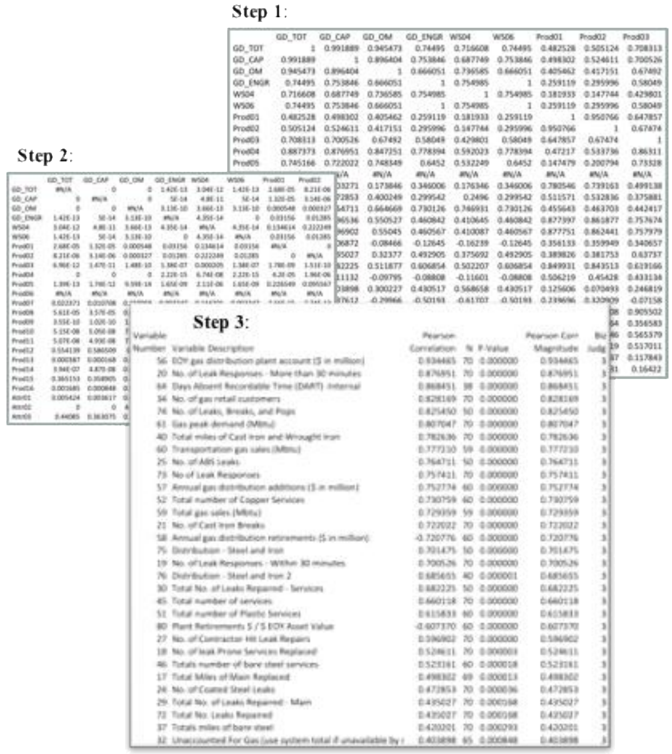
3. Round 1: Data Modeling

We performed a series of statistical calculations to take the broad data set of independent variables (system attributes and production data) that we initially asked the utilities to provide. We eliminated the variables that did not vary in the same manner as costs or hours data (the dependent variables. This step allowed us to narrow the number of data points used to perform subsequent correlation analyses. We further filtered the initial set of variables for each functional model to minimize the effects of multicollinearity on the resulting model estimation. The multicollinearity phenomenon occurs when two or more independent variables in a model show high correlation, meaning that one variable can be linearly predicted from the others with a high degree of accuracy. These variable screening techniques required us to use the regression software to examine tens of thousands of combinations of the independent variables against the dependent variables. We used this screening to generate rank-ordered lists of variable combinations that had the most explanatory power. The next illustration depicts this process.

Illustration III.4: Model Development Steps for Electric and Gas Functions

Round 1 models were developed by:

- *Step 1: Screening all independent variables and rank ordering by correlation with the dependent variables.*
- *Step2: Elimination of independent variables that were auto-correlated .*
- *Step 3: Running all the combinations / permutations of multivariate models for the top 28-70 variables (depending upon the sample data size) to identify the best fit models, based upon R^2.*
- *Key Result: Determining the appropriate level of detail for modeling each function.*

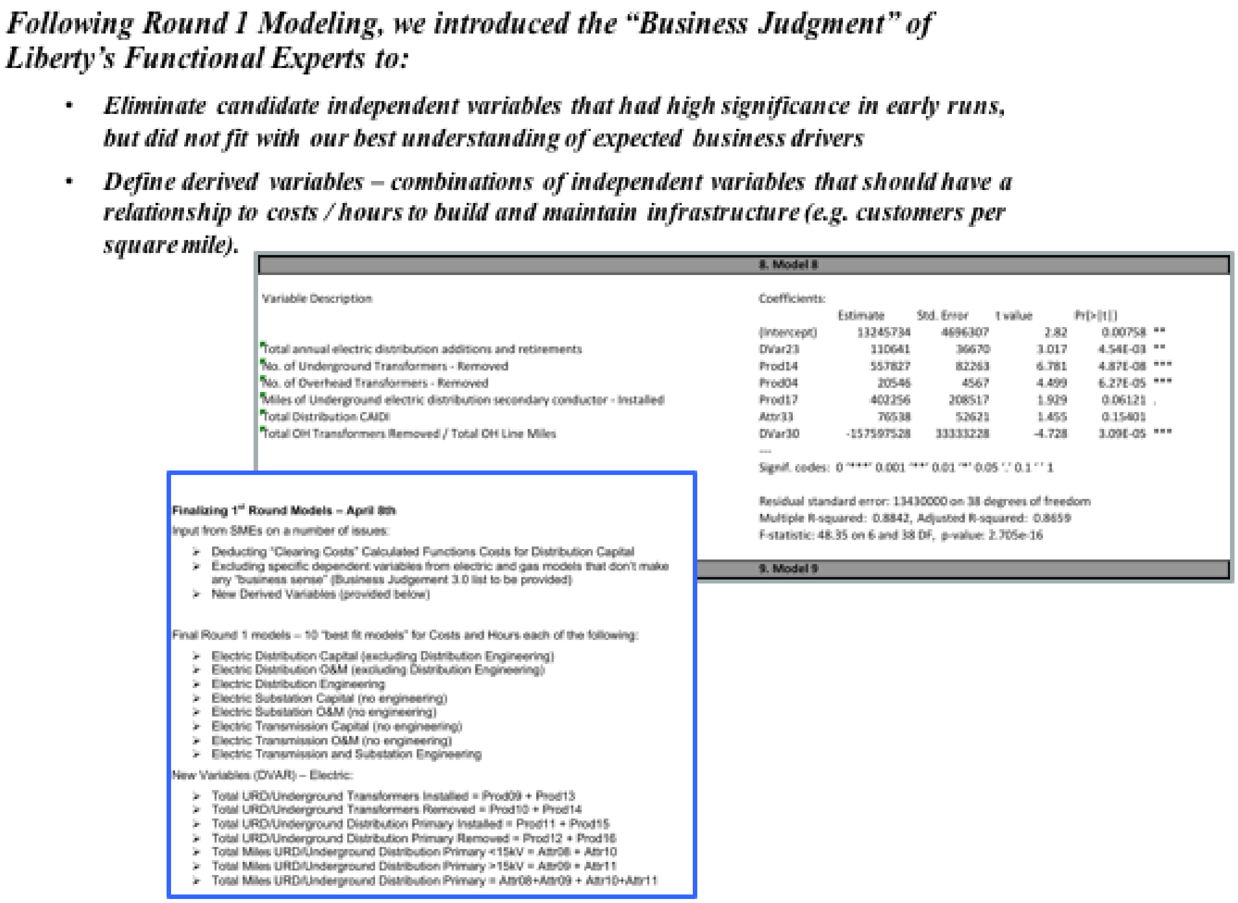


Applying this approach increases a model's explanatory power. That benefit became important here, given the small size of the data set (due to the number of New York electric and gas operations included). We also generated a sample of un-scrubbed candidate models, in order to examine the resulting estimates. Here began our process of "informed" model selection. These un-scrubbed models consisted of early model runs, made before correction of data gaps and errors and before the application of business judgement.

4. *Business Judgment*

Application of business judgment formed a very important part of the statistical filtering process described in the modeling steps. Based on the results of Round 1 development of candidate models, we turned to our functional experts; *i.e.*, those conducting the process reviews addressed in our report concerning each of the operations we reviewed. They each have decades of experience in the electric and gas functions being assessed. They examined the initial results to determine whether or not the filtered variable set made intuitive sense based on their industry knowledge and what they had learned in reviewing the staffing processes of the participating utilities. In addition, their review considered whether and how secondary and tertiary effects (*e.g.*, combinations of single variables into derived variables having multiple dimensions, such as customers per square mile) being indirectly captured reflected credible operational aspects of the business, in cases where the models identified as correlations to costs and hours. The next illustration depicts this approach.

Illustration III.5: Model Development – Business Judgment



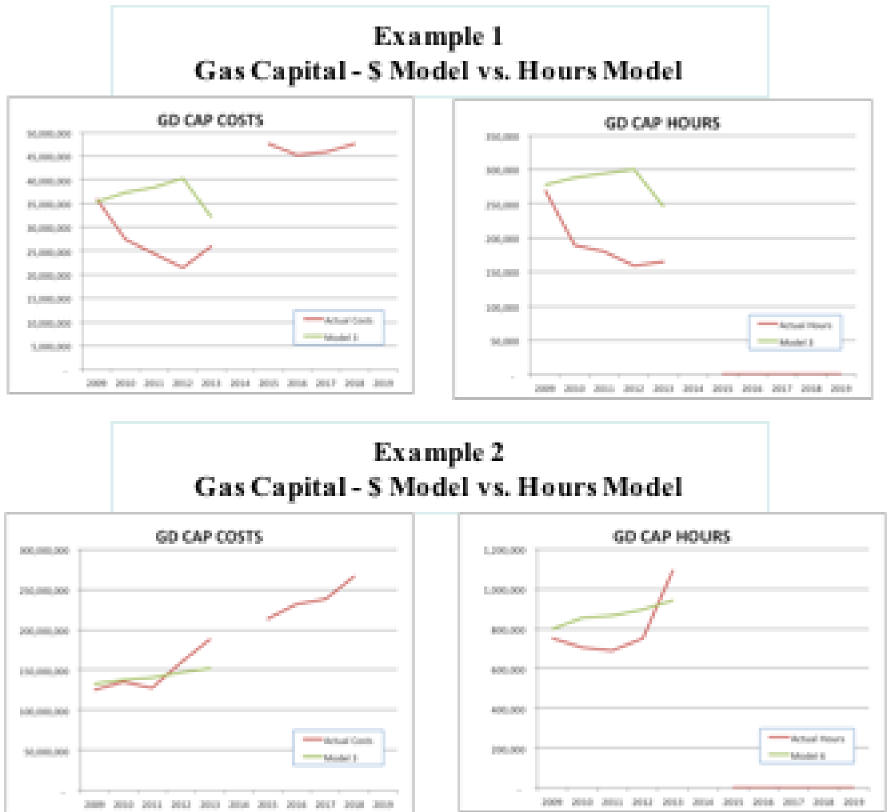
This process of business judgement checking helped to ensure that early models and their results proved logical, given our experts' knowledge of the business. The pure statistical properties of the underlying data thus did not alone determine whether to consider each independent variable for final modeling. Like the data corrections process, business judgement reviews were iterative. As we approached Round 2 modeling, business judgment was also applied to the selection of candidate models, in order to determine the final models used in the study.

5. *Round 2: Data Modeling*

The second round of modeling combined the outputs from the first round with the feedback on variables and data corrections, in order to develop a final group of candidate models for electric and gas functions, each statistically significant in its own right. Our experts reviewed these candidate models. Here, we also incorporated and tested company-specific and regional knowledge, in order to determine if it provided any additional explanatory value. We produced a selection of models for each electric and gas function, using costs- and hours-dependent variables. Our business experts scrutinized the results of the models, their variable specifications, and their predictive power, in order to identify those best for use in translating costs and hours into headcount and staffing impacts. We used a custom-built calculation engine to compare cost/hour estimates for each of the candidate models. The calculation engine compared estimates against actuals for functional costs and hours for each company. This approach allowed our experts to undertake a granular review of model results, in order to identify and investigate differences. Ultimately, this process let our experts select the model for each electric and gas function that provided both statistically significant results and consistent estimates for costs and hours across all companies in the study.

After we chose a final model for each function, we used that model equation with the values for independent variables provided by the companies to check against actuals, compare outputs against forecasted values, and used them to identify large differences between model estimates and actuals. The next charts exemplify the comparisons using our model calculation engine.

Illustrative Example III.6: Company Actuals vs. Model Results Charts



We used the final model for each function (capital, O&M, and engineering) chosen by business and functional experts to screen cost and hour variances and in the process to translate forecasted costs into estimates of hours and FTEs. In the case of the former use, we identified companies exhibiting high variances from the model-generated baseline for functional analysis and investigation.

Our work led to an interesting observation, developed as our experts examined the models. We observed that historical cost profiles and model estimates from both the cost models and hours models demonstrated similar dynamics, characteristics, and trends, and in most cases, even highly similar variables. This concurrence made sense intuitively, because hours and costs effectively reflect the same data, scaled by wages. However, hours models had a notable shortcoming for use as a comparison. Specifically, the utilities could not provide forecasts stated in hours for the group of operations we were studying. An example of this similar behavior is apparent in the charts shown above. The charts for hours show the line over the forecasted years (in red) as flat against the y-axis. This result occurred because companies do not typically prepare forecasts for hours. They do, however, typically forecast costs five years into the future, including labor and contractor costs. We therefore decided not to provide separate, hours-based models, but used the cost-based data to develop equivalent numbers of FTEs for the forecasted portion of our study period.

The final step in the modeling process was to convert the cost estimate outputs from each of these functional models into FTE estimates that were used to compare historical company staffing levels in each function against model estimates.

D. Our Use of Models in This Study

We prepared a five-year average (2009-2013) number of FTEs, derived from model estimates compared to the company's five-year average actual FTEs for each function (capital, O&M, and engineering). The Resource Planning section of the quantitative analysis in each company report shows and explains the results of that data assembly and comparison.

We constructed our models to provide a way to account for variations in characteristics that affect staffing requirements, both obvious and not. The model's staffing estimates have a statistical significance limited by the accuracy and availability of the data. We discuss these underlying statistical measures in the next section.

We succeeded in constructing models that produced functional staffing estimates suitable for use in identifying where company staffing levels had significant variations from levels experienced by other New York companies (given their infrastructure and characteristics). We used the model estimates to inform our experts and augment the other quantitative analyses (for example, FTEs per unit rate and equivalent production unit (EPU) productivity), as they assessed staffing. The advantage of the comparative view provided by the models lay in the ability to look across companies and across historical time horizons to review performance in comparison with peers, and to gauge statistically relative effectiveness of staffing level results.

E. Model Results: The Models for Electric and Gas Functions

The structured model development process described above produced nine separate models - - one for each functional area we modeled for electric and gas operations. Each model comprises an equation representing the mathematical relationship between costs, the dependent variable, and the independent variables (system attributes and work activities). Our development process allowed us to develop models with high levels of statistical significance (correlation between the independent variables and the dependent variable). Our process also produced models containing variables that passed multiple business judgement screenings by our functional experts. The business judgement reviews helped eliminate variables that, while highly correlated with costs, did not pass the experience and expertise test/judgement of our business experts who performed the functional assessments of this study. We undertook an iterative process of developing successive sets of candidate models and business judgement reviews, to eliminate variables showing a correlation to costs mathematically, but not likely relevant based on our team's collective experience and judgment. That iterative process produced the model results shown below.

Given that the purpose of these models was to provide a screening mechanism to identify where individual company staffing costs for a functional area were significantly different from those of other companies we studied, we are confident that we constructed a useful tool for this study. Our confidence in the models arises from the methods we used to create them. The models comprise combinations of variables that are statistically significant, have common sense relationships to the underlying structure of the business, and are consistent with our experts' understanding of the business itself.

The following tables detail the equations that comprise each model, accompanied by selected statistics for the variables, for each functional electric and gas model used in the study. In the first, larger box the model variables are shown in the first column, the co-efficient for each variable is shown in the second column, and the remaining columns show key statistics relating to each variable. The section in the smaller box beneath the box with the model variable listings shows key statistical measures for the model as a whole.

Figure III.7: Electric Distribution Capital Model Equations

Variable	Coefficient	Std. Error	t-value	p-value	
Intercept	-10,864,755	9,425,336	-1.153	0.2562	
Miles of Underground electric distribution primary conductor - Removed or Abandoned	914,600	116,221	7.869	0.0000	***
Miles of Underground electric distribution primary conductor - Installed	143,551	51,850	2.769	0.0087	**
Total Distribution CAIDI	299,544	46,458	6.448	0.0000	***
Miles of Underground electric distribution secondary conductor - Removed or Abandoned	111,208	48,291	2.303	0.0269	*
No. of Line Locates	612	142	4.304	0.0001	***
No. of Overhead primary conductor miles - Removed	165,353	120,597	1.371	0.1784	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:

Multiple R-squared: 0.9653, Adjusted R-squared: 0.9598
F-statistic: 176, p-value: < 2.2e-16

Figure III.8: Electric Distribution O&M Model Equations

Variable	Coefficient	Std. Error	t-value	p-value
Intercept	6,567,382	11,020,258	0.596	0.5549
No. of Underground Transformers - Installed	93,732	24,337	3.851	0.0005 ***
No. of URD Single Phase Padmount or silo Transformers - Removed	-197,613	80,555	-2.453	0.0190 *
No. of Trouble Job Tickets (including all types of jobs)	855	147	5.819	0.0000 ***
Total OH Transformers Removed / Total OH Line Miles	111,863,994	49,601,838	2.255	0.0301 *
Miles of Underground electric distribution secondary conductor - Removed or Abandoned	-79,589	39,205	-2.03	0.0496 *
No. of Overhead Transformers - Installed	6,662	1,396	4.773	0.0000 ***
Miles of Underground electric distribution primary lines <15kV	2,489	1,755	1.418	0.1645

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:

Multiple R-squared: 0.8782, Adjusted R-squared: 0.8551
F-statistic: 38.1, p-value: 4.988e-15

Figure III.9: Electric Distribution Engineering Model Equations

Variable	Coefficient	Std. Error	t-value	p-value
Intercept	6,655,300	1,608,475	4.138	0.0002 ***
Substation transformer capacity (MVA)	859	238	3.616	0.0009 ***
Total Distribution CAIDI	20,152	4,954	4.068	0.0002 ***
Miles of URD electric distribution primary lines >15kV	-25,369	3,806	-6.666	0.0000 ***
No. of URD Single Phase Padmount or silo Transformers - Installed	-13,936	3,978	-3.503	0.0012 **
Total OH Transformers Removed / Total OH Line Miles	-14,888,877	7,863,930	-1.893	0.0664 .
No. of Trouble Job Tickets (including all types of jobs)	65	17	3.832	0.0005 ***
No. of Overhead primary conductor miles - Removed	45,829	14,934	3.069	0.0041 **
Annual electric distribution retirements ($ in million)	-49,386	31,418	-1.572	0.1247

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:

Multiple R-squared: 0.9268, Adjusted R-squared: 0.9106
F-statistic: 57.01, p-value: < 2.2e-16

Figure III.10: Electric Substation O&M Model Equations

Variable	Coefficient	Std. Error	t-value	p-value	
Intercept	-1,836,936	3,356,814	-0.547	0.5891	
Transmission SAIDI	784,356	403,732	1.943	0.0634	.
Total annual electric distribution additions and retirements	83,056	6,901	12.036	0.0000	***
Number of distribution substations	-153,289	73,101	-2.097	0.0463	*
Total Substations	147,349	41,398	3.559	0.0015	**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:
Multiple R-squared: 0.9675, Adjusted R-squared: 0.9489
F-statistic: 185.9, p-value: 2.2e-16

Figure III.11: Electric Transmission O&M Model Equations

Variable	Coefficient	Std. Error	t-value	p-value	
Intercept	3,923,943	2,283,641	1.718	0.0986	.
Annual electric transmission retirements ($ in million)	463,397	90,874	5.099	0.0000	***
EOY electric transmission plant account ($ in million)	3,283	628	5.23	0.0000	***
Total Miles Transmission	1,028	231	4.458	0.0002	***
Subst MVA per Res Cust	-422,403,348	230,128,253	-1.836	0.0789	.
Miles of UG transmission lines <130 kV	-3,801	3,749	-1.014	0.3207	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:
Multiple R-squared: 0.933, Adjusted R-squared: 0.9191
F-statistic: 66.89, p-value: 2.674e-13

Figure III.12: Electric Transmission and Substation Engineering Model Equations

Variable	Coefficient	Std. Error	t-value	p-value	
Intercept	-2,255,499	3,979,945	-0.567	0.5764	
Miles of Underground electric distribution primary conductor - Installed	49,438	4,750	10.407	0.0000	***
Trans MVA per Res Cust	-343,366,612	228,238,654	-1.504	0.1461	
Annual electric transmission retirements ($ in million)	635,099	105,817	6.002	0.0000	***
Transmission SAIDI	828,138	162,409	5.099	0.0000	***
Subst MVA per Other Cust	80,280,781	34,230,442	2.345	0.0280	*
No. of Overhead primary conductor miles - Installed	16,604	5,225	3.178	0.0042	**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:
Multiple R-squared: 0.9832, Adjusted R-squared: 0.9788
F-statistic: 224, p-value: < 2.2e-16

Figure III.13: Gas Capital Model Equations

Variable	Coefficient	Std. Error	t-value	p-value	
Intercept	-35,359,063	8,807,510	-4.015	0.0002	***
Total Miles of Main Replaced	364,276	158,145	2.303	0.0246	*
Total miles of main	-6,402	1,751	-3.656	0.0005	***
EOY gas distribution plant account ($ in million)	100,561	6,041	16.646	0.0000	***
Annual gas distribution additions ($ in million)	-696,686	107,786	-6.464	0.0000	***
Plant Addition $ / $ EOY Asset Value	599,222,374	133,388,820	4.492	0.0000	***
Square miles of gas system territory	-1,001	771	-1.297	0.1992	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:

Multiple R-squared: 0.9709, Adjusted R-squared: 0.9681
F-statistic: 350.5, p-value: < 2.2e-16

Figure III.14: Gas O&M Model Equations

Variable	Coefficient	Std. Error	t-value	p-value	
Intercept	14,833,438	3,093,446	4.795	0.0000	***
No. of leak Prone Services Replaced	2,286	694	3.297	0.0017	**
Total miles of main	-8,605	943	-9.123	0.0000	***
EOY gas distribution plant account ($ in million)	26,064	3,257	8.003	0.0000	***
Annual gas distribution additions ($ in million)	-196,559	26,355	-7.458	0.0000	***
Service leaks per 1000 services	3,053,830	733,148	4.165	0.0001	***
Total Customers / Square Mile of Service Territory	1,807	309	5.848	0.0000	***
% of Leak Prone Pipe	-47,916,206	8,122,212	-5.899	0.0000	***
% of Leak Prone Services	-16,106,383	7,307,277	-2.204	0.0314	*
Total number of services	89	20	4.44	0.0000	***
Total No. Leaks Repaired	5,802	1,966	2.952	0.0045	**

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Key Statistical Measures:

Multiple R-squared: 0.9614, Adjusted R-squared: 0.9548
F-statistic: 146.8, p-value: 2.2e-16

F. Statistical Considerations

The model development process relied on a number of assumptions, both qualitative and quantitative/statistical in nature. Multivariate linear regression itself makes multiple assumptions, and indeed, the full specification of a model using such regression relies on assumptions being met. Model design assumes certain things; *e.g.*, that the behavior of a population follows a normal distribution. However, many of the statistical assumptions are geared towards hypothesis testing or rigorous forecasting and large, robust data sets underlie those models and statistical assumptions. We provide below a brief discussion of the most important of our assumptions and design choices in developing the model.

1. *Robustness and Sufficiency of the Data Set*

Multivariate regression requires typically large data sets, in order to generate the mathematical relationships that underlie final equations. Our dataset, while incorporating numerous independent variables for use, was limited in robust, historical dependent variable data available from the participating companies. Given the number of electric companies in New York, the available data set for developing and calibrating electric models results proved small. This was less of a problem for the gas operations we studied - - there are more of them. We increased the number of data sets modeled by using subsets for larger utilities at the regional level for both electric and gas. This approach ultimately proved successful, and provided a broad enough data set. Nevertheless, the results' modest number of data points produce limitations on the amount of candidate, explanatory variables that can be used by any single model.

We used regional data for both independent variables and dependent variables for three companies: CECONY (four regions), Niagara Mohawk (three regions), and NYSEG (two regions). These regions were consistent with the companies' organizations, operating approaches, or geographical conditions. We defined data for these parts of companies, and collected it on the same basis as we used for whole-company data for the other utilities in the study. For the purposes of comparing model estimates to actuals for companies with regions, we made these calculations at the regional level, and then summed them for the company-as-a-whole results shown.

Given that we were able to define and collect the data for both companies with regions and companies without regions on an apple-to-apples basis, we believe use of these models and data for the study creates a fair basis for comparison across all companies in the study.

2. *Limited Ability to Complete Longitudinal Model Development*

Best practice would have led to the creation of longitudinal models. Longitudinal models attempt to describe data that is across both a horizontal space (*e.g.*, individuals, companies, countries) and time. The concept underlying this type of analysis is to account for unobservable factors that might induce correlations among common observations, such as a company's historical infrastructure choices and repair cycles. However, as noted above, the ability for such analysis was data-limited. When confronted with the choice of using independent variables that tried to account for unobserved differences, or those directly measurable (such as system attributes and production quantities), we chose the latter. Dummy variables for companies were also considered, but it was decided that their use suppressed information observable from system attributes and production quantities too severely. We used dummy variables, but found that doing so did not improve the total models' explanatory basis. We therefore did not use this approach in the final models.

The linear equation specified for each functional model contains numerous pieces of information useful for assessment of the model and for its application. The pieces of information most important to the goals of this study, include the following:

- <u>Coefficients Description</u> – details the variables selected for the final model
- <u>Estimate</u> – details the parameter coefficient calibrated as part of model development for the selected independent variable
- <u>Standard Error</u> – provides a statistical measure for standard deviation of a population normalized by the mean of the population; it is a measure of spread

- t-value – a statistical measure used for determining significant differences between population means or between the population mean and a hypothesized value; its use in multivariate regression is intended to determine if the coefficient estimate is statistically different from zero, and thus, of consequence to the developed model
- p-value – shows the significance of the test in terms of a percentage: in essence, the p-value demonstrates the likelihood that the result is no different from the null hypothesis. It is calculated for individual coefficients and the overall model
- Multiple R-squared – also known as just R-squared, offers a statistical measure of how close empirical data lie to the fitted regression line and explains the percentage of the variation (i.e. behavior) that is explained by the developed linear model
- Adjusted R-squared –a statistical measure normalizing Multiple R-squared for the number of variables selected by the model; enables determination of the incremental benefit or cost of including additional variables. With too many variables, a model's adjusted R-squared will decrease, indicating that the additional, new variables are not providing any beneficial new information
- F-statistic – shows the joint significance of the model using an F-test. An F-test compares a model with no predictors to the model developed. A regression model that contains no predictors is also known as an intercept-only model and sources of variation occur due to randomness around the intercept

For the purposes of this effort, the most important metrics are R-squared, the F-statistic, the t-value, and their respective p-values. In general, the higher the R-squared, the better the model fits the data. Similarly, for F-statistics and t-values, the higher the values, the higher the likelihood that the model or the coefficients are considered statistically significant. In contrast, a lower p-value for both the F-statistic and the t-value is indicative of greater statistical significance.

As shown in the Model Results section above, most of the models have substantial R-squared values. This result shows that the identified model and its combination of explanatory variables fits the variation (*i.e.*, behaviors) exhibited by the cost data. Furthermore, all models demonstrate substantially high F-statistics, such that each equation may be considered jointly significant (*i.e.*, the total equation does a better job at explaining behaviors in the underlying data than an intercept model).

While high R-squared values are generally confidence producing, there are cases where R-squared values can be too high, indicating over-fitting and data-mining. This study attempted to avoid selection of spurious and over fit models through two methods: (a) business review of final candidate variables and models prior to selection of the final model, thus ensuring models and variables make physical or economic sense, and (b) upfront filtering as part of Round 1 to remove variables with high statistical correlation but limited or dubious intuitive basis for such correlation. Another comforting factor is that physical processes underlie the focus of this study; *i.e.*, maintenance and capital processes associated with electric and gas infrastructure. Many physical processes have evidenced high R-squared values and these physical processes are often associated with precise measurements or low amounts of process noise.

Chapter IV: Total Staffing - Resource Planning

A. Defining Characteristics

Utility companies very typically embark on annual cycles of planning and budgeting processes to set objectives related to electric and gas infrastructure requirements and to develop budgets and staffing resources to meet these objectives. Staffing resource planning (hereinafter referred to as "resource planning") should reflect an integrated set of processes that define underlying future workload for each organizational unit within the company to accomplish these objectives. Resource planning encompasses the supporting processes and systems to develop budgets, staffing, overtime, and contractor plans to accomplish anticipated future workloads.

Resource planning is critical to a utility's ability to develop work plans and define and budget for sufficient manpower resources (employees and contractors) to support system infrastructure maintenance, development, and expansion requirements. We examined each company's processes for developing resource plans to support the adequate staffing of the electric transmission and distribution and gas operations organizations and functions in our work scope.

We found that New York resource planning practices varied widely among the utilities. Practices ranged from companies (at the one end) with significant resource planning support staffs that promote consistency and support analysis and coordination of resource planning activities during work plan and budget development. At the other end, we found decentralized planning within operations groups who carry out resource planning/budget development with minimal staff support, analytical capabilities, and heavy reliance on local management's knowledge of work requirements. Most importantly, we found that "optimum" resource planning is a function of many things, which include the utility's strategies for internal staffing and contracting.

1. *Resource Planning Objectives and Benefits*

Resource planning has always been an essential part of developing a utility's future plans and budgets. It addresses a broad range of utility needs, characterized as:

- Planned Capital Program Work - - Robust analysis of system infrastructure conditions and requirements must underpin and drive any short- and long-term workload forecasts for adding to and replacing system infrastructure. In addition to planned capital workloads, each company must also anticipate near term, response driven capital work, such as new customer work and relocation of their facilities that interfere with other companies or public infrastructure (such as highways).
- Planned and Unplanned O&M Work - - Each year brings a diverse array of O&M work that can be planned or anticipated related to system infrastructure. Management must account for required maintenance activities related to equipment on the system, activities to operate the system, and a broad array of system inspection activities. Much O&M work is known in advance and can be forecasted; nevertheless, a large amount of emergency response activity is required to maintain a safe, reliable system. Typically, it is possible to forecast some minimum, required level for these activities. However, actual staffing requirements can vary dramatically from these minimum levels, depending on factors like the number of outages (mostly storm driven) or gas odor/gas leak calls experienced.

- Engineering to Support Capital and O&M Requirements - - the work described above requires varying levels of engineering work.

In the past, resource planning relied heavily on the knowledge and experience of operational and engineering managers to gauge the nature of work required to build, replace, operate and maintain electric and gas systems. Longer-term capital plans were developed to understand and define construction requirements, but were not linked to development of quantitative staffing resource estimates. Staffing and contracting plans were largely incremental in nature, relying on the ability to recognize changes in anticipated capital spending levels, and then "balancing" the planned staffing and overtime levels with use of contractors and the amount of discretionary O&M work to level out workload peaks and valleys.

Today's complex utility environment has made resource planning more sophisticated and data-driven. Utilities have developed more robust financial, operational, and planning systems; they have also moved to develop resource planning methods and tools to define future workloads quantitatively, and more fully optimize their mix of staffing resources and options to accomplish work.

Ultimately, the objective of resource planning is to provide management the tools, analysis, and perspective throughout annual planning/budgeting processes and cycles to make effective decisions about the staffing resources necessary to support electric and gas infrastructure requirements.

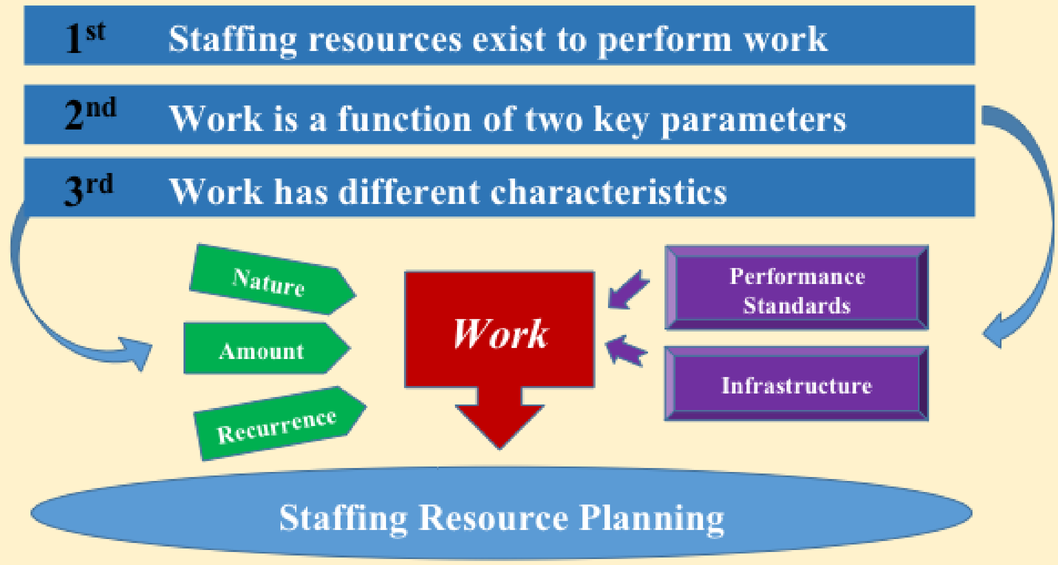
2. *Resource Planning's Connection to Staffing Adequacy*

Our primary focus in examining staffing resource planning in this report fell on determining how it influences staffing resource levels, and on how resource planning relates to internal staffing requirements and use of contractors. We focused on the key question of whether the resource planning organization, information, and processes employed by a utility tell us anything about that utility's adequacy of staffing levels. As we will discuss in this chapter, we think it does. Although specific resource planning approaches and methods may not lead to definitive conclusions on internal staffing and contractors, they do provide strong suggestions in that regard. Specifically, there are correlations for some utilities between resource planning and adequacy of staffing for some functions within the utility. This will be discussed in detail in the specific analyses of those utilities.

3. *Fundamental Principles: Defining the Work*

We build a framework for this discussion by considering the overall effectiveness of a company's staffing resource planning approaches and tools. This framework necessarily requires an understanding of the nature of the annual resource planning process. First we begin with basic principles and definitions:

Figure IV.1: Resource Planning Fundamental Principles



The need to define and plan for the work necessary to support the utility's electric and gas system infrastructure lies at the heart of staffing resource planning. Staffing resources exist to perform this work. Staffing resources must relate not only to the amount of work required to support system infrastructure requirements, but also the characteristics of these work requirements. First and foremost, two primary drivers create work:

- The extent and condition of the system *Infrastructure* itself. Electric transmission and distribution and gas transmission and distribution facilities are required to connect customers to bulk power and gas supplies; they formed the focus of this study.
- The system must not only be adequate to connect and serve electric and gas customers, but it must be constructed, operated, and maintained to provide electric and gas service safely and reliably. *Performance Standards* define these requirements and system performance measures such as reliability statistics (SAIFI, CAIDI) and safety statistics (leaks per 1,000 customers) provide measures of a utility's system condition.

One needs also to understand that the work driven by system infrastructure has different characteristics, which management must recognize in the resource planning process.

Nature of the work - - Work requirements generated to support electric and gas infrastructure require a broad array of functional expertise and skills requirements to accomplish. Management must formulate resource plans for each electric and gas organizational unit that supports the infrastructure. Moreover, these individual plans must have sufficient detail to differentiate among the various functional work requirements within these organizations. We grouped our analysis of these work requirements as utilities do in their planning processes: capital work, O&M work, and engineering work for the electric distribution system, electric transmission and substation system and the gas system (including both transmission and distribution facilities). The following tables detail the unique work functions that comprise each of these work requirements.

Figure IV.2: Electric and Gas System Work Functions

Electric System - Capital Work Functions

Electric Distribution Capital Work	Brief Description of Work Function	Electric T&S Capital Work	Brief Description of Work Function
OH & URD Construction New Business	Capital work for system additions and reinforcement related to new business.	OH Transmission Construction	Overhead transmission construction work for system additions, reinforcements, and upgrades.
OH & URD Construction Renewals & Replacements	Capital work for day-to-day system replacements relating to aging infrastructure.	UG Transmission Construction	Underground transmission construction work for system additions, reinforcements, and upgrades.
OH & URD Construction Major Projects	Capital work for major upgrade and replacement projects.	Substation Construction	Substation construction work for system additions, reinforcements, and upgrades.
Construction Interference Work	Capital work for moving electric facilities due to governmental and transportation requirements.		
UG Construction New Business	Capital work for system additions and reinforcement related to new business.		
UG Construction Renewals & Replacements	Capital work for day-to-day system replacements relating to aging infrastructure.		
UG Construction Major Projects	Capital work for major upgrade and replacement projects.		

Electric System - O&M Work Functions

Electric Distribution O&M Work	Brief Description of Work Function	Electric T&S O&M Work	Brief Description of Work Function
OH Maintenance	O&M work related to maintaining the distribution system such as pole treatment or switch maintenance. Tree trimming is excluded from study.	OH Transmission Maintenance	O&M work related to maintaining the transmission system such as pole treatment or insulator maintenance. Tree trimming is excluded from study.
OH Inspections	O&M work related to routine system inspections.	UG Transmission Maintenance	O&M work related to maintaining the transmission system such as vault maintenance.
OH & URD Emergency Response	O&M work for responding to electric system trouble calls.	Substation Maintenance	O&M work related to maintaining the substations such as breaker and switchgear maintenance.
URD Maintenance & Inspections	O&M work related to inspecting and maintaining the URD distribution system	Substation Operations	Work required to operate substations including field switching and tagging procedures and routine surveillance.
UG Maintenance & Inspections	O&M work related to inspecting and maintaining the UG distribution system	Relay & Instrumentation Test and Maint.	Testing and maintenance of relays and system protection equipment.
UG Emergency Response	O&M work for responding to underground electric system trouble calls.	Communications Test & Maintenance	Testing and maintenance of substations and transmission communications equipment.

Electric System - Engineering Work Functions

Electric Distribution Engineering Work	Brief Description of Work Function	Electric T&S Engineering Work	Brief Description of Work Function
Distribution Engineering and Planning	The central planning and design of the distribution system. Includes major project design.	**Transmission Engineering and Planning**	The planning and design of the transmission system.
Distribution Area Engineering	Field engineering of distribution work to support the day-to-day work of the crews.	**Substation Engineering and Planning**	The planning and design of substations and substation equipment.
Distribution Engineering Support	Engineering support functions such as maps and records and surveying.	**T&S Engineering Support**	Engineering support functions such as maps and records and surveying.

Gas System - Capital Work Functions

Gas Capital Work	Brief Description of Work Function
Construction New Business	Capital work for system additions and reinforcement related to new business.
Construction System Additions - Mains	Capital work for system additions of mains.
Construction Main Renewal & Replacement	Capital work for main upgrade, renewal, and replacement projects.
Construction Service Renewal & Replacement	Capital work renewal and replacements of services
Construction Interference Work	Capital work for moving gas facilities due to governmental and transportation requirements

Gas System - O&M Work Functions

Gas O&M Work	Brief Description of Work Function
Emergency Response to Leaks	O&M work for responding to gas system leak calls.
Leak Repairs	Repair of the gas system to correct leaks.
Distribution System Maintenance	All other maintenance and repair activities on gas system mains.
Leak Surveillance & Follow-up Inspections	Inspections related to follow-up activities following leak repairs.
Annual Leak Survey Inspections	Inspections for annual leak survey requirements.
All Other Inspections	All other inspections including corrosion surveys, valve inspections, and poor pressure calls.
Gas System Pressure Control Inspections and Maintenance	Inspections and maintenance related to the gas pressure control systems.

Gas System - Engineering Work Functions

Gas Engineering Work	Brief Description of Work Function
Distribution Engineering (Plan & Design)	The planning and design of the gas transmission and distribution system. Includes major project design.
Gas Engineering Support	Engineering support functions such as maps and records and surveying.

Amounts of work - - The fundamental requirement to define the amounts of work needed to support each of the functions listed above proves key to planning staffing resources. Each function has its unique mix of characteristics for describing amount of work (*e.g.*, number of work activities performed, average duration of each work activity, units of work completed/installed, or hours per work unit installed). The combination of these characteristics yields quantities of work stated in person-hours or FTE requirements for the function. Data-driven resource planning requires this type of quantification of the amounts of work, both for measuring historical experience (past years and year-to-date accomplishment of work) and for forecasting requirements.

Systems (engineering, operational, and financial) must have the capability to capture data about labor hour expenditures (for both employee and contractor work) and future work activity requirements and estimated person-hour requirements to meet these needs. Without these basic building blocks, which describe amounts of work accomplished (stated in person-hours or FTEs) and amounts of work required in the future, data-driven resource planning is not possible.

Recurrence of work - - Nearly as important as understanding the amount of work required, understanding the underlying nature of how the need for each type of work is created by the electric and gas systems defines a key characteristic in successful resource planning. In particular, how certain types of work are generated on a recurring basis is important for translating past work requirements into future plans. The concept is often stated when work plans are broken down into "planned work" and "response-driven" work.

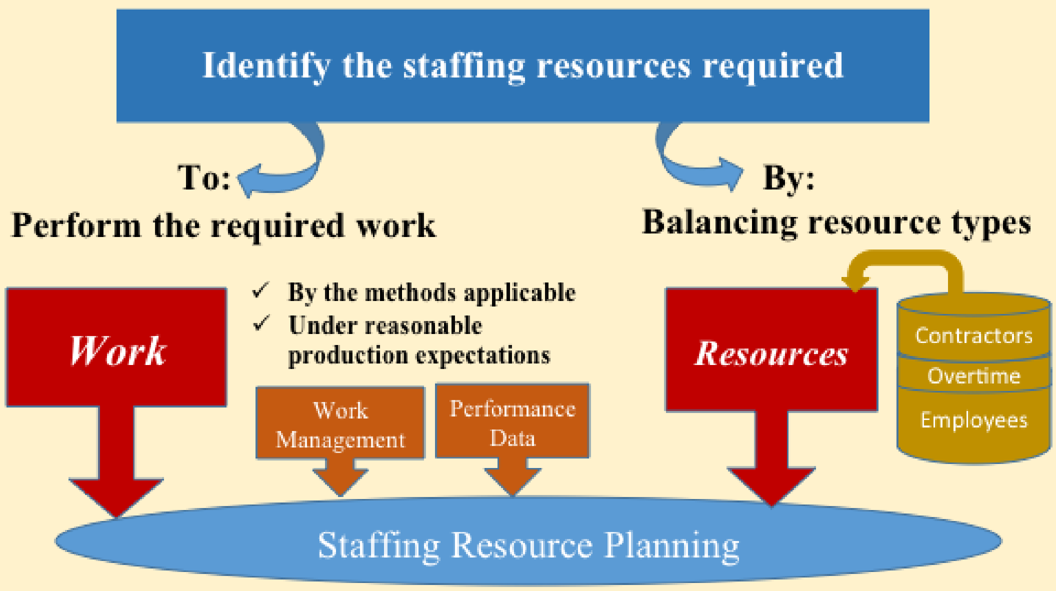
Planned work includes both capital work and O&M work that recurs with enough regularity to allow forecasts of future work quantities, based upon either past or anticipated activity levels or on applying historical unit rates to forecasted quantities of facilities identified by system planning studies. This type of "bottom-up" forecasting is the hallmark of a data-driven resource plan detailing person-hour or FTE requirements for particular organizations and work functions. For example, the miles of pipeline being replaced in next year's forecast can be used to drive an estimate of person-hours required for these replacements, based upon prior years' unit rates of person-hours per mile replaced. The same would be true for a forecast of person-hours of annual pipeline inspections for a future year.

Response-driven work is harder to forecast quantitatively and to source in future resource plans. Typically, work estimates in functions like emergency response and new business use analysis of past hours expended for these functions, developing trends to help understand how work activities are changing in these functional areas. Understanding of the historical amounts of work performed in these categories remains important, but managers must also use judgment to develop flexible resource planning strategies for meeting workload demands, if conditions change. For instance, historical workload trends can help define a strategy for allocating sufficient personnel to meet base load staffing resource requirements for responding to emergency work, but the strategy must also build in enough flexibility to allow for addition of overtime and contractor resources to meet peak workload requirements if conditions change.

4. Annual Planning and Budgeting Cycle: Developing the Resource Plan

Using the basic principles and building blocks described above, the resource planning process forms part of a continuous cycle that develops each year's resource plan as part of the annual planning and budgeting cycle. Discussions of resource adequacy usually begin with the resource planning process, but resource planning is no "Big Bang" - - coming first, and driving all else. Resource Planning forms part of a continuum that informs and is informed by many complimentary processes. The following diagram illustrates this relationship:

Figure IV.3: What Resource Planning Seeks



The previous section explores, in detail, how *Required Work* for coming years is forecasted using a data-driven approach. Based upon quantitative analyses of system plans, historical unit rates from *Work Management*, and *Performance Data* from historical workload reporting, management can develop "bottom-up" quantitative estimates and forecasts of workload requirements for future years - - typically stated in either person-hours or FTE requirements. The resource planning challenge then (as an integrated part of the annual budget development process) becomes one of developing a staffing resource plan for each organization performing this work, prioritizing defined workloads against top-down financial guidance provided within the budgeting process. The goal is to develop a resource plan that cost-effectively balances *Staffing Resources* (employees, overtime, and contractors) against these workload priorities. This balancing process must also explicitly take into account operational factors and constraints such as:

- Available skill requirements and competencies of each type of staffing resource
- Workload forecast confidence levels for planned work and response work
- Strategies for assuring, developing, and maintaining minimum levels of workforce competency and capabilities (explored more fully in the Internal Staffing chapter)
- Overtime desirability and constraints (explored more fully in the Overtime chapter)
- Contractor desirability and constraints such as the availability of contractors to perform specific types of work (explored more fully in the Contractor Use chapter).

During the annual resource planning/budgeting cycle, the balancing process should include determining which priorities fit within top-down financial guidance constraints. It should also allow for the possibility that top-down constraints, but may not be sufficient to cover all high-priority, necessary work to meet valid system infrastructure investment and O&M requirements. The process should be iterative, in order to ensure that system requirements exceeding financial guidance constraints in one area lead to resource rebalancing and reprioritization involving other functional areas (or alternatively fed back into future rate proceedings) to ensure adequate attention to future financial needs.

The end result should comprise a data-driven resource plan that quantitatively defines the five-year work plan, detailing an appropriate FTE/person-hour mix of employee, overtime, and contractor resources for each organization. These work plans form the starting point (strategy) for the coming year for each organizational unit, following approval of its capital and O&M budgets. These work plans provide the basis for setting levels of employee staff, planned overtime, and planned contractor activities for the coming year.

Creation of the initial resource plan as an integrated part of the annual budgeting process is not the end of the resource planning process. As stated earlier, resource planning should occur as part of a continuum that informs and is informed by many complementary processes. During the year, management should revise resource plans as the work unfolds. Work plans and resources should be rebalanced as emergent work unfolds and as planned work progresses. Input from work management and performance management processes should be used to update resources status and rebalance resources appropriately (as well as provide input during the next resource planning cycle). The need for readjusting resources during plan execution is particularly true in terms of managing and rebalancing overtime and contractor resources. The report chapters addressing these areas explore such requirements in greater detail.

5. Assessing Resource Planning as It Relates to Adequacy of Staffing

We have addressed the building blocks, definitions, and key resource planning processes in this chapter by framing the concept of how data-driven staffing resource planning should comprise an integrated part of the annual planning and budgeting cycle. Management should employ a thoughtful, analytical process in planning the levels of employees, overtime, and contractors deployed to accomplish the work required to sustain the electric and gas infrastructure. We have often seen less structured decision-making. More typical practices continue to prevail, such as relying on past expenditure and staffing levels or employing rules of thumb for continuing the use of contractors for certain types of work, regardless of whether it continues to be cost-effective in the long run.

B. Evaluation Criteria

In defining the optimum resource planning process, we have defined five summary evaluative criteria (supported by more detailed components) for assessing resource planning, as a contributor to staffing optimization. We list and describe them below.

Resource Planning Criterion 1: The organization for coordinating and supporting manpower resource planning should be treated as a specialized activity, with dedicated resources.

The organization should be staffed with personnel experienced in the methods, systems, and tools associated with performing resource planning on a comprehensive, structured basis. The organization should also have access to the necessary information to support these analyses on a data-driven basis.

Resource Planning Criterion 2: Complete and accurate information about units of work performed and costs by work function, by region, and by staff resource type should be available.

Information should provide breakdowns of required staff resources in FTEs and/or person-hours. The information should also break down associated costs for internal resources, overtime, and contractors. This breakdown should include measures relating their work levels in some tangible and credible way to staffing numbers for each type of work performed (functional work load data) within each organizational unit. This level of detailed information facilitates bottom-up development of work plans tied to budget requests, and allows management to review overall workload levels and how staffing resources are assigned to meet this workload.

Resource Planning Criterion 3: Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.

There should exist comprehensive and sufficiently detailed forecasts of medium- and longer-term capital and O&M work. These forecasts should identify likely staffing resource requirements based on an adequate factual and analytical foundation. There should also exist an integrated process for balancing the use of internal, contractor, and overtime resources across all work functions.

Resource Planning Criterion 4: Overtime use should comprise a formal part of the process of identifying required resources and relies on an analytically supportable method for determining optimum levels for each work function.

Details related to this criterion are explored in detail in the Overtime chapter.

Resource Planning Criterion 5: Contractor use should comprise a formal part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

Details related to this criterion are explored in detail in the Contractor Use chapter.

C. Data and Analysis

1. Staff Resource Levels - Electric

Total 2013 expenditures for the electric operations functions that we studied totaled $2,950 million - - $1,646 million for capital work, $1,107 million for O&M work, and $197 million for engineering work. Total 2013 expenditures for the gas operations functions that we studied were $1,352 million - - $877 million for capital work, $391 million for O&M work, and $85 million for engineering work. Labor formed the largest components of these expenditures - - approximately 55 percent for both electric and natural gas operations. Total expenditures also included materials, vehicles, and corporate indirect charges (covering functions such as Information Technology, facilities, Human Resources, and other administrative functions).

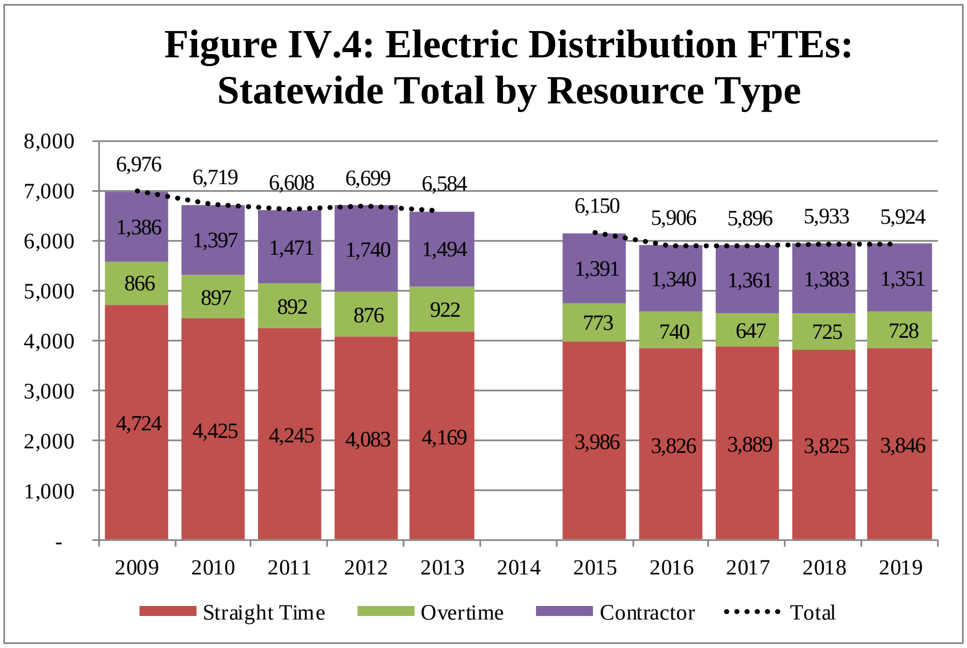
This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for electric distribution and transmission and substation functions statewide.

Historical data provided by each company was based upon actual hours and dollars collected within each company's accounting systems for the functional work categories that comprised our study. We converted the actual hours provided by the companies in these work categories into Full Time Equivalents (FTEs) using the hours available for work (with leave and training time excluded) provided by each company. An FTE equates to the amount of work provided by one employee for a year - - a common way of depicting staffing/workload levels for different types of staffing resources.

Forecast data provided by each company for the years 2015-2019 were based upon their five year forecasts of expenditures that were approved during their annual budget process in 2014 - - the period when we conducted the field work for this study. Forecasts were provided to us for straight time, overtime, and contractor expenditures within each of the functional work categories that comprised our study. We converted the forecast expenditure data into hours and FTEs based upon unit rate data ($ per hour) from the last year of historical data provided by the company, escalated for inflation.

a. Electric Distribution Staffing Trends

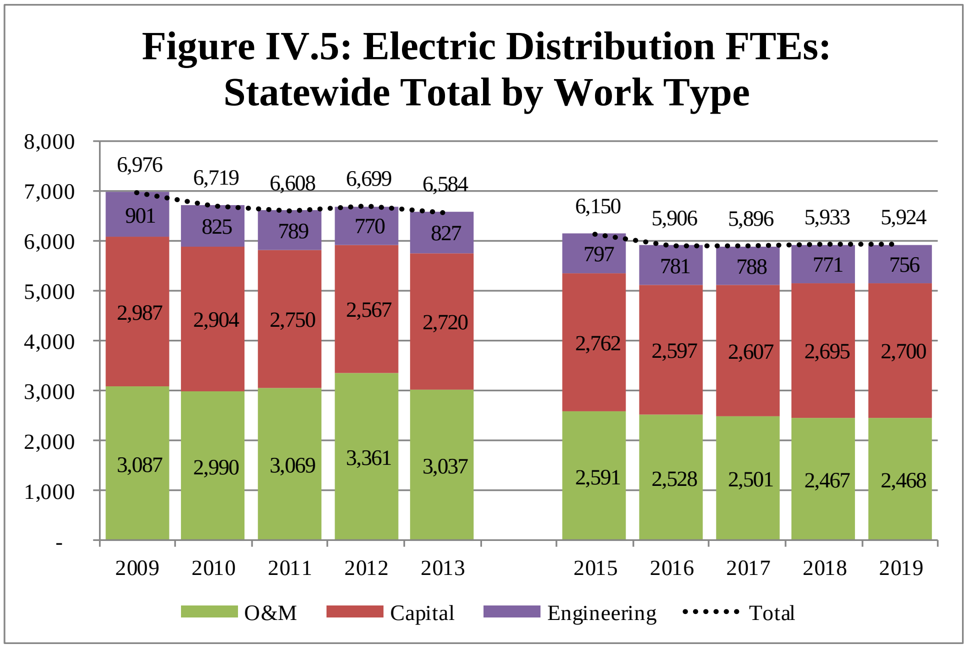
For 2013, total expenditures for electric distribution were $1,935 million - - $982 million for capital work, $829 million for O&M work, and $124 million for engineering work. Labor formed 55 percent of the nearly $2 billion total. The following chart shows historical and forecasted staffing resources for electric distribution functions for the period 2009-2019, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors. Staffing resources are depicted in terms of Full Time Equivalents (FTEs). We did not include data for 2014, during which we performed study field work. The companies reported data on incompatible bases for 2014, which at the time required a combination of actual year-to-date and forecasted data. Each of the other study years for the 2009-2019 period were either fully actual or fully forecasted data.



Examining the historical period, overall workload declined steadily, exhibiting an ultimate decrease of approximately 400 FTEs by 2013. Internal straight time staffing dropped steadily between 2009 and 2012, ending with a 555 FTE drop by 2013 - - a 12 percent drop. Internal overtime and contractor FTE levels remained relatively stable throughout the period (with the single exception of 2012, the year of Superstorm Sandy). The 2013 levels were modestly higher than 2009 for overtime (56 FTEs) and contractors (108 FTEs).

Workload throughout the forecast period (2015-2019) is projected to be consistently lower than the historical period. By 2019, workload is projected to be 660 FTE (10 percent) lower than 2013 staffing levels. These reductions are forecast to be spread among all types of staffing resources - - 343 FTEs from straight time, 194 FTEs from overtime, and 143 FTEs from contractors.

The next chart breaks down the same data, shown above by type of workload - - O&M work, capital work, and engineering work.



This breakdown shows that the overall 400 FTE decrease in historical workload came primarily from decreases in capital and engineering work. Major storms drove the 2011 and 2012 increases in O&M work that the utilities frequently resourced with short-term increases in overtime and contractor FTEs. This approach to meeting peak demands in workload with overtime and contractors is a typical management approach used by many distribution operations groups.

Examining the decreased workload during the 2015-2019 forecast period gives us concern about two related issues: (a) the level of work projected for O&M is unrealistic, showing much lower FTEs than any historical year (about 500-880 FTEs), and (b) given that straight time levels are projected to decrease over historical years, the forecasted levels of overtime do not appear credible, given past experience. A smaller internal workforce applied to distribution could drive emergency-response work overtime to unsustainably high levels. We address overtime later in this report.

The accompanying table compares each electric company's historical and forecasted resource mix for electric distribution work to that of the Reference Utility.

Table IV.6: Electric Distribution Actual Resource Mix 2013

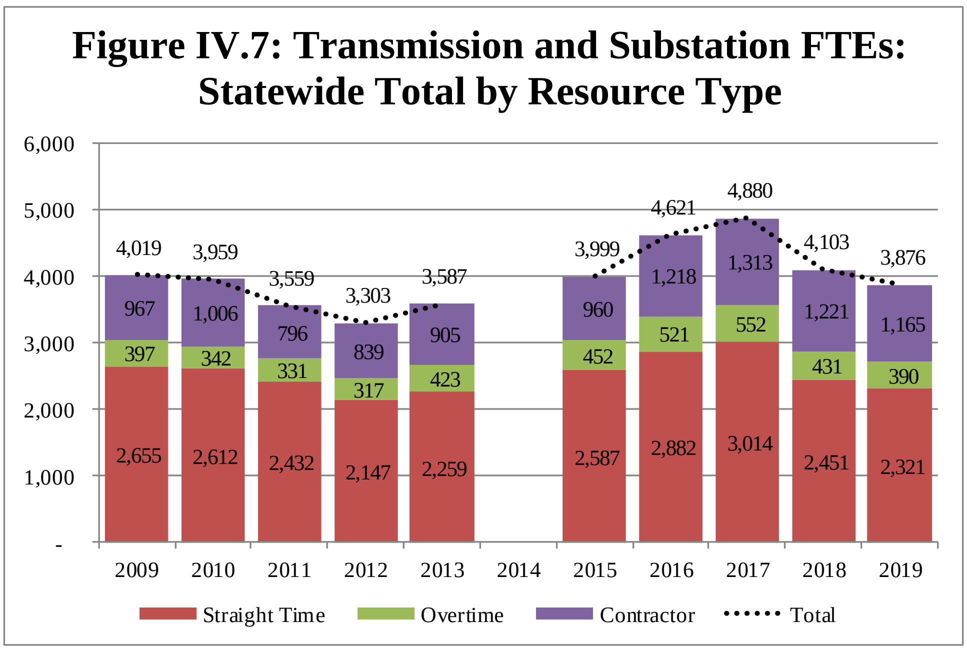
Source	RU	1	2	3	4	5
Straight Time	67%	83%	73%	62%	60%	58%
Overtime	13%	7%	14%	18%	13%	10%
Contractor	20%	10%	13%	19%	27%	32%
Total	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019						
Source	**RU**	**1**	**2**	**3**	**4**	**5**
Straight Time	65%	74%	76%	63%	64%	48%
Overtime	10%	6%	8%	18%	11%	7%
Contractor	25%	20%	16%	20%	25%	45%
Total	100%	100%	100%	100%	100%	100%

The Reference Utility shows an overall shift to contractors, increasing in the future from 20 percent of the resource mix to 25 percent. This pattern, forecasted by most of the state's five utilities, would rebalance the resource mix to reduce overtime by increasing either the relative percentage of straight time resources and/or contractor resources. Overall FTEs for straight time and overtime decrease from the historical period, with overtime FTEs falling at a much faster rate.

b. Electric Transmission and Substations Staffing Trends

Total 2013 expenditures for electric transmission and substation work were $562 million - - $296 million for capital work, $197 million for O&M work, and $68 million for engineering work. Labor again amounted to about 55 percent of the total.

The following chart shows historical and forecasted staffing resources for electric transmission and substation functions for the period 2009-2019, broken down by internal staff straight time, internal staff overtime, and contractors.



During the historical period, as distribution exhibited, overall workload declined steadily until 2012, showing a decrease of approximately 700 FTEs between 2009 and 2012. This trend reversed with a 250 FTE increase in 2013 (projected to continue through 2017). During the 2015 – 2017 period an additional 400 to 1,300 FTEs are forecast to be required. Following the increase, FTE levels during 2018-2019 are projected to return to similar levels to those experienced historically.

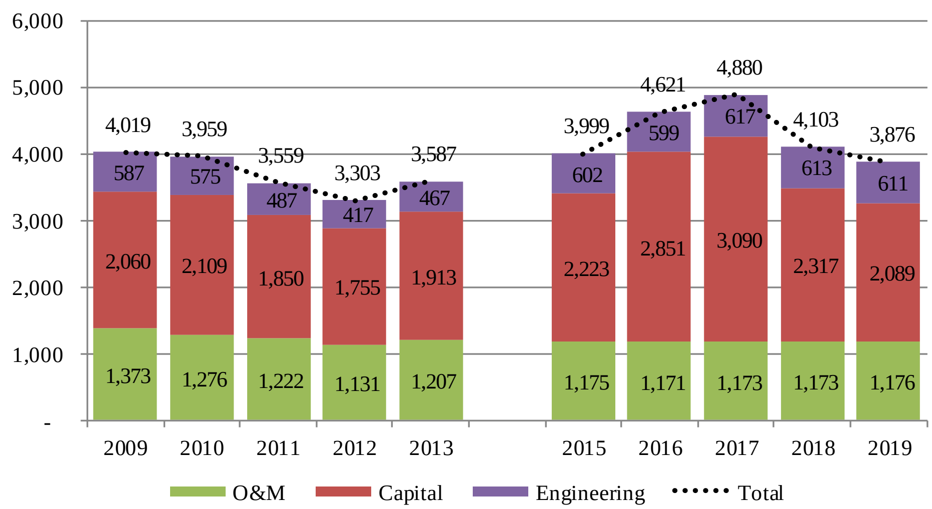
Internal straight time staffing dropped steadily between 2009 and 2012, ending with a 508 FTE drop by 2012 (19 percent). Internal overtime and contractor FTE levels also decreased, but not as fast. FTE levels then became modestly higher in 2013, but were still below 2009 levels, with the exception of overtime's increase of 26 FTEs.

FTE resource levels for the forecast period show levels consistently higher than the historical period through 2017. Straight time resources increase by 325 FTEs, overtime by 30 FTEs, and contractors by 419 FTEs. The larger increase in contractor use, relative to internal resources, typifies peaks in substation construction activity experienced throughout the industry.

By 2019, workload is projected to be approximately 300 FTE (8 percent) higher than 2013 levels, with increases forecast to be spread between internal and external staffing resources (62 FTEs from straight time and 260 FTEs from contractors).

The next chart breaks down the same data, as shown above, by type of workload – O&M work, capital work, and engineering work.

Figure IV.8: Transmission and Substation FTEs: Statewide Total by Work Type



This breakdown shows the variability in workload as primarily attributable to capital and engineering work. O&M FTEs remained stable through the historical period and were forecasted to remain stable, at a modestly lower level, throughout the 2015-2019 period. Forecasts showed 2013-2017 increases in capital (construction) activities resourced with internal and external resources, with 2019 internal staffing levels returning to historical levels and contractor resources remaining at higher FTE levels. The next table shows this rebalancing.

We examined the projected staffing resource mix for the state and each electric transmission/substation work function. The accompanying table compares each company's historical (2013) and forecasted (2019) resource mix for T&S work to that of the Reference Utility.

Table IV.9: Electric Transmission and Substation Actual Resource Mix 2013

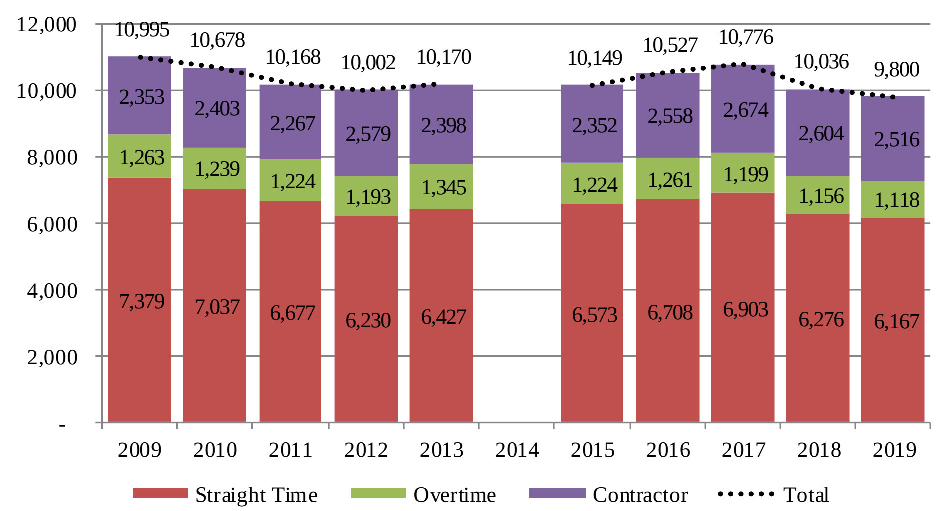
Source	RU	1	2	3	4	5
Straight Time	56%	73%	60%	58%	56%	31%
Overtime	8%	17%	9%	5%	8%	3%
Contractor	36%	11%	31%	38%	36%	66%
Total	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019						
Source	RU	1	2	3	4	5
Straight Time	53%	72%	54%	61%	53%	24%
Overtime	7%	14%	5%	6%	8%	3%
Contractor	40%	14%	40%	33%	39%	73%
Total	100%	100%	100%	100%	100%	100%

The Reference Utility showed an overall shift to contractors, whose FTE levels increase from 36 percent of the resource mix to 40 percent. The pattern forecast by all but one of the state's five utilities showed rebalancing of the resource mix by increasing the relative use contractor FTEs. Overall FTEs for straight time and overtime remain near historical period levels, but contractor FTEs levels were projected to increase.

c. <u>Summary – Overall Electric Staffing Trends</u>

The following chart shows historical and forecasted staffing resources for all of electric, including both distribution and T&S functions, for the period 2009-2019, broken down by resource type – internal staff straight time, internal staff overtime, and contractors. The chart depicts staffing resources in terms of Full Time Equivalents (FTEs).

Figure IV.10: Total Electric FTEs: Statewide by Resource Type



Considering the individual analyses for electric distribution and electric transmission and substations discussed above, overall electric business trends include:

- Applied FTEs decreased substantially during the 2009-2013 historical period. The 2013 FTE levels numbered 825 less than those of 2009 – a drop of eight percent of the 10,000+ FTEs of total electric workload.
- 2015-2019 forecasts projected continued decreases in distribution workload (about 400 FTEs) and continuing increases in transmission and substation workload (about 250-600 FTEs. While the combination of these two types of workload results in significant year-to-year variations, overall electric business workload as projected remained within a few percentage points of 2013 FTE staffing levels.
- The forecasts showed the state's electric utilities generally projecting a rebalancing of staffing resource mix, reducing reliance on overtime and modestly increasing the relative percentage of contractors. On an absolute basis, the forecasts collectively showed an increase of approximately 275 FTEs (from 2,398 to 2,674) in contractor staffing levels between 2013 and 2017, the year electric workload was forecasted to peak. By the end of forecast period in 2019, contractor FTE levels were projected to decrease modestly from peak levels to 2,516 for a net gain of approximately 120 FTE over the entire 2015-2019 period.

2. *Overall Analysis of Electric Staffing Levels*

This section summarizes at a high level the detailed analyses we performed for each individual company to assess how their FTEs compared with average or expected levels. We used two approaches: (a) ratios of staff versus key system attributes, and (b) five-year average FTE levels compared to estimates from Liberty's staffing model.

First, we compared how 2013 FTE levels compare among NY utilities in the study on a simple ratio basis for certain key system attributes. The next table compares each utility's 2013 FTE levels with those of the other electric operations we studied, using a simple ratio basis for certain key system attributes.

Table IV.11: Total Electric Staffing Ratios

Parameter	1	2	3	4	5
Distribution FTEs					
Per Customer	1.40	1.13	0.66	1.00	0.71
Per OH Line Mile	1.69	0.46	1.00	6.46	0.47
Per Unit Sales	1.08	1.43	0.47	1.00	0.57
T&S FTEs					
Per OH Line Mile	1.00	0.52	1.10	13.49	0.24
Per Substation	1.00	0.28	1.20	4.22	0.42
Total					
Per Customer	1.27	1.10	0.92	1.00	0.72
Per Unit Sales	1.00	1.43	0.67	1.03	0.59
Per Average of All Attributes	1.16	1.13	0.97	0.88	0.67

A value of 1.0 for any particular attribute means that, relative to others, the number of FTEs for that unit of measure was proportional to the Reference Utility value. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index described in the "Hard Drivers" subsections of this report. This measure roughly indicates overall total FTEs as a function of the size of a utility. If the number of FTEs for each utility were proportional to its size, and no other factors were considered, this index value would equal 1.0 for every utility. A higher index suggests that FTEs are higher than might have been expected, based on size alone.

This analysis yields some interesting perspectives relative to utility staffing levels:

- With one exception, company FTE per unit for distribution and T&S ranged between 0.46 and 1.69. This range indicated that staffing levels, relative to that unit of measure were widely disbursed, *i.e.*, staffing variations ranged +/– 60 percent relative to specific measures.
- In the utility where the FTEs per OH line mile metrics were very high, the ratio was driven by the relatively high percentage of underground facilities in the utility.
- For the Total Index, the FTEs per customer and FTEs per unit of sales varied within a narrower range. Ratios varied between 0.59 and 1.43 – a variation of +/- 40 percent. Most indices were closer to 1.00 than that.

While not a definitive, standalone assessment of overstaffing or understaffing, combined with other quantitative assessments discussed in this section, the ratios helped us focus on areas where a utility was near average (1.00) or diverged from staffing levels across the state.

Next we examined how average staffing levels for the historical portion of our study period compared to staffing levels estimates from the model we developed. We developed that model using the data provided by all the utilities we studied. The model correlates actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produces staffing level estimates, broken down by capital, O&M and engineering, for each utility. The estimates consider how the utility's unique combination of attributes vary with staffing levels compared to how the other NY utilities' staffing levels vary for the same combination of attributes. The model provides a more sophisticated way to consider each utility's staffing levels normalized for each utility's unique mix of infrastructure. The model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Those variances provide one of the bases used to question issues and perform analyses of staffing.

The next tables show five-year average actual FTEs versus model results for distribution activities. The tables break the results down by capital, O&M, and engineering functions.

Table IV.12: Electric Distribution Five-Year Average FTES (2009-2013)

Company	Capital		O&M		Engineering	
	Actual	Estimate	Actual	Estimate	Actual	Estimate
1	1,881	1,895	1,270	1,292	412	417
2	582	586	1,082	1,133	246	240
3	152	104	402	384	103	60
4	84	87	178	153	54	21
5	104	88	138	154	18	62

The results of modeling show a meaningful level of consistency between most companies' actual FTE staffing levels and the model's FTE staffing estimates for these functions. Electric distribution five-year average actual staffing levels fell within 15 percent of FTE model estimates, with FTE levels for all but four of 15 functional categories assessed. In these cases, these variances were weighed against other quantitative analyses to come to a conclusion about whether staffing levels were appropriate.

Next we show the five-year average actual FTEs versus model results for transmission and substation activities. The tables break the results down by substation O&M, transmission O&M, and engineering functions. Note the two instances (substation capital and transmission capital) where no models are shown. We could not develop meaningful models for these functions, because year-to-year expenditures for transmission and substation capital functions proved too volatile to support a statistically valid model from only five years of data.

Table IV.13: Electric Transmission and Substation Five-Year Average FTES (2009-2013)

Company	Transmission O&M		Substation O&M		Engineering	
	Actual	Estimate	Actual	Estimate	Actual	Estimate
1	60	60	533	477	335	334
2	64	73	313	365	124	160
3	74	62	99	101	14	13
4	18	21	44	34	5	7
5	10	10	32	39	29	29

Similar to the electric distribution modeling results, results of modeling for transmission and substation functions showed a strong level of consistency between most companies' actual FTE staffing levels and the model's FTE staffing estimates. Electric transmission and substation five-year average actual staffing levels are within 18 percent of FTE model estimates for all but two of the functional categories assessed. In these cases, the variances were weighed against other quantitative analyses to come to conclusions about staffing levels.

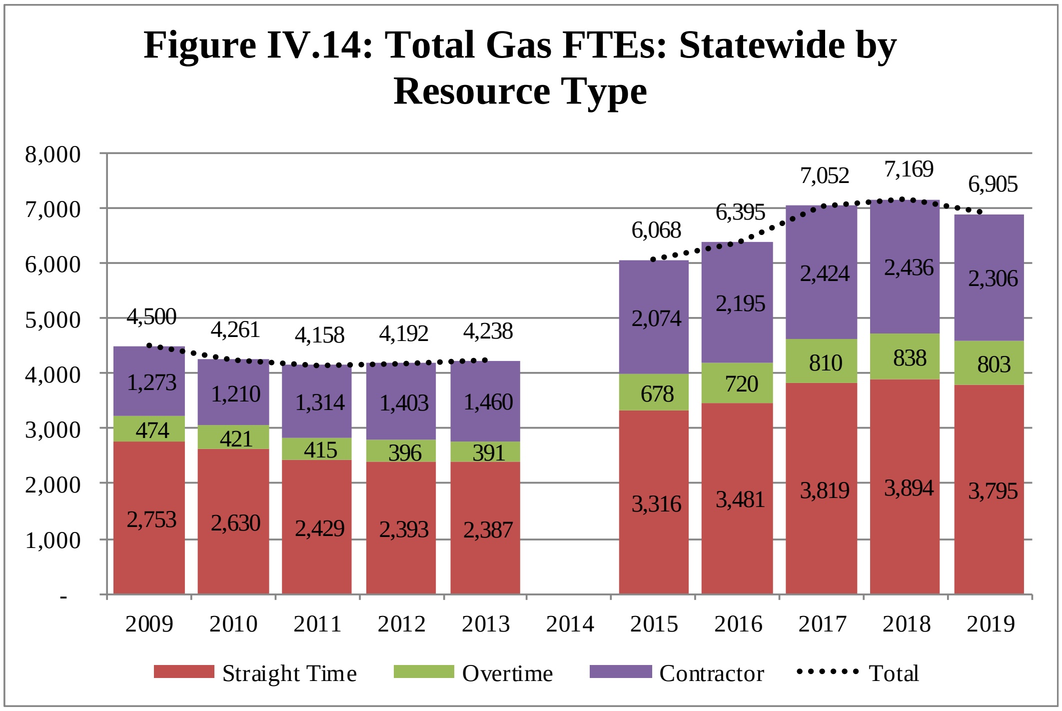
3. Staff Resource Levels - Gas

This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for gas operations functions statewide. As with data for electric operations, we received historical information denominated in dollars and hours from each utility, and we made conversions to FTEs similarly. Forecast data, again as was the case for electric operations, came from the companies in dollars, which we converted to FTEs similarly to how we treated electric forecast data.

a. Gas Staffing Trends

Total state gas operations expenditures for 2013 totaled $750 million - - $476 million for capital, $230 million for O&M, and $43 million for engineering. Labor contributed 55 percent of total costs.

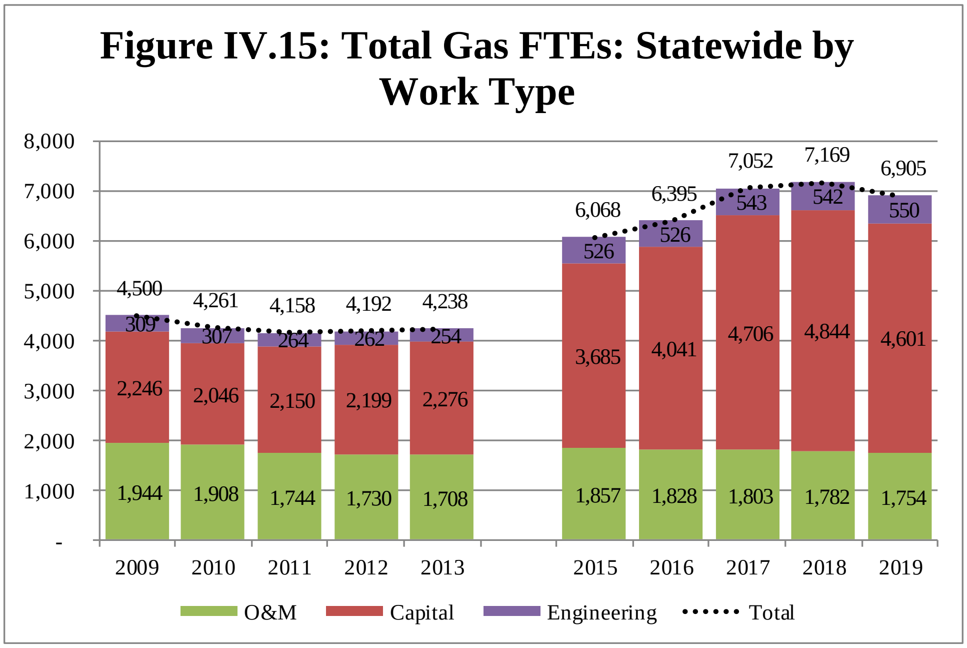
The following chart shows historical and forecasted staffing resources for gas operations functions for the period 2009-2019, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors. Staffing resources and workload are depicted in terms of FTEs



Through 2013, overall FTEs declined modestly but steadily, producing an ultimate decrease of approximately 260 FTEs. Internal staffing, straight time and overtime staffing, dropped steadily, declining respectively by 366 FTEs (13 percent) and 83 FTEs (17 percent). Contractor FTE levels increased by 187 FTEs during the same period.

Forecasts (2015-2019) showed major increases, beginning in 2015 and peaking in 2018. Acceleration of pipe replacement programs drove much of the projected increase. Projected 2018 FTEs were 2,931 higher than 2013 levels (a 69 percent increase). These forecasted additions increased all three types of staffing resources (929 FTEs from straight time, 287 FTEs from overtime, and 614 FTEs from contractors).

The next chart breaks down the same data, as shown above, by type of workload – O&M work, capital work, and engineering work.



This breakdown shows that the declines in historical workload came primarily from decreases in O&M work. Such work decreased by 12 percent (234 FTEs) between 2009 and 2013. Forecasts showed O&M levels higher than those of 2013 levels, but never returning to 2009-2010 levels (a gap of about nine percent). Sustained levels at or below 1,800 raise a concern with respect to O&M work involved in maintaining leak related service levels.

As pointed out above, substantial increases in capital and engineering work related to the pipeline replacement program increases for most of the state's utilities drove the dramatic increases in forecasted 2015-2019 FTEs. Some of the growth in capital programs are also driven by increasing new business work, especially among the downstate utilities. Looking forward to the increased workload during the 2015-2019 forecast period raises concerns about two related issues. First, the level of work projected for capital is so large compared to past FTE requirements (a net addition of about 3,000 FTEs over three years) that the ability to increase resources this quickly may not be realistic. Second, given dramatic increases in projected straight time and overtime levels to meet capital program requirements, overtime capacity would be strained, particularly should O&M requirements prove higher than forecasted. The pressure to maintain leak response levels could drive overtime to unsustainably high levels.

We examined the projected staffing resource mix for the state and each gas utility. The accompanying table compares each company's historical (2013) and forecasted (2019) resource mix for gas work to that of the Reference Utility.

Table IV.16: Gas Resource Mix – 2013 Actual and 2019 Forecast

Gas									
Actual Resource Mix - 2013									
Source	**RU**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Straight Time	62%	73%	71%	70%	67%	64%	62%	57%	30%
Overtime	8%	9%	1%	6%	6%	10%	16%	14%	5%
Contractor	30%	18%	27%	24%	27%	26%	22%	29%	64%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019									
Source	**RU**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Straight Time	59%	70%	68%	66%	59%	62%	55%	53%	37%
Overtime	8%	8%	2%	4%	4%	7%	17%	15%	9%
Contractor	33%	22%	31%	30%	37%	31%	28%	31%	55%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

The Reference Utility shows an overall shift to contractors, increasing from 30 to 33 percent of the resource mix. All but one state utility forecasted an increase in the relative use of contractor resources. Forecasts for straight time and overtime FTEs increased significantly above historical FTE levels, but forecasted contractor FTEs were projected to increase at a faster rate.

4. Overall Analysis of Gas Staffing Levels

This section contains a high-level summary of the detailed analyses we performed for each individual company to assess how each company's FTE staffing levels compared to average or expected staffing levels. To do these comparisons we used two approaches: ratios of staff versus key system attributes and five-year average FTE levels compared to estimates from Liberty's staffing model.

The next table compares each utility's 2013 FTE levels with those of the other gas operations we studied, using a simple ratio basis for certain key system attributes.

Table IV.17: Gas Staffing Ratios

Total Gas Staffing								
Parameter	1	2	3	4	5	6	7	8
Gas FTEs								
Per Customer	2.32	1.05	1.16	1.35	0.83	0.95	0.70	0.82
Per Mile of Main	2.11	3.60	1.05	0.95	3.06	0.85	0.49	0.66
Per Unit Sales	1.82	0.90	0.99	0.76	1.08	1.44	1.01	0.60
Per Average of All Attributes	1.49	1.42	1.19	0.99	0.93	0.90	0.88	0.80

As was true for our electric utility comparisons, a value of 1.0 means that the number of FTEs for that unit of measure was proportional to the Reference Utility value. We applied the "FTEs per Average of All Attributes" parameter similarly as well.

This analysis yields some interesting perspectives on gas staffing levels:

- With a few exceptions, company FTE per unit for ranged between 0.49 and 1.82. This is an indication that staffing levels, relative to that unit of measure were widely disbursed. Staffing variations ranged +/- 80 percent relative to specific measures.
- In the utilities where the FTEs per mile of main were very high, the ratio was driven by the relatively compact, dense service territories.
- For the Total Index, the FTEs per customer and FTEs per unit of sales varied between 0.77 and 1.98. Most indices were closer to 1.00 than that.

While not providing a definitive, standalone assessment of overstaffing or understaffing, combined with other quantitative assessments discussed in this section, the ratios helped us focus on areas where a utility was near average (1.00) or diverged from staffing levels across the state.

Next, we examined how average staffing levels for the historical portion of our study period compared to staffing levels estimates from the model we developed. We developed that model similarly to our work involving the electric utilities. The next tables show five-year average actual FTEs versus model results for gas activities. The tables break the results down by capital, O&M, and engineering functions.

Table IV.18: Gas Five-Year Average FTES (2009-2013)

	Capital		O&M		Engineering	
Company	Actual	Estimate	Actual	Estimate	Actual	Estimate
1	657	667	364	370	52	48
2	518	569	366	382	47	54
3	387	392	200	213	35	61
4	251	256	260	264	41	40
5	152	166	138	137	27	24
6	75	72	195	182	47	54
7	99	112	154	171	13	27
8	63	47	139	151	27	24

The results of modeling show a consistency between most companies' actual FTE staffing levels and the model's FTE staffing estimates for these functions. For gas, five-year average actual staffing levels 21 of the 24 functional categories assessed fell within 15 percent of FTE model estimates, which reflects a fairly small range for a group of this type. In the three other cases, we examined (in the relevant individual company reports) these variances against other quantitative analyses to come to a conclusion about whether staffing levels were appropriate.

5. *Conclusions*

Our quantitative analyses of electric distribution and electric transmission and substation resources produced several overall conclusions:

- Overall FTEs decreased from 2009 levels of 10,000+ by 800 through 2013(8 percent).
- 2015-2019 forecasts projected continued decreases in distribution workload (about 400 FTEs), with offsetting increases in transmission and substation FTEs. Despite significant

year-to-year variations, overall electric business workload forecasts indicated 2019 FTEs within a few percentage points of 2013 levels.

- The companies forecasted a rebalancing of the resource mix to reduce reliance on overtime and to increase modestly the relative percentage of contractors. Statewide, rebalancing was projected to produce an increase of approximately 500 FTEs (from 2,400 to 2,900) in contractor staffing levels between 2013 and 2019.
- Quantitative analyses at the functional level (capital, O&M, and engineering) for most individual electric operations disclosed no reason to question staffing adequacy. In a handful of individual cases, we found variances that warranted review of staffing levels for specific capital, O&M, or engineering functions, in order to explore possible indications of overstaffing or understaffing.

Our quantitative analyses of gas operations resources also produced several overall conclusions:

- Overall FTEs decreased modestly from 2013's 4,500+, falling by 260 through 2013.
- Internal staffing, straight time and overtime staffing, dropped steadily (by 366 and 83 FTEs, respectively). Contractor FTE levels increased by 187 FTEs.
- Statewide, forecasts showed higher reliance on contractors, whose work share rises from 2013's 30 percent to 33 percent of the mix by 2019. Forecasts showed increased FTEs for straight time and overtime, with contractor FTEs increasing at a faster rate.
- Forecasts showed greatly increased workload, with a peak in 2018, driven primarily by accelerating pipeline replacement programs.
- FTE projections for 2018 showed almost 3,000 more FTEs (about 70 percent), compared to 2013 levels.
- Forecasts showed large additions in all three resource types (1,507 straight time FTEs, 447 overtime FTEs, and 976 contractor FTEs).
- The extremely large and unprecedented forecasted resource increases give reason for substantial concern about the ability to add some 3,000 FTEs in so short a period and about the potential for overtime to be driven to unsustainable levels should O&M work prove larger than expected (particularly given forecasted levels of O&M FTEs that are down from historical levels).
- Quantitative analyses for individual utilities found no reason to question staffing adequacy, but a small number of individual cases showed variances significant enough to cause us to examine more closely the potential for overstaffing or understaffing.

D. Process Analysis

1. Background

An effective resource planning process is critical to a utility's ability to develop work plans and define and budget for sufficient staffing resources - employees and contractors - to support infrastructure maintenance, development, and expansion requirements. Section A of this chapter describes the critical components and dimensions for resource planning and Section B details the key criteria by which we examined resource planning at each state utility. We considered effectiveness among five key elements related to resource planning capabilities:

- Organization
- Information

- Processes and tools
- Planning for overtime use
- Planning for contractor use.

This chapter summarizes our findings and conclusions at the statewide level.

2. Overall Findings

Some companies employed a centralized approach, while others used more decentralized approaches. Typically, when the company was a combined electric and gas utility, the support organization was located within the electric or gas business unit. The larger utilities typically assigned budget/resource plan responsibility to a more centralized group, while the smaller utilities typically used a more decentralized approach, locating more responsibilities within the operating groups. The key differences we observed as they involved effectiveness of resource planning processes did not center on organizational approach as much as on the maturity of the resource planning organization(s). In more than one case, resource planning support had been implemented during three or more annual planning cycles prior to our 2014 field work. Gas support organizations were often in either in their first or second planning cycle. Implementation efforts relied on information and processes consistent with their electric counterparts, but tailored for the unique nature and requirements of gas work functions and infrastructure. Therefore, we found the experience and process maturity for the gas organization behind progress in the electric business units, but progressing.

From a resource planning information standpoint, all companies were using a structured, data-driven annual resource planning process linked to developing annual budgets, incorporating key information such as:

- Use of financial systems to provide historical information on expenditures and hours used for functional areas within work groups, in many cases supported by powerful query capabilities and business intelligence software for extracting and sorting this information.
- Robust programs for identifying and prioritizing future capital work, with capital spending frameworks and risk analyses (addressing multiple categories; *e.g.*, mandatory work, customer work) showing consistency across businesses and functions.
- Electric capital forecasts typically driven from sophisticated system planning analyses, with gas capital investments for main replacements identifying main to be replaced and using risk-based analysis to set priorities.
- With few exceptions, a more incremental approach to identifying future O&M (expense) work requirements, based upon historical work activities and/or expenditure levels.
- A wide range of tools and information systems for developing budgets and resource plans that are linked to work activities.
- Visibility on historical dollars spent, and in some cases, on amounts of associated work, generally existing for each functional work group in electric and in gas operations.
- Units of work available for many types of internally assigned work, with contractor work units available for some types of capital work and most types of O&M work.
- Planning information including detailed breakdowns for hours and costs for internal staffing resources (straight time and overtime) for the functional/work group level of detail.

Statewide, the information for work to be performed by contractors was largely limited to costs, with a single exception. In some cases, units for work assigned to contractors in the past were available, but historical workloads were not tracked (nor were future workloads forecasted) in person-hours or FTEs. In providing data for our study, companies were able to use the expertise of engineering estimators to provide estimates for historical electric and gas contractor hours. The historical estimates provided to us used averaged labor hours per dollar contracted for different types of work, and applied these average unit rates to contractor expenditure levels.

Information for contractor historical workload (hours/FTEs) and estimates for future workload is important for providing management perspective about overall workload for each type of staffing resource – straight time, overtime, and contractors. Without the ability to see overall workload by resource type, it becomes difficult to balance resources and make data-driven decisions about trade-offs among straight time, overtime, and contractors.

The resource planning process, integrated within the annual budgeting cycle, was well understood and mature at all companies. Typically, the annual process begins in late spring with the development of guidance from finance and senior management about financial constraints and key issues or initiatives. After development of work plans and associated budgets in the early summer timeframe, submissions go through a series of presentations, reviews, and challenges (with increasing roll-ups and organizational levels). At various points throughout this process, line management has the opportunity to make its case for funding changes and increases, especially when requests exceed guidance and/or past spending levels. The process culminates late in the year with the presentation for board of directors' review of consolidated, vetted, and management-approved resource plans and budgets.

The process and tools used by NY utilities in the study varied by size and sophistication of the company. Characteristics of the approaches common to most companies included:

- Forecasts took into account top-down overall guidance, past spending levels, identified future capital projects (on a risk-prioritized basis) and incremental O&M spending requests.
- Gas and electric operations both looked at priorities at the project (capital) and program (O&M) level for each group within the company.
- Some company forecasts were developed bottom-up (stated in person-hours), and then converted to cost estimates using work-specific historical unit rates. Other companies developed plans at the functional/work group level and tied them less formally to budget requests.
- Smaller companies generally lacked the sophistication of the larger companies. Approaches are appropriate, given size considerations.
- Throughout the year, senior management used periodic reviews to track whether current year budgets remained on track, and adjusted forecasts as required. Status tracking provided input for adjusting future-year forecasts.
- Some, but not all, company forecasts took into account anticipated cost increases or inflation, and allowed for productivity gains.

Resource planning for overtime at most companies relied heavily upon historical use for certain functions and plans reflect past usage levels. Resource plans for different work groups and types of work frequently did recognize different levels of planned overtime was appropriate. Qualitative guidelines were considered, and often used in developing planning estimates. Where past levels were excessive, plans were put in place to reduce overtime use, with forecasts reflecting the intention to achieve these lower levels. One-time studies examining the cost-effectiveness of overtime versus other staffing resources (straight time and contractors) as a resource planning method were rarely observed and we were not aware of any company that routinely performed this analysis at the functional/work group level during the resource planning process.

At most companies, resource plans for contractors identified future workloads on a total dollar basis only. These forecast expenditures include all labor, materials, vehicles, and administrative costs. Historical data for work done by contractors were typically based upon expenditures, and did not include information about hours worked to accomplish the work.

Unlike budgets for internal resources (straight time and overtime), contractor budgets were not built from person-hours, FTEs, units of work, or unit rates required for each functional work requirement. Without FTE/ person-hour data, it is not possible to have strong foresight into the trade-offs between the use of straight time, overtime, or contractor resources to perform the work. In addition, we did not observe analyses comparing the cost-effectiveness of contractors versus the use of straight time employees or overtime for specific types of work (at the functional or work group level) as an on-going part of the resource planning process.

3. Overall Resource Planning Conclusions

1. NY utilities' consistent use of data-driven, often sophisticated approaches to the resource planning process were generally appropriate.

NY utilities use resource planning information and tools and capabilities typical of data-driven resource planning approaches throughout the industry. We found organizations, processes, and information for resource planning generally well-developed, broadly understood, and consistently executed.

2. In several utilities, gas operations lag electric operations in the maturity of its approach to resource planning, but we found progress in closing the gap.

During our field work, some electric organizations showed more experience, and used a wider range of available information and tools to develop work plans and budgets. For the gas organizations at these companies, resource planning tended to reflect earlier stages of implementation. For example, some companies had just begun to staff and develop the work planner function in gas operations, and were employing their first cycle of resource planning using the approaches developed by their electric counterparts. In the cases of companies in the earlier stages of implementation within gas, we concluded that more detailed implementation plans would help close the gap in resource planning capabilities.

3. Resource planning processes for identifying and understanding overall workload, including reliance on cost data as a measure of contractor work load, did not generally optimize the process of balancing resources.

Identification of contractor workloads (historical and forecast) on a total dollar basis does not provide sufficient information for optimum resource planning. Historical information for work done by contractors, based only upon expenditures, does not provide sufficient information for understanding past capital and O&M workloads. If contractor workloads cannot be understood in terms of person-hours or FTEs, it is not possible to compare meaningfully the amounts of work forecasted for contractors to work forecasted for internal resources (straight time or overtime). This inability inhibits an understanding of the relative amounts of work to be performed by internal resources (straight time FTE and overtime FTE) versus contractor FTEs. When evaluating proposed work group/functional plans and budgets and an objective management review and evaluation of proposed work group/functional plans and budgets, the lack of this understanding makes optimization more difficult.

Consequently, we generally recommended resource planning enhancements, intended to produce a more complete understanding of total workload, including expanding measures of contractor work load to include FTE- or person-hour based values. The resource planning/budgeting process should include FTE estimates for straight time, overtime, and contractor person-hours/FTEs for each type of work underlying the forecasted dollar amount being requested. This robust display would create an integrated resource plan/budget request that not only shows the dollars requested, but the underlying staffing resources required to accomplish the work. This type of resource-based budget would provide the basis for an objective management review of the total amount of work being proposed, as well at the relative amounts of work to be performed by internal resources (straight time FTE and overtime FTE versus contractor FTE) in each proposed work group/functional work plan and budget request.

The companies should develop quantitative FTE or person-hour estimates for forecasted contractor workloads within each major functional program and organizational unit in the electric and gas organizations. These workload person-hour/FTE forecasts of the amount of work to be performed by contractors are central to understanding total work proposed during the bottom-up development of work plans that feed budget requests for each organization. The resource planning process can be enhanced by developing these estimates, either by using historical person-hour amounts from past contracts to project unit rates, or by using engineering estimates to quantify workloads at the program level.

4. NY utilities were not generally making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use at the functional level.

Effective use of overtime and contractor staffing resources at the functional/work group level in resource plans cannot be accomplished without ongoing, data-driven analysis of how the results of using overtime and contractors compare to the use of internal staff, and to each other as well. We found occasional, one-time, limited scope studies for accomplishing these types of analyses and reviews during the resource planning process, but more regular, structured use should exist to support the most effective balancing of internal staff, overtime and contractor resources for each type of work.

We find appropriate the development of budgets for each organizational unit based upon resource plans that quantitatively define all forecasted work for straight time, overtime, and contractors, stated in person-hours and FTEs of underlying workload. Such budgets would provide a better understanding of the entire scope and amount of work to be accomplished. Utilities could then develop ongoing data-driven analysis methods for comparing the equivalent cost of each of these resources for accomplishing different types of work within this resource plan.

Consequently, we generally recommended that resource plans include the capability to conduct data-driven analyses that help management evaluate the trade-offs for overtime, contractors, and internal staff at the functional and work group levels. We observed a fairly widespread need for the state's utilities to enhance their ability to incorporate the use of the comprehensive workload and expenditure data described above into an ongoing, data-driven process for evaluating the trade-offs for overtime, contractors, and internal staff at the functional/work group level. Their annual processes would benefit from formalization that requires each organizational unit to develop these "total workload" bottom-up workload forecasts, linked to the budget expenditure requests.

The companies should then develop methods for comparing the equivalent cost of each of these resources for accomplishing different types of work for these functional work groups. The methods for comparing the equivalent cost of each of these resources for accomplishing different types of work in the resource plan can be used to determine the optimal levels the straight time, overtime, contractor mix for each organization, and can also be used to inform requests that justify changes to internal staffing levels.

Chapter V: Internal Staffing

A. Defining Characteristics

1. Introduction

Utilities employ internal resources to perform a very wide range of activities. The scope of this study addressed resources (which we measure on the basis of FTEs) who execute work activities related to the maintenance, operation, and expansion of the infrastructure required to provide adequate, safe, reliable, and economic service to customers. Our scope specifically excluded functions without direct and measurable impacts on the quality of service delivered (*e.g.*, customer operations; administrative and general) and some that do, such as vegetation management).

Internal staff represents the non-contractor resource contingent, both craft and salaried employees, employed to execute business functions. What companies deem as critical or core functions can vary across the industry, for reasons related to corporate strategy, business practices, resource availability, cost, and other causes. Internal staff complements, even for companies in the same industry and of similar size, vary widely. No "one size fits all" answer exists to the question of what should constitute internal staff functions and numbers. Management nevertheless must apply sound, objective rationales and supporting processes and analyses to plan, provide, and manage the resultant staff profile.

Our process-based review of internal staffing examined the long term planning processes, practices, procedures, tools, and systems employed to ensure the presence of the necessary levels of internal staff. These resources require appropriate training and development for current and anticipated work activities, allowing for anticipated attrition, retirements, and other demographic shifts. We did not begin under the premise that all of the operations we studied should have the same staffing processes, tools and systems, or proportionate internal staff complements. Size differentials in both service territory area and customer base, and geographic variation, among other factors, account for the differences. Managements' processes and resulting internal staff levels nevertheless should reflect a robust understanding of their own conditions, and result in objectively sound internal staff complements that fully support service and cost mandates and expectations.

2. The Role of Internal Staff

Management needs to maintain effective levels of internal staffing to provide high quality, cost effective, and reliable service. Internal staff, in both type and size, reflect what a company believes comprise the critical skills and functions that must be resident within a company to execute its strategies effectively and successfully, and to meet sound goals and objectives. Apple, for example, considers design, but not manufacturing, to be a required internal function, consequently outsourcing almost all manufacturing needs. Apple certainly considers manufacturing critical, but, for many reasons, including cost, considers itself better served by outsourcing manufacturing. Utilities must make similar kinds of choices. Vegetation management operates as a critical function at all electric utilities, on both planned and emergency bases. It directly affects reliability and restoration efforts, particularly during adverse weather events. Nevertheless, it is almost universally outsourced, largely for reasons of cost and the fact that is not considered a critical "skill."

A number of key considerations should drive Internal utility staffing decisions, including:

- Maintaining costs and reliability at acceptable levels
- Maintaining a critical mass of staff subject under immediate and direct utility control, to allow for effective and efficient response to emergency situations
- Maintaining an appropriate balance among internal and external resources, to avoid over reliance on external resources when those emergency conditions arise
- Maintaining adequate expertise and skills in areas critical to the operation, maintenance, and expansion of networks
- Providing sufficient back-up strength to ensure that development of less experienced personnel remains sufficient to compensate for attrition and retirement of resources without compromising core competencies
- Allowing for the development and introduction of new skill sets commensurate with the anticipated demands of the business.

Notwithstanding these considerations, individual utilities may conclude properly that they can meet those goals with differing amounts or proportions of internal staff relative to other resource types, such as contractors or overtime. Certain companies may depend, for example, more heavily on contractors for project management or engineering services if their workload or cost structure makes this an attractive alternative.

In sum, a utility's internal staff comprises a critical and integral element in the provision of safe, adequate, reliable, and cost effective service. Nevertheless, the absence of a universal "right" internal staff complement in either size or type, requires management to make appropriate tradeoffs among internal staff, overtime use, and contractor use, reflecting careful and considered analysis of the costs and benefits of those tradeoffs.

3. A Balancing Act

Total staff complements, at any time and over time, reflect a complex interplay of many factors that reflect particular issues related to economics, customer demand, technological change, core and critical skill set needs, regulatory requirements and constraints, daily operational demands, safety, political concerns, and corporate goals and objectives. In practice, however, many companies' staff complements and the balance of internal, overtime, and contractor FTEs largely reflect a continuation of recent company trends, barring a major business dislocation or expansion (*e.g.,* a divestiture or acquisition). This pattern repeats itself most often at utilities that historically have had an especially stable business model, driven by mandatory reliability service quality standards, regulated returns, and a slow pace of technological change.

Assuming acceptable recent performance in key quality, reliability and cost measures, managements often see little value in radical (or even substantive) year-to-year changes in resource distribution and maintenance. With long-standing and usually well-understood processes and procedures in place, plus significant and mandated regulatory requirements, current staff levels, and year-to-year changes, frequently tend to remain predictable and reasonably static. That does not mean, however, that internal staff levels are optimal, or that staffing decisions should result from simplistic processes.

Ongoing examination of current and future work load, monitoring of new technologies and their potential impacts, and a keen awareness of internal and external demographic trends should drive distribution and management of the workforce, with balance among the three resource sources (internal, overtime, and contractor FTEs), a driving concept. How companies achieve that balance should reflect, among other factors, a careful consideration of cost, risk, demographic trends (*e.g.*, retirements, attrition), potential new skill sets needed, union work rules and, as appropriate, regulatory considerations.

Balance among the resource types should also consider how many hours internal resources have "available" for work during a year or other planning period. Fewer available hours require a greater number of FTEs to perform a projected amount of work. The determination of the number of required FTEs, while not complicated, can and does vary by company. Equivalent FTEs in any function or across functions are determined by dividing total hours needed (or worked) by hours available for work by an individual in a year. For example, if 10,000 hours of work are needed to be performed by engineering in a year, and available hours for work are 2,080 (*i.e.*, 52 weeks multiplied by 40 hours/week), then the equivalent FTEs would be 10,000 hours divided by 2,080 hours, or 4.81. However, if available work hours were reduced to 1,700, for example, in order to allow for vacations, training, sick time, holidays and other non-productive time, then the number of FTEs required to perform 10,000 hours of work would be 5.88 (*i.e.*, 10,000 hours/1,700 hours), an increase of approximately 22 percent. Obviously, the allowance for non-productive time has significant implication for cost and, potentially, productivity.

It might be expected that New York utilities would have similar average available hours associated with their internal staff given the similarity in resource types, functions, union rules, and regulatory mandates, but that is not the case. In fact, average available hours for internal staff range from 1,650 to 1,810, almost a 10 percent differential. This differential in itself has an impact on the comparative size of New York utilities' internal staff complements.

As previously noted, many companies, including utilities, make conscious decisions to outsource particular types of work such as vegetation management, customer call centers, IT related activities, benefits management, and other functions that their circumstances cause them to view as not critical to the core business. Those decisions are company-specific, reflecting a unique history, current circumstances, and view of the future. Decisions related to required internal skill sets, however, require support in the form of detailed analyses that underpin and support the ability to continue to provide adequate numbers of staff via hiring, training and development, and reassignment in the face of a changing industry and demographic trends.

4. *Demographics Trends*

The utility industry has spawned a great deal of discussion over the last decade about the expected large-scale retirements of experienced internal staff in critical functions, such as operations, engineering, and planning. Demographic data supports the emphasis on the "graying," workforce. New York utilities face it, but do not seem to show a significant surge in retirements. Even given existing trends, however, it is inevitable that, absent effective mitigation, retirements and attrition will begin to affect the ability to deploy appropriate internal staff. The demographic trend takes on added importance with the increasing rate of technological and regulatory change and the concomitant need to hire and retain younger, highly skilled staff having familiarity and comfort with new technologies and business models.

Given these developments, internal staffing decisions need to rest on data and analyses that reflect the unique circumstances associated with an individual company. Examples of such data include:

- Staffing-related reliability and service quality data
- Current staffing levels
- Recruitment and hiring plans
- Anticipated retirements
- Anticipated skill set needs
- Retention plans
- Succession plans
- Knowledge transfer programs.

New York's electric and gas networks are technically well understood and historically have not been subject to rapid change, but have become subject to an increasingly complex set of forces that include technological change, regulatory model shifts, heightened customer demand for product and service optionality, and increased resiliency expectations. Forces like these affect networks and systems that need to operate continuously with minimal down time under normal and extreme conditions. The challenge is great – and growing.

In addition, the widespread acknowledgement of workforce aging will further stress internal staff. These stresses should produce at the least a recognition of the need to adapt traditional approaches to succession planning, career path programs, mentoring, on-the-job training, recruitment, apprenticeships and management training programs. A lack of forward thinking in these areas likely will lead to sub-optimal staffing decisions in both numbers and timing.

B. Evaluation Criteria

In assessing efforts to optimize internal staffing process, we applied the following criteria in our evaluations of each operation we examined:

Internal Staffing Criterion 1: There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.

Internal Staffing Criterion 2: Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.

Internal Staffing Criterion 3: There should exist sufficient sources of complete, accurate staffing information by region and by function.

Internal Staffing Criterion 4: Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.

Internal Staffing Criterion 5: Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.

Internal Staffing Criterion 6: Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

C. Data and Analysis

1. Internal Staff Resource Levels

Total 2013 internal staffing expenditures for the electric operations functions that we studied ran to $2,311 million - - $1,210 million for capital, $921 million for O&M, and $180 million for engineering. Total 2013 internal staffing expenditures for the gas operations functions that we studied amounted to $803 million - - $408 million for capital, $321 for O&M, and $73 million for engineering. Labor comprised about 55 percent of these totals for both electric and for gas operations.

This chapter focuses on straight time resources; *i.e.*, the hours, translated into full time equivalents (FTEs), provided by employees during regularly scheduled work periods. This measure of straight-time work corresponds most closely to the actual number of company employees (headcounts) assigned to perform work. We examine the overtime component of internal staffing resources in a subsequent report chapter.

As note earlier, our analyses did not include data for 2014, during which we performed study field work, given incompatible data the companies provided for combining year-to-date actual and year-to-go forecasted data.

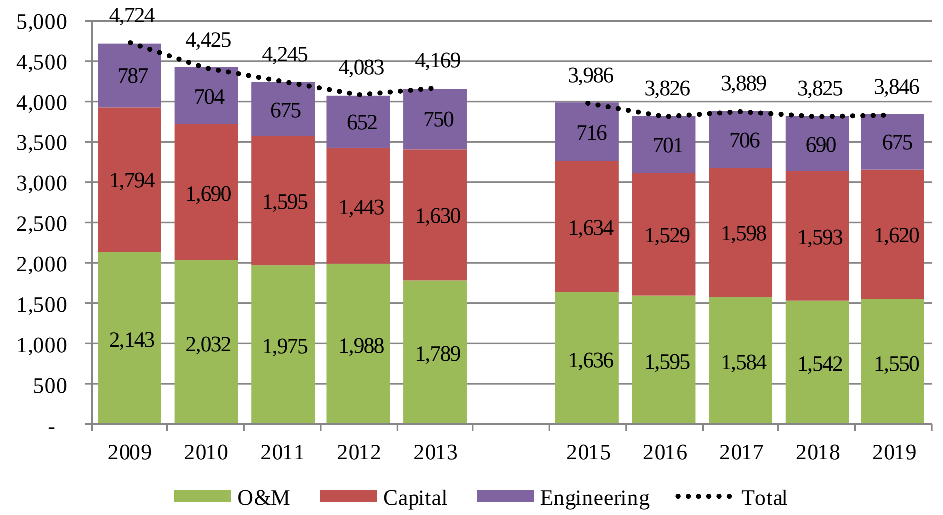
2. Internal Staffing Levels - Electric

We performed quantitative comparisons of historical (2009-2013) and forecast (2015-2019) straight time resources for electric distribution and transmission and substation functions statewide. We used data provided by each participating company in the ways and subject to the limitations described in the preceding chapter addressing total resource levels.

3. Electric Distribution Internal Staffing Trends

The following chart shows historical and forecasted straight time staffing levels for electric distribution functions for the 2009-2019 period, depicted in terms of FTEs and broken down by type of workload (O&M, capital, and engineering work).

Figure V.1: Electric Distribution Straight Time FTEs: Statewide Total by Resource Type

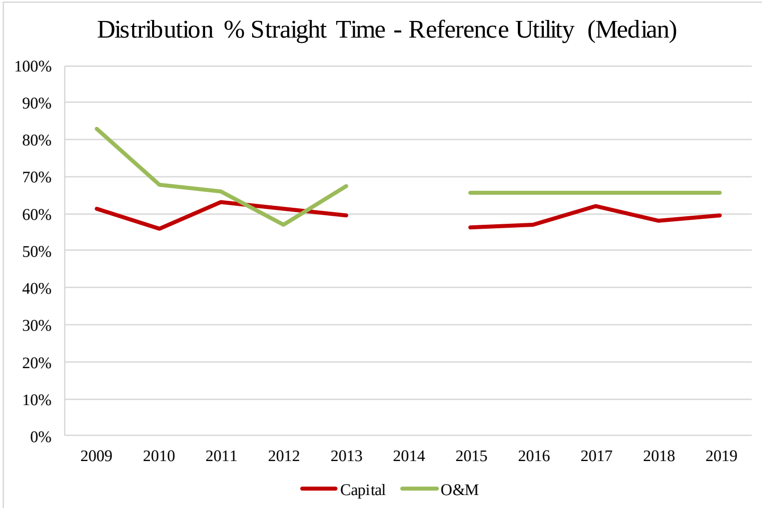


Overall straight time FTE levels for electric distribution work consistently decreased through 2012, and then held fairly constant for 2013. O&M, capital, and engineering FTEs all consistently decreased through 2012. The 2013 capital and engineering FTEs increased by about 15 percent, in part due to follow-on effects from Superstorm Sandy in 2012. The gain in these areas was mostly offset by a reduction in O&M FTEs which decreased 10 percent from the prior year. Even with 2013's small increase, a net decline in electric distribution equivalent to 555 FTEs amounted to a substantial, 12 percent drop from 2009 levels.

Management of the operations we studied forecasted a continuation of the historic drop in straight time workload in electric distribution activities across the 2015-2019 period. Overall, those forecasts show straight time workload in FTEs for electric distribution dropping by 323 FTEs (eight percent) from 2013 levels. Forecasts showed declines in all work categories, with O&M accounting for the largest share of the projected decline (239 FTEs).

We focused on absolute staffing levels for straight time, but it remains material to understand internal levels in relation to the whole staffing resource mix. The following chart shows how the percentage of straight time work (the Reference Utility value) varied each year between 2009 and 2019 for capital and O&M work.

Figure V.2: Distribution Percent Straight Time



The chart demonstrates shows two distinct trends for electric distribution work:

- The percentage of capital work performed using straight time remained virtually flat, at about 60 percent of the resource mix, throughout the historic and the forecast periods.
- The percentage of O&M performed using straight time resources declined from more than 80 percent of the resource mix in 2009 to less than 70 percent of the resource mix in 2013. The 2012 drop to below 60 percent likely resulted largely from Superstorm Sandy. Management's forecasts of straight time for O&M showed continuation of this lower level (less than 70 percent of the resource mix) through 2019.

The next table shows the 2013 actual and 2019 forecast resource mix for the Reference Utility and for each electric operation's electric distribution work.

Table V.3: Electric Distribution Actual Resource Mix 2013

Source	RU	1	2	3	4	5
Straight Time	67%	83%	73%	62%	60%	58%
Overtime	13%	7%	14%	18%	13%	10%
Contractor	20%	10%	13%	19%	27%	32%
Total	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019						
Source	**RU**	**1**	**2**	**3**	**4**	**5**
Straight Time	65%	74%	76%	63%	64%	48%
Overtime	10%	6%	8%	18%	11%	7%
Contractor	25%	20%	16%	20%	25%	45%
Total	100%	100%	100%	100%	100%	100%

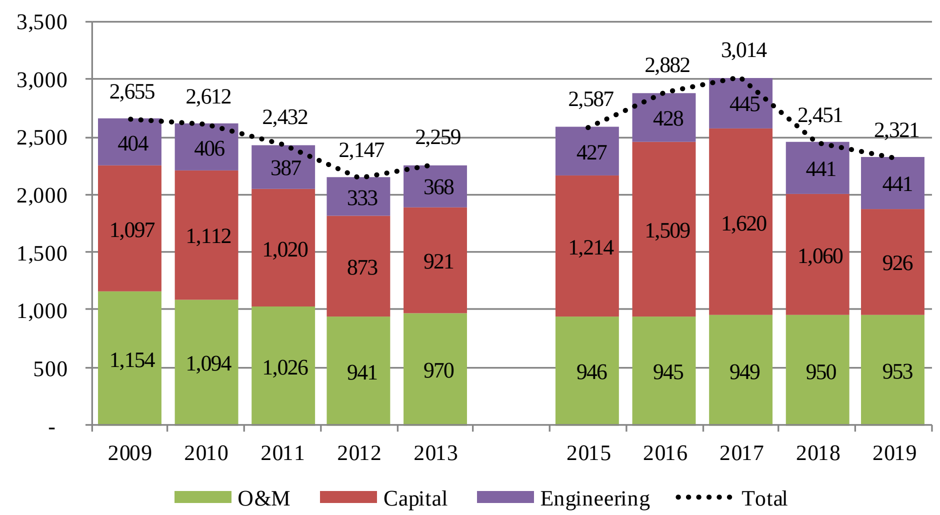
Comparing the table's 2013 and 2019 entries confirms that forecasted overall use of straight time for the Reference Utility (the average of all companies) remained at levels in the mid 60 percent range. Three operations forecast moderate increases in the use of straight time and two utilities expect to drop straight time significantly as a share of their resource mix.

The chart also shows a pattern of a relatively stronger reliance on external resources. The Reference Utility shows an overall shift to contractors (increasing from 20 percent of the resource mix in 2013 to 25 percent in 2019). The pattern forecasted by management of most of the electric operations showed a rebalancing of the resource mix to reduce overtime. That rebalancing takes two routes: increasing the relative percentage of contractor resources (four companies), or increasing straight time resources (one company).

4. Electric Transmission and Substations Internal Staffing Trends

The following chart shows historical and forecasted straight time FTEs for electric transmission and substations functions, broken down by type of workload (O&M, capital, and engineering work).

Figure V.4: Electric Transmission & Substation Straight Time FTEs: Statewide Total by Work Type



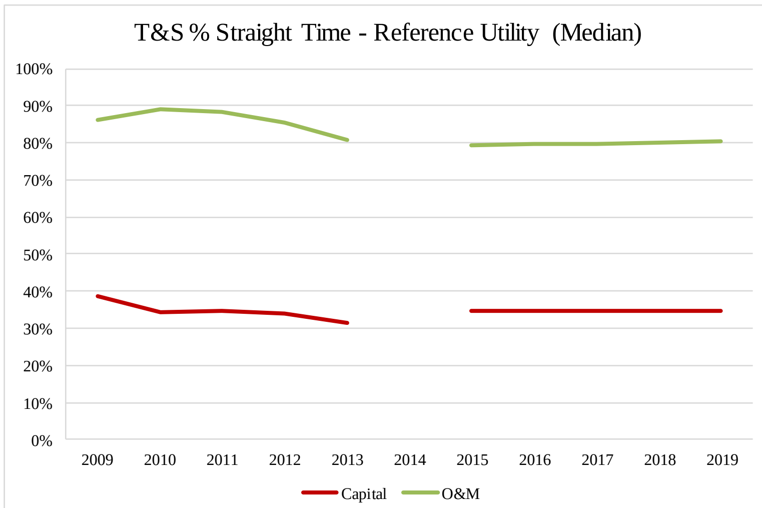
Transmission and substation straight time FTEs declined significantly through 2012 - - a period during which distribution levels decreased as well. In 2013, FTEs increased by 110. Management forecasts showed increases continuing statewide through 2017, then dropping back, but still substantially exceeding 2013 levels. O&M FTEs declined steadily and significantly through 2012, increased nominally in 2013, but then, according to forecasts showed a return to 2013 levels, which held steady through 2019. In all, O&M straight time FTEs showed a drop of more than 200 from 2009 levels (184 by 2013 and another 20 through 2019).

Straight time FTEs for capital showed a great deal more variability, by contrast with their O&M counterparts. From a low of 873 in 2012, forecasts showed them rising to a high of 1,620 in 2017. Engineering FTEs mirrored that variability. Their range extended from 333 to 445 FTEs between 2009 and 2019. This pattern typifies industry experience for transmission and substation construction programs, which produce highly variable amounts of new facilities and corresponding workloads from year to year.

Combining O&M, capital, and engineering FTEs showed very little expected change in total resources ((62 more, or less than three percent) between 2013 actual and 2019 forecasted levels.

The next chart shows straight time's shares of the whole staffing resource mix on a statewide basis. It depicts how the average percentage of straight time staffing work for the Reference Utility varied yearly between 2009 and 2019 for capital and O&M work.

Figure V.5: Transmission & Substation Percent Straight Time



As was true for electric distribution, the chart shows (after a step drop in 2010) relatively stable historical and forecasted percentages for straight time in the resource mix for capital work. Straight time declined historically as a percentage of the resource mix for O&M work, from a 2010 high of 90 percent to stable levels close to 80 percent from 2013 to 2019.

The next table shows the 2013 actual and 2019 forecast resource mix applied to all electric transmission and substation work by the Reference Utility and by each of the operations we studied.

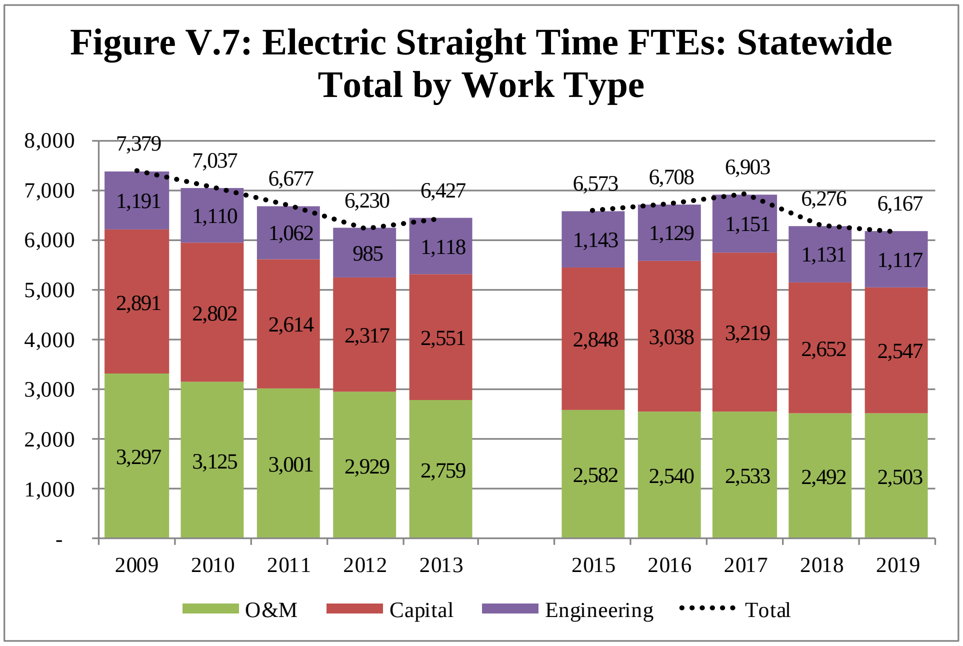
Table V.6: Electric Transmission and Substation Actual Resource Mix 2013

Source	RU	1	2	3	4	5
Straight Time	56%	73%	60%	58%	56%	31%
Overtime	8%	17%	9%	5%	8%	3%
Contractor	36%	11%	31%	38%	36%	66%
Total	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019						
Source	**RU**	**1**	**2**	**3**	**4**	**5**
Straight Time	53%	72%	54%	61%	53%	24%
Overtime	7%	14%	5%	6%	8%	3%
Contractor	40%	14%	40%	33%	39%	73%
Total	100%	100%	100%	100%	100%	100%

Comparing the table's 2013 to 2019 entries shows decreasing reliance on straight time resources, with an accompanying stronger reliance on contractor resources. The Reference Utility shows an overall shift to contractors, whose work share increases from 36 percent to 40 percent of the total resource mix. Forecasted straight time resources show a decrease from 56 percent to 53 percent of the total resource mix. Four of the five state electric operations expected to reduce straight time and to increase contractor shares of their resource mix.

5. *Total Electric Internal Staffing Trends*

The following chart shows historical and forecasted staffing resources for all of electric functions (*i.e.*, combining distribution, transmission, and substation work activities) for 2009 through 2019, broken down by type of workload (O&M, capital, and engineering work).



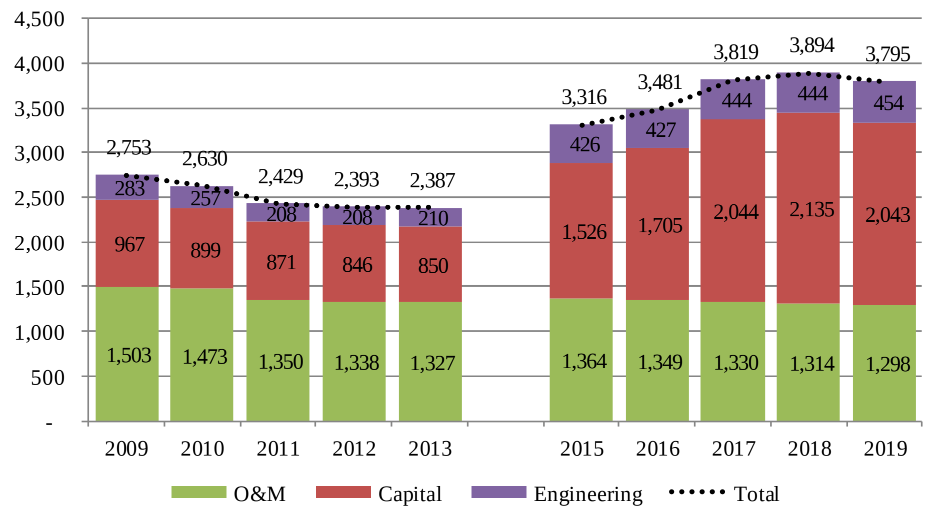
We drew the following statewide observations from this data:

- Use of straight time FTEs decreased by about 10 percent (950 of 10,000+ FTEs through 2013).
- The majority of this the drop occurred in O&M work generally (538 FTEs) and in transmission/substations capital work (176 FTEs).
- Forecasts projected continued decreases in O&M (about 350 FTEs), and the fairly typical types of variations in transmission and substation capital (between 250-700 FTEs in any given year).
- Altogether, the data show significant year-to-year variations, with 2019 straight time FTEs ultimately falling 260 FTEs below 2013 levels.
- Forecasts showed a statewide reduction in the percentage of straight time resources and increase in the corresponding percentage of contractor FTES in both distribution and transmission/substations work.

6. *Internal Staffing Levels - Gas*

This section provides an overview of historical (2009-2013) and forecast (2015-2019) straight time resources for gas operations functions statewide. The following chart breaks down historical and forecasted straight time resources for gas operations functions by type of work.

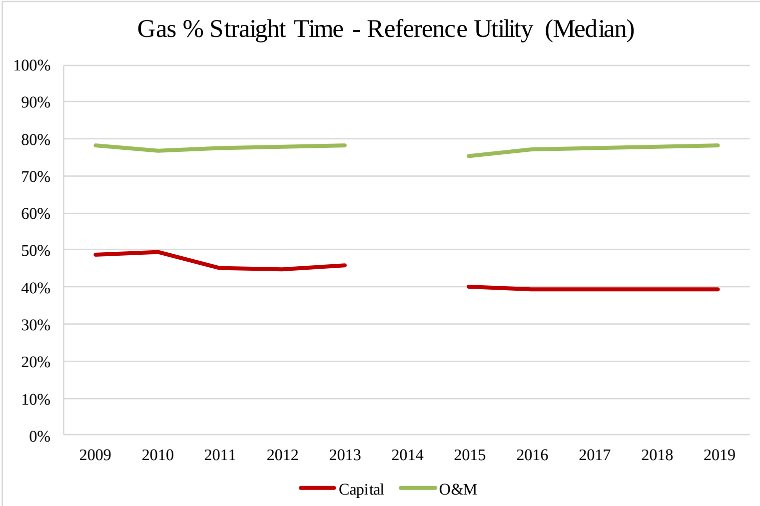
Figure V.8: Gas Straight Time FTEs: Statewide Total by Work Type



Through 2013, straight time FTE levels consistently decreased, dropping by 366, spread across all types of work. By contrast, forecasted straight time FTEs showed substantial increases, beginning in 2015 and peaking in 2018. Accelerating pipeline replacement programs drove most of the very large projected increase. The 2018 total straight time FTE forecasts exceeded 2013 levels by two thirds (64 percent, or 1,507 FTEs). Forecasts for O&M straight time FTEs did not vary much, ending in 2019 with an approximately 30 FTE decrease from 2013 levels. Across the entire 2009 – 2019 period, the drop is much greater (about 200 FTEs). In addition to pipe replacement as a capital work driver, some companies (particularly those downstate) also expected substantial new business work.

The next chart shows straight time staffing shares of the whole staffing resource mix for capital and for O&M work.

Figure V.9: Gas Percent Straight Time



The chart demonstrates an overall flat trend (at just below 80 percent) in the use of straight time FTEs for O&M work. Projections showed capital work FTEs decreasing from historical levels (from 45 to 50 percent to 40 percent). This reduction reflects the unprecedented increase in FTE requirements to support accelerated pipeline replacement programs, rather than a change in resource mix strategy.

The next table shows the 2013 actual and 2019 forecast resource mix for the Reference Utility and for each of the gas operations we studied.

Table V.10: Gas Resource Mix – 2013 Actual and 2019 Forecast

Actual Resource Mix - 2013									
Source	**RU**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Straight Time	62%	73%	71%	70%	67%	64%	62%	57%	30%
Overtime	8%	9%	1%	6%	6%	10%	16%	14%	5%
Contractor	30%	18%	27%	24%	27%	26%	22%	29%	64%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019									
Source	**RU**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Straight Time	59%	70%	68%	66%	59%	62%	55%	53%	37%
Overtime	8%	8%	2%	4%	4%	7%	17%	15%	9%
Contractor	33%	22%	31%	30%	37%	31%	28%	31%	55%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Comparing the 2013 and 2019 entries indicates a slightly higher reliance on contractor resources. The Reference Utility shows a shift from straight time to contractors of three percent of the overall resource mix. All but one of the nine gas operations forecasted this same pattern. Projections of statewide levels of FTEs for straight time and for overtime showed increases significantly above historical levels. The somewhat higher rate of increase for contractor FTEs, however, pushed the share of work by internal resources down by that three percent magnitude.

7. Conclusions

We formed a number of observations and conclusions about overall electric distribution and electric transmission and substation FTE levels:

- Internal distribution and transmission/substations FTEs declined by close to 1,000 FTEs (more than 10 percent), weighted somewhat more heavily toward transmission and substations.
- Increases appeared in the forecasts through 2017, peaking at 6,903, which still remained significantly under the study period's 2009 opening levels of 7,379. Forecasts showed them dropping significantly to a 2019 level of 6,167 (another four percent reduction from 2013 and nearly 20 percent from 2009). Essentially all of that forecasted decrease came in distribution FTEs.
- Overtime and contractor resources absorb some of this decrease, but attention to ensuring that continuing decreases in straight time resources available for O&M work will not lead to infrastructure condition decline or performance degradation in the future should be a matter for continuing attention.
- Generally, forecasts show a rebalancing of the staffing resource mix in coming years to reduce straight time resources and modestly increase the relative percentage of contractors in the resource mix.

The observations that we formed from combining the gas operations data include:

- With overall FTEs decreasing by about 6 percent during the 2009-2013 historical period, internal straight time resources fell much more substantially (13 percent).
- 2013 straight time levels were 366 FTEs lower than in 2009, reflecting a drop of eight percent of the 4,500+ FTEs of total 2009 gas staffing resources (straight time, overtime, and contractors).
- Forecasts showed substantial and equally sized increases in straight time FTEs (59 percent) and contractors (58 percent) between 2015 and 2019, peaking in 2018 and dominated by accelerating pipeline replacement programs. We did not observe a shift in strategy regarding internal resource use, but rather the effects of the large magnitude of resources needed to support accelerated replacement programs.
- We question validity of resource drop following the forecasted 2018 level; pipe replacement program horizons extend to the range of 20 years, making it far from clear that resource levels can be expected to drop in high production years (the "sweet spot") of replacement programs.
- The concern lies in the degree to which the resource forecasts from management tie to the duration of rate mechanisms designed to support replacement acceleration, as opposed to tying to a derivation of yearly needs based on total miles and planned total duration.
- The forecasted increase for straight time resources between 2013 and 2018 (63 percent) was very aggressive. The large increase makes the viability of increasing straight time FTEs to maintain historical straight time resource mix levels questionable.

- More importantly, the size of that increase, combined with the number of added contractor resources forecasted on a statewide basis, underscores our concern about the critical need to ensure access to sufficient resources for gas capital work.
- Very large forecasted increases in contractor FTEs over the same time period during which gas operators throughout the region will also be ramping up resource needs, further demonstrate the difficulty of the overall staffing challenge that pipe replacement needs will continue to present.
- Increasing resource levels by this magnitude over such a short period, and the need to sustain them for a long time thereafter (should replacement efforts continue across the multi-decade durations contemplated) pose a great, and perhaps unprecedented industry challenge for management of New York's gas distribution utilities.

D. Process Analysis

1. Background

The organizations, systems, approaches, methods, resources, processes and tools used generally for resource planning support the planning, forecasting, and measurement of internal staffing. With internal resources forming a core element of resource planning, it stands to reason that internal resources be treated as part of the short- and long-term processes for planning and budgeting. We focused on aspects where internal resources raise unique considerations. Apart from confirming that resource planning treats the internal component of staffing appropriately, we focused on a number of areas of particular concern to the internal component:

- Knowledge of the capabilities, distribution, and application of existing resources
- Understanding of the implications future changes in work types and amounts have for internal resources
- Awareness of areas of significant potential resource loss (*e.g.*, through retirement) and means for addressing them
- Recruitment, training, and development needs identification and means for supporting those needs.

2. Findings

All of the electric and gas operations paid significant attention to ongoing and special (*e.g.*, large, non-recurring transmission) projects, or changes in future rates of leak-prone pipe replacement. Whether developed through formal, centralized efforts (typical of the larger operations), or informally, through close management engagement with infrastructure condition and needs (more common in the smaller operations), managements generally showed a sound, comprehensive understanding of how coming work requirements related to and differed from those of the past. This knowledge was accompanied by knowledge of where and how deployment of resources was likely to change in meeting emerging and longer-term needs. Our discussions with management and our review of the data provided showed universal awareness of existing resource levels, how and where they were deployed, and what implications future changes in work might have for that staffing and its deployment.

Notably high rates of retirement eligibility remain for operations across the state. Historical rates of retirement would suggest that the issue is manageable, but it will require close focus on particularly critical skill sets to ensure that resources remain adequate. With one exception, the operations we studied have systematic methods for determining where and to what degree they face significant levels of retirement eligibility, combining data about numbers eligible for retirement and historic rates of actual retirements. They use sound information, pay attention to the areas where attrition potential is the highest, and segregate the data to allow a focus on key resource areas.

Approaches to training and development of existing resources focuses appropriately on the technical and broader developmental issues needed to ensure appropriate growth in the capabilities of in-house resources.

3. Conclusions

1. The operations we studied generally employed well-developed specifications of capital and O&M work requirements.

We found, as other chapters address (see, for example Statewide Main Replacement and Resource Planning), a range of effectiveness and credibility in how resource forecasts correspond to infrastructure needs, but in no case could we tie those issues to inadequate attention to the underlying work needed.

On the premise that changing work requirements can generally be expected to produce changing staffing, we observed only one case where there appeared to be an essentially static view of internal staffing needs on an historical basis. We did recommend a more dynamic approach, but also observed that none of our performance indicators identified any problems, but, to the contrary, showed the operation involved to be a comparatively strong performer by quantitative methods. That utility also operates in an environment and with an infrastructure that does appear to lead to greater year-over-year consistency in work needs than was typical for the other operations we studied.

2. Managements of the operations we studied also demonstrated strong knowledge and understanding of where and how resources were being deployed at the time of our field work, and of how that deployment conformed to plans and goals.

The uniform strength of understanding about resource application at the detailed level (*e.g.*, by work type, worker classification, region, program, project) was not surprising. It conforms to what we see almost universally in the electric and natural gas industry. It nevertheless reflected a source of strength in promoting effective planning and management of internal resources.

3. Managing losses through retirement will remain for New York, as for the industry, a major challenge, although trends in tenure and work-force age, with some exceptions, are encouraging.

We found generally sufficient attention to the question of attrition, particularly in addressing the industry's long-standing and well documented "graying" workforce.

We do, however, have a concern about the degree the past is prologue with respect to historical retirement rates in at least one particular respect. With expansion of pipe replacement programs widespread, demand for skilled resources will increase. We have already observed in other work a loss of senior personnel experienced in the activities involved. With other utilities and contractors competing for those resources, inducements to retire from one position to take work at another, similar one must be considered. Some operations have already undertaken notable efforts to concentrate on those resources where there is expected to be high demand for skills already at or close to marginal levels. The individual utility reports discuss how New York utilities are approaching the challenges and areas where we think improvements can be made.

We believe that all of the state's gas operations need to ensure that their Human Resources personnel are working closely with line management to bring attention at the individual work group or worker type level, by assessing likely increases in market demand, assessing where their current staff ages or numbers indicate problems, tailoring inducements to keep senior people on board, and designing mentoring and other programs to ensure that key institutional knowledge and experience continues to have robust avenues for transfer to others. In particular, the enhancement we recommend here concern focusing greater attention externally (to areas where market information shows increasing demand) and internally (potentially increasing rates of attrition in those areas).

Two particular risks that an aging work force brings do not appear generally in the data we secured and analyzed for this study. First is increasing work-force age. While that age brings experience, it also can impose strains, particularly, for example, when emergencies produce long hours for older workers. The data generally shows stable or slightly decreasing ages, despite growth in retirement eligibility over the coming years. Loss of tenure can also result from large scale retirements. Concern for that issue in the future remains important, but the data we studied also shows that, with one exception, average tenure did not drop significantly through 2013.

The one exception to this general observation about tenure is an important one. It exists for a company that, compared to the others, relies more strongly on a depth of senior experience (than on centralized organizations, processes, systems and the like) to make and manage in response to the staffing plans and decisions relevant to our work. This reliance significantly increases the risks it would face from loss of such experience. While it does not see potential gaps, our review of the data shows otherwise. Perhaps our most significant recommendation for that operation was to develop clear and comprehensive plans to ensure institutional knowledge transfer through well-defined and carefully implemented means (*e.g.*, mentoring).

We found one other, single outlier in another respect. We found it unable to report to us information that would demonstrate a comprehensive approach to identifying and addressing areas where it may face critical resource issues in the areas we studied. As a small company, its exposures to loss are, all else equal, greater than normal, making the risks that arise from its significantly lesser handle on the relevant data greater.

4. **Across the state, recruitment, training, and development of resources focuses appropriately on the areas and on the types of people needed to ensure that internal staffing needs can continue to be met.**

The companies generally were paying sufficient attention to using and developing alliances with outside sources of recruitment of and basic training in the skills of relevance to the work types our study addressed. We found some participation in joint efforts with bargaining units in creating recruitment sources, relationships with local institutions, and participation in peer groups focused on addressing industry recruitment, training, and development. In particular, involvement with the Center for Energy Workforce Development (CEWD) is prevalent. Two companies are new to the group; we consider growing into active, robust participation important.

Chapter VI: Overtime

A. Defining Characteristics

Compared with straight time and contractor hours, overtime hours generate a comparatively low portion of total resource costs. Nevertheless, managing them effectively matters in optimizing costs. Overtime hours used to excess can have less direct, but still important impacts. Overtime practices among the operations we studied varied widely, and levels ranged from nearly zero to what appeared to be excessive levels. We do not believe that a single "right" answer exists regarding the question of overtime levels. A simplistic 10-15 percent level as a rule of thumb has been widely used, but good reasons can make those levels too high or too low. Most importantly, "optimum" overtime is a function of many things, not the least of which are the utility's strategies for internal staffing and contracting.

1. Overtime Objectives and Benefits

Overtime provides the flexibility to respond to a number of staffing challenges and opportunities, including, for example:

- Meeting short-term variations in workload
- Responding to emergencies
- Performing critical schedule work, including major projects
- Making up for personnel shortages
- Producing economies (where an immediate payback is at hand).

Generally, management categorizes overtime as "casual" or "planned." Casual overtime occurs as needed, is generally very short-term in nature, and responds to perturbations in the supply of labor and the unexpected emergence of new demands. Companies often apply the 10-15 percent rule of thumb to casual overtime, recognizing that considerably higher levels of planned overtime sometimes become required. Many uses of overtime come when management has no other real choice. For example, emergencies often leave no other viable source of people.

2. Overtime Costs

Overtime typically produces a higher wage rate, known as premium time. A "time and a half" rate is prevalent, with that premium increasing for higher levels of overtime or for work at certain times. As a result, the direct (unloaded) costs of overtime are high in comparison to the corresponding costs of an hour of straight time. However, when looked at as a separate element of the resource stack, as our study has done, overtime sometimes proves a lower cost resource when compared with straight time on fully loaded and fully comparable bases.

With respect to loaders, straight time and overtime hours do not have the same payroll adders. These adders include items such as employee benefits, allowances for vacation, sick leave, and holidays. The adders also include the employer-paid portion of employee insurance and social and retirement benefits, federal and state payroll taxes, premiums for insurance (those measured by payroll costs), and other contributions and benefits imposed by applicable laws and regulations. For comparative purposes, we assume a payroll additive rate for a straight time hour to be 100 percent. While sufficiently enough in line with general industry experience to serve as a proxy for this example, actual rates differ among employers. It is therefore important that management at each company have and use actual loaders based on its individual compensation and benefits structures. Applying our 100 percent proxy loading rate to the direct wage cost of a straight time hour makes the loaded cost two times the wage rate.

From a cost impact perspective, however, it is not appropriate to apply the full payroll loading rate to an overtime hour. Rather, only those elements of the adder directly proportional to wages paid will be applicable. For example, the costs to the employer for holidays and vacations are among those that do not increase when an employee works an overtime hour. The same is true for a number of other components of the adder to direct wage costs. The effect is to reduce the loading rate applicable to overtime hours. If the loading rate falls (again using a proxy) to 35 percent for overtime hours, then the loaded costs of straight time and overtime hours (as the next table summarizes) become almost equivalent. In this example, the use of a 100 percent premium, not uncommon for particular types of overtime (*e.g.*, Sundays or holidays), the gap between straight and overtime equivalent costs would widen for overtime on those occasions.

Table VI.1: Effect of Loading on Overtime Labor Hour Cost

Hour Type / **Cost Component**	*Straight Time*	*Overtime*
Base Hourly Wage	$35	$35
Overtime Premium (%)	0%	50%
Overtime Premium ($)	0	17.5
Wage Cost (1 hour)	$35	$53
Payroll Adder (%)	100%	35%
Payroll Adder ($)	$35	$18
Equivalent Cost (1 hour)	$70	$71

Accurate comparisons of loaded hourly straight time versus overtime rates depends on factors that differ among employers. Examples include rates for premium time, the total costs of payroll adders, and accounting for those adders that do not increase due to overtime all play a role. These factors differ to some extent among the state's utilities. Using the best available data from the utilities we studied here, we determined that, overall for these utilities, the cost of an incremental overtime hour roughly equals that of a straight time hour. The variation among the companies appears roughly to span a range of ±15 percent.

The relatively small size of this gap indicates that significant financial penalties do not result from wage rate differences when choosing overtime in lieu of the straight time or contractors (measured on a properly loaded hourly unit cost basis). However, one must go on to examine the other "costs" overtime brings. These costs often do not get the weight they deserve. Reduced productivity, fatigue, safety, and longer-term employee satisfaction are among the considerations that have received some study and attention in other industries, but less so in the utility business. The effects of overtime on construction productivity, where workers on large projects often put in overtime of

20 percent or more for sustained periods, have long been an issue. What to infer from the sizes of the impacts shown in the quantitative analyses that have been publicized is debatable, but there is no question that productivity impacts exist, and become substantial as overtime levels rise above 20 percent on a sustained basis.

The notion of diminished productivity as overtime increases suggests that at some level there may actually be very little work product added by further increasing overtime hours. Nevison (see Nevison, J. *Overtime Hours: The Rule of Fifty)*, for example, defined the “rule of fifty” suggesting that there no added output results after about 10 hours of overtime. The studies he reports found this result even with only one week of such overtime levels. The effects over several weeks became more noticeable. Few disagree with these effects, but many fail to use them in a robust fashion in planning resources - - sometimes with good reason. Moreover, we do not here extrapolate the Nevison results to our study, but rather address the well accepted phenomenon that production decreases as overtime extends to high levels.

A line worker performing in a situation of widespread outages may thus not be very productive, but managers tend to see any level of contribution to service restoration as “worth the price.” In addition, some situations justify taking productivity penalties when they serve non-cost objectives. For example, it is common to schedule overtime in order to attract crafts for projects where resources may be scarce.

An aging workforce adds an important dimension. Many of the skilled personnel reviewed in our analysis have decades of experience, which makes them the most valuable contributors, particularly in times of emergencies. The extent to which such people must function for long hours in harsh conditions raises real questions of safety and fairness to the employee. While direct out-of-pocket costs for management may be minimal, other impacts are real and substantial.

3. *Overtime as a Source of Structural Issues*

Organizations with overly high levels of overtime also increase their risks of encountering organizational disruption and problems. We recently worked with a utility that, due to a personnel shortage, was forced to work operators at levels of overtime near 50 percent for a sustained period. Recognizing the inappropriateness of this approach over the long term, the utility took steps to cut this figure in half. After reducing overtime hours (and therefore compensation to its employees) the company experienced numerous resignations, which further aggravated the work force shortage that caused the need for such high levels of overtime in the first place. The workers, in this unique case had other employment options, and proved simply unwilling to take the cut in compensation from levels to which they had grown accustomed.

Choosing who benefits from overtime can also be a source of turmoil. Employees may have to compete for the added hours, which can create issues. Alternatively, when overtime becomes too intrusive, employees compete to avoid it, which can compromise the call-out process. We recently observed a utility that got around these issues by delegating call-outs to the customer contact center. This approach necessitated the preparation of a rigid procedure together with an accurate listing of skills and skill needs, both of which produced added, unintended benefits.

These issues illustrate that optimizing overtime requires a balancing act. Management must balance negative effects on the worker and productivity versus the benefits, or even necessity, of working extra hours. Workers must balance the benefits of added compensation against the resulting fatigue, overwork, and lessening of quality of life. The bargaining unit representing workers must balance the benefits its members receive against the reality that a high amount of overtime can mean fewer jobs.

4. Identifying Linkage between Overtime and Staffing Adequacy

Our primary interest in examining overtime in this report lay in determining how its use influences staffing levels, and how the determination of overtime levels relates to internal staffing and use of contractors. A key question for us in that analysis was whether data addressing the level of overtime experienced by a utility could show anything about that utility's adequacy of staffing levels. We did find some level of correlation, which we discuss later in this chapter. Overtime may not justify definitive conclusions on staffing, but neither did we find it irrelevant. Specifically, our analysis showed that correlations existed (for some of the operations we studied) between declining staffing and increasing overtime, and vice-versa for some others.

5. Assigning Overtime a Role in Staffing Optimization

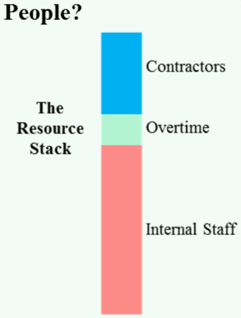
A useful framework for looking at overtime includes placing how it provides value into perspective. Management typically plans internal resources to address generally permanent and core-business related activities. We see the role of overtime as providing a fine-tuning capability around the chosen level of internal staffing. While some businesses can hire and fire on a continuing basis, most utilities cannot. Overtime provides "a relief valve." Contracting, by contrast, predominantly fills the need for broad adjustments to internal staffing, not for fine-tuning them.

The "Resource Stack" inset to the right addresses some of the reasons for treating overtime planning as a process of resource fine tuning, illustrating what generally makes overtime resources different, even where the same employee is involved. The fine-tuning perspective provides significant guidance in how to best evaluate overtime levels, and link them with analyses of staffing. For example, assume that a utility has defined an appropriate level of internal staffing, using the principles and objectives discussed earlier. This level will be the one considered optimum for its circumstances. Those

Figure VI.2: The Resource Stack

The Resource Stack: 2 or 3 Different People?

For purposes of our analyses, we are treating the overtime resource as a distinct "person", although not necessarily a very effective one. It can be argued that overtime is a subset of internal staffing and it is wrong to look at a staff person and an overtime person as separate. We have chosen our approach because the straight time and overtime employee, while literally the same person, are actually very different in terms of their attributes. We believe that a sound staffing analysis must consider these attributes as an important part of the mix. Accordingly, we "pretend" that they are actually two different people.



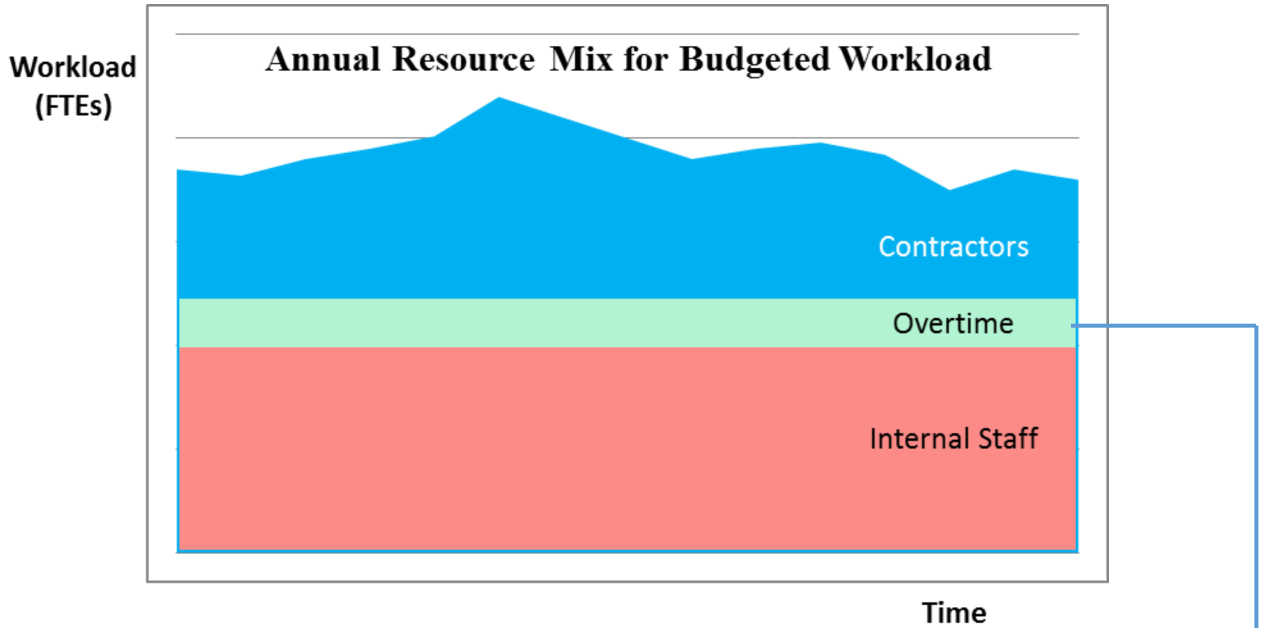
In terms of attributes, their differences are substantial:

- The OT person is less productive
- The OT person negatively influences the productivity of the ST person
- The OT person is not well-suited for a defined, continuing "job"
- The OT person is especially well-suited for narrowly focused work and that requiring specialized skills

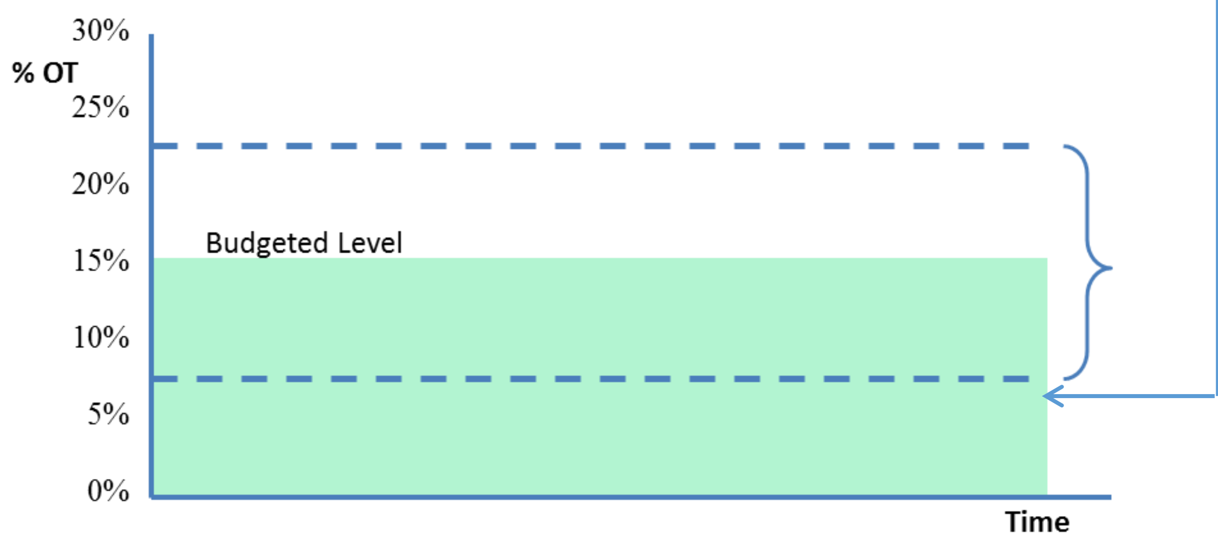
These are reasons why it is helpful to look at the overtime resources as a separate person.

circumstances include a corresponding level of contracting. In defining its plan, the utility also decides upon a budgeted level of overtime, again based on its circumstances and the kinds of approaches discussed here. What results is the planned staffing mix for a given time period, which might look like the illustration below.

Illustration VI.3: Planned Staffing Mix Example

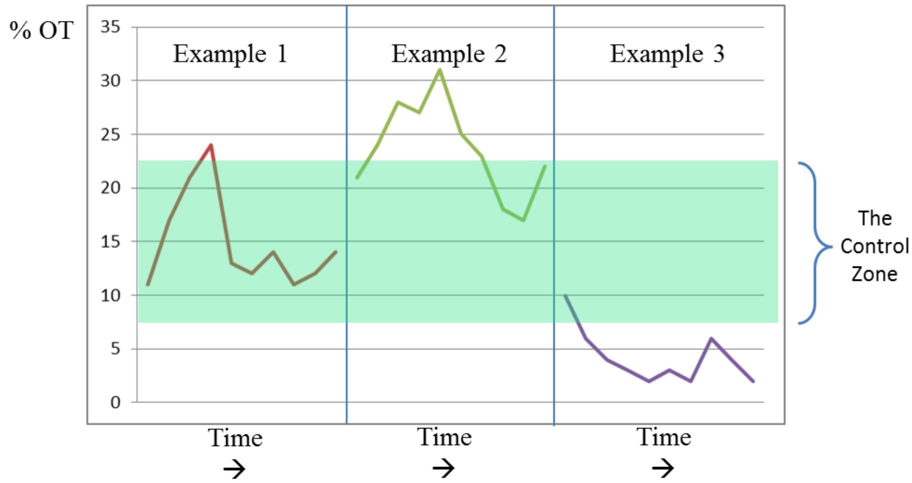


This plan includes a definitive amount for overtime (let us say 15 percent). However, the intent of overtime is to provide a fine-tuning mechanism. Given that role, it becomes better to look at overtime in terms of a "control zone" around the budgeted level and not as a single absolute value. The chart below illustrates this control-zone approach. It expands the overtime region with an example level of 15 percent budgeted and a control zone of ± 8 percent.



This approach creates a construct for considering the ramifications of various overtime patterns. If actual overtime throughout a given year stays within the control zone, then one can conclude generally that the fine-tuning objective has been met. If on the other hand overtime strays outside the control zone, above or below, for a significant amount of time, then overtime has not met its fine-tuning mission. The following three hypothetical examples show this point.

Illustration VI.4: Control Zone Examples



Example 1 indicates that actual overtime remained within the control zone. One way of interpreting this "success" is to assume that internal staffing was sufficient to the extent that workload demands, with their inevitable fluctuations, could be met by internal staff working a reasonable amount of overtime, where "reasonable" is defined as the planned control zone.

In Example 2, the utility failed to keep overtime to the planned region. Either actual head count or workload deviated to the extent that fine-tuning was not enough. Overtime was presumably not the only tool available to management, but it had to be used to the extreme. This result suggests that internal head count perhaps should have been higher.

In Example 3, the utility was able to function well under budget and well below the control zone -- typically considered a good outcome. However, one must recall that the utility defined the control zone to represent its optimum resource mix so, by definition, the actual outcome was not optimum. In other words, the utility could have managed the year with a lower head count, while still maintaining acceptable levels of overtime.

The question that remains is whether this construct establishes a basis for linking overtime and adequacy of staffing. We consider it a useful indicator, if not a way to produce a definitive answer. There are simply too many variables at work to support firm conclusions. Nevertheless, as will be seen in our analyses of each individual utility, deviations from the control zone have a real significance and represent a real contribution to understanding the basic question of staffing adequacy.

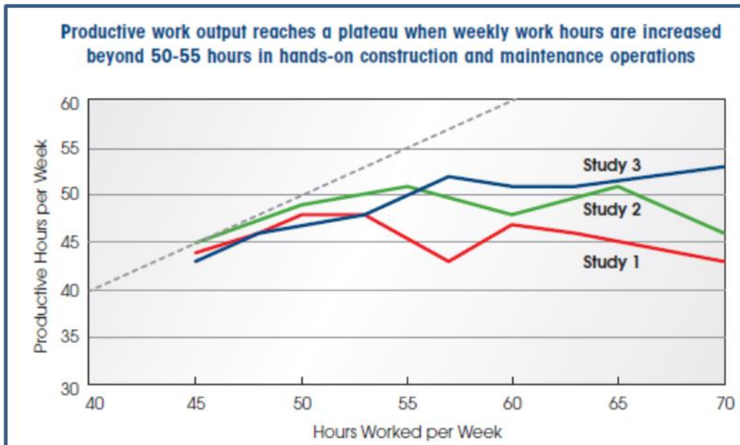
6. *Defining an Overtime Control Zone*

The control zone approach requires an appropriate setting of the zone. Its dimensions will vary according to the specific needs and characteristics of the operation and the work involved. An established zone will identify a range around the budgeted value, recognizing that much larger spikes on the upside (as compared with the downside) are more likely. Our examinations of the processes at the state's utilities for targeting overtime levels did not find formal, structured, analytical approaches generally in place. This does not mean that the utilities lack a sound rationale. For example, a utility satisfied with its overtime levels over the past five years, and seeing no reason or means for reductions might logically use something near the average of those five years for a budgeted value.

Nevertheless, as we discuss later, some of the New York utilities exhibit levels of overtime that, at least on the surface, are discomforting. Sustained overtime in excess of 20 percent raises, in our view, substantial questions.

From a quantitative point of view, the chart below depicts the effect of overtime on production. In this chart, the 45-degree dashed line represents one-for-one production; *i.e.*, an hour of output for each hour expended. A horizontal line would represent no output for each hour expended. One can measure the loss of productivity as the slope moves from 45-degrees to horizontal. This deterioration begins in earnest at about 50 hours per week, and approaches near zero production by 55 hours. One pays a significant penalty after 50 hours, and loses essentially all production benefits at 55. One can debate where each utility's line for each particular worker type or work activity would fall, but the notion of such "break points" clearly applies.

Figure VI.5: Overtime Effect on Production



This is a Circadian® depiction of Nevison's 1992 results. Study 1 encompasses four weeks of sustained overtime while Studies 2 and 3 cover single weeks.

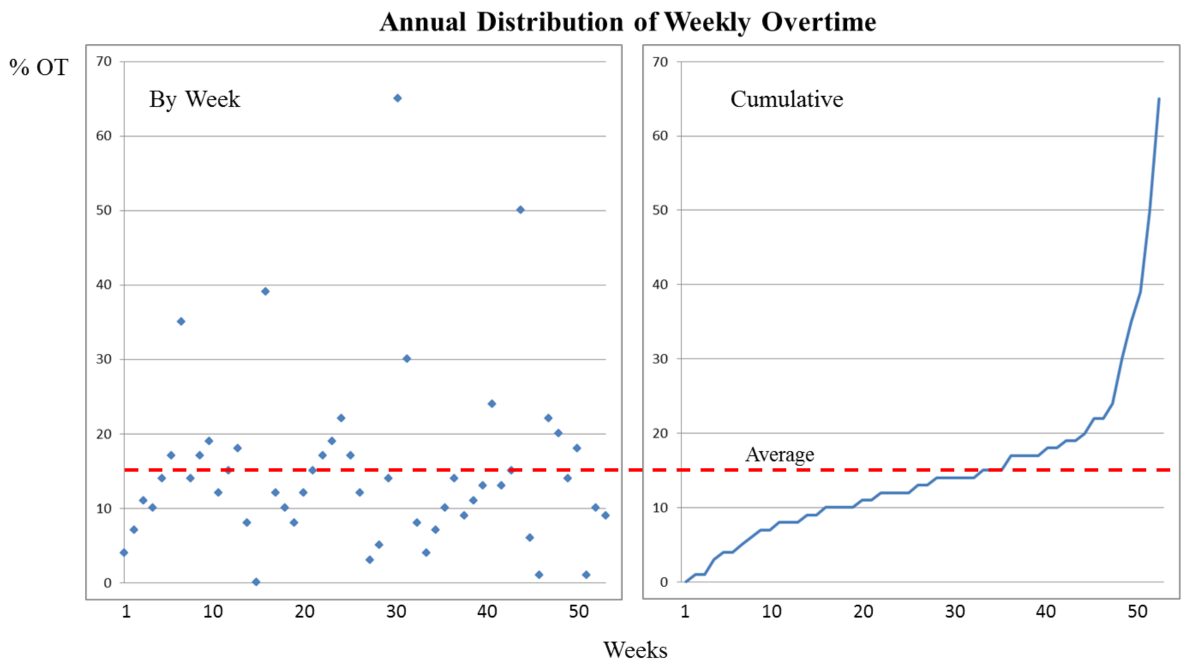
Discussing raw overtime levels can produce an overly benign view of their magnitude. The overtime percentages stated represent the average for a full year; the average needs to be applied to every person in the organization in order to gauge size. Some weeks will involve overtime at much higher levels and overtime of some individuals will be much higher as well. Recognizing this factor makes clear that levels of 20-25 percent are very significant, and sure to take a personal and a productivity toll, and corresponding cost one as well. Therefore, even an annual average 20 percent budgeted level cannot be deemed optimum, without compelling support. At the least, use of overtime at levels approaching, equaling, and (as we saw in our study) exceeding 20 percent should be accompanied by close management scrutiny for opportunities to reduce them.

We did find that all of the operations we studied did employ some sort of process to determine the "right" amount of overtime for their organizations. We consider it correct to question (*i.e.*, management should accept the burden to justify credibly) anything above about 15 percent. More importantly, however, upon application of sound methods to choose one's own, unique identification of an optimum value, it should become the starting point (but not necessarily the centerline) for a control zone with clear dimensions. The next challenge becomes defining the width of the zone, which again can be analytically determined by the utility.

The critical element in defining the width is that it must meet the objective of fine-tuning. A zone too wide precludes real control, fine tuning or otherwise. A zone too small provides little room for the inevitable variances; therefore, the tool again loses value.

A company's historical overtime distribution sets a good starting point in defining the zone. The charts below offer some hypothetical sample data for discussion purposes. For those purposes, we begin with the standard that 80 percent of the time intervals in a year (about 40 weeks) should exhibit overtime data falling within the control zone. The sample data show some interesting features. Consider the sharp break-off in the cumulative curve at about 22 percent overtime. The scatter diagram shows that this amounts to 5-6 data points. An upper limit of 22 percent to the control zone seems logical in this case. The lower limit appears less obvious, but selecting a 5-6 percent overtime range produces 6-7 points. One might therefore propose a control zone of 5 to 22 percent with an average (budgeted) value of 15 percent.

Illustration VI.6: Historical Overtime Distribution Sets Example



The acceptability of this range remains to be assessed. It would not be acceptable under two conditions: (a) an inappropriately high historical average, or (b) an inappropriately large zone width. Considering these two attributes is necessary to ensure that one respects the role set for overtime in the resource mix in the first place; *i.e.*, using it as a fine-tuning mechanism to accommodate variations in workload and availability of internal personnel.

More importantly (and the most important conclusion of our analysis of overtime) an inability to satisfy those two conditions provides significant evidence of a sub-optimal resource mix. Failure to achieve a reasonable amount of overtime likely means that internal staffing is too low. If a reasonable control zone width cannot be established, then contractor-provided staffing (which predominantly aims at gross adjustments) is likely too low or otherwise insufficiently responsive.

7. The Impacts of Emergencies

Utility management emphasized the role that emergencies have on generating high overtime levels. The connection between emergency response and overtime raises, on the surface, a powerful argument (particularly considering some of the extreme weather events that the state has experienced in recent years). The degree to which emergencies drive overtime, however, takes some analysis.

First, consider that emergency response exists a normal part of the utility business (recognizing that staffing to support a worst-case scenario is not an option). Whether its wires come down, lights go out, or gas pipes leak, utilities are staffed to respond at some level. Overall (but with exceptions) reliability and quality data reported to the Commission show that responses across the state have met New York standards (through 2014, the last year for which we had data). In some of the extraordinary circumstances seen in some recent years, the demand for resources has been too great, and extraordinarily high overtime and use of supplemental resources certainly occurred at times logically connected to those events.

It thus becomes easy to see a direct cause and effect relationship between those events and high levels of overtime. Determining how much those events can account for in terms of overtime, however, takes more work. The overtime percentages in question are annual averages. Take, as an example, a major storm that demands two weeks of continuous work with 16-hour days. The result is 144 overtime hours, which affects the annual average by about eight percent. We observed that some of the companies had annual overtime percentages in the 30s and 40s. Even such a storm, would only produce two data points outside the control zone, and thus do little to change perceptions on expected and acceptable variability.

8. Optimizing Overtime Use

Two major influences on overtime fall largely outside the control of management. The first source, emergencies, we have discussed. Work rules comprise the second of those influences. An example is a rule requiring minimum overtime levels or other mandatory overtime expenditures, such as a requirement for a minimum level of employee overtime based on the use of contractors. Any evaluation of overtime management, or comparison of overtime amounts among utilities, needs to recognize and consider such influences.

Some view overtime's value on the basis of "the less the better." This may be true in certain industries, such as manufacturing, but not in the utility business. There is a constructive, productive role for overtime, out of necessity, for production, and for economic reasons. The minimalist view therefore becomes inappropriate. Given that overtime is not necessarily a bad thing, the challenge becomes determining the optimum amount.

B. Evaluation Criteria

In evaluating overtime in the specific utility reports, we examined the management processes underlying the planning and execution of overtime. Liberty has reviewed these processes in detail and has provided our conclusions in the process analysis chapters. The basis for our overtime management evaluation is a set of six criteria that flow from the principles discussed here.

Overtime Criterion 1: There should exist an analytically supportable method for determining optimum levels of overtime.

The concept of a control zone, with the key parameters being the average amount of overtime and the width of the control zone provides a framework for that determination. This is simply one approach and utilities are likely to employ others. The important consideration is to employ a thoughtful, analytical process. As we describe below, we have not generally found analytical strength in the processes employed by the operations we studied. Less structured approaches are more common, with reliance on past levels or rules of thumb (*e.g.*, 15 percent) observed. The science of overtime deserves more, however, as too many important factors are at stake, including cost, production, productivity, human factors, safety, and other considerations. Our first criterion therefore requires a structured and formal process.

Overtime Criterion 2: Overtime planning and use should consider the relationship between amounts of overtime use and productivity and costs.

Productivity effects of overtime present a major consideration in large construction projects and other intense work, but we have not commonly seen such considerations applied to electric work or gas work of the types we studied here. This second criterion recognizes the important productivity tradeoff associated with overtime, requiring its consideration in determining optimum values.

Overtime Criterion 3: Overtime determinations should be uniquely applied to differing work functions and types.

We have emphasized the need for specific analysis, and dismissed a tendency towards generic rules of thumb. A suitably granular approach requires that overtime be addressed at a functional level - - not at a broad organizational level. The needs and circumstances associated with functions will obviously vary from function-to-function. A blanket rule regarding overtime is therefore not likely to prove useful in optimizing resources.

Overtime Criterion 4: Overtime use considerations should occur as a formal part of processes for identifying required resources.

A critical element of planning is the determination of workload and the resulting staffing requirement, which produces a work force budget. That budget must consider overtime.

Overtime Criterion 5: Overtime use should conform to assumptions used for determining resource requirements.

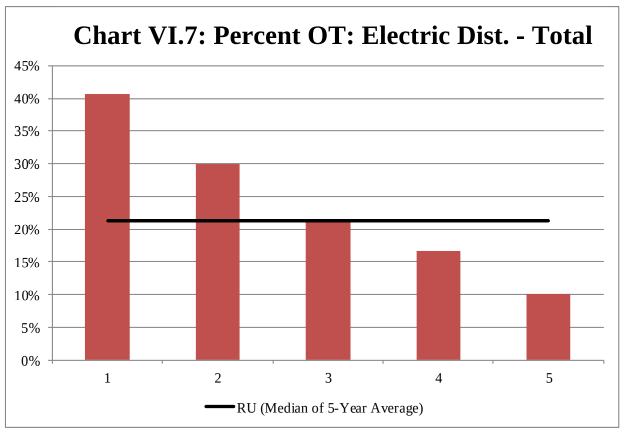
This criterion addresses the management of overtime. The notion of using overtime to manage short-term variations in workload seems somewhat at odds with the effective management of overtime levels to an established budget. We do not suggest that actual overtime levels need not be managed. However, in most cases the budgeted level of overtime does not mark the appropriate performance standard, because the purpose of overtime is (in part) to accommodate deviations from the budgeted workload. A more credible performance standard is the initial assumptions about the circumstances in which overtime is planned to be used. Consistency with those assumptions becomes a standard of performance, not a fixed target.

Overtime Criterion 6: Overtime use should comprise part of an integrated process for balancing internal, overtime, and contractor resources across all functions we are examining

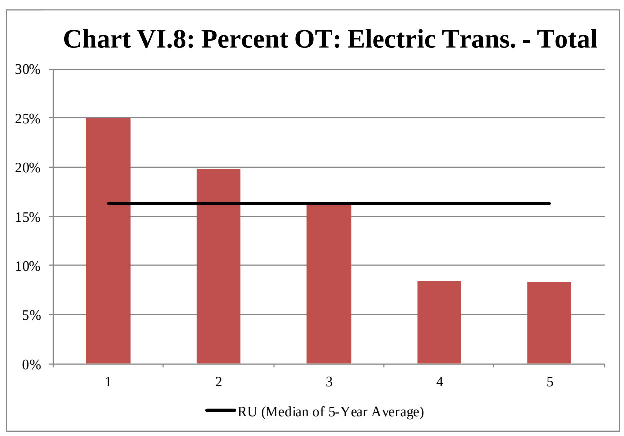
Management should undertake integrated analysis of the resource stack that makes use of straight time, contractors, and overtime to optimize staffing. None of the three elements can be analyzed and optimized without consideration of the other two. Optimization involves a balancing among the three. This integrated approach is required in both planning and executing the work.

C. Overtime Resource Levels - Electric

The chart to the right shows that four of the five state electric operations had sustained (five-year historical average) overtime levels above 15 percent in distribution. Even the Reference Utility value exceeded 20 percent. Remarkably, two utilities had levels much higher (30 and 40 percent). Explanations for a portion of these levels exist (*e.g.*, weather emergencies and bargaining agreements), but high levels would remain even after accounting for them.



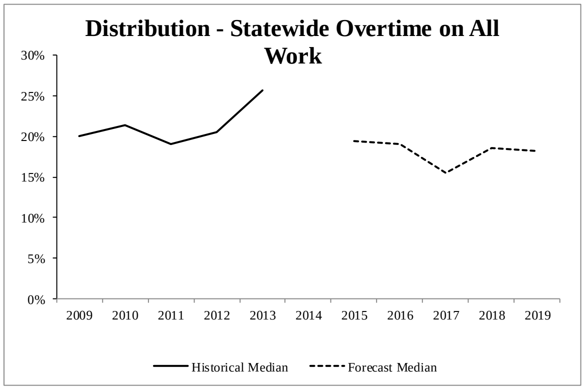
For the two operations with the highest historic levels, the data indicates in essence a permanent 52 - 56-hour work week sustained over five years. That way of looking at the data may exaggerate circumstances in one respect. However, looking at it another way indicates that for sustained periods work weeks for many were far in excess of 60 hours. Such high levels provide a very strong indication of understaffing, which also makes it more likely that productivity issues existed as well.

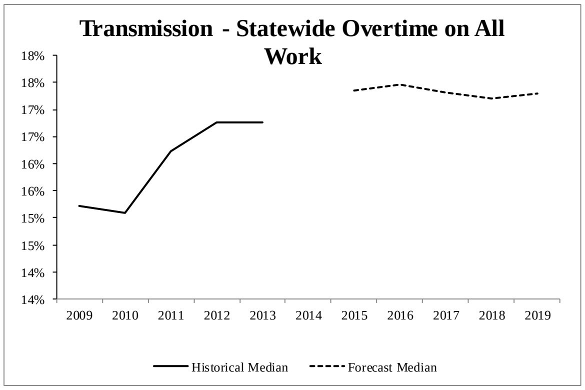


The transmission/substations pattern raises less concern, but the issue remains. Three utilities out of the five, including the Reference Utility, exceeded 15 percent over the five years. At the low end, two utilities had overtime levels of less than 10 percent. The large disparity underscores the need for a stronger analytical foundation for setting and managing overtime within an appropriate range.

We cannot conclude that the state's electric operations, overall, have an adequate foundation for optimizing the use of overtime. The next chart shows that median levels of more than 20 percent have persisted in distribution for many years, and spiked much higher in 2013. Forecasted rates showed a drop in Reference Utility value to the 15-20 percent level. Already high, those projections also did not produce a high degree of confidence in their attainability. We address the reasons in the individual utility reports, with a common one being those projections of lower overtime accompanied by projections of no increase in internal resources. History does not provide a basis for confidence in that combination.

Chart VI.9: Distribution and Transmission OT on All Work



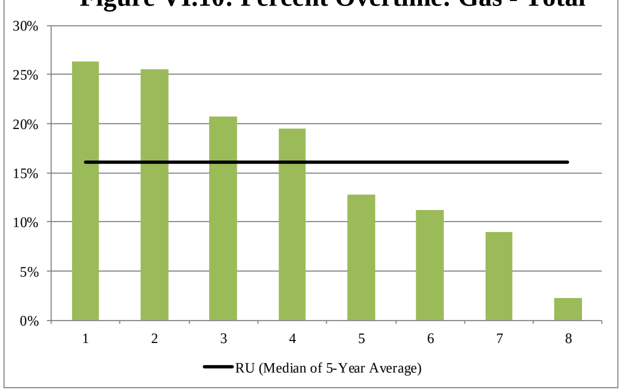


Forecasted transmission/substations overtime was problematic. Actual levels rose historically since 2010, and management forecasts placed them at even higher levels in the future. Moreover, the forecasted increases appeared more in O&M work, with capital overtime expected to decline. Traditional patterns of overtime use between these two work types make this forecast unusual, casting doubt on its credibility.

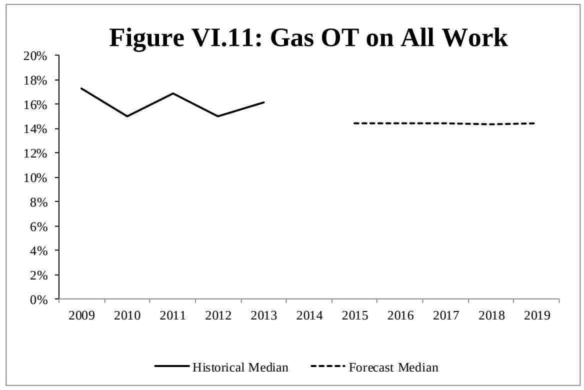
D. Overtime Resource Levels - Gas

The eight gas operations have made wide-ranging use of overtime, but at lower overall levels than their electric counterparts. Two outliers at the high end used more than 25 percent overtime on a sustained (five-year average) level, while two required less than 10 percent. The Reference Utility value of 16 percent was not low, but we did not consider it likely to decline to substantially lower levels. Statewide overtime levels in gas operations were similar for capital and O&M work.

Figure VI.10: Percent Overtime: Gas - Total



Gas overtime for the Reference Utility did not change year-over-year historically, remaining flat according to management forecasts (declining slightly to 15 percent). We found the gas overtime forecasts more credible. No operations forecasted major declines, and those anticipating moderate declines appeared to have a reasonable basis.



We do not mean to offer 16 percent as a firm "standard" for gas overtime; it does appear somewhat high. On the other hand, gas utilities do not seem to exhibit the same extreme high values as electric and the opportunity for reductions, although probably present, will not be as great.

E. Conclusions

The notion of average workweeks in excess of 48 hours in electric and 46 in gas, on a seemingly permanent sustained basis, does not seem reasonable. In the process analysis to follow, we explain that few utilities focused on overtime to the extent we feel is warranted, and fewer still sought analytically to devise optimum levels of overtime and hence optimized staffing mixes. Meanwhile, a few utilities in both electric and gas functioned with far smaller amounts of overtime, despite presumably facing the same challenges as their peers. We largely found internal staff levels adequate (except as discussed in the individual utility reports). However, it cannot be considered optimum with excessive overtime a permanent and sustaining feature.

F. Process Analysis

1. Background

Liberty conducted a detailed review of staffing-related processes at the electric and gas operations. Our review of overtime covered planning and management of this resource type. We evaluated those processes against the six criteria discussed earlier in this chapter. For the most part, we found many utilities to be less aware of the importance of overtime as an element of the resource stack. We also found that utilities do not apply the same level of planning and analysis to overtime, and often treat it as a necessary expenditure whose underlying drivers lie largely outside management control. We did not find this assumption sustainable. Some state utilities have functioned with very limited overtime. Moreover, reference to emergencies as an overtime driver, while valid, does not suffice to explain the very high levels we found at some operations.

2. Findings

All utilities have established overtime targets. They range from about 5 percent to 25 percent. We did not find these targets generally to reflect the results of a structured process for setting them. The more common practice we found was acceptance of historical level of overtime as a satisfactory basis for targeting future levels in budget preparation. For operations with very high levels, high overtime use continues to be "baked into" future plans. Even where usage is lower, over-reliance on historical rates does not serve to optimize resource use.

It was particularly revealing to observe that those utilities with lower overtime targets demonstrated greater success in meeting those targets. Those with targets in the 25 percent range, which Liberty considers high, only marginally met or frequently exceeded their targets. This observation begs the question of whether high targets are really targets, or more in the nature of self-fulfilling prophecies of high overtime use.

Moving from setting overtime goals to measuring performance in meeting them, we did not see suitably strong efforts to reconcile year-end actual overtime performance to either the current or the coming budget. Even those that "beat" historical rates did not show attention to determining whether more aggressive or challenging targets for the ensuing years were attainable. Here again, we observed a lack of focus on optimization.

We found measuring and monitoring of overtime at the functional level generally to comprise an overall area of weakness. Some even had difficulties in providing valid overtime information for both the capital and O&M functions for use in this study. Management of overtime cannot be effective without proper measurement and analyses at the functional levels. Furthermore, one utility even included unavailable time, such as training, meeting, inclement weather, etc. in its calculation of the overtime percentage. The true level of overtime, high though it is already among the group, is thus understated internally in some cases, obscuring its impacts.

We found that managers at all of the operations had the experience and the ability to analyze overtime options on a real-time basis. It is over the longer term that most need to address controlling overtime better.

None of the operations fully met our two most significant overtime evaluation criteria; *i.e.*, employment of an analytically supportable method for determining optimum levels of overtime, and the consideration of the interrelationship among overtime, cost, and productivity in overtime decision-making. We did not find among any of the operations a structured analysis of how excessive overtime levels affect cost and productivity.

3. Conclusions

1. Wide disparity exists in how the state's utilities choose to use overtime, with some levels appearing excessive.

Liberty recognizes that the optimum application of overtime will vary among utilities. Nevertheless, without seeing substantial analytical work that sought to define what is an optimum level, or perhaps more appropriately, an optimum range for overtime, the rates of use by some operations simply are not self-validating. The very high levels of overtime experienced by some indicate merit in improving the approach to overtime, which is likely to produce a more optimal (effective and economical) staffing resource balance. Liberty therefore recommended more focus and structure in analyzing and optimizing overtime.

Our work disclosed what appears to be a linkage between the adequacy of internal staffing levels and the use of overtime. The correlation was not 100 percent, but we saw sufficient evidence that declining trends in internal staff levels are often accompanied by rising levels of overtime, and vice-versa. This is a measure that Staff may want to track over a sustained period, recognizing that it may not be very revealing for a short time frame.

2. A "control zone" approach to the management of overtime may offer a more effective control scheme for some utilities than those we observed.

Failing the appearance of a better approach among the operations we studied, we structured a control zone approach that seeks one analytical method for employing an overtime strategy that views overtime as a fine tuning mechanism to accommodate variations in work load. The process would seek an optimum average overtime level that balances the utility's resource mix. A reasonable range around that average (the "control zone") would then be defined. Excessive variations below or above the control zone suggest too many or too few employees (since, by definition, the average is "optimum"). If the excursions outside the control zone are frequent and in both directions, they would raise control issues requiring focused management attention.

Chapter VII: Contractor Use

The use of contractors has considerable influence on staffing decisions, workforce planning and staffing flexibility. The impacts can prove large in resource numbers. The impacts can also be almost immediate, for example, when major storms bring the addition of large numbers of off-system line workers. Judicious use of contractors can also offer an effective cost-saving tool for the utility and its customers. However, effective contractor use requires a sound process regularly applied. Our work provided insight into the levels and types of contractors being used and into drivers behind large variances in contractor usage rates among the companies. We found a number of material opportunities for process improvement among the operations we studied.

A. Defining Characteristics

1. Distinguishing Contractors from Employees

Significant differences exist between employees and contractors as staffing resources. Management treats independent contractors differently from employees from a behavioral viewpoint. To some extent, those differences derive from state and local policies, especially in the construction industry. Generally, a company must withhold income taxes, withhold and pay Social Security and Medicare taxes, and pay unemployment tax on employee wages. For contractors, that obligation generally falls on the firm hiring them, rather than the customer company served. The same result applies to pension and health benefits. Thus, rates that contractors charge already include adders that the contractor must pay to its resources. Seeking an equivalent effective labor cost for internal employees requires addition of those adders and other costs incurred as a result of maintaining the employment relationship. The resulting total costs may not differ widely. Nevertheless, management must judge equivalency after accounting for those costs already built into contractor fees for service.

2. Work Quality Differentials

Work quality comprises a factor when choosing between contractors and employees. Management must ensure that work meets quality standards and expectations, whether provided by employees or contractors. Companies in the industry commonly determine that certain work activities have sufficient importance to warrant reserving their performance for internal staff, excluding contractors from performing them on the basis of criticality rather than efficiency. Lists of such critical work differ from company to company, depending on factors like system configuration, sensitive locations, and core internal competencies. Somewhat common examples, however, include station breaker relaying or underground distribution feeder cable terminations. We have, however, seen others get sound results from contractors even in such areas.

Practice varies so widely and for such differing reasons, that we consider it appropriate to give management fairly wide discretion in identifying what it considers critical work. We did not see indication among the operations we examined of patterned overuse of or arbitrary designations.

Wherever contractors are used, effective contract arrangements and terms, utility management of the contractor, and sound quality assurance and control of the work form key links in ensuring quality performance. Moreover, whether employees or contractors perform them, construction work activities require proper training. Ensuring that contractor-provided workers have the same training that a company requires of its own employees offers a means for equalizing the quality of work performance. Providing a level of contractor oversight commensurate with that which management applies to internal resources offers another quality equalization method. It may well be that providing commensurate training, management, and oversight of contractors imposes added costs. However, such needs present a cost, not an inherent quality issue, to the extent that equalization methods prove effective. Thus, the best perspective on work quality "advantages" looks at the effectiveness and costs of equalization methods, and then uses the results to measure alternatives against each other.

There will certainly remain areas where management appropriately identifies certain work types as too critical to take outside, even where the quality differential leading to such determination comes at a small efficiency loss. Even small quality difference risks may be deemed too great and even marginally better contractor costs may be deemed too small to justify contracting. Generally, however, there should exist no inherent quality bias in favor of or against employee versus contractor use. The general approach should look at quality difference risk, determine what it would take to manage it effectively, decide whether mitigation of the risk is sufficient, and consider the costs in providing mitigation when deciding what resource types to use.

Moreover, management needs to make the decisions at issue from a long-term perspective, recognizing that employees take an investment that rewards employer and employee over the long term, while contractors can more readily ramp up or down without the loss of development time and effort. That said, however, we also emphasize that a "relationship" approach to key contractors, which has become common in the industry, proves important in ensuring continuing access to resources. The competition for resources in gas pipe replacement offers a compelling example. Where significant and particularly mid- to long-term reliance on contractors becomes clearly necessary to get work done, management must think past the cost of "the next job" regarding them as well.

3. Productivity Differentials

When making economic decisions about what sort of resources to use, management must also determine how contractor and employee productivity compare. We found generally among New York's utilities a need for more and better information with respect to resource planning, work force management, and performance measurement, as they concern the comparisons that we consider critical to optimizing staffing. Robustly comparing contractors with employees as a resource requires consideration of total cost and of work units performed. Contracting based on lump sums for fixed work scopes or unit rates for "linear" type work (*e.g.*, dollars per mile installed) provide a basis for controlling contractor costs and for enabling comparisons with internal costs. We have recommended for most companies material improvement in their ability to place measurements of contractor and employee costs on an equal footing.

Apart from matters strictly definable in terms of productivity, management needs to consider a related issue associated with reliability. One might ask whether greater use of contractors tends to lessen reliability. Consider the generally confined descriptions of contractor job activities and the fact that compensation depends entirely on performance of only those activities. Compare this construct with the role of an employee. The measures for judging internal resource effectiveness certainly include productivity in accomplishing assigned tasks. However, employees also likely (and appropriately) have enough job freedom to investigate (and in many cases even to address) reliability concerns observed, even when they fall outside the immediate work tasks at hand. Effectively, one can expect employees, compared with contractors, to pay more attention during their normal work to reliability issues beyond what lies on their daily work lists. Theoretically, this difference should improve reliability, but it would be difficult to measure the difference in a meaningful way. We have, however, in a number of individual company cases observed a concurrence between internal staff reductions and reliability declines.

4. Contractor Usage Drivers

Many factors drive contractor usage in utility operations. Utilities generally consider them, usually in combination, in making the decision as to whether to hire employees or contractors for specific activities.

Workload proves by far the largest driver of contractor usage. Workload peaks and consistency offer the most important workload parameters in this respect. In our experience, utility operations tend generally to staff for base load work, and to use contractors for swing or peak work. The Northeast treats construction as a seasonal activity in most relevant respects. Idling construction crews during winter months can impose significant costs. Workloads in winter months fall to levels that simply will not allow productive application of the complement of construction crews that more temperate weather permits. Storm outage emergency response provides another and sometimes compelling example of extreme peaks in workloads. Moreover, for most utilities, the construction of a large new facility (like a substation or a major transmission line) imposes transitional needs that can exceed both the numbers and the skills of the internal workforce.

Schedule Considerations also play a considerable role in contracting decisions. Time constraints very frequently affect projects. For example, infrastructure work typically involves coordination with municipalities, other utilities, and traffic disruption. Solving those constraints is often most effectively accomplished by applying a large number of workers to reduce the time across which work extends. An internal workforce constructed to handle base load work has limited ability to respond, without producing impacts on other, planned work.

Specialized Skill Sets often find immediate, but not ongoing, steady-state use. Even large utilities typically do not have enough ongoing activity to keep enough people in house to populate crews for occasional, specialized activities. The activity types that fall into this category tend to be unique to each utility. Some fairly typical examples include boring for tunnels and conduit systems under rivers, helicopter patrols, grading, and road paving. The factors that drive differences among utilities include utility size, the nature and configuration of the infrastructure, and local/regional job markets.

Lower-Skill, Repetitive, High Volume Work activities frequently require a narrow and relatively low level of training or skills, which tends to distinguish them from the sometimes challenging work that internal utility staffing frequently performs. Common examples include trenching, substation concrete foundations, conduit system installations, and pipe installations. These activities can include those without the specific code-mandated training and testing requirements, such as Operator Qualification. Utility operators commonly build a multi-disciplined internal workforce, providing resources qualified in a number of tasks. Higher pay comes with higher qualifications and capabilities. While strong in promoting workforce flexibility, this common industry approach also tends to make internal employees less competitive with contractor-provided crews that have lesser capabilities (albeit still commensurate with the tasks assigned to them), and therefore command lower compensation in the marketplace.

Opportunistic Cost Savings sometimes drive contractor decisions as well. The preceding examples address areas that tend to produce consistent choices between contractors and employees. Management, however, inevitably will face occasions where one-off contracting becomes an option. For example, a suddenly emerging project might nominally exceed the ability of internal resources given their planned work, but tolerable adjustments to the schedules for their other work might free enough resources to do the work internally. In cases where schedules or workload do not prove determinative, management has the ability to make the decision on the basis of a straightforward analysis of the relative cost differential of resource types. In those cases, management must develop and analyze the cost of performing the work in-house versus using outside contractors. We have found that the capabilities of the operations we studied to make those evaluations varies considerably.

Bargaining Unit Considerations often have an effect on resource type decisions as well. They often prove amenable to direct economic evaluation. For example, a labor-agreement provision requiring overtime for employees when contractors are present has cost impact. Some, such as maintenance of minimum numbers of certain types of workers, may not be as clearly denominated in dollars, but can limit management flexibility in placing work with contractors.

The incremental costs that such factors create for overtime can prove material in determining whether a contractor's costs that appear nominally competitive become prohibitive when analyzed with such effects included. We do not suggest that effects should be looked on as an indirect criticism of bargaining agreement terms and conditions. Bargaining agreements reflect, on the whole, a complex balancing of many issues requiring "give and take." The same bargaining process that produces incremental benefits for bargaining unit members in one particular area (and therefore incremental costs to management in that area) is the same one that management found acceptable, presumably because, all factors considered, the resulting agreement produces acceptable results. We did not examine labor agreement "effectiveness," but took each as it stood during our work. Thus, our views about the need to examine incremental costs that such agreements may produce should not be construed as a conclusion that those costs are somehow a "penalty" or were avoidable.

5. Contract Pricing Methods

Utilities make use of a number of contract pricing methods, each of which particularly suits different types of circumstances. Management should match the pricing basis to the underlying work tasks, in order to maximize the benefits of using contractors. Pricing may form the dominant cost-influencing element of contract terms and conditions, but not the only one. Whether a particular contract best matches the particular circumstances involved requires consideration of all of the provisions (beyond those directly applicable to pricing). Thus, while one can generally associate sound contracting types with particular types of work, only general guidelines can result - - not a single, formulaic method of judging any particular contract's effectiveness.

a. Lump-Sum Pricing

The industry generally uses the terms "lump-sum" and "fixed price" to refer to the same types of contract pricing. Agreements using this pricing approach involve a firmly fixed amount for performing a defined scope of work. Lump-sum and fixed pricing finds fairly widespread use on large, complicated projects. In the electric industry, typical examples include new substation and new transmission line work, most of which we generally find contracted out under this pricing method.

Lump-sum pricing's comparative advantages for a utility include:

- Straightforward comparisons of competing prices
- Avoidance of the need to estimate costs associated with complex and sometimes infrequently employed construction techniques
- Higher up-front confidence level about final costs
- Transfer of need to work efficiently to the contractor
- Transfer of risk of unexpected costs to the contractor
- Simplification of the utility's project management needs.

Lump-sum pricing's comparative disadvantages include:

- Its limit to single-project applications
- The requirement for detailed scope requirements, specified at the outset
- The need to deal with potential scope change orders
- Potentially long lead times for contract execution.

b. Unit Pricing

Unit price contracts fix the price for specified units of work, which typically include many types. Typical applications for pricing based on units of work apply measures such as a foot of trench, or the setting of one pole. High-volume work with readily quantifiable and measurable units of that work most generally lend themselves to unit pricing. Particularly for distribution work, this form of pricing proves most prevalent.

The comparative advantages of unit pricing include:

- Extension to multiple projects with comparable units under one contract with one contractor
- Transfer to the contractor of the need to work efficiently
- Ability to commission and vary work quickly with respect to unit types and quantities.

The comparative disadvantages of unit pricing include:

- Long contract implementation lead times
- Need for identification and quantification of all work units
- Need for a system of oversight to measure and verify actual work unit numbers
- Need to address rates for time and equipment to deal with non-conforming or other work units.

Two primary unit pricing contract methods commonly apply. One method solicits bids where each contractor provides unit prices for each work unit. This method can make cost comparisons difficult. No means exist for directly comparing bids. Many utilities evaluate such bids by adding up the total bid cost based on the total number of anticipated work units. Bidders can attempt to gain advantage by bidding low on some units (either as loss leaders or in anticipation of lower than forecasted volumes) and higher on other, less frequent items to make up the differences. This phenomenon can produce unbalanced unit rates; *i.e.*, a rate structure not necessarily closely correlated to the level of effort required.

Managements having more experience with unit rates can employ a second unit rate method. As part of the bid process, they provide a base rate for each work unit to prospective bidders (typically based upon historical costs of those units). Starting from the base rate provided by the utility, bidders propose a single figure (a multiplier to be applied against the base rate proposed by the utility). The multiplier may be less than or greater than one. This method simplifies the bid evaluation process, because the utility need only evaluate the multiplier proposed by each bidder. This second method also avoids unbalanced bids, because bidders do not have opportunity to bid lower prices on low-volume units and higher prices on high-volume units.

c. Time and Equipment Pricing

Under time and equipment pricing, contractors offer a rate for each employee classification and piece of equipment to be made available for use. This contracting method generally finds favor in the industry for work of unclear scope and for fixed and repetitive activities involving unvarying work requirements. Typical industry examples of such work include storm response work, street light repair (one worker in a bucket truck), field construction monitoring (one worker and a truck), and infrared patrolling (one team with fixed equipment).

The comparative advantages of time and expense pricing include:

- Addressing work-type flexibility
- Addressing work unit flexibility
- Short lead times to secure contracts.

The comparative disadvantages include:

- Often higher costs when compared to lump-sum and unit price rates
- Owner risk of contractor work inefficiency
- Increased oversight to measure and verify equipment and personnel actually used.

d. Cost Plus Pricing

Under this method, contractors generally invoice after work completion for actual costs and for overheads and profit adders. Utilities generally seek to limit this type of pricing to emergency or highly complex work. The disadvantages of this contracting method for the utility company are high costs, unknown costs, and lack of a contractor work efficiency incentive.

6. Monitoring and Oversight of Contractors

Effective use of contractors requires an effective contractor management process. Central elements of the management process come when vetting potential providers before the bid process, bid process assistance, integration into utility company culture, safety practice monitoring, work management systems training, work unit measuring, time and equipment monitoring, work inspection, work order closeout and billing. We have not found one single prevailing best approach to contractor management. Utilities differ widely in their approaches and methods, but the following characteristics generally define best industry practice:

- A central organization providing a well-structured, staffed, and focused approach better supports contractor management (as opposed to dispersing oversight responsibility among multiple departments), and generally best serves operations that make use of contracting at levels typical of or above those common in the industry.
- Clear, comprehensive, and transparent procedures encourage activities and attention best suited to effective contractor management. Procedures should be documented and employees who use them should know them well and use them consistently.
- Formal work inspection procedures provide an objective and comprehensive basis for ensuring effective contractor performance.
- Defined field monitoring procedures and assignments ensure coverage of all significant contractor activities.
- Defined billing processes enable effective cost control; many companies use a billing system exclusively for contractors.
- Formal contractor evaluation procedures ensure that initial contractor selections are sound and that continuing work with the company depends on strong performance.
- Special procedures for large projects need to exist and to be defined in the equivalent of a utility Project Management Manual.

7. Loss of Core Expertise

Much of the previous discussion addresses the specific considerations that arise at the tactical level; *i.e.*, what opportunities and risks exist after a decision to contract, or at least to seek out contracting as an option for specific work has been made. Strategic considerations must be considered as well. Generally longer-term in nature, they can be harder to assess quantitatively, but nevertheless should apply in determining at broad levels and from a longer range view what consequences particular contracting tactics may have.

When managed effectively, contracting for the reasons discussed above (*e.g.*, workload, timeliness, specialized skill sets and low skill, repetitive, high volume work) can coexist with retention of a strong core of internal expertise -- another important contributor to long-term effectiveness. Nevertheless, even where such factors indicate a preference for contractor use, unintended consequences can arise. Often they arise when contracting becomes broadly used as part of efforts to reduce headcount (through right-sizing programs, for example). For skills and numbers considered critical, contracting out (or "renting") expertise or resource numbers is not the same as developing and retaining (or "owning" them) in-house. Retaining judiciously determined levels of core technical and craft expertise is necessary for sustaining the ability to work effectively over the long term - - for reasons that include retaining the ability to manage properly inside and outside resources, and providing and monitoring performance against standards that address work results.

B. Contractor Use Evaluation Criteria

Based on the principles and discussion laid out in the above sections, we applied the following criteria in evaluating contractor use.

Contractor Use Criterion 1: The level of contractor use and the types of contractors retained should be supported by a contractor strategy that considers work volume, quality, timeliness, costs, and other relevant considerations.

Contractor Use Criterion 2: There should exist a data-driven understanding of the comparative costs of using contractor versus internal resources, and a good qualitative rationale supporting the use of contractors in lieu of internal resources.

Contractor Use Criterion 3: Management should retain a sufficiently broad base of firms under contract, pre-screened or pre-qualified for activities and tasks for which contractors are regularly used or anticipated to be used.

Contractor Use Criterion 4: (Gas only) Where contractor resources are limited in terms of numbers of crews available or skill sets to meet anticipated future needs, the utility should be working to promote development of a skilled pool of resources.

Such efforts include:

- Working with the contractor community to acquire additional resources
- Working with the contractor community to enhance the contractor skill sets
- Working to increase the number of internal resources and internal skill sets.

Contractor Use Criterion 5: Contractor strategy should be supported by appropriate contractor management processes.

Processes include:

- A comprehensive contractor oversight program encompassing both central program monitoring and field oversight.
- Formal invoice and payment control systems and processes.
- A robust quality assurance program which includes formal contractor evaluations and project audits.
- Where appropriate, a feedback loop which incorporates the results of contractor evaluations and project audits into some type of incentive system for the contractors.

C. Data and Analysis

1. Overall Analysis of Contractor Use

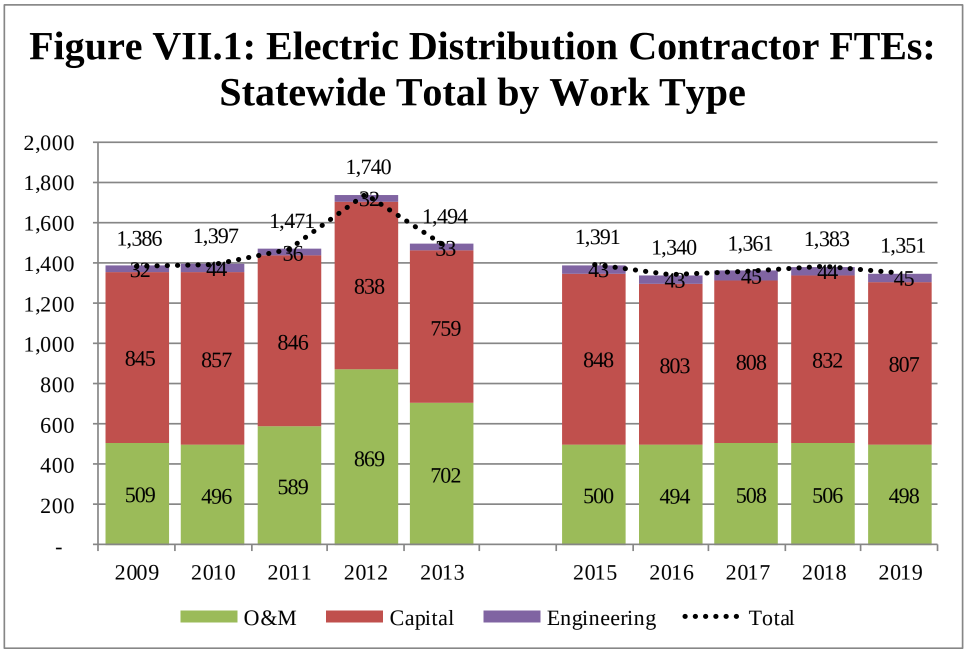
The 2013 contractor expenditures for the electric operations functions that we studied totaled $640 million - - $436 million for capital work, $186 million for O&M work, and $18 million for engineering work. The 2013 contractor expenditures for the gas operations functions that we studied totaled $550 million - - $469 million for capital work, $70 million for O&M work, and $11 million for engineering work.

2. *Electric – Contractor Staffing Levels*

This section provides an overview of historical (2009-2013) and forecast (2015-2019) contractor resources for electric distribution and transmission and substation functions statewide.

a. Electric Distribution Contractor Staffing Trends

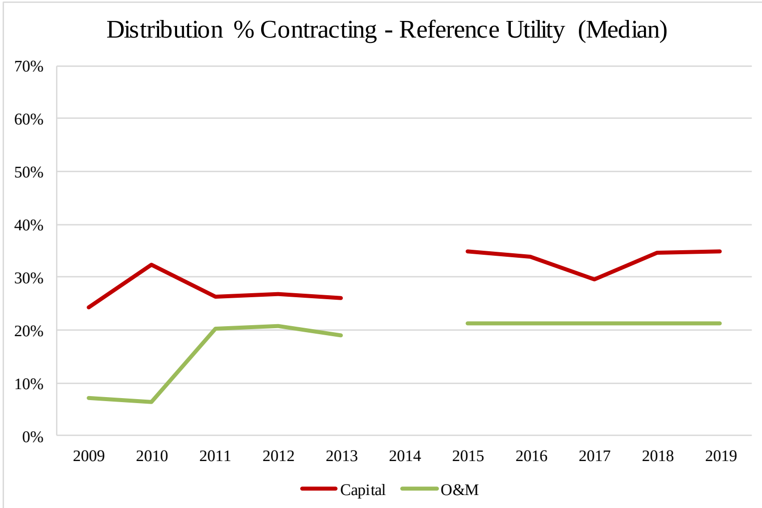
The following chart shows historical and forecasted contractor staffing resources for electric distribution functions for the period 2009-2019, broken down by type of workload (O&M, capital, and engineering work).



Overall contractor FTE levels (driven by a dramatic O&M increase) spiked during the 2012-2013 period. This O&M increase not surprisingly followed Superstorm Sandy. Otherwise, 2009-2011 historical values and forecasts for 2015-2019 showed fairly consistent use of contractors for O&M and capital work. Throughout the historical and forecast periods, capital work ranged between 803-857 FTEs and O&M work ranged between 496-508 FTEs.

Apart from the raw numbers, we also looked at how contractor versus internal FTEs related to each other. The following chart shows trends in average percentage of contractor work statewide (represented by the Reference Utility value) between 2009-2019 for capital and for O&M work.

Figure VII.2: Distribution Percent Contracting



The chart demonstrates an increasing use of electric distribution contractors relative to internal resources. The contractor share of O&M increased by 13 percent between 2010 and 2011. Contractor share of forecasted capital work increased by 13 percent for 2015 -2019. The next table demonstrates these trends, showing the 2013 actual and 2019 forecast resource mix for the Reference Utility (Reference Utility) and each electric company for all electric distribution work.

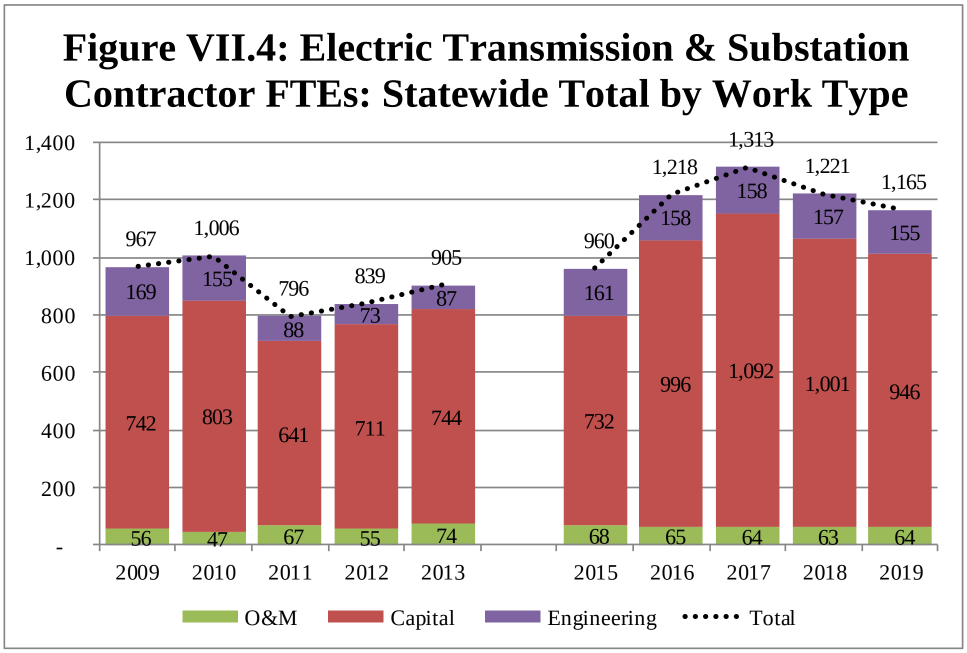
Table VII.3: Electric Distribution Actual Resource Mix 2013

Source	RU	1	2	3	4	5
Straight Time	67%	83%	73%	62%	60%	58%
Overtime	13%	7%	14%	18%	13%	10%
Contractor	20%	10%	13%	19%	27%	32%
Total	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019						
Source	RU	1	2	3	4	5
Straight Time	65%	74%	76%	63%	64%	48%
Overtime	10%	6%	8%	18%	11%	7%
Contractor	25%	20%	16%	20%	25%	45%
Total	100%	100%	100%	100%	100%	100%

As compared with 2013, the 2019 data shows a relatively stronger reliance on external resources. The Reference Utility shows an overall shift to contractors - - increasing from 20 percent of the resource mix to 25 percent. This pattern forecast by most of the state's five electric operations shows reduced overtime from increasing either the relative percentage of contractor resources (four companies) or by increasing straight time resources (one company). This resource rebalancing results from reducing straight time and overtime FTEs from the historical period while holding contractor FTEs constant. The chart also demonstrates that, by 2019, most companies forecasted a move into the 20 to 25 percent range for contractors, with one company that expects an increase to 45 percent.

b. Electric Transmission and Substations Contractor Staffing Trends

The following chart shows historical and forecasted contractor staffing resources for electric transmission and substations functions for the period 2009-2019, broken down by type of workload (O&M, capital, and engineering work).



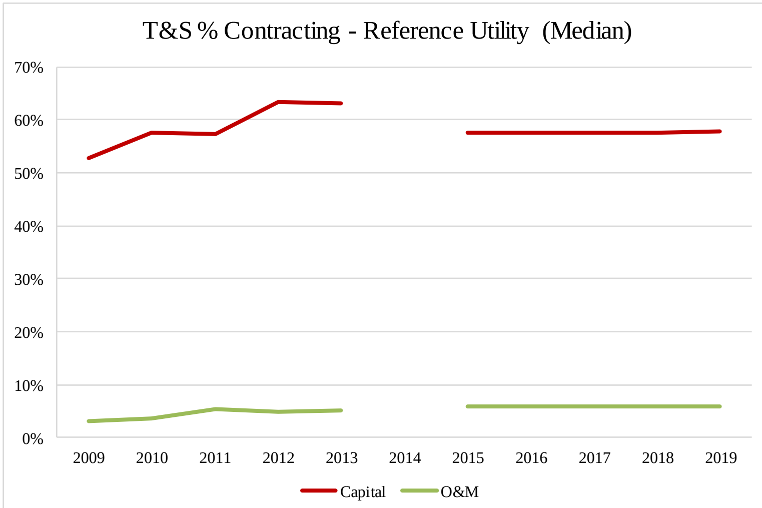
Transmission and distribution contractor FTEs declined dramatically between 2009 and 2011, at the same time that contractor FTEs applied to distribution increased. The coincidence of these shifts implies a move of contractor resources during this period. The ability to move contractor resources quickly among types of work reflects one of the advantages of using them. Much, but not all of that transmission and substation loss reversed, with gains in 2012 and 2013. Forecasts showed the increases experienced by 2013 continuing through 2017.

Throughout the 2009-2013 historical period and the 2015-2019 forecast period, both O&M FTEs and engineering FTEs remained relatively stable. Annual O&M FTEs fell mostly in the 55-67 FTE range, with annual engineering FTEs mostly in the 155-169 range (with the exception of the 2011-2013 period).

Contractor FTEs for capital work show significant variance throughout the historical and the forecast periods. During the historical period, contractor FTEs for capital work ranged between 641-803 FTEs. Forecasted contractors showed a significant increase from the historical period, ranging between 731-1092 FTEs. This pattern typifies transmission and substation construction programs, where the number and sizes facilities under construction in any given year prove highly variable. Given New York's seasonal construction period, 200-300 FTEs could actually equate to as many as 300-500 actual personnel (headcount). The ability to deploy or reduce as many as 200 to 300 incremental FTEs in any given year (often at very different work locations) also reflects a comparative advantage of contractor use for seasonal work.

We also examined contractor staffing levels, as compared to internal staffing resources; *i.e.*, the whole staffing resource mix. The following chart shows statewide trends in the average percentage of contractor work (represented by the Reference Utility value) between 2009-2019 for capital and for O&M work.

Figure VII.5: Transmission & Substation Percent Contracting



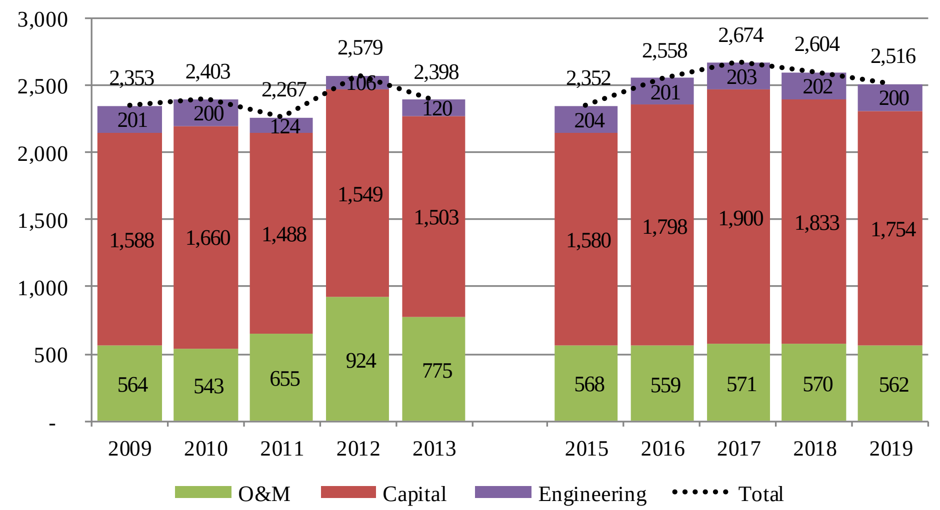
Contractor FTE shares of O&M remained low, growing from three to five percent by 2011, and forecasted to rise to six percent in future years. Percentages of capital work performed by contractors also increased by about 10 percent during the historical period. Forecasts showed these levels remaining at just below 60 percent of the total resource mix. The next table illustrates the net impact of these trends, showing the 2013 actual and 2019 forecast resource mix for the Reference Utility (Reference Utility) and each electric company for all electric transmission and substation work.

Table VII.6: Electric Transmission and Substation Actual Resource Mix 2013

Source	RU	1	2	3	4	5
Straight Time	56%	73%	60%	58%	56%	31%
Overtime	8%	17%	9%	5%	8%	3%
Contractor	36%	11%	31%	38%	36%	66%
Total	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019						
Source	**RU**	**1**	**2**	**3**	**4**	**5**
Straight Time	53%	72%	54%	61%	53%	24%
Overtime	7%	14%	5%	6%	8%	3%
Contractor	40%	14%	40%	33%	39%	73%
Total	100%	100%	100%	100%	100%	100%

Comparing the 2013 to 2019 data shows a relatively stronger forecasted reliance on external resources. Forecasts showed the Reference Utility value reflecting increased contractor use - - from 36 to 40 percent of the total resource mix. This pattern, forecast by most of the state's utilities, conforms to the pattern observed for distribution work. Utilities expected to reduce overtime by increasing either the relative percentage of contractor resources (four companies) or by increasing straight time resources (one company). This rebalancing came primarily through holding internal FTEs from the historical period constant, while increasing contractor FTEs. The chart also demonstrates that by 2019, most companies forecast moving to the 25 to 40 percent range for contractors, with one company expected to increase to 73 percent.

Figure VII.7: Electric Contractor FTEs: Statewide Total by Work Type

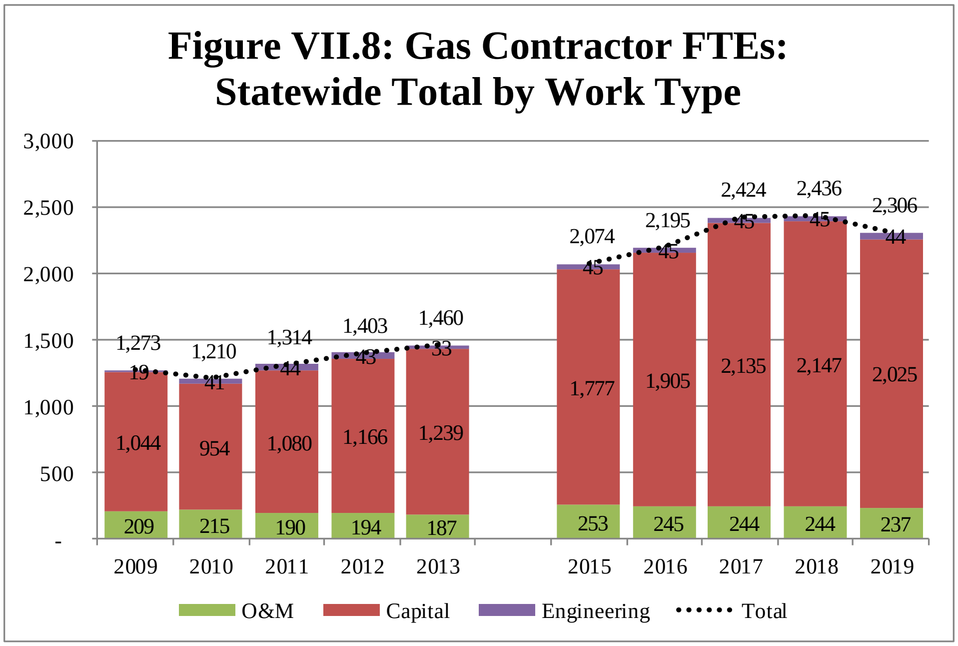


The preceding chart shows combined electric (distribution plus transmission/substation) statewide contractor use, broken down by work type. Considering the separate analyses for electric distribution and electric transmission and substation discussed earlier in this section, overall electric business trends include:

- Overall contractor workload increased modestly through 2013. The 2013 FTE levels increased by about 45 FTEs, an increase of two percent from 2009 (and less than half of one percent of the 10,000+ FTEs of total electric workload statewide).
- Forecasts showed 2019 levels 118 FTEs, or five percent above 2013 levels. This increase coincides with projected 2015-2019 decreases in overall distribution workload of about 400 FTEs, and with continuing increases in transmission and substation workload of about 250-600 FTEs. Forecasts showed overall 2019 electric FTEs within a few percentage points of 2013 FTEs.
- Forecasts showed reduced reliance on overtime and an increased relative percentage of contractors in both distribution and T&S. On an absolute basis, forecasts showed an increase of approximately 200 FTEs (from 2,400 to 2,600) in contractors between 2013 and 2019.

3. *Gas– Contractor Staffing Levels*

The following chart shows historical and forecasted contractor FTEs for gas operations functions for the period 2009-2019, broken down by type of workload (O&M work, capital work, and engineering work).

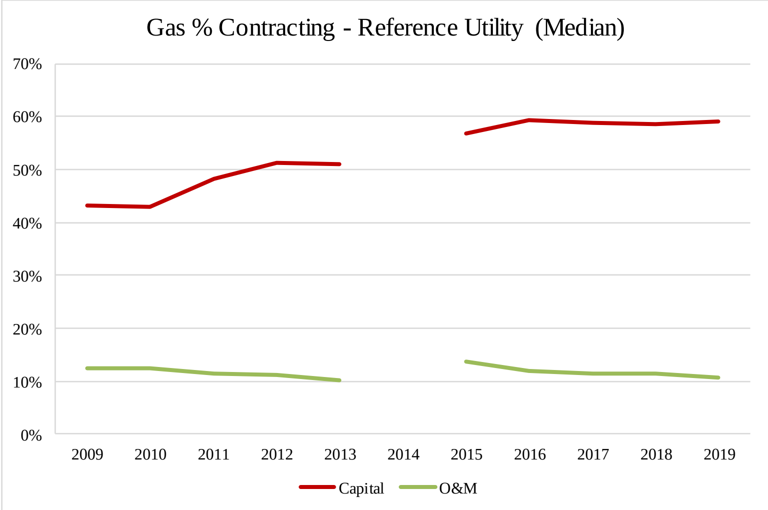


Contractor FTE levels increased by 187 during the 2009-2013 period. Forecasts for 2015-2019 showed a substantial increase, beginning in 2015 and peaking in 2018. Accelerating pipeline replacement programs drove much of the projected increase; however, projected forecasts showed 2018 total contractor FTEs approached a level of 1,000 higher than 2013 levels of 1,460. Forecasted O&M contractor FTEs also increased (by 50 FTEs).

In addition to increases driven by capital and engineering work for pipeline replacement, some forecasted capital work growth also comes from increasing new business work, especially among downstate utilities. As we look forward to the increased workload during the forecast period, we have concern that the strain on the pool of available resources will prove very challenging. This concern has particular importance because: (a) the state's utilities also forecasted very large increases in their internal staffs during this same period, and (b) utilities throughout the Northeast are also trying to ramp up their resource needs significantly, to support pipeline replacement programs.

We also examined contractor staffing levels, as compared to internal staffing resources; *i.e.*, the whole staffing resource mix. The following chart shows how the statewide trends in average percentage of contractor work (represented by the Reference Utility value) between 2009 and 2019 for capital and for O&M work.

Figure VII.9: Gas Percent Contracting



The chart demonstrates a modest overall historical decrease in the use of gas contractors relative to internal resources for O&M work. From 2009 to 2013 contractor percentage of the resource mix decreases from 12 percent to 10 percent. Forecasts showed this percentage returning to 12 percent of the resource mix in future years. The percentage of capital work performed by contractors increased during the historical period - - from 42 percent to 50 percent. Forecasts showed the contractor percentage of capital work increasing to about 58 percent of the total resource mix in the future.

The next table illustrates the net impact of these two trends, showing the 2013 actual and 2019 forecast resource mix for the Reference Utility and each company for all gas work.

Table VII.10: Gas Resource Mix – 2013 Actual and 2019 Forecast

Gas									
Actual Resource Mix - 2013									
Source	**RU**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Straight Time	62%	73%	71%	70%	67%	64%	62%	57%	30%
Overtime	8%	9%	1%	6%	6%	10%	16%	14%	5%
Contractor	30%	18%	27%	24%	27%	26%	22%	29%	64%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%
Forecast Resource Mix - 2019									
Source	**RU**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Straight Time	59%	70%	68%	66%	59%	62%	55%	53%	37%
Overtime	8%	8%	2%	4%	4%	7%	17%	15%	9%
Contractor	33%	22%	31%	30%	37%	31%	28%	31%	55%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%

Forecasts anticipated a higher reliance on external resources, with the Reference Utility value showing a contractor increase from 30 to 33 percent of the resource mix. The pattern forecast by all but one of the state's nine utilities showed an increase in the relative use of contractor resources. The forecasts showed overall FTEs for straight time and overtime increasing significantly above historical FTE levels, with contractor FTEs increasing at an even faster rate.

4. Conclusions

We formed the following overall observations and conclusions about contractor FTEs for electric operations:

- Overall electric contractor FTEs decreased substantially through 2013, with 2013 FTE levels down by 800 FTEs, or 8 percent of the statewide total of 10,000+ FTEs.
- Forecasts projected continued decreases in distribution workload (about 400 FTEs) and continued increases in transmission and substation workload (about 250-600 FTEs).
- The combination of these two types of workloads produced significant year-to-year variations, but projected electric business FTEs statewide remained within a few percentage points of 2013 FTE levels.
- Forecasts showed reduced reliance on overtime and a modestly increased relative percentage of contractors.
- On an absolute basis, forecasts showed an increase of roughly 100 (from 2,400 to 2,516) in contractor FTEs, as compared with 2013 levels.

Overall gas business observations include:

- Overall total gas workload (combined straight time, OT, contactor) decreased modestly through 2013, with 2013 levels 260 FTEs lower (a drop of six percent of the 4,500+ FTEs from 2009).
- Internal staffing (straight time and overtime staffing) dropped steadily, declining by 366 FTEs and 83 FTEs, respectively. Contractor FTE levels increased by 187 FTEs during the same period.
- Forecasted FTEs showed a substantial contractor increase, beginning in 2015 and peaking in 2018, driven largely by accelerating pipeline replacement programs.
- Projected 2018 total gas workload was 2,931 FTE higher than 2013 levels, with the nearly 70 percent increase spread among all types of staffing resources - - 1,450 straight time, 420 overtime, and 960 contractor FTEs.
- Forecasts showed higher reliance on contractors in the future, increasing from 30 percent of the resource mix in 2013 to 33 percent by 2019.
- The pattern forecast by all but one of the state's nine gas operations increased the relative use of contractor resources.
- While forecasts showed overall FTEs for straight time and overtime increasing significantly above historical FTE levels, contractor FTEs showed increases at a faster rate.
- The substantial forecasted increase in contractor FTEs creates substantial concern because of the companion increases forecasted for internal resources, and because of the competition that will exist with utilities throughout the region who will require resources as they ramp up their pipeline replacement programs.

- Achieving these increased contractor levels in such a short period of time will be difficult, given severely competing demands on the resource pool.

D. Process Analysis

1. Background

Effective processes relating to contractor use form a central part of the ability to maintain adequate staffing to support infrastructure maintenance, development, and expansion requirements. We discussed the critical components and dimensions for contractor use earlier and we listed the criteria by which we evaluated the processes related to contractor use. Each company assessment considered effectiveness in five key elements for contractor use:

- Developing contractor strategy
- Understanding comparative cost of using contractors
- Maintaining a qualified resource pool
- Developing expanded resources, when resource pools are limited (gas only)
- Maintaining appropriate contractor management processes.

2. Overall Findings

We conducted our assessment of contractor use separately for electric and gas operations, given the unique requirements of each type of business.

a. Electric

i. Contracting Strategy

Management at all of the electric operations we studied articulated clear overall approaches to the use of contractors. The approaches to contracting and the principles and details of the types and amounts of work contracted varied, but showed a number of important, consistent elements:

- Skill sets: types of work where specialized skills or lower skill (lower cost) workers are needed.
- Schedule driven requirements: projects and programs, especially large ones, where the combination of schedule requirements and skills requirements makes it logical to separate the work from day-to-day workload demands.
- Workload driven requirements: types of activities where workload varies (especially peaks), making staff augmentation preferable to increasing internal staffing levels permanently.

Examples of the types of work that fall within these general parameters prove numerous, but not necessarily consistently applied across all New York electric utilities. Examples included:

- <u>Lower skill/low value work:</u> trenching work, excavation work, oil spill clean-up, street light maintenance, and civil work (duct banks, concrete pads, manholes, and vaults).
- <u>Specialized skills/higher skilled work:</u> substation transformer and breaker diagnostic maintenance, engineering design work, transmission line inspection, stray voltage inspections.

- Schedule driven requirements: capital projects, driven by system planning requirements, with firm in-service dates; *e.g.*, transmission or substation construction projects, distribution line inspections
- Workload driven requirements: the largest category of contracted work, included planned distribution system capital projects (rebuilds of large line sections and recurring capital work with variable workloads), bundles of distribution repair work, entire turnkey substation construction projects, turnkey transmission construction projects, incremental maintenance requirements (above normal maintenance levels), such as wood pole inspection and treatment, insulator replacement, load tap changer replacement in substations, animal fencing, and relay work.

A second dimension of contracting strategy cited by every company was the need to balance the factors described above (such as skills requirements, timeliness, and variations in workload levels) with the unique requirements of each company's environment and service territory. In addition, most cited the need to retain certain levels of contractors to supplement internal staff resources during major storms and emergencies. Another dimension of an individual company's contractor strategy arose from limitations and constraints related to bargaining agreement terms. Four of the six companies had bargaining agreements that limited contracting decisions, either by amount or type.

Given the wide range of past practices and constraints, we observed that each company's contracting strategy combined elements of long-standing past practices and corporate policy decisions. Policies included approaches such as:

- Targeted internal staff versus contractor staffing levels (examples cited included: 70 percent internal versus 30 percent contractor for distribution work; 20 percent internal versus 80 percent contractor for substation work).
- Qualitative guidelines for specific types of work (minimizing use of contractors for distribution work, not using contractors for underground residential development construction work; contracting low-value work).
- Approaches to maintaining access to qualified contractors (seeking to keep available line contractors that can perform both overhead and underground work and civil contractors; keeping present at least a specified minimum number of crews to avoid loss of access to contractors when critically needed to supplement internal forces).

The result was widely different internal versus contractor resources mixes for the six New York electric utilities in the historical study period, partially driven by individual workload requirements and partially driven by policies and strategies. However, it was clear that use of contractors increased during the historical period, and was projected to continue to increase during the forecast period.

ii. Comparative Costs of Using Contractors

In assessing whether the companies employed a data-driven understanding of the comparative costs of using contractor versus internal resources, we found a wide variety of results:

- A few companies could not cite examples of either one-time or regular, structured analyses of comparative costs, even for specific types of work or work functions.

- Some companies cited one-time, specific analyses of comparative costs for specific types of work or work functions. Examples included some specific types of distribution construction or engineering work.
- Companies only cited a handful of examples of regular, structured analysis of the comparative costs for internal staff versus contractor staff for specific work functions. A notable example was one company that compares each lump-sum bid for large capital projects with an estimate of its internal costs to perform the work. A second example was a company that compares contractor costs for overhead distribution projects to the costs of company crews, using their engineering cost estimating system.

Specific examples aside, we observed broadly that managements were not performing regular, data-driven comparisons for internal staff versus contractors for the wide range of distribution and transmission and substation work contracted (or not contracted).

iii. Maintaining a Qualified Resource Pool

Maintaining a qualified resource pool for contractors proved a foremost concern of every company. As stated earlier, it is not only a consideration within each company's strategy, it is also essential for accomplishing work during both normal workload conditions and for system restoration following major storm events.

Unlike the widely varying approaches to overall contractor strategy, we observed similar approaches to maintaining qualified contractor resource pools across most companies. Examples included:

- One company sought to maintain a base number of electrical distribution contractors, in order to promote mutual aid relationships. For overhead line work, this company sought to have several multi-person crews in each work area. A different line contractor worked in each area, allowing a number of different contractor companies to be called for storm response.
- Another used framework agreements to keep a pool of contractors available. Its 30 percent contractor work mix goal supported keeping a ready pool of overhead line contractors available for storm assistance.
- Another used a broad number of contractor firms in electric operations, and undertook efforts to have contractor resources available to support storm response efforts. At the time of the study, multiple contractor overhead line crews were present for transmission and distribution projects. In order to promote the availability of overhead contractors for storm needs, management scheduled contract overhead line work in the main storm season.

iv. Contractor Management

In assessing the processes used for managing contractors, we considered organizational approach, contractor oversight and performance monitoring (amount, schedule, and quality of work), invoice processing, and quality management (including use of incentives). While specific approaches varied, we did form some overall observations:

- Contractor management organizations were often centralized at the larger companies and decentralized in the smaller companies and companies with large service territories. This allowed company oversight to be more closely matched to the make-up and deployment of the contractor force.

- Companies used dedicated project managers as well as line personnel or technical/engineering personnel to manage projects and programs, depending on the nature of the work. We did find some minor deficiencies related to these issues for specific companies, but overall contractor management processes were appropriate.
- Type and use of inspectors varied across companies, often based on nature of the work and type of contractor. Close levels of inspection were required for underground construction work, less for overhead work (which can be readily witnessed after-the-fact). We did not find specific deficiencies in this area of the assessment.
- Approaches to assessment of contractor performance also varied widely. We did note a number of best practices in this area including:
    - Use of a subscription service to pre-screen and monitor contractor performance. All contractors must subscribe to this service. Management of one company was performing and documenting evaluations of every contractor for every job. Weekly reports showed ratings of performance in all work groups, as well as for any other utilities for which the subscription service information was available.
    - Formal ratings for each contractor at one operation included four main metrics: delivery (actuals versus bids), safety, quality (measured through third party QA/QC audits) and ethics. Performance affects consideration for future work.
    - Another company used a contactor oversight system to track issues and safety infraction reports. Distribution work was 100 percent inspected. Set dollar variances triggered project reviews. Contractors were required to report both safety incidents and the number of lost time hours for all accidents.
- Approaches to contractor invoice processing were relatively standard across the companies. Companies processed invoices through their financial systems, and consistently used contractor oversight personnel to review and approve these invoices. We did note a best practice in this area. One company monitored the percentage of contractor invoices processed within 30 days and reported performance as a Key Performance Indicator (KPI) on company performance reports.
- We also examined the use of incentives to manage performance. Two of the utilities used incentives for contractors; four did not. Those using incentives based payouts on meeting cost and schedule targets, as well as upon quality scores, including safety performance. There was concern expressed by those who chose not to use incentives, that contractor incentives actually promote the wrong atmosphere/relationship, and do not result in measurable performance increases. While we respect the need for latitude in crafting what are the best forms of contractor agreements from a holistic or "all things considered" perspective, we consider the use of incentives and clear metrics a useful tool for optimizing performance.

b. <u>Gas</u>

i. Contracting Strategy

Management at each company was able to articulate a clear approach and strategies regarding the use of contractors. While all had an approach to contracting, the principles and details of the types and amounts of work contracted varied by company. The common elements that most strategies addressed covered the same elements observed in electric operations.

Examples of the types of gas work that fall within these general parameters were not consistently applied across all of the gas operations. Examples included:

- Lower skill / low value work: line locating and mark-outs, leak survey work, excavation work, and paving work.
- Specialized skills / higher skilled work: welding, instrument calibration, meter testing.
- Schedule driven requirements: large capital projects, driven by planning requirements, with firm in-service dates such as specific regulator stations construction projects, time-based inspection programs.
- Workload driven requirements: the largest category of contracted work, the primary example is pipeline replacement program work, particularly for main replacement and, in some cases, service replacements.

All New York utilities were contracting significant portions of their main replacement program work. Percentages of internal versus contractor use for pipeline replacement varied significantly. All utilities performed at least some of their main replacements, if only to retain skill levels for their employees. But the predominant mode during the historical period was to perform the majority of the pipeline replacement work with contractors. Staffing was projected to change in the forecast period, as companies ramp up their capabilities by adding both significant amounts of contractors and internal staff resources.

Of the remaining work functions cited above, other than line locating, companies did not consistently contract other work functions. However, there appeared to be movement toward increasing use of contractors for performing the periodic, time-based inspections required by regulators.

A second dimension of contracting strategy cited by every company was the need to balance the factors described above (skills requirements, timeliness, variations in workload levels) with the unique requirements of each company's environment and service territory. Another dimension of an individual company's contractor strategy related to limitations and constraints from bargaining agreement terms. Several companies had bargaining agreements that limited contracting decisions.

As we found for electric operations, we observed that each company's contracting strategy reflected a combination of past practices and corporate policy decisions. Policies included approaches such as:

- One targeted internal staff versus contractor staffing levels (examples cited included: "…contract 65 percent of pipe replacement work; we contract out about half of our construction work and about thirty percent of our O&M").
- Another used qualitative guidelines for specific types of work; *e.g.,* seeking to maximize the use of contractors for pipe replacement work to maximize completion during the shorter, warm-weather season; trying to contract low-value work; limiting the number of internal construction resources to those it can keep busy during the off-season, when weather conditions prohibit construction.

- One cited the approach to maintaining access to qualified contractors as "…keeping at least some level of contractors year-round, to avoid loss of access to contractors during the construction season."

We found different internal versus contractor resources mixes for the nine New York gas utilities in the historical period, partially driven by individual workload requirements and partially driven by policies and strategies. However, as true for electric operations, use of contractors increased during the historical period, and was projected to continue to increase during the forecast period.

ii. Comparative Costs of Using Contractors

In assessing whether the companies were employing a data-driven understanding of the comparative costs of using contractor versus internal resources, the approaches we observed varied:

- A few companies cited no examples of either one-time or regular, structured analyses of comparative costs - - even for specific types of work or work functions.
- Some companies cited one-time, specific analyses of comparative costs for specific types of work or work functions.
- Examples included citations such as: "management considers cost trends in determining where to use contracts, and has performed some specific cost studies'.
- Among all companies, we found only a handful of examples of regular, structured analysis of the comparative costs for internal staff versus contractor staff for specific work functions.
- A notable example was one company that compares each lump-sum bid for large capital projects with an estimate of its internal costs to perform the work.
- An innovative approach at another company was being explored at the time of our field work. This "Managed Competition" initiative operated under agreement with two bargaining units, put in-house employees and contractors on a level playing field to bid on specific work activities. The work types involved included certain surveillance activities, mark-outs, and public works projects.

We also generally concluded for gas operations that the utilities are not performing regular, data-driven comparisons for internal staff versus contractors for the wide range of work that they are contracting (or are not contracting).

iii. Maintaining a Qualified Resource Pool

Maintaining a qualified resource pool for contractors was a key concern of every gas company. Unlike the widely varying approaches to overall contractor strategy, we observed similar approaches to maintaining qualified contractor resource pools across most companies. Examples cited included:

- One had a goal to retain a sufficient number of contract firms and crews to promote availability when emergencies produce work spikes. This goal was based on the premise, which has merit, depending on the overall size and nature of the relationship, that contractors give preference to their regular client companies under such conditions.
- Another used framework agreements to keep a pool of contractors available.

- Another maintained a base of approximately twenty firms pre-screened and pre-qualified for construction. That approach allowed for rapid deployment of contractor crews once a firm is selected. The company had observed the increasing costs of contractors, embarking on an internal five-year hiring plan to double internal construction and maintenance work forces during that time period.
- Another company was using local firms; with which it had long-standing relationships. This approach enabled sharing of longer term plans to provide assurances to contractors that the demand for services by the company will continue.

iv. Developing Expanded Resources

Given the challenges related to rapidly expanding requirements for large numbers of additional qualified gas personnel over the coming years, we examined whether companies were engaged in approaches to expanding the available staffing resource pool. We only found a limited number of examples being pursued at the time of our study, including:

- One company cited extensive relationship-building discussions with its contractors.
- Another had typically used three-year contracts, but had begun to include options to extend them to a fourth and fifth year.
- Another recognized the tightening of the capital contracting markets and the difficulty in bringing new contractors in and attracting national firms. One factor limiting the latter was their relatively higher prices. While recognizing the issue, management had not taken specific, significant action to address it yet, but was moving to longer term (five-year) contracts.
- Another had started a new rotational program for engineers, using input from the American Gas Association and the Interstate Natural Gas Association, among others. It was also working with local colleges to develop an internship program.

For the most part, while the companies recognized the challenge in attracting and retaining sufficient contractor resources to meet forecast contractor staffing increases, few companies were currently venturing far beyond the contractor procurement approaches used in the past.

v. Contractor Management

Our inquiry included assessment of the processes used for managing contractors. While specific approaches varied from company to company, overall observations included:

- Mirroring the approach of their electric counterparts, contractor management organizations were often centralized at the larger companies and companies with smaller service territories, and often decentralized in the smaller companies and companies with large service territories. We did find some minor deficiencies related to these issues for specific companies, but overall contractor management processes were appropriate.
- Type and use of inspectors varied across companies, often based on the nature of the work and type of contractor. In many cases, dedicated inspectors were used. Close levels of inspection were typically required for gas construction work, because it involves excavation and installation according to specific standards. We did not find specific deficiencies in this area of the assessment.
- Approaches to assessment of contractor performance also varied widely. We did note a number of best practices in this area including:

- One company has a comprehensive contractor evaluation form, with some 50 dimensions and attributes, which it uses to rate contractor performance.
- Another used formal ratings for each contractor, addressing four main metrics: delivery (actuals versus bids), safety, quality (measured through third party QA/QC audits) and ethics. Performance will affect their consideration for future work.
- In managing contractor performance, gas operations at another company used the same multi-level system as electric operations. Management met quarterly with each contractor to provide a performance review. In addition, the general managers prepare a report of contractor performance semi-annually.
- Another used a contactor oversight system to track issues and safety infraction reports, and inspected 100 percent of construction work. Set dollar variances triggered project reviews and contractors were required to report both safety incidents and the number of lost time hours for all accidents.
- Another was tracking all jobs and contingencies, and conducting a post-mortem on any project deviating from the initial estimate by 5 percent or more.

- Approaches to contractor invoice processing proved relatively standard across all the companies. Companies processed invoices through their financial systems, and consistently used contractor oversight personnel and construction inspectors to review and approve these invoices.
- We also assessed the use of incentives as quality and performance management. Three of the New York gas utilities were using incentives for contractors; the remaining six were not. For those who used incentives, payouts were based upon meeting cost and schedule targets, as well as upon quality scores, including safety performance. One company cited that contractors are eligible for compensation incentives and penalties based upon performance ratings. The ratings affect up to 10 percent (five percent plus or minus) of total compensation. There was concern expressed by those who choose not to use incentives, that contractor incentives actually promote the wrong atmosphere/relationship, and do not result in measurable performance increases.

3. Overall Contractor Use Conclusions

1. New York electric and gas utilities' contracting strategies, approaches for maintaining qualified resource pools for contractors, and contractor management processes were, for the most part, appropriate.

Our assessments of these key elements for contractor use (developing contracting strategies, maintaining qualified resource pools, and contractor management approaches) found that, with limited exceptions for individual companies, these processes were appropriate for managing the diverse needs found across New York. In those cases where we found specific deficiencies at individual companies, we describe conclusions and recommendations in that company's individual report.

2. New York gas utilities were not paying sufficient attention to the challenge of expanding the available contractor resource pool required to meet the near-term challenge of significantly ramping up contractor resources to support accelerated pipe replacement programs.

To support the accelerated pipeline replacement programs for New York gas utilities, company forecasts anticipated increasing contractor workload by some 1,000 FTEs between 2015 and 2018, likely sustaining these increased staffing levels into the future.

Companies have recognized the tightening of the capital work contracting markets and the difficulty in bringing new contractors in and attracting national firms. One factor limiting attracting these firms to the region is their relatively higher prices. For the most part, while the companies recognize the challenge in attracting and retaining sufficient contractor resources to meet forecast contractor staffing increases, few were venturing beyond the contractor procurement approaches used in the past. We are concerned that the inability to expand contractor resources quickly will slow the progress of the planned pipe replacement efforts and place additional strains on internal staffing resources, especially overtime levels.

Consequently, we generally recommended that New York gas utilities explore methods and approaches to increasing contractor resource pools beyond current levels to meet the demands of accelerating the pipe replacement program. Our study evaluation criteria considered dimensions of this challenge including efforts to:

- Work with the contractor community to acquire additional resources.
- Work with the contractor community to enhance the contractor skill sets.
- Work to increase the number of internal resources and internal skill sets.

A few New York gas companies had begun some efforts to pursue these goals including relationship discussions with contractors, extending contract terms to five years, and limited cooperative training with local schools. It is imperative that each company recognize these challenges and develop plans to significantly increase the size of qualified labor to staff both contractor and internal staff requirements.

3. Program and project approaches, organizations, staffing, systems, tools, processes and oversight sufficient to support business-as-usual will not adequately serve the staffing needs of accelerated main replacement programs.

Please see the Statewide Main Replacement chapter for a complete discussion of the findings underlying this conclusion and our general recommendations for addressing the improvement needs that we believe exist. The individual utility reports supplement the Statewide Main Replacement chapter of this report by providing findings, conclusions, and recommendations unique to each state gas operation.

Accelerated main replacement imposes great challenges across the state, and regionally and nationally. Those challenges have implications for contractor management, but involve program needs that need to be addressed at a broader level. The Statewide Main Replacement chapter of this report addresses pipe replacement program challenges and their implications for staffing and for efficiency and effectiveness. That chapter, and the accompanying, individual utility reports describe replacement program needs and where New York's gas operations show room for improvement. The findings, conclusions, and recommendations addressed in this contracting chapter address what can be more appropriately described as the other, generally more mainstream needs of gas contractor management, except where they may specifically cite main replacement.

4. New York electric and gas utilities were not making regular use of ongoing, structured analyses of the effectiveness of contractor use at the functional level.

Effective use of contractor staffing resources at the functional/work group level cannot be accomplished without ongoing, data-driven analysis that compares the use of contractors to the use of internal staff for specific work functions. Use of one time, limited scope studies for accomplishing these types of analyses are not sufficient for determining the most effective balance of internal staff contractor resources for each type of work. Utilities should develop ongoing data-driven analysis methods for comparing the equivalent cost of each of these resources for accomplishing different types of work within this resource plan.

Consequently, we generally recommended enhancement in the capability to conduct ongoing, data driven analyses that help management evaluate the trade-offs between contractors and internal staff for specific types of work. The companies need to enhance their ability to perform ongoing, data driven analyses for evaluating the trade-offs for contractors and internal staff for the wide variety of work that they perform. The companies should develop methods for comparing the equivalent cost of each of these resources for accomplishing different types of work for functional work groups throughout their service territories. The methods for comparing the equivalent cost of each of these resources for accomplishing different types of work in the resource plan can be used to determine the optimal levels of contractor versus internal resources mix for each organization.

Chapter VIII: Main Replacement Programs

Our examination of state gas operations produced a paramount series of related findings and conclusions applicable across the state. To some extent, the underlying issues already do, and in other ways should, operate as an overriding determinant of staffing requirements. The replacement of "leak prone" pipe challenges natural gas distributors, their regulators, and their stakeholders across the country. Reducing the public safety risks that such infrastructure presents has become a priority with national dimensions. Eliminating high-risk pipe has historically been and will continue to prove immensely costly (and likely far more so than currently recognized), leading to long durations for replacement. Those durations remain measured in decades, despite a surge in efforts in New York, the broader region, and other parts of the country to accelerate elimination.

The recognized safety risks and the many billions of dollars that New Yorkers will bear in eliminating those risks make replacement a first-order, immediate priority in terms of establishing aggressive, yet affordable goals. Looking beyond the establishment of those goals, it is equally certain that pipe replacement will remain a matter of high visibility and great consequence for many years. The need to recognize the vastness of the management challenge, the great costs that inefficiently addressing it can have, and repetition of the experience of others who have embarked on accelerated replacement from a weak management foundation will keep replacement pace and cost at the forefront indefinitely.

We have substantial knowledge of and interest in the challenges of addressing a program area that may prove for the gas industry to be on the order of that faced by the electric industry during the last, great wave of U.S. utility nuclear construction. The aspects of our knowledge and interest of relevance here concern the staffing implications, which have vast dimensions.

A. Background

For the most part, commercial gas pipes in the distant past consisted of cast iron, with bell and spigot joints every 10 or so feet. Those joints were packed with jute and tar or other sealing materials. They reflected the technology of the times and the low pressures of the systems as then operated. In the early to mid-1900s, steel, mostly bare (uncoated and not cathodically protected) superseded cast iron.

Cast iron and steel pipe have generally very long lives as utility infrastructure goes. With average service lives in the 60- to 80-year range for depreciation purposes, they have proved as or even more resilient from an operating perspective. Far more vulnerable to leaks and failures than newer pipe using different materials and installation techniques, these *leak-prone* pipes comprise the primary targets of pipe replacement programs, along with certain types of service lines found in many areas. Cast iron and bare steel comprise most of New York's leak-prone pipe mileage.

The first federal legislation regulating pipeline safety came with the Natural Gas Pipeline Safety Act of 1968. That statute created the Office of Pipeline Safety, located within the Department of Transportation, to oversee and implement pipeline safety regulations. The Pipeline and Hazardous Material Safety Administration (PHMSA) came in 2004, subsuming the Office of Hazardous Materials Safety.

Increasingly stringent federal regulation and improved technology have introduced infrastructure with significantly lower risk, but thousands of miles of older, high-risk pipe remain in operation. The risk for New York looms greater than for the nation as a whole, give the proportion of cast iron and bare steel pipe remaining in the state. The next table shows that about four percent of the nation's distribution pipe operates in New York, but cast iron and bare steel pipe represent a percentage about three times higher.

Table VIII.1: Percent of Leak-Prone Pipe[1]

Pipe Type	US	New York	
Miles	*Miles*	*Miles*	*Percent*
All types	1,255,257	48,051.7	3.8%
Cast Iron	30,904	4,254	13.8%
Bare Steel	56,879	7,407	13.0%

New York has an especially long history of gas distribution, particularly in the state's large metropolitan areas. Gas delivery dates in many locations back to the nineteenth century. Gas replacement has proceeded for decades, yet New York still has large quantities in operation. More recently, New York, like many other jurisdictions in a similar situation, has increased emphasis on removing leak-prone pipe through the development and implementation of programs designed to: (a) identify all leak-prone pipe, (b) perform risk analyses and rank the risk of those pipe segments, (c) prioritize replacements taking those and other factors into account, and (d) get the highest risk pipe eliminated first and the remainder eliminated faster.

The start of the 21st century found many utilities conducting loosely defined programs that would have continued to leave leak-prone pipe in the ground for many decades and even into the 22nd century. A difference today appears in the growing introduction of *accelerated main replacement programs* that contemplate much shorter periods (often 10 to 30 years), depending on a utility's inventory of leak-prone pipe, the cost of replacement, and the degree of engagement and support of stakeholders, including public service commissions. In some cases, disasters have spurred attention and action. In a 2015 Order (Case 15-G-0151 – Order Instituting Proceeding for a Recovery Mechanism to Accelerate the Replacement of Leak Prone Pipe, April 17, 2015), the Commission established a statewide goal for utilities, on average, to complete their replacement of leak prone pipe within 20 years.

[1] Source: US DOT/PHMSA, https://hip.phmsa.dot.gov/analyticsSOAP/saw.dll?PortalPages. Pipe of unknown date of installation is considered as pre-1970 pipe.

B. Magnitude of the Problem

Figure VIII.2: Leak-Prone, Non-Leak Prone, & Total Miles of Main

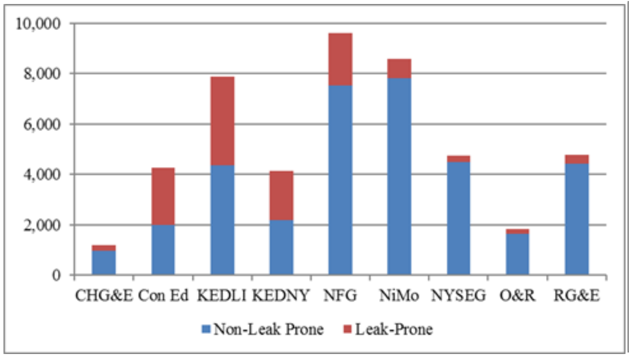
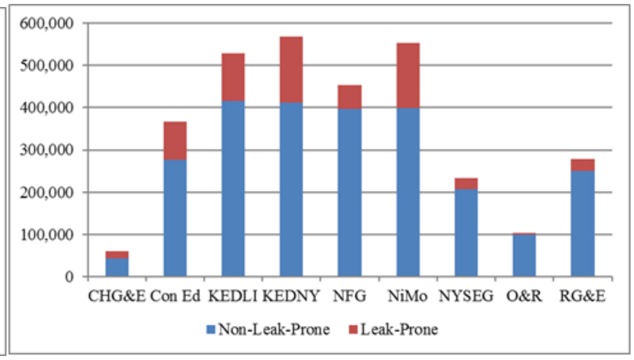


Figure VIII.3: Leak-Prone, Non-Leak Prone, & Total Services



These two charts illustrate the great magnitude of the challenge in New York State, using 2013 data (near the end of the historical portion of our study period). Four of the nine gas utilities (CECONY, KEDLI, KEDNY, and NFG) have more than 1,000 miles of leak-prone pipe. A number have several times that many. For a few, both the miles and percentages of leak-prone infrastructure are relatively small, but none are free of the challenge. The state's number of leak-prone services is also remarkable, with several utilities having more than 100,000.

The numbers themselves are troubling; their locations make them far more so. The state's major population centers have most of the leak-prone facilities. CECONY, KEDLI, and KEDNY account for about two-thirds of NY's leak-prone pipe. Risk is a function of occurrence likelihood and consequence. With both numbers and consequence greater, the need for aggressive action downstate is high.

The need to replace thousands of miles of pipe raises for utilities, regulators, customers, and other public stakeholders the questions of how long (years) and how much (dollars) and through what mechanism (rates). Our examination of replacement rate forecasts in this study indicated the earliest of the company completion dates at 2022 and the latest at 2046. We caution, however, that those are only approximate dates, for reasons we will discuss below.

C. The Staffing Challenge

The magnitude of the mileage, cost, and replacement durations all have a substantial impact on forecasted the staffing needed for accelerated replacement. The size of the increases in staffing needed and the market in which utilities will have to meet them raise fundamental questions, which our study has shown still not to have clear answers:

- Getting the people: Does management know who and how much it needs, based on realistic views of production levels and rates? Management needs this foundation to plan for acquiring and retaining the resources needed to support pipe replacement plans.
- Competing for talent: Does the knowledge and sophistication being brought to bear in acquiring people recognize the risks created by the large group of utilities and contractors

who will be in the market for the skilled resources required? Replacement acceleration, while becoming more widespread, has not ceased advancing.

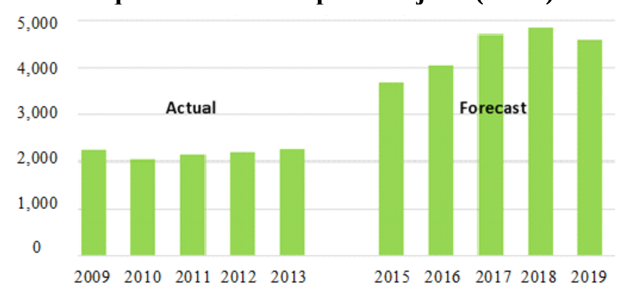
- Managing the resources: Are the utilities well situated to manage a massive effort likely to require efficient, effective, and (perhaps most importantly) expeditious expenditures of tens of billions of dollars? The people management part of that effort will impose a central aspect of this challenge.

Our study has shown that significant needs remain in getting these answers, and then in acting appropriately with respect to them.

1. *Getting the People*

The chart at the right illustrates the magnitude of the planned staffing increase. This chart lists requirements for capital projects, which include more than replacements, but are largely driven by them. The table shows a doubling of FTEs for gas capital work. The earlier discussion of Resource Planning, questioned the realism of such targets. That questioning undercuts confidence on the face of things, given the vastness of the increase.

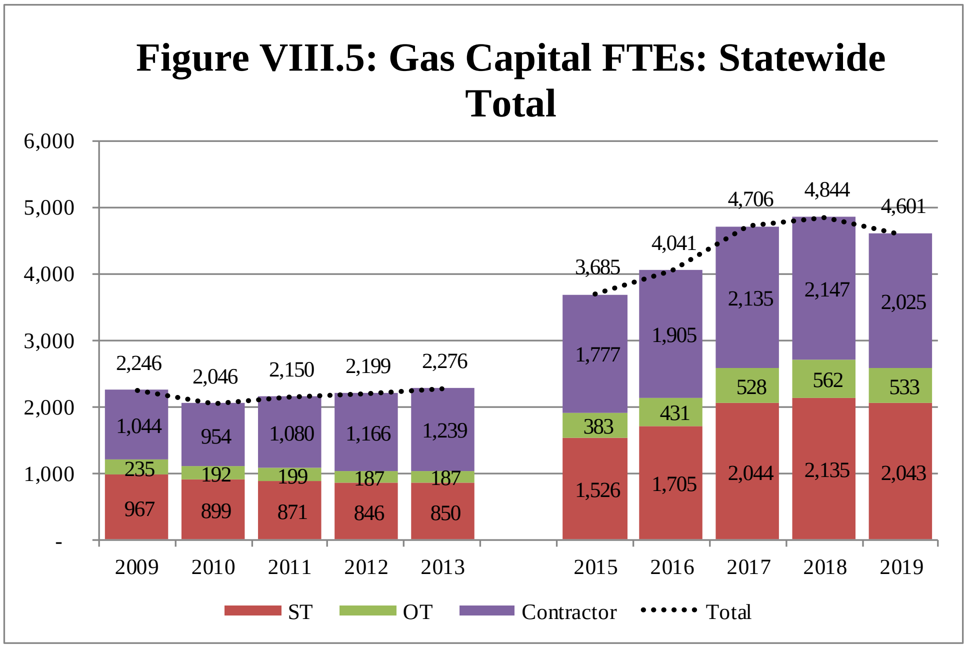
Chart VIII.4: NY Gas Utilities Staffing Requirements for Capital Projects (FTEs)



Gas Capital Program Resource Needs (FTEs)		
2009-13 Average (Actual)	2,183	
2015-19 Average (Forecast)	4,375	+100%

On top of that concern, however, prudent planning dictates introducing two other staffing considerations: (a) companies in other states have underestimated work requirements in the early stages of planning for replacement acceleration, and (b) these increases will not come in a demand vacuum, because others will be facing similar needs in magnitude and in immediacy. Those two factors call into question how much bigger those intimidating 2015-2019 people "barrels" shown in the chart really are, and how many bodies will be out there to "fill" them at whatever final levels prove required.

Some sensitivity to the challenge shows in intentions to support the massive build-up required through maintaining balance in the resource mix of internal and contractor resources. See the following chart. Even so, the great challenge still lies in numbers and time when it comes adding so many resources in so short a time.



We saw attention to the challenges discussed here, but not a comforting level of momentum in moving forward. When managements begin mobilization in earnest, the question shifts to where to find people. Strains already exist on availability and pricing of contractors. It will take more than recognition of the problem and even the best of intentions to ensure that people with appropriate training are there to hire, noting that training and testing requirements mandate long lead times.

We thus find, in the absence of more comprehensive planning and initiatives, a concerning level of doubt regarding the credibility of the staffing underpinnings of main replacement initiatives.

2. Managing the People

We have found that companies have managed pipe replacement programs across the country differently. We believe that the magnitude of the expenditures in such programs, the large number of people involved, the often complex logistics of urban underground work, and the intricacies of coordinating that work with municipalities and other utilities, demand sophisticated approaches. Moreover, the extended timeframe and high investment in such programs permit utilities to spend the money to get that highest level of sophistication. Such large programs require strong management and systems, reaching world-class level for those facing multi-billion dollar expenditures.

We therefore find it unusual, and from our perspective unacceptable, that many utilities treat such huge programs in a "business-as-usual" fashion, as if main replacement consisted simply of adding more projects to their workloads. As we will see in our reports on the individual utilities, some NY utilities fall into this category, which adds to our concern about whether adequate, efficiently applied staffing will be put in place and managed effectively to meet the utility targets.

We also examined productivity in selected gas functions, and found a very large disparity among the utilities. Although we expected that the unique characteristics of the utilities would produce a divergence of results, the magnitude of the differences was too large to attribute solely to the physical characteristics of the systems. Those differences in productivity underscore the need for close attention to ensuring that design and execution of program and project management approaches, organizations, resources, systems, and tools have the "world class" quality that matches the "world class size" of a number of the state's gas operations. Even those with smaller programs face significant cost, quality, and schedule risk if they treat replacement acceleration on a "business as usual" basis.

With some exceptions, we have found the utilities' approaches to their business-as-usual program, project, and contractor management generally sound. By no means, however, do we suggest that merely extrapolating them to large scale replacement efforts would prove satisfactory, even with the technical improvement recommendation we offered in a number of cases.

D. Conclusions

1. Pipe Replacement programs, despite their long-term, high cost nature, are generally managed as routine projects by the utilities.

With respect to the pipe replacement programs, we did not find a dedicated program- (and associated project-) management approach or structure. We did not observe a team, or a comprehensive, long term program. Rather, each utility manages the activity on a short term (one to several year) basis. Most have long term, very general conceptual goals, such as an overall program duration and prioritization by pipe material or other attribute, with the dominant factor being the parameters in the current rate case.

The lack of a true program approach and good project management (supported by organizations, resources, systems, tools, controls, and oversight) will tend to drive up costs and slow progress. Accordingly, the individual utility reports commonly recommended, especially for those with major commitments in pipe replacement, that management develop and apply an approach, organizations, resources, systems, tools, controls, and oversight proportional to the large investment in pipe replacement.

Programs of this cost, complexity and duration should not be treated as business as usual and located within day-to-day operations. Each utility's program should have the following components:

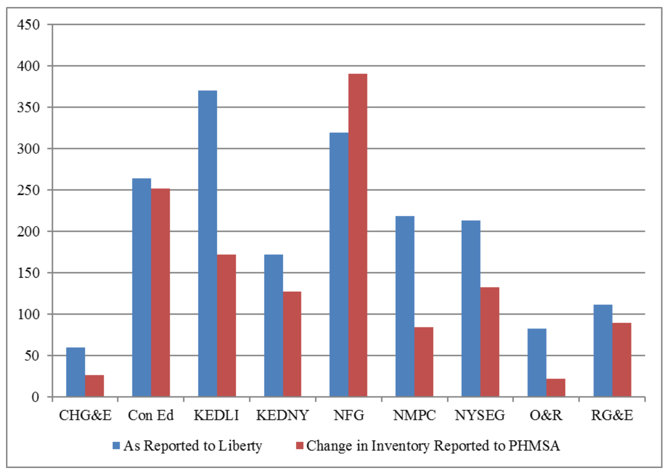
- A staffing plan
- A reporting and analysis program
- Production and productivity measurements
- Separate project management for larger companies, or specific assignments for smaller companies.

The size and scope of each plan should be tailored to the size, scope and duration of each company's pipe replacement program. The needs of the companies with several thousand miles of pipe to replace over decades clearly require a much greater commitment to program and project management than holds for companies having several hundred miles to replace over a decade.

2. It was difficult to reconcile pipe replacement data and the ability to report replacement information was inconsistent.

Utilities must file with PHMSA an annual report listing, among other things, the compositions of their transmission and distribution systems by material (*e.g.*, plastic, steel, or cast iron), the decade of installation, the pipe diameters, leak data and other system parameters. The year-to-year changes in the data reflect, in general, reductions in mileages of leak-prone pipe and services, as those elements get replaced. One would expect an offset in the form of an increase in new pipe. The ratio of old pipe to new pipe, however, is not necessarily one-to-one. Newer pipe often operates at higher pressures, and some unused pipe is abandoned, but one would still expect the ratio to be close to 1 to 1. One company estimated its ratio to be on the order of 1.1 or 1.2 to 1, generally reflecting the efficiencies of higher pressures. There may also exist timing differences, given lags between when new pipe is put into service and old pipe is physically removed. Physical and accounting database updates may not take place at the same times. However, over time it is reasonable to expect rough parity, within a reasonable tolerance band.

Figure VIII.6: Miles of Pipe Replaced 2010-2013



Liberty compared the changes in year-over-year inventory reported to PHMSA with the data provided by managements in this study, using the 2010 to 2013 period. Approximately two-thirds of the companies exhibited significant discrepancies between the miles of pipe replaced management reported to us and the change in inventory of leak-prone pipe reported to PHMSA. Four companies had differences within ranges that raised no questions. Additionally, one company provided an explanation showing that certain types of early-generation, leak-prone plastic, of which it had significant quantities, distorted its result. For the others, however, the data variances were far enough apart to raise a significant accuracy concern.

With respect to base replacement data, we found problems with a number of operations. Those companies provided data indicating total pipe installed annually for the five-year historical period, but could not provide a breakdown of pipe replaced versus new pipe constructed. It is a basic principle that one cannot manage what one cannot measure. We found problems with adequate tracking of these programs. Consequently, consideration should be given to requiring annual reconciliations of pipe replacement quantities reported to the Commission and PHMSA. This reporting provides only the starting point, however. The need for complete and accurate data goes further, as the next conclusion addresses.

3. Many of the gas operations we studied exhibited gaps in tracking of pipe replacement performance, including applied staffing and productivity.

Given the costs and durations of the utilities' pipe replacement programs, it is reasonable to expect that management would have considerable levels of associated performance tracking and measurement. As we will point out in the individual utility reports, however, the utilities' reporting systems are, for the most part, not up to that task. They typically capture production and cost data separately, do not marry the two on a project or aggregate basis, and do not segregate pipe replacement from other construction activities.

We found strong performance at only one company in this regard. It has robust performance and productivity data, and calculates productivity at aggregate levels, but it too does not track pipe replacement as a distinct and separate project.

4. The connection of long-term staffing plans to rate case cycles obscures a clear vision of future requirements, and would serve to misdirect staffing optimization if relied upon by those responsible for staffing planning.

Reported plans for pipe replacement programs appear not to look past the current rate cycle. We found the credibility of future staffing plans questionable for a variety of reasons. One factor results from uncertainty about the level of investment included in future rates. The Commission has set pipe replacement targets in the one to three-year range in most recent rate cases. This gives one indication of regulatory expectations, and provides at least some basis to extrapolate into the future. There is no certainty associated with such extrapolation, however, with the result that longer-term replacement targets and hence staffing can only be considered tentative. However, no utility was able to point to a long-term plan, either filed with the Commission or for internal use, addressing overall pipe replacement efforts programmatically over the duration of the effort. While the Commission typically does not pre-approve specific long terms plans, it does, from time to time, give conceptual approval to certain very large, long term programs. For example, in March 2016, the Commission approved a 20-year advanced metering infrastructure plan for Con Edison which will cost well over a billion dollars.[2]

Management at most of the operations we studied observed that rate case targets formed the driving force behind their pipe replacement activities, and claimed to carefully track their progress to meet those targets. In one case, Liberty observed a severe drop-off in pipe replacement activity in the year between the expiration of one rate case agreement and the implementation of a new one. Pipe replacement dropped to approximately one-third of its previous levels in the year in which there was no Commission-specified target.

Utilities also observed that they generally do not make commitments to contractors until a Commission order is in hand, due to the uncertainty as to the terms of the final decision. Thus, when a decision is issued, particularly if it includes a substantial increase in activity, the utilities may have to scramble to find contractors, facing the risk of an inability to retain contractors immediately. Effectively, each utility ramps up rate case to rate case. This factor may produce a reluctance to make commitments and to assume continuation at the same or an accelerated rate beyond the short-term horizon of the most recently approved rate decision. Even at the same rate, a long-term view would be expected to affect the employee versus contractor decision as well as longer term commitments to contractors so they can make longer term commitments.

It is not our role to evaluate this process, only to note its impact on staffing. That impact, in a nutshell is this: companies are not making long-term commitments, and staffing projections are

[2] Case 15-E-0050 - *Order Approving Advanced Metering Infrastructure Business Plan Subject to Conditions*, issued and effective March 17, 2016.

uncertain. Flexibility will be necessary to respond to changing future circumstances. Even so, seeking to optimize staffing in the face of a multi-decade program that presents fundamental staffing implications cannot be effective when driven by very short-term planning.

5. Cooperation and sharing of knowledge about pipe replacement programs among utilities is minimal.

Liberty observed that each utility is essentially "going it alone." That approach is consistent with what Liberty has observed in other jurisdictions. Most utilities displayed only basic knowledge of what other in-state and regional utilities were doing. To be sure, the subject of pipe replacement has been and continues to be discussed at state, regional and national gatherings, but such discussions tend to be overviews. There does not appear to be any significant sharing of experiences and best practices among New York utilities or between New York and non-New York utilities.

This appears to be due, at least in part, to the "business as usual" approach to pipe replacement, which does not recognize the unique and special challenges. Utilities consider pipe replacement as routine work and no different from what they have been doing for years, albeit with increased emphasis.

We believe that the state's companies should create a mechanism for cooperation, moderated by Commission staff if needed to overcome initial management reluctance. The efforts might include greatly expanded training for in-house staff and contractors, information sharing, and much increased emphasis on exploring new technologies. Except for the urban/suburban/rural differences across the utilities, the infrastructure and the actions needed to upgrade it are remarkably similar within New York, the Northeast, and in some respects the entire country. Nevertheless, there exists insufficient interaction among utilities. Each utility displayed only a very general knowledge of what the others in the state were doing with respect to program size, technology, contractor availability, and training. It may be that Staff engagement would assist in producing a greater level of interaction, which we believe would advance the efficiency and effectiveness of actions by all of the companies involved.

6. Based on current staffing projections, NY gas utilities face significant risks of shortages in trained and qualified employees and contractors.

The ramping up of programs in New York and surrounding states will fuel further increases in demand for skilled and operator qualified field workers, as well as engineering and technical staff. Given the long lead times for acquiring new employees or contractors and appropriate training and Operator Qualifications testing, as well as competition for resources within the state and region, this is a significant issue facing the industry.

While most of the utilities seem aware of this threat and are taking some actions, the magnitude of the problem requires more aggressive actions.

Chapter IX: Quality of Service

A. Approach to Relating Staffing and Service Quality

New York utilities annually report a series of service quality measures to the Commission. The latest reports available when we performed study field work address the year 2014. We looked at how reliability, as those reports address it, changed over our historical period. Our goal was to determine whether any correlation existed between changes in applied resources and changes in the results as reported to the Commission. Broadly-based metrics (*e.g.,* customer satisfaction rankings) would not assist in this search, given that they result from a broad range of service aspects, thus failing to isolate sufficiently on the staffing areas our study addresses. We found a number of the metrics reported to the Commission more directly related to the aspects of customer service connected to the functions and activities we studied. Those functions and activities are largely infrastructure related. We discuss below those we settled on as most useful.

We understand that the measures reported to the Commission provide floor-level measurements, not high-end goals. While appropriate for regulatory purposes, such low-range measures do not alone suffice to provide a robust and dynamic view of service quality. We certainly began with them, recognizing that performance above floor levels can legitimately be described as "adequate" from a compliance perspective. Our study moved beyond the compliance view - - looking at how quality measures trended, even where they remained above floor levels (which proved true with small exceptions). In doing so, we paid particular attention to where levels approached or were moving in the direction of those floor levels. Finally, in cases where data suggested a connection between staffing and quality, again particularly where declining trends existed, we examined management's forecasts of staffing resources from a reliability perspective.

Where proximity to floor levels or noticeable declines trended toward those levels, we compared what was happening in staffing, in order to determine whether any correlation existed. In doing so, we recognized that factors other than staffing changes affect the quality measures that we trended. We also recognized that time has passed since the most recent statewide reliability report issuance (covering 2014 performance) and the study field work that produced our quantitative views of staffing (2013 being the last full year). Both reliability and staffing numbers may have changed.

Thus, while a comparison of staffing and service quality trend lines may not be conclusive, it did provide another indicator we used to examine staffing adequacy.

B. Electric Quality Measures Selected

In addressing the quality of electric service, we began by considering two measures for which the Commission has adopted standards and for which it requires reports. The electric industry commonly uses both as measures of service reliability. The first of those measures, SAIFI (System Average Interruption Frequency Index), consists of the average number (frequency) of interruptions customers experience. We chose not to use this measure, even though we believe it does have some connection to staffing. Applying resources to inspect, maintain, and operate electricity delivery infrastructure clearly has a bearing on the frequency with which outages occur.

The difficulty in using SAIFI for our purposes lies in the time lag involved; *i.e.*, the fact that systems decline over time when a company underperforms such activities.

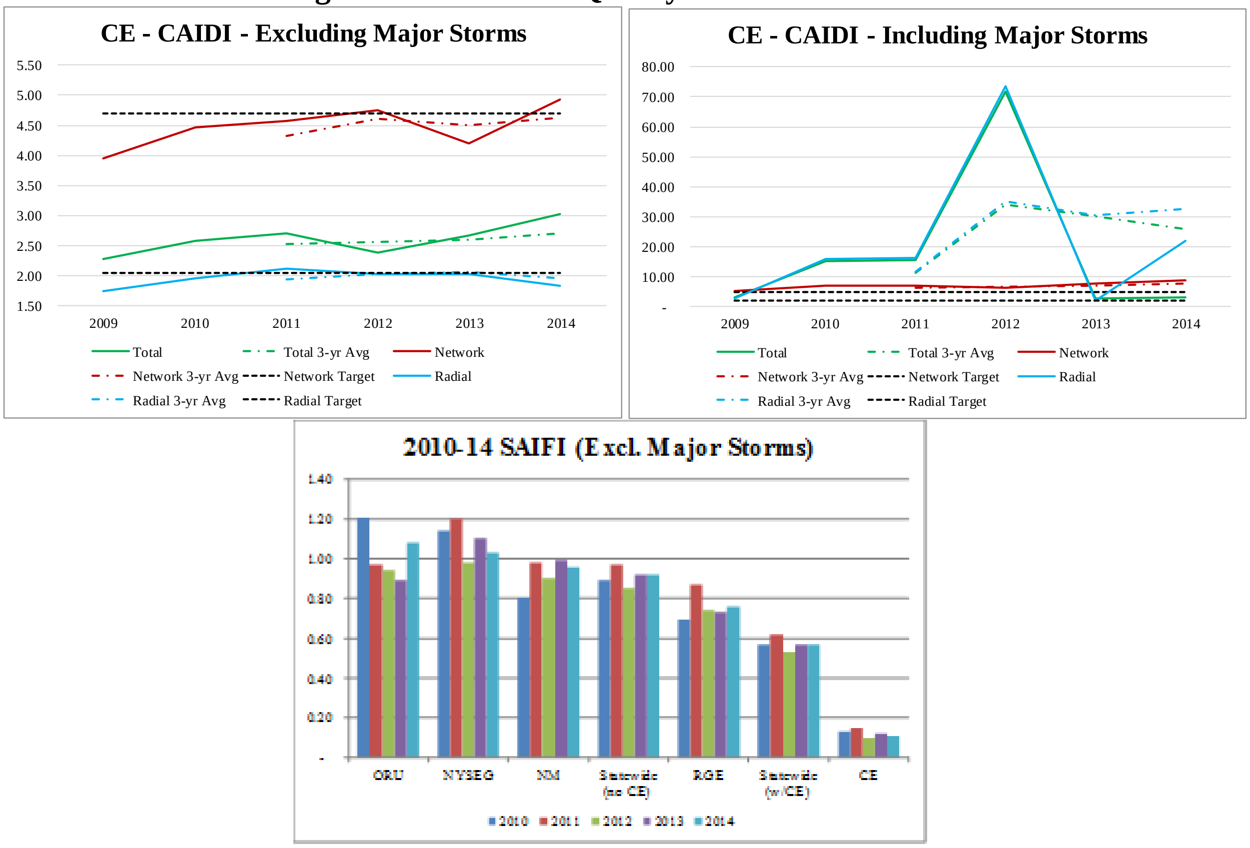
With consequences of staffing curtailment in these areas delayed by some and perhaps many years, it becomes impossible to connect staffing changes over fairly short durations with outages. For example, following a period of short staffing, a utility may be engaged in a "catch-up" program designed to restore infrastructure to desired conditions. As that work proceeds, outages may occur owing to work not performed years ago and still not "caught up" in a cycle of heightened activity. While tempting, it could well be wrong to assign causation to current staffing levels. In addition, the scope of our study excluded vegetation management (*e.g.*, tree trimming) by design. The failure to provide for diligently executed vegetation management can have a major impact on outages, particularly their frequency. An inability to consider this factor further diminishes the already tenuous value of using SAIFI as a way to gauge staffing in the areas our study was charged with examining.

We found the second measure, CAIDI (Customer Average Interruption Duration Index), more pertinent to our purposes. CAIDI also finds common industry application in measuring reliability. It sums all the durations of all customer outages (usually across a period of a year), and divides that sum by the number of customer interruptions experienced. Restoration work is performed largely internally (often supplemented substantially in cases of widespread, severe outages by crews from outside those normally available to the utility) when it is of manageable scope. Measures of CAIDI generally exclude extreme events. Thus, longer outage durations do give reason to question the numbers of internal staff.

Vegetation management (outside the scope of our study) also can affect CAIDI. For example, spotty vegetation management can produce overgrown trees that take more time to clear in order to provide crews with the access needed to repair and replace the equipment needed to restore service). However, the exclusion of extreme events mitigates this effect. Moreover, the effect of vegetation management on CAIDI is less substantial than its effects on SAIFI after exclusion of such events.

CAIDI metrics in New York and elsewhere show great variance when reported with and without the inclusion of major storms. The next charts show these differences, using CECONY as an example. The charts show, for example, the great impact of Superstorm Sandy. Using CECONY as an example also shows the how network configuration affects outages. Complex underground systems exhibit much less frequent outages comparatively, but it takes comparatively much longer to restore customers when they occur.

Figure IX.1: Electric Quality of Service Metrics



C. Gas Quality Measures Selected

For gas operations, we selected the metrics of leak response times and leak backlogs. The gas companies have widely varying customer densities and territorial dispersions. They also differ in their approach to leak repairs. For gas operations, we therefore relied more on internal trends (*i.e.*, comparing the company's performance to itself year over year). We also compared each company's leak response time performance to that of the Reference Utility value. We used comparisons to the Reference Utility value to show how performance trends within a given operation compared with trends in the state overall (represented by the Reference Utility value).

D. Findings and Conclusions

For electric operations, we the available data allowed us to track CAIDI performance for the reporting "units" shown below.

CECONY	Avangrid-NYSEG	National Grid-NIMO
ORU	Avangrid-RG&E	Central Hudson

We did not use the Central Hudson data because its inability to provide reliable FTE data precluded meaningful comparison of its trends in staffing applied relative to its trends in measured quality service quality as reported to the Commission.

Three of these five operations showed steady or improving CAIDI performance. Therefore, we found no service quality basis for questioning their staffing. Two showed contemporaneous declines in CAIDI performance and O&M staffing. After examining future planned application of O&M FTEs, we concluded that management attention was required to examine the connection among: (a) trends in service quality through 2014, (b) reductions in applied O&M FTEs through 2013, and (c) forecasts of future applied O&M FTEs, in order to determine whether application of resources will be sufficient to promote service quality. A first inquiry in making that examination will be to determine how 2015 staffing and service quality changed.

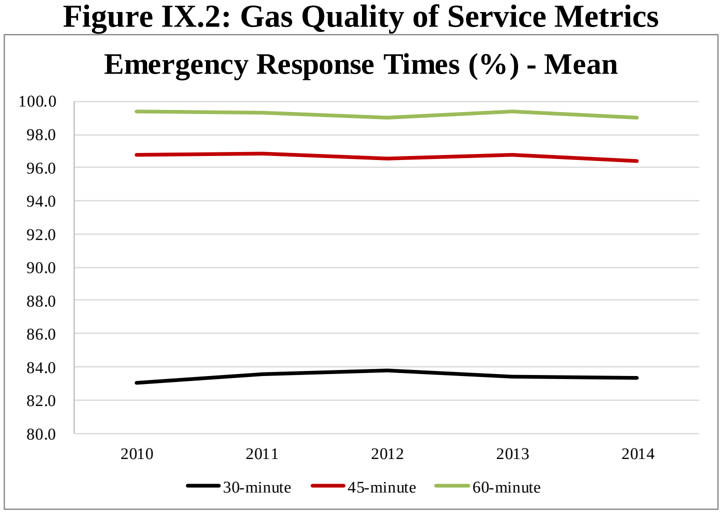
For gas operations, we were able to track performance for the reporting "units "shown below. We again excluded Central Hudson from our comparisons.

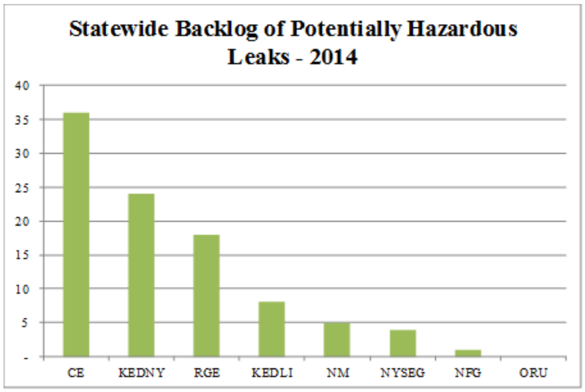
CECONY	Avangrid-NYSEG	National Grid-NIMO	National Grid-KEDNY	Central Hudson
ORU	Avangrid-RG&E	National Grid-KEDLI	NFG	

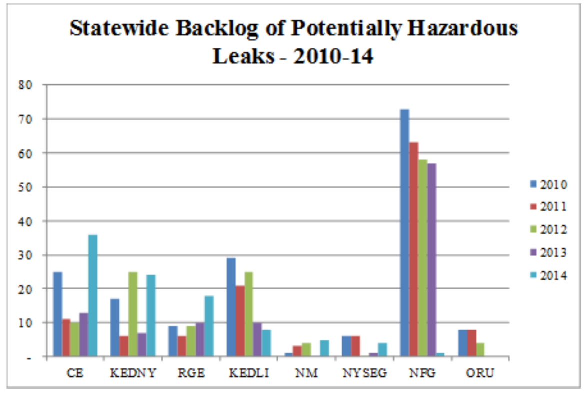
The data were more mixed for gas operations, with improvements and decline noted. In some cases, historical declines were followed with increases in forecasted applied FTEs. In other cases, the changes were small and would have raised no concerns in the absence of staffing drops. In others, 2014 data (the last year for which performance data was available) showed marked improvements (a positive sign), but in those cases, we nevertheless examined (as described in the individual utility reports) whether staffing forecasts gave confidence that such improvements would be sustainable. We made a number of observations in the gas operations chapters of the reports addressing each individual utility but they are difficult to characterize simply on a statewide basis.

Statewide performance (measured by the Reference Utility) in response times showed remarkably little change overall. The next chart shows the Reference Utility value. The two charts following show backlogs at the individual utility level.

Figure IX.2: Gas Quality of Service Metrics




Statewide Backlog of Potentially Hazardous Leaks - 2014
40
35
30
25
20
15
10
5
-
CE
KEDNY
RGE
KEDLI
NM
NYSEG
NFG
ORU


Statewide Backlog of Potentially Hazardous Leaks - 2010-14
80
70
60
50
40
30
20
10
-
CE
KEDNY
RGE
KEDLI
NM
NYSEG
NFG
ORU
2010
2011
2012
2013
2014

Chapter X: Productivity

A. Background

We examined a range of quantitative indicators of staffing as part of our study, focusing on the development of comparative measures. We included production and productivity among the areas where we sought useful indicators. Comparative analysis of productivity, generally through benchmarking studies, has been regularly attempted, but may be known as much for the methodological questions it has raised as for the confidence inspired by its results. "Apples to oranges" is the common refrain, particularly when unfavorable comparisons get placed before regulators.

We nevertheless found appeal in the fact that we began this study with the advantage of a contained population of utilities operating under a number of common parameters (although some varying to the extreme as well) and the presumed ability to generate a common set of data for each. On the whole, we considered it worth the effort to use those presumed advantages in hopes of defining and applying methods that would support the collection and use of comparable data on costs, production, and productivity.

We pursued this effort guided by a conceptual framework having three key pillars:

- **New York normalized unit rates (NYNURs or 9ers):** parameters describing cost, production, and productivity, all normalized to facilitate comparisons among the New York utilities.
- **Equivalent production units (EPUs):** a common measure of production that can be applied to dissimilar commodities and functions, individually or in combination.
- **The Reference Utility:** a <u>hypothetical</u> utility having characteristics common to the New York utility population; a composite, or average, or other meaningful aggregation of the utilities.

We had success in developing data and analytical techniques sufficient to validate these concepts and to establish their appropriateness for future applications. The balance of this chapter explains the derivation of the concepts, the resulting data and conclusions, and recommendations for future applications.

We ultimately had to conclude, however, that, with very limited exceptions, the utilities we studied were not collecting the data required to fully support a complete and meaningful analysis of production and productivity. Specifically, we learned that the hours and associated production units for many functions are not available. The analyses that follow are limited to those cases where such data did exist, which means that our results are representative, but only about 50 percent complete.

B. Labor Cost

For this effort, we used a composite hourly labor rate. We define that rate as the weighted (by hours) average of: (a) internal labor costs, including overtime, divided by total workhours, and (b) hourly contractor costs, as estimated by the utilities.

The unit labor costs we were able to establish varied wider than we initially expected. We attribute the large size of this variance primarily to differences in accounting, especially in the application of payroll adders. Variances in these adders often proved significant on: (a) a utility-to-utility basis, and (b) even within a given utility from year to year. It was not practicable to explore and account for such differences; therefore, we recognize that our productivity work provides indicators of where to look for potential productivity improvements, but not conclusive determinations of either success or weaknesses in productivity.

We completed our analysis and establishment of labor cost 9ers at a detailed level, and included both internal and contractor effective wage rates. We examined how the rates established varied among different functions and types of work. We did not ultimately find examination of those variances particularly informative, determining the patterns and values we observed at the summary level to be representative.

In general, we found contractor costs higher than internal costs, but not by a large amount. We did not, however, mark up the contractor wage rate to reflect the need for internal oversight. A fully robust comparison of internal wage rates to contractors would include a markup on the contractor rates for such internal overheads.

C. Production

1. Summary

In implementing our approach, we sought to develop a measure of production that was:

- Additive
  - Permitting adding different commodities and units together
  - Permitting summing of production units over different functions and organizations
- Comparable among the utilities
- Comparable over time, for example, on an annual basis

Measurement of production on an individual commodity scale is common. Totaling numbers of poles or meters or of conductor or main proves comparatively straightforward. More difficult is combining these commodities to produce a level of production that is comparable among companies at various levels of detail.

Utilities commonly use the “earned value” concept, especially on large construction projects, to pursue comparability. Earned value, expressed in hours, effectively weights each commodity by its budgeted unit rate. In other words, if the budgeted rate for installing each “widget” is 10 hours, then one “earns” ten hours for each widget actually installed.

The ratio of the hours earned to the hours actually expended provides a good measure of productivity versus budget. We need to move beyond this direct application of the concept however. We were not seeking to compare actual to budget hours. Rather, we were seeking to compare production and productivity across different companies. The notion of a budget unit rate therefore had no value. Instead, we needed to weight production units by <u>the actual unit rate for the Reference Utility</u>. This added feature provides a common measure that facilitates comparisons among all the utilities in the population. Instead of a budget unit rate as the measuring standard, we used the actual performance of the Reference Utility as the standard.

Illustration X.1: The 9ers Concept

The earned value concept	The 9ers concept
The Standard is: • budgeted unit rate • for the measured organization	**The Standard is:** • actual unit rate • for the reference utility

We measured units of production in terms of hours. For example, if the Reference Utility's unit rate is 20 hours per widget, then each utility would earn 20 hours for each widget installed. The ratio of hours earned to the hours actually expended by a utility would thus provide a measure of productivity (not versus budget) versus the Reference Utility value.

Converting all commodities to a common basis (hours), enabled us to combine disparate production quantities. Two-inch widgets expressed in hours can be added to ten-inch widgets expressed in hours. The total can equally well include feet of pipe or number of poles, provided they too are expressed in hours. The result of adding them together is total production quantities expressed in hours. As a result, we term the earned value calculated on this basis as an equivalent production unit, or EPU. This commonly denominated measure permits comparison of production among utilities on an equal footing, which is necessary to calculate "productivity." The number of EPUs a utility achieves and the dollars or hours it takes to achieve each EPU thus offer a basis for common measures of performance.

Illustration X.2: Equivalent Production Unit (EPU)

$$1\ \text{EPU} = \text{reference utility unit rate for the commodity} = UR_{C,RU}$$

$$\text{EPUs earned by a utility} = \sum (UR_{C,RU} \times Q_C)$$

where Q_C = quantity of the commodity produced by the measured utility

While potentially useful, the measure is by no means perfect. Reference Utility values reflect a composite, but equal neither good nor bad performance. Therefore, a utility's performance versus the Reference Utility cannot be superficially judged as good or bad, but only as above or below the Reference Utility value. We therefore focused on comparisons within a well-defined utility population - - not against an established absolute standard.

Our dependence on a defined population of utilities, would seem to rule out comparisons within a specific utility company. That consequence, however, was not necessarily the case. For example, for a utility organizationally broken into a number of divisions or regions, the 9ers concept would appear to become applicable, simply by replacing the Reference Utility with a "reference region." Collection of unit rates, without revealing company identities, as we have done, offers another alternative. The Reference Utility data could be distributed among the utilities for their use in internal analysis.

2. Deriving New York EPUs

In order to implement this concept, one requires the following data for all the utilities:

- Hours expended for each utility function
- The production quantities associated with those hours and functions

Unfortunately, we were able to obtain only perhaps half of this data from the utilities. In order to maximize the value of our data, we grouped certain functions to assure comparability, and deleted others where the available data did not support logical comparison. Because we were limited to the functions for which the companies could provide useable data, we could not offer results that are definitive or representative of performance across a broader range of activities. The resulting functional groupings for electric operations are limited to a subset of distribution as follows[3]:

- Overhead Construction - Renewals and Replacements (miles)
- Underground (each)
  - UG Constructions - Renewals and Replacements
  - URD Constructions - Renewals and Replacements
- Additions (each)
  - Overhead Constructions - New Customer Additions
  - URD Construction - New Business
  - Underground Construction - New Business
- Emergencies (each)
  - Overhead Emergency Response
  - URD Emergency Response
  - Underground Emergency Response.

These groups cover 44 percent of the hours and 49 percent of the costs within our study scope as they concerned electric distribution activities. We could not develop from the data that management was able to provide any usable functions for transmission/substations. Therefore, our analysis does not address any costs in that area.

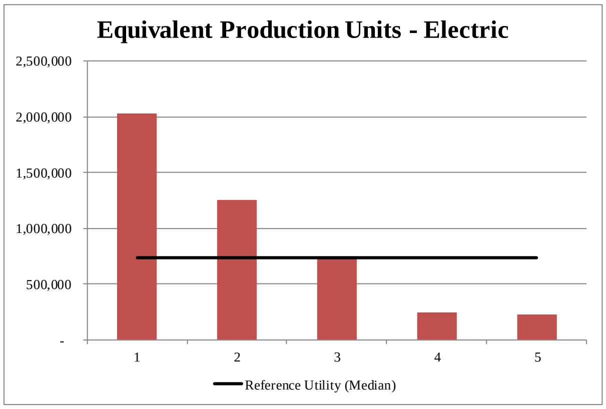
A similar approach was used in gas operations, with functional groupings as follows:

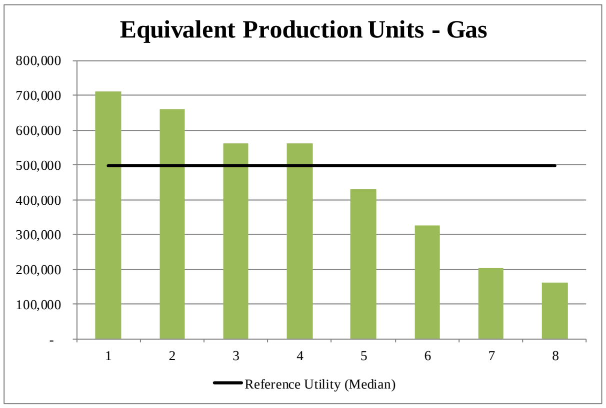
- Construction - Main Replacements
- Construction - New Customer Additions
- Services Renewals & Replacements
  - Leaking
  - Non-Leaking
- Construction - System Additions – Mains
- Leak Repairs
- Emergency Response.

These groups cover 56 percent of the hours and 60 percent of the costs in the gas activities within our study group. The charts illustrate the number of EPUs for each company for the groupings of functions noted above. The utilities have not been named here for reasons of confidentiality.

[3] The functions are as defined in the data requests provided to the utilities and included in the "super data base".

Chart X.3 Equivalent Production Units – Electric and Gas





The rank order of EPUs does not directly align with the relative sizes of the utilities, particularly so for gas operations. To facilitate such analyses, the above charts with the subject utility identified, but no others, are included in each of the utility reports.

The EPUs are a matter of import in and of themselves; however, their real value lies in their application to analyses of productivity and cost effectiveness.

D. Productivity

As in production, we present limited analysis and discussion here due to confidentiality. The report addressing each utility specifically contains more data and discussion. The discussion here, however, does tend to validate the 9ers concept, and introduce its potential future use as a meaningful comparative tool.

The EPUs permit an examination of utility productivity based on their hours per EPU. We term this measure "physical productivity." We can also examine costs per EPU, which we term cost productivity or cost effectiveness. We can analyze these two measures at a detailed functional level, or combine functions in various groupings or at a total bottom line. This chapter's discussion focuses on the last of those approaches. We can also examine physical productivity and cost effectiveness at an organizational level. This can prove particularly helpful for utilities with multiple regions, allowing comparisons among the workforce in different divisions.

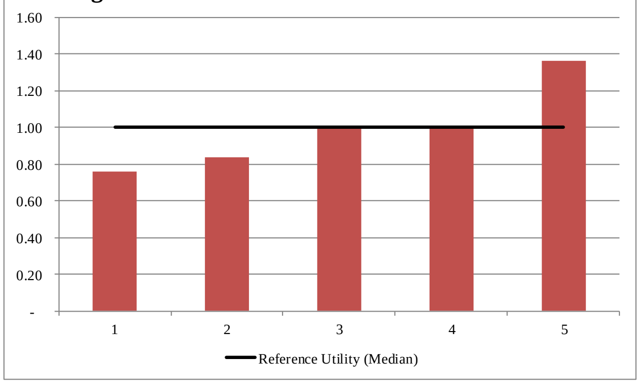
Illustration X.4: Physical Productivity

$$\text{Physical productivity (in hours)} = \frac{\Sigma H_C}{\text{EPUs}}, \quad \text{where } H_C = \text{the hours spent by the utility in each commodity}$$

1. Physical Productivity - Electric

Material variation of distribution productivity among the five electric operations we studied was expected, but the spread proved interesting. With some of the significant differences in characteristics, it would be unusual for the utilities to perform alike. On the other hand, the wide variation from top to bottom, amounting to about 60 percent, means that their varying productivity has material cost significance.

Figure X.5: Electric Distribution–Actual Hours/EPU



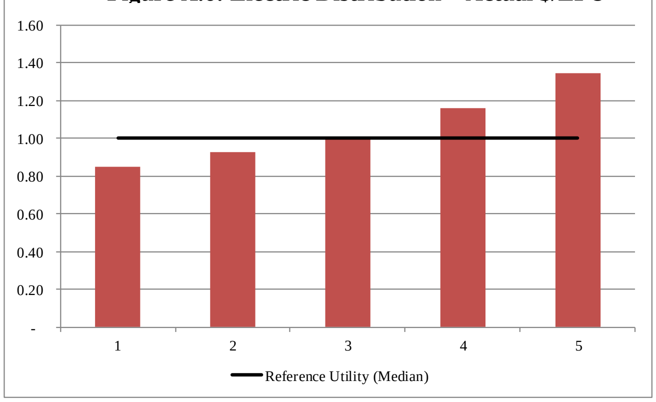
A value of 1.0, representing the productivity of the Reference Utility, is "typical" for the New York utilities. A utility with a 9er greater than 1.0 measures as less efficient and a utility with a 9er less than 1.0 measures as comparatively more efficient. The Reference Utility for each commodity always represents the average or median unit rate (generally depending on whether and to what degree outliers existed) for that commodity, thus having a value of 1.0, whether considering one commodity or all commodities aggregated. In order to consider multiple commodities, we must determine and calculate a new Reference Utility for each commodity.

Analysis needs to move past this first comparative measurement. One must consider the possibility that four or even five of the five utilities are highly efficient, even though some have a base value greater than 1.0. This is not out of the question given a small sample size. Similarly, most may be poor performers, but that cannot be determined here, as we are evaluating only *relative* performance among the five. The comparative results provide a reference point, but not a definitive answer. In any event, even if all or most have absolutely high efficiency, finding out the reasons why some remain more so can lead to improvement opportunities.

2. Cost Productivity – Electric

The general shape of the cost effectiveness chart is the same as the physical productivity chart; *i.e.*, the utilities occupy approximately the same positions. It is interesting to note that the utility with the best physical productivity had the highest wage rate. The result is a worsening of its position in cost effectiveness, but not by much.

Figure X.6: Electric Distribution – Actual $/EPU



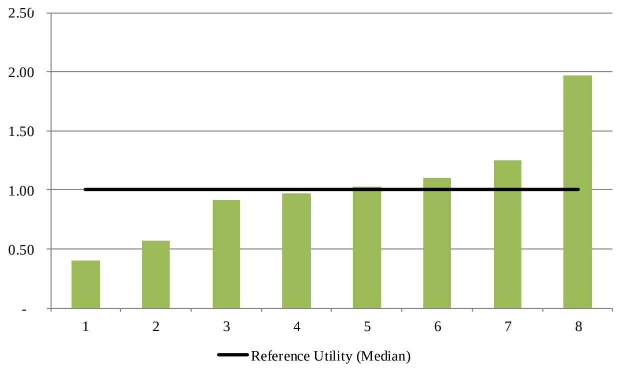
This demonstrates that, while hourly productivity continues to be a critical parameter, it does not tell the whole story. In fact, from a customer perspective, it is the cost parameter that drives rates, and argues for more attention to an indicator we have not seen used. In this regard, the EPU concept can be a real improvement to performance measurement.

The variability of cost effectiveness among the utilities is about the same as physical productivity. We are encouraged by this result; it suggests that the measures we are using pass a sanity check. In addition, well-defined variances should facilitate comparative analysis.

3. Physical Productivity – Gas

While the variability of electrical 9ers was significant, gas results are even more spread out, with three outliers, two on the low side and one high. The difference is a factor of more than four between the high and low calculated values for physical productivity. Such a disparity becomes hard to accept at face value. Nevertheless, it is the case that a review of the individual functions verifies that the hours and quantities reported by the utilities do vary widely. Further, there seems to be some rationale for the differences, including whether utilities are upstate or downstate and the density of their service areas. Whether that rationale justifies such a wide variance can be debated, but it is nonetheless clear that the utilities face different circumstances and widely different levels of production efficiency.

Figure X.7: Gas Distribution–Actual Hours/EPU

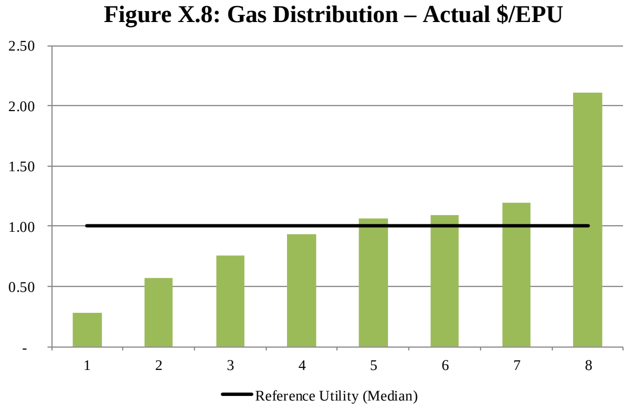


This observation points to the value of questioning productivity, given the role of main replacement programs as a driver of future staffing. Replacement of leak-prone pipe comprises a major statewide priority involving many billions of dollars over a sustained time period. More importantly, it engages a serious issue of public safety. No one should expect that all of the utilities can perform equally here; they face simply too many unique challenges. However, variations of the magnitude we observed point to the staffing challenges in the years ahead and, for other purposes show that continuing attention to work effectiveness and efficiency can have major consequence for customers. Given the billions of dollars in main replacement costs that will be borne by New York gas customers in the decades ahead, a focused statewide effort to assure optimum productivity at all the companies is in order.

4. Cost Productivity – Gas

The shape of cost distribution is very similar to the physical productivity distribution among the utilities. The major gap between the highs and lows remains. The rankings in physical productivity and cost effectiveness in gas are nearly identical; *i.e.*, each utility's rank for productivity is almost always the same as its rank for cost effectiveness.

Figure X.8: Gas Distribution – Actual $/EPU



The cost productivity data thus supports the observations drawn from the review of the physical productivity data, again suggesting that there may be merit in a focused, statewide review.

E. Conclusions

1. The lack of consistent collection and reporting of production quantities and associated hours limits the ability of utilities to understand their performance.

This conclusion, and its solution, is valid, whether one chooses 9ers or any other method for the measurement and management of productivity. The utilities were generally weak in their treatment of production data and its link to costs and hours. We therefore generally recommended in the individual company reports that the utilities establish improved internal systems and processes to: (a) define production quantities in all functions or groupings of functions, (b) collect that data routinely, and (c) collect the associated hours and costs. Staff may wish to consider the applicability of the 9ers concept to its monitoring and oversight of utility performance (see the next conclusion).

2. The 9ers concept, although not fully implementable in our study, nonetheless has (subject to resolution of data issues) validity as a tool for the comparative analysis of costs, production, and productivity within an organization or across multiple organizations.

The utilities should examine the 9ers concept for internal applications, including comparing production and efficiency among tasks, groups, and trends over time. Comparisons outside each company would not be possible now, but Staff may wish to consider requiring certain data, such as that collected in this study, and distributing the Reference Utility data to the utilities for their internal analyses.

3. Very large variances exist in physical productivity of the gas utilities, with main replacements as a key driver, pointing to the need for close, continuing examination of work efficiency and effectiveness, and their relationship to staffing needs.

We expected a divergence of productivity among the New York utilities, based on their varying characteristics, but the spread in gas productivity data was particularly noteworthy. Such a large disparity is unlikely to be fully explained by unique factors outside of the control of the utilities. These differences in efficiency are so wide that even small changes to the range could produce large savings for customers.

Chapter XI: Reforming the Energy Vision

A. Background

Reforming the Energy Vision (REV) represents a comprehensive and transformative initiative that aims to align New York's electric industry practices and regulatory model with technological advances in information management and power generation and distribution. REV began under Case 14-M-0101, Reforming the Energy Vision, Order issued February 26, 2015. The REV initiative proposes nothing less than the redesign of retail electric markets and regulatory practices accompanied by the modernization of the power grid to better meet the energy requirements and challenges of the 21st century. Ultimately, REV aims to drive an increasingly efficient, climate-friendly, reliable, resilient, and customer-oriented electricity industry. As dramatic as it is bold in its vision, it stands, along with a similar initiative in California, as unequalled - - and unprecedented - - in the US electric utility business for its potential to reshape the industry.

One key outcome of the REV transformation is the implementation of a new business model for the state's utilities. Distributed energy resources, such as end-use energy efficiency, distributed storage, and distributed generation, will be integrated into the planning and operation of a modernized grid. Customers will be encouraged and empowered to optimize their priorities with respect to reliability, cost, and sustainability, while providing, and being compensated for, producing system benefits.

The REV proceeding has progressed along two tracks:

- Track 1 – Examine, among other items, the role of distribution utilities in enabling the achievement of REV goals, the provision of a robust market for customers and service providers, market issues, and whether incumbent electric utilities should serve as the Distribution System Provider (DSP).
- Track 2 – Address regulatory and ratemaking issues necessary to implement REV.

Under the REV vision, end-use customers and DER service providers become active market participants, and sell products and services, such as base load modification, peak load modifications and non-bulk ancillary services, directly to the DSP. Likewise, the DSP will need to provide or sell a set of products and services to customers and service providers. Offerings might include interconnection services, pricing and billing services, metering information services and data sharing, and DER maintenance, operation, and financing. The DSP will need to administer procurement processes with competitive solicitations for the products that it buys in the marketplace. The redesigned retail markets envisioned under REV will also need to interact seamlessly with and complement wholesale electricity market operations, as well as other federal, regional and state energy programs.

Multiple parties raised numerous concerns regarding the assignment of the incumbent utilities as the DSP. Many parties believe, and Department of Public Service (DPS) Staff acknowledged that an independent DSP design could facilitate statewide uniformity, reduce market power concerns and increase the rapidity of innovation. Nevertheless, the Commission concluded that the DSP's core functions would be highly integrated with utility planning and system operations. Assigning them to an independent party would be redundant, inefficient and unnecessarily costly. Thus, incumbent utilities, as opposed to third parties, have been designated as the DSPs, and are required to develop Distribution System Implementation Plans (DSIPs).

A set of functions must be provided at the distribution level to enable reliable electricity service and to animate retail markets under the REV vision. These functions include: (a) market operations, (b) grid operations, and (c) integrated system planning with modifications to enable the DSP market development.

In the April 20, 2016 *Order Adopting Distributed System Implementation Plan Guidance*, the Commission required utilities make three filings in 2016:

> *"(1) a plan and associated timeline for a stakeholder engagement process during DSIP filing development (due May 5, 2016); (2) an individual utility Initial DSIP addressing its own system and identifying immediate changes that can be made to effectuate state energy goals and objectives (due June 30, 2016); and, (3) a joint — and as necessary, individual — Supplemental DSIPs by all utilities addressing the tools, processes, and protocols that will be developed jointly or under shared standards to plan and operate a modern grid capable of dynamically managing distribution resources and supporting retail markets (due November 1, 2016)."*

The Initial DSIP plan (item 2 above) should result from a self-assessment, in which the utility assesses its systems, and identifies where it can make immediate changes that align with and support REV policies and objectives. The Supplemental DSIP (item 3 above) focuses on furthering the Initial DSIPs by identifying the tools, processes, and procedures necessary to implement REV mandates fully.

In the May 2016 *Order Adopting a Ratemaking and Utility Revenue Model Policy Framework*, the Commission approved structural reforms to electric utility regulations designed to better align utility shareholder interests with consumer interests. The Commission established new opportunities for utilities to earn profit through a combination of outcome-based performance incentives and revenues earned directly from facilitating consumer driven markets. These new financial mechanisms substantially augment the traditional cost-of-service model by bringing objectives such as system efficiency and facilitating the rapid innovation occurring in the electric sector, into the core business of utilities. The Order identified specific near term utility earnings opportunities from improving system efficiency, achieving energy efficiency goals that are beyond current targets, earning a high level of satisfaction from renewable power developers seeking to interconnect with utility systems, and enhancing customer participation in specific innovative programs.

Clearly, the state's electric utilities are in the midst of process changes that will significantly transform the industry in New York. The process is lengthy, complex, and comprehensive. It is in that context that we conducted our study, and it is in that context that we examined each utility's approach to addressing how the companies have, or are planning to, address REV's impacts on utility staff levels, skills, and capabilities. We conducted fieldwork in other areas of the audit earlier; however, the companies provided updates addressing their REV initiatives in May of 2016. Our study included a thorough and comprehensive examination of certain (not all) utility staff functions. For example, metering, customer service, and corporate functions were not part of our work.

The state's utilities have identified a number of areas that raise potential new or increased staffing needs, including:

- Program management and leadership
- Data analytics
- Business development
- Technology specialists (*e.g.*, AMI, data exchange, cyber security)
- Instrumentation, controls, and communication
- Grid Operation
- Customer service.

In addition, cultural changes at utilities must occur to achieve the goals of the REV initiative, including fostering identification of new utility revenue opportunities and facilitating alignment of utility goals with those of third parties and DER developers.

B. New York Utilities REV-Related Planning

1. Evaluation Criteria

We sought to answer the following questions in examining each utility's REV related activities and plans.

1. Have organizational changes been made to respond to the REV initiative and are they adequate for the current stage of REV?
2. Have studies or assessments been completed by the utilities to determine expected REV staffing requirements?
3. If completed, are there any significant, actionable results?
4. Does REV thinking and planning on staffing permeate the organization?
5. Have REV related training needs been identified, planned, or begun?

2. Findings

a. CECONY and Orange & Rockland

CECONY, at the time we conducted field work, had taken the lead in responding to REV. Orange & Rockland is following its lead, leveraging the resources that CECONY has brought to this effort. Organizationally, CECONY initiated changes in the fall of 2013, when it created the Utility of the Future group. Management has also made subsequent, additional organizational changes. In July 2015 CECONY created a Distributed Resource Integration (DRI) organization, headed by a Vice President. The group, whose responsibilities include REV issues, had over 100 employees in 2016. O&R has similarly established a new director position to lead a group dedicated to the REV proceeding, aligning its efforts with CECONY's.

Notwithstanding the significant organizational changes at CECONY and the changes at ORU, management has indicated that it is too early to quantify the impacts of REV on the core functions that our study addresses. CECONY management did note, however, that it anticipates the possibility that it may need different skills in the period extending from 5 to 10 years out from today. What those skills will comprise has not yet been identified, however.

We generally inquired about what drivers of change, including REV, might affect the maintenance, augmentation, or reduction of anticipated staffing levels in either electric or gas operations in the next five years. The response was that possible changes that might affect the need for new employee capabilities or resource levels were in a number of areas, including but not limited to:

- Data Analytics: management and analysis of increasing amounts of customer data
- Business Development: implementation of new business models and management of relationships with new third party vendors and developers.
- Technology: Advanced Metering Infrastructure (AMI), data exchange, cyber security, controls and communications, for example.

In terms of scenarios or studies analyzing the impacts of REV, CECONY stated that it had not, as of March 2015, undertaken planning efforts, analyses or other documents addressing REV implications. on staffing requirements. Its May 2016 supplemental response did not provide additional information. Management did not identify potential specific training requirements that might be necessitated as an outgrowth of REV implementation, except to the extent reflected in the earlier notification of the areas where new or enhanced skill sets might prove needed.

In summary, CECONY and ORU have placed an organizational focus on REV, but have yet to translate that focus into clear assessments of staffing changes that may be required. The ability of the two companies to identify and meet staffing needs for planning, maintaining, operating, and expanding both their gas and electric networks does not yet extend to REV. CECONY has created a group (to which ORU has and uses access) it calls the Utility of the Future to monitor, participate, and plan for impacts of REV and REV-like changes, but it has stated that it is too early to identify any staffing impacts associated with these changes. This is understandable. However, neither Company has produced studies, analyses or reports regarding REV staffing needs. The impact of REV could be significant. Scenario analyses, or similar studies of the impact of REV and REV-like changes on utility staffing needs ought to be conducted on a regular basis. These efforts need to focus on needed skills.

b. <u>NYSEG and RG&E (Avangrid)</u>

The Companies' response to REV, in particular the development of the DSIP, falls under its Business Effectiveness leadership, supported by affected functional areas. Management considers many aspects of the REV vision, citing electric grid operations particularly, already considered in forming existing strategy and staffing plans. Consequently, NYSEG and RG&E do not expect changes to staffing plans in such areas to accommodate REV. Management anticipates material, but not substantial REV-induced resource impacts over the next several years. For example, although REV will require increased automation of the distribution system to accommodate greater penetration of distributed energy resources, management notes that such automation, although not at the pace envisioned by REV, was already incorporated into the strategy and staffing plans of Avangrid's New York companies.

Management considers the areas of customer service, system planning, and system engineering the business most likely to see the earliest impacts of REV on work activities and functions. None of these areas were part of our study. The two functional areas with the most likely early impacts will be in the Interconnections and Demand Response areas, driven by an increasing number of requests to connect to the system and the need to assess the impacts of customer or developer proposed distributed energy solutions. Management also observed the potential for work by substation and distribution operations field personnel to support more sophisticated technologies, which would require technical and operational training.

NYSEG and RG&E indicated that they would prepare concrete plans, in this case a REV Readiness Plan, targeted for delivery by late 2015. The Plan was intended to provide a rolling five-year roadmap of readiness plans for impacts on people, processes and technologies. However, management stated in March 2016 that it would adjust the date for Readiness Plan completion, reflecting Commission direction and other REV related proceedings. No plan therefore existed at the writing of this report. The Companies did, however, provide a document titled "Utility of the Future Reforming the Energy Vision Impact on Utility Operations, November 2014," as part of a data request. While not specifying or indicating the degree to which internal staffing will be affected, this document did identify operational impact areas. The document was impressive in scope and, albeit lacking in detail regarding specific staff impacts, represented a thoughtful consideration at this early stage of REV and its potential impact areas. Liberty notes that management considered this document to be confidential.

Almost alone among the operations we studied, NYSEG and RG&E made available early studies and analyses of the potential staffing impacts of REV. Such studies were, at this stage, not probative, and NYSEG and RG&E do not anticipate significant skill or resource gaps in the next five years, management clearly showed focused understanding of some of the potential impacts.

In summary, management's understanding of detailed staffing needs for base business requirements did not yet extend to REV. There existed, however, an appreciation of the impact that such future changes may have on staffing structure, locations, and numbers.

Management acknowledged that it did not foresee substantial near-term (*i.e.*, over the next five years) internal staff impacts at its New York operations from the implementation of REV. However, management, unlike most other NY state utilities, has prepared a detailed, thoughtful study on the potential general (*i.e.*, not staffing specific) implications of REV on its business.

c. <u>Niagara Mohawk</u>

Management indicated that the impacts of REV on its processes and work plans had not yet been determined, but considered significant impacts possible. It did not identify any internal staff impacts in the forecast period 2015 – 2019. However, management did note that it anticipated that the electric distribution system will become more complex, and will require new engineering and analytical skills, including those in power systems and instrumentation and control. In addition, management noted that field operations line mechanics would need to be augmented by field technicians to install and maintain the advanced systems and controls likely to be deployed due to REV implementation. Management also indicated the need for enhanced skill sets in cyber security and IT, among other areas. Management later noted that it had made internal organizational changes to prepare for effects of REV. They included enhanced analytical capabilities, a New Energy Solutions function, and a new distribution and control & integration team.

With respect to its efforts to identify staffing changes associated with market and policy changes, management identified a December 2014 analysis it termed the "Strategic Workforce Planning Project" (SWPP). Management intended this analysis to be an enterprise wide assessment of the resources that the Company anticipated it will need to effectively execute its long-term plans. The goal of the study was to identify FTE gaps in both supply and demand over a 10-year period, related to Network Strategy and Operations. This confidential study included potential impacts from REV along with impacts from other initiatives. The Company described design of the work as focusing on strategic direction, rather than resource levels. However, among New York state utilities, the SWPP presentation was the most comprehensive and thoughtful analysis regarding potential policy impacts (and long term strategic plans) provided to us. Subsequently, the Company noted that it had applied the same analytical framework to a confidential FERC jurisdiction study, which, although outside the staffing audit scope, showed continued focus on future resource impacts.

In summary, National Grid's efforts to address matters like REV and DER integration, while remaining largely conceptual, show greater attention than was generally true for the rest of the operations we studied. Management considered it too early to identify staffing impacts associated with REV or REV-like regulatory or market changes but it showed that it was actively involved in the ongoing REV proceedings and demonstrated a thoughtful and comprehensive approach to evaluating long term staff impacts from REV and other market changes

d. Central Hudson

Management cited an inability to predict outcomes of the REV proceeding, or how it might affect work activities or staffing levels, skills, and experience required. Management believed that the areas most likely to be affected include distribution engineering, system planning, program administration, information technology, and distribution system operations. While noting that the Company had actively participated in the REV proceeding, management did not identify organizational changes, training requirements or process changes that it was considering in the near term due to REV. It did not identify or provide studies, analyses or scenarios that it had completed regarding REV, citing such planning activities as speculative. Management did note the existence of programs, including REV demonstration projects, for which it had begun to add resources in the areas noted above. Management has reported the creation of an executive steering committee that addresses REV-related skills, and that it has "begun to add" some skills outside the scope of our study.

Management's belief that there existed no substantial likelihood of REV affecting work activities, skills and experience levels, or the number of resources required to construct, maintain and operate its infrastructure, is consistent with the lack of significant internal, analytical efforts, and stands in contrast to other NY state electric utilities. It may well be that, given Central Hudson's comparatively small size, it anticipated accommodating REV needs through part time assignments to existing resources. Even so, however, part-time roles will need to be performed by those possessing required skills and experience. Therefore, scenario planning remains important for management to address.

e. National Fuel Gas

NFG did not anticipate that the REV Proceeding will lead to significant impacts on its staffing levels, given the focus of proceeding's content on electric utilities. NFG further noted that departments that were represented in its completion of Liberty's data templates were not responsible for the market or policy changes in question. For example, NFG had integrated its energy efficiency program, inaugurated in 2008 via the Conservation Incentive Program, into normal utility operations and the departments responsible for administering the program, *e.g.*, Energy Services, Consumer Business, Rates and Regulatory Affairs, were not represented in Liberty's review. NFG also considered it speculative to opine on what impact REV might have on the skills or experience required to further support its energy efficiency program. NFG's position was not an unreasonable one given its profile and under the circumstances of an uncertain REV outcome(s).

NFG did indicate, though, that certain current initiatives could impact staff levels in the medium term, specifically the Collaborative Gas Expansion Plan (GEP).

In summary, management did not believe that REV, which it views as having a much stronger electric utility focus, or other potential market structure or business model changes, will have a substantive effect on its internal staffing requirements. This position appears appropriate to NFG's situation at the time of our study.

C. Conclusions

1. None of the companies has made REV-related changes to operations staffing in the areas we have examined; CECONY and ORU are the only companies to have made significant organizational changes to address the potential implications of REV.

Management at all of the companies reported that it was too early to gauge and plan for substantive REV-related staffing changes in the horizon covered by our study period (2009-2019). None has therefore made such changes. CECONY, however, has created a very large Distributed Resource Integration group under executive leadership. ORU has access to and has placed reliance on CECONY's efforts and organization.

All, with the exception of Central Hudson and NFG, however, appear to have dedicated enough time to examine REV and other major sources of industry structural or technological change in a reasonably focused manner. Central Hudson, without citing an analytical foundation, appears to have excluded REV as a source of significant staffing changes, and NFG took the position that its consequences will not be significant for gas utilities.

2. Some studies of REV's impacts have been performed, but none have addressed staffing implications.

National Grid and Avangrid have undertaken studies that provide their operations a basis for qualitatively, and in a nascent way, quantitatively, assessing areas of potential resource needs. CECONY/ORU efforts appear to give them a sense of at least the general types of resources that could be required. None of the state's utilities, however, has identified specific areas or work activities whose staffing requirements will be affected by REV or other "game changing" initiatives or possibilities through the 2019 end of our study period.

3. CECONY/ORU were alone in making planning for REV and similar possibilities an organizational focus.

CECONY has created a sizably staffed organization whose responsibilities include consideration of REV and related matters. National Grid and Avangrid have undertaken notable studies of looming industry changes, like REV for example, but have not made such issues a material, dedicated organizational focus.

4. None of the operations we have examined has identified or initiated any training or development needs associated with REV or similar initiatives or potentials.

With none of the operations having yet identified clear needs for staffing changes, none has a basis for doing so.

D. Recommendations

1. All of the operations we studied (save NFG) should undertake scenario studies of the impact of REV and other similar type changes, to better prepare for multiple possible eventualities.

Scenarios might include aggressive or slow implementation of REV, acceleration of technological and/or market changes, accelerated customer participation, or many other outcomes. The key element is to formalize the conduct of such studies to be better prepared to address potentially very different futures.

Chapter XII: Workforce Management and Performance Measurement

A. Defining Characteristics

1. Objectives and Benefits

f. Workforce Management

From an approach just getting started in the 1980s and 1990s, workforce management ("WFM") has become an increasingly important tool in optimizing the efficiency and effectiveness of human resources in the utility industry and elsewhere. Current conceptions of WFM at large enterprises contemplate a broad range of systems, processes, and activities that seek to optimize work effectiveness and efficiency. Automation and integration have become increasingly more sophisticated and prevalent at such entities. Even smaller companies without a scale of operations sufficient to justify the very large expenses of the more sophisticated approaches and systems nevertheless need to address the central elements of workforce management, in order to optimize the resources they use to build and maintain infrastructure.

WFM encompasses efforts to manage performance, forecast and schedule work and resources, budget labor, quantitatively analyze the time and the schedule of work activities, and track the workforce. The more sophisticated elements of modern workforce management systems provide for an integrated, automated means of addressing key Human Resources ("HR") elements driven by or related to work performance. They include time reporting, payroll and benefits calculation, and HR administration. These advanced applications of WFM also provide a foundation for identifying and tracking acquisition of acquiring needed skills, and developing existing resources through training, development, and succession planning.

g. Performance Measurement

Managing operations efficiently and effectively requires those responsible for planning and managing resources to have a command of the following questions, as they affect both the immediate and the longer terms:

- Do we have the right numbers of staff?
- Do we have the right mix of staff (employee straight time, overtime, and contractors?
- Do the employees have the proper skill sets to accomplish the tasks to which they are assigned?

Managers thus need to define and regularly use means for measuring outputs (work units accomplished) relative to resource inputs (productivity, or efficiency). Measuring production requires first that the utility define applicable units at a suitable level of detail. Examples of units of production might include:

- Installation of a 30-foot pole (capital)
- Installation of a foot of six-inch diameter plastic gas main (capital)
- Routine testing and servicing of a circuit breaker (maintenance)
- Routine inspection and servicing of a valve (maintenance)
- Work to address a customer outage (repair)
- Fixing of a gas leak (repair).

Defining, collecting, compiling, and reporting, sorted by appropriately structured, detailed, and comprehensively-defined production units, provide a data-driven representation of production work the utility has accomplished (or plans to accomplish) in a given period of time (daily, weekly, monthly, annually).

The next step in effective performance management requires an analytical and comprehensive approach to measuring productivity; *i.e.*, how much labor it takes to accomplish one unit of production, how much it costs, and what sorts of support (*e.g.,* hand-helds for field crews) are or can be made available. Using an example from above, quantitative productivity measurement might include the cost of installing a 30-foot pole, the number of person hours it takes to install the pole, or the differential pole installation productivity *e.g.*, hours per pole installed) with and without overtime or by contractors versus internal resources. In short, productivity directly measures the relationship of outputs (production) to inputs (cost and labor hours) across the range of staffing alternatives for accomplishing those outputs.

The following three hypothetical examples typify the range of experience among utilities in using performance measurement as a staffing driver. In each case, assume that all three maintain the required plant records, financial statements and staffing records to operate the business and meet the minimum operational, safety and reliability, and financial requirements of the regulatory commission and other regulatory bodies:

- ***Utility A*** -- An annual budget process looks at the past year's work load, staffing and expenditures, and trends them with data from earlier years, in order to identify any meaningful trends. Management then applies judgment to the results, and develops resource projections for the next year's budget and for following year forecasts.
- ***Utility B*** -- During its annual budget process, this company calculates annual average productivity for a range of defined, specific tasks (*e.g.*, hours to install a pole). It then uses those averages, along with the application of judgment, and considering any known, significant changes, to budget and forecast resources.
- ***Utility C*** -- On a month (or other regular, periodic basis), this utility collects production data, labor data, and cost data for all major work activities. Management uses that data to develop regular, periodic reports showing production, labor productivity, and cost productivity for the major work activities. These reports form a source of regular analysis and adjustment. When developing resource budgets and forecasts, this utility includes trends in productivity, and applies projected unit rates to projected work load to develop overall workloads and associated staffing requirements.

Clearly, Utility A, an applier of the most common approach historically used, has the least sophisticated and precise processes for managing its resources. Utility C works at the other end of the range, reflecting current thinking about planning and managing staffing. Utility C has a much stronger foundation for optimizing overall staffing, including its mix of in-house labor, overtime, and contractor use.

The size, scope, and complexity of a utility's operations have much influence on where it likely falls among this range of alternatives. Larger and more geographically dispersed utilities tend to be more likely to find investment in developing and sustaining comprehensive performance measures justifiable (that is, producing benefits that exceed their costs). Increasing remoteness from field work in larger or more dispersed companies, makes these types of measures more valuable in analyzing staffing needs. Operations, cost, and other managers in some companies work much closer physically and organizationally to field work. That closeness does not necessarily compel the "Utility A" approach, but does make the adverse effects of that approach more significant as size, scope, and complexity grow.

2. Connection to Staffing Adequacy

a. <u>Workforce Management</u>

Work Management Systems ("WMS") often form a central element of a comprehensive workforce management program. Optimizing resource levels and activities depends substantially on the ability to plan effectively and efficiently for and dispatch field personnel who have appropriate vehicles, equipment, and stock. Software-supported methods exist to assist to forecast expected work levels at detailed levels, identify the numbers and types of workers needed to perform the work, automate scheduling by using established work activities and requirements, optimize dispatch on a zonal basis, and provide mobile technology that permits real time communications to and from the field.

Workforce management has been described as getting the right employees possessing the right skills to the right job at the right time. Used effectively, workforce management uses a demand-driven approach, which seeks to optimize resource planning and scheduling on the basis of a dynamic consideration of work activity structure and definition, what types and numbers of resources can most effectively sequence and perform them, and discrete performance objectives and results expectations.

A structured workforce management approach seeks to:

- Create analytically derived forecasts of work requirements and the resources required to perform them
- Establish data-driven work schedules
- Manage work activity times and the accounts that measure them closely
- Continually monitor and analyze work activity definitions and actual work requirements
- Use results to maintain a sound, thorough understanding of current resources and future needs relative to near-term work types and levels, as well as expected and potential future needs.

Utilities have historically managed (and many still do) workforce with spreadsheets and time recording. Transitioning to software-based solutions can help control non-productive and premium time, and improve customer service metrics, by enabling planners to conform staffing better to work requirements in developing schedules that more fully consider and combine forecasted requirements.

Scheduling comprises a key aspect of workforce management. It can establish likely demand (required work) through use of historical data, making adjustments for factors such as trending unit rates or changes in work methods, or distribution of work by types. Software-based approaches then can generate expected resource requirements, after appropriate adjustments to historical data and expected future requirements. Fully informed planning approaches consider present and expected resource requirements, peak load conditions, availability of needed resources, budgets, and even labor contracts and legal requirements. Integrating time reporting and measurement of actual work times with scheduling supports generating accurate forecasts of resource requirements. Automated systems also provide a source of real-time support for addressing how to respond quickly and effectively to unexpected shortages or overages in resources.

Effective workforce management begins with a clear and comprehensive definition of required work activities, derived from identification of optimal methods for performing tasks safely and efficiently. Applying demand-based forecasts to this foundation generates schedules and task assignments. Using carefully identified metrics, sound management then measures performance, with feedback provided. That feedback informs the work activity definition process, and allows for a dynamic approach to optimizing resources in the immediate and longer terms.

Workforce management has implications beyond its role in optimizing staffing, as the preceding discussion illustrates. Liberty examined in this study the staffing optimizing implications of workforce management. Our focus lay on how the electric and gas operations covered by this study use workforce management processes, methods, systems, and tools to optimize staffing resources through the identification, scheduling, monitoring, reporting, and management of the infrastructure-related capital and maintenance activities this study addresses. Applying a set of workforce management processes appropriate for the scale and scope of the operation involved, supported by proper training and tools, operates as a strong contributor to ensuring staffing adequate to meet capital and maintenance needs.

The workforce management practices on which we focused principally involve those used once the utility has established its list of approved capital projects and maintenance plans. Those practices include:

- Scheduling work on a long-term (multi-year) basis, at the milestone schedule level (*e.g.*, when design must start, when procurement has to occur, when construction has to begin and end).
- Planning, assigning, and scheduling work short-term (weekly or monthly) to ensure timely and efficient accomplishment by sufficient resources with skills that correspond to the activity sequences required.
- Monitoring and reporting on work progress, including productivity, schedule, and budget.
- Applying the feedback loops and processes necessary to understand and promptly respond to deviations in these key measures.
- Ensuring that all data related to the work (*e.g.*, person-hours, expenditures, and contract costs) is collected for each project or program.
- Having the processes to document the completion of work, including any and all quality checks and final cost collection.

Liberty considered how the size, scope, and nature of operations might affect each company’s approach to workforce management. These factors tend to cause the approach and tools that a utility uses to vary. As the size and complexity of capital and maintenance budgets increase, the more cost-effective it becomes to institute and to integrate software systems to support workforce management. The most effective workforce management systems for larger operations tie to payroll, accounting, budgeting, Human Resource and other corporate systems. However, utilities with small budgets, simple, flat management structures, and sound budgeting policies can and do manage effectively with largely manual systems. The processes and goals of workforce management apply to all the New York electric and gas operations we studied; what one can expect to vary is the sophistication, automation, and integration of the tools used to carry them out.

Whatever the systems and tools used, it is also important that the operation provide clear and actionable documentation and training to support their use in a consistent, comprehensive manner. Optimizing engineering, design, support, and the sizing and balancing of labor staffing all benefit from effective, well-understood, effectively applied work management approaches, processes, systems, and tools. Effective workforce management processes enhance the ability to identify short- and long-term staffing needs, ensure resource availability, understand funding requirements, and measure progress real-time, so that adjustments to staffing can occur as the operation continues to measure actual performance against expectations.

b. Performance Measurement

We sought to identify work-related performance measures and performance measurement data used to plan staffing measurement and to measure effectiveness of resources applied. We sought to determine what data those responsible for electric and natural gas operations collect, at what levels in the organization, and at what level of detail. We then examined what reporting and analyses enable the use of such data in making staffing decisions, and optimizing staffing levels and balances among resource types. The types of metrics we sought to identify included:

- Productivity
- Overtime
- Staffing levels
- Contractor-related performance measures
- Other measures the utilities consider work-related
- Cost and hourly per unit measures.

Examples of the cost and hourly per unit measures we expected to see on the electric side included:

- Cost or hours to install a new residential service
- Productivity measures (actual hours to estimated hours)
- Trouble (*e.g.*, outage) response time
- O&M costs per customer
- Overtime percentage.

Examples of the cost and hourly per unit measures we expected to see on the gas side included:

- Cost per unit of pipe - new additions installed, by pipe size
- Hours per unit of pipe - new additions installed, by pipe size
- Cost per unit of replacement pipe installed, by pipe size
- Hours per unit of replacement pipe installed, by pipe size
- Cost per leak repair
- Hours per leak repair
- Cost per emergency response callout

- Hours per emergency response callout.

B. Evaluation Criteria

We formed our conclusions on the basis of examining performance against clearly established and delineated criteria, which we determined to reflect the relationship between workforce management and staffing adequacy and optimization. These criteria are:

Workforce Management/Performance Measurement Criterion 1: The systems and tools used to support workforce management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.

Workforce management processes should generally be the same across all utilities, but the tools used to support these processes depend on the individual circumstances of each utility. The larger and more complex the capital and maintenance programs, the more important integrated workforce management systems, such as SAP, Oracle, or Maximo, become. Small utilities with simple management structures, small budgets and relatively few projects generally cannot justify the costs of these more expensive systems, given the small scope of work that they will help manage.

Workforce management should extend beyond capital projects to maintenance programs, in order to provide for a sufficiently encompassing program for forecasting, planning, and assignment of internal and contract resources. Often, especially in trade labor, employees perform both types of work.

Workforce Management/Performance Measurement Criterion 2: Comprehensive, adequate documentation of the work management processes, systems, and tools should exist, and be supported by appropriate training.

Documentation should describe clearly what the operation does, how, and in what sequence. The groups responsible for each activity should be clear and those responsibilities should be well-defined. How workforce management processes related to each other should also be clear. Even the most advanced tools require significant knowledge and experience to use effectively. The materials should be complete, current and understandable. Training can come in a formal classroom environment, through computer-based e-learning, or by on-the-job interaction and mentoring from subject matter experts.

Workforce Management/Performance Measurement Criterion 3: Management should have and regularly employ well-defined processes for the short-and long-term planning and scheduling of capital and O&M work.

Optimizing resources requires a comprehensive picture of not just how they will be applied, but when. Effective scheduling is necessary to provide a framework for effective resource planning. Effective means of schedule management must also exist in order to allow for balancing and redirection of resources in the most efficient means possible, when inevitable barriers arise to completing work as planned. Good scheduling not only ensures a sufficient number of staffing resources, but also keeps the need for unanticipated, inefficient resource-supplementation needs at reasonable levels.

Workforce Management/Performance Measurement Criterion 4: Management should apply an appropriate approach, resources, and methods to program and project management.

This approach and structure should exist for key projects and programs. A utility should use project managers for major capital projects or programs. They should have training and experience appropriate to their duties as project managers. Certification by recognized organizations (*e.g.*, the Project Management Institute) offers one method for providing a sound baseline of knowledge and understanding. Management should use clear criteria for determining which projects or programs to place under project managers. The degree to which the operation combines project management duties with others (*i.e.*, uses part time project managers) is also a factor.

Effective program and project management depend upon sound means for measuring cost, schedule, and quality progress, for identifying variances, and for identifying and implementing effective responsive actions. Data, analysis, and reports should keep management informed enough to assess efficiency and effectiveness and of the need for resource rebalancing. Workforce management therefore needs to include regular and timely reviews of productivity, cost, and schedule progress for capital and maintenance work. The more frequent these reviews, the better informed management stays about progress and potential "red flags." These reviews should inform the resource planning process in a way and at times that permit decisions to be made promptly about the sufficiency of resources to accomplish planned work and about the match between budgets and plans and the assumed work inputs that support them.

Workforce Management/Performance Measurement Criterion 5: Systems and tools should capture and enable the analysis of data respecting all types of staffing resources.

There exist approaches, guidelines, policies, and in some cases firm rules about overtime amounts for internal staff and about the nature and amount of contractors to use. They may be specific to certain crafts, to addressing peak work periods, or to ensuring the availability of contract labor for system storm and other emergencies. Workforce management information and activities should support the formulation and continuing assessment of the effectiveness and efficiency of sources of guidance for overtime and contractor use. There also needs to be regular comprehensive reporting and assessment using clear metrics, in order to support adjustments intended to enhance resource optimization.

Workforce Management/Performance Measurement Criterion 6: There should exist an appropriate approach to and organization for Quality Assurance and Control.

The role of Quality Assurance and Quality Control (QA/QC) programs, both during project or program progress and at conclusion comprises an important step to ensure that work performed under established structures and sequences meets design specifications, and will operate safely and reliably. Ideally, a QA/QC process should form part of the engineering/design function as well. For gas utilities, both state and federal regulations require inspection and documentation regarding pipeline work. Making quality assurance an integral part of workforce management recognizes that resource optimization needs to consider that the consequences directly relevant (*e.g.*, rework) to staffing optimization and those indirectly relevant (*e.g.*, emergency call-outs for failures during operation) get due consideration.

Workforce Management/Performance Measurement Criterion 7: Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness in resource use and balancing.

Management should monitor and measure levels of work performed in relation to resource inputs required to perform that work. Those measures should be routinely applied (with adjustments as appropriate to work load projections and performance). Effective staff planning incorporates performance measures into its decision-making process on staffing levels, both internal and external.

We looked at measurements in areas such as the following:

- Electricity
    - Distribution Engineering
    - Distribution O&M
    - Distribution Capital
    - Transmission/substation Engineering
    - Substation O&M
    - Transmission O&M
- Natural gas
    - Engineering
    - Pipe installation (steel/plastic)
    - Leak repairs
    - Emergency response
    - Leak Surveys
    - (Potentially) Inspections.

The quality of the performance measures used and the processes to measure them should be commensurate with the size, scope, and complexity of the organization, for example:

- The data should be collected at the appropriate level in the organization
- Measurement creation, distribution, and use need to be timely
- The measures need to present the results in a way that support analysis and action
- The measures need to go to the appropriate individuals at the appropriate levels
- A robust quality assurance program should include formal contractor evaluations and project audits
- A feedback loop should incorporate the results of contractor evaluations and project audits into measures that affect contractor compensation and future work eligibility.

C. Overall Conclusions

1. Workforce Management

This discussion needs to acknowledge the great challenges that accelerated main replacement impose for most of the gas operations in New York. The Statewide Main Replacement chapter of this report addresses why, and discusses the areas in which a "business-as-usual" approach to program and project management for main replacement imposes undue risk to staffing access, as well as to program efficiency and effectiveness. That chapter, along with the accompanying reports addressing the circumstances of each individual utility, describes the needs particularly associated with replacement program management and the areas where the utilities more generally need to make improvements. The individual utility reports offer conclusions and recommendations specifically tailored to each company's unique improvement opportunities with respect to main replacement.

The following conclusions, to the extent they concern gas operations, thus focus on the more traditional needs of the gas distribution industry in New York. A few specific references to pipe replacement appear below, but we need to stress the need for recourse to the Statewide Main Replacement chapter and to the individual utility reports to understand fully the depth of our concerns and the nature of our recommendations for addressing them in the context of leak-prone pipe replacement.

With some exceptions, we found workforce management approaches, systems, and tools generally supportive of effective staff resource planning and management. There have been management audit recommendations addressing some particular gaps. We found approved plans for responding to those recommendations appropriate for addressing our concerns. We also found that other gaps we recognized at some operations (*e.g.*, advancing gas operations capabilities to match those existing for electric operations) are already subject to specific improvement initiatives. We emphasized in our company reports the need for expeditious action with respect to the audit-and self-initiated improvement plans. With the improvement plans underway, we found grounds for optimism that workforce management approaches, organizations, systems, and tools across the state will become a source of general strength.

We found no broadly applicable problem themes in program and project management, scheduling, performance monitoring (apart from the broad concern addressed below about performance measurement at detailed levels), and quality assurance and control. Process performance at all the operations we reviewed were generally effective. We found a number of more technical concerns that need to be addressed. We can classify none of them, with perhaps a single exception, as particularly troubling from a staffing perspective. In one case, we did find that lingering problems concerning data accuracy and completeness remain a barrier to staffing optimization efforts. While efforts remain underway to recapture capabilities to use data, the biggest concern we observed was in the quality of the data, not in how it can be "processed." Giving management credit for seeking to make the best of its difficulties, the problems of the past nevertheless appear destined to continue to affect management's ability to use historical data effectively, until it builds experience under what have become (and are still in the process of becoming) more useful bodies of staffing-related data.

2. Performance Measurement

Only one of the state's operations had a relatively mature, sophisticated, systematic, and comprehensive approach to performance measurement. Its system provided detailed production and productivity data at the division level. Half of the remaining companies we examined used a system of key performance indicators (KPIs) for high-level measurement, but not at a level that would permit effective use for staff resource planning on a comprehensive basis or at a detailed level. The other half were in in the process of implementing KPI systems at the time of our study field work.

Generally, the companies we examined, again with the single exception of the particularly advanced one, aggregated production levels, costs, and hours separately, and did not formally bring them together except at budget time. Some utilities looked more closely at individual areas of the business, but not formally to get a sense of productivity levels. Our concern about the lack of a structured, data-driven comprehensive approach has less significance at some of the smallest operations, whose management remains close enough to the work to compensate. Even so, more formal data collection, reporting, and analysis would be of at least moderate benefit to them.

Consequently, we recommended (see the individual utility reports), as a first priority for all but one of the operations we studied, the development of detailed performance measures for replacement and installation of pipe. This recommendation grew out of two concerns: (a) the commonality of acceleration of replacement efforts among New York and other regional utilities, and (b) already existing concerns about the availability of skilled resources for such work and the fact that competition for those resources will be increasing. Particularly fine-tuned expectations about productivity thus have great importance in two areas: (a) meeting total program durations that stakeholders have found appropriate for eliminating threats to public safety, and (b) ensuring that efforts to optimize performance on activities that will cumulatively cost New York gas customers many billions of dollars in the coming years.

For those same operations, we recommended development and execution of plans for capturing work unit measurements more comprehensively in all areas that we studied. Adoption and use of comprehensive work unit measurement systems will permit them to track recent and inform forecasted productivity levels, assess the sufficiency of current staffing level needs, and allow for better forecasts of future staffing needs. We provided a list of the types of measures typically useful for subjecting to regular reporting (set forth below).

The commonality of the need for enhanced performance measurement raises what may be a useful opportunity for the Commission as well. Utilities over time have developed their own systems for cost and production data collection. They tend not to be broadly comparable. With a need for nearly universal state improvement, comparability may be an option, if common efforts are undertaken to define units and how to measure them. This information may give the Commission's staff a strong tool for comparing and analyzing data among companies. If interest and sufficient Commission Staff resources exist to pursue this effort, we commend the following list of measures and the experience of the single state utility with a high level of performance in this area as starting points. However, even in the absence of such a common effort, the list remains appropriate in our view as a basis for guiding the performance measures enhancement process we believe that all but one of the state's operations should undertake.

Possible Performance Metrics

Monthly Overall Staffing Monitoring – Actual versus Planned (FTE):

(a) Straight Time
(b) Overtime

(c) Contractors
(d) Total Company – ST, OT, Contractors displayed as stacked bars

Internal / Contractor Mix – Actual versus Planned (Functions with major contractors), as appropriate:

- Construction – Main Renewals, Replacements and Upgrades
- Construction – Services Renewals, Replacements and Upgrades
- Construction – New Customer Additions – Services
- Construction - System Additions - Mains

Internal Resource Replenishment (Headcounts) – Actual versus Planned:

(a) Total workforce
(b) Attritions (based on historical data, adjusted for anticipated future conditions)
(c) Retirement (based on potential retirees, adjusted for anticipated future conditions)
(d) New Hires (based on qualifications and training duration required to become fully qualified)

High-level Performance Indicators on Productivity:

- Hours per Mile of Main Replaced
- Hours per Service Replaced
- Hours per Meter Replaced
- Hour per Mile of Main Installed
- Hours per Leak Repaired
- Hours per Trouble Job Ticket Responded

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

Final Report: NYSEG and RG&E
Case 13-M-0449

Presented to:	**Presented by:**
Public Service Commission State of New York	***The Liberty Consulting Group***

February 21, 2017

279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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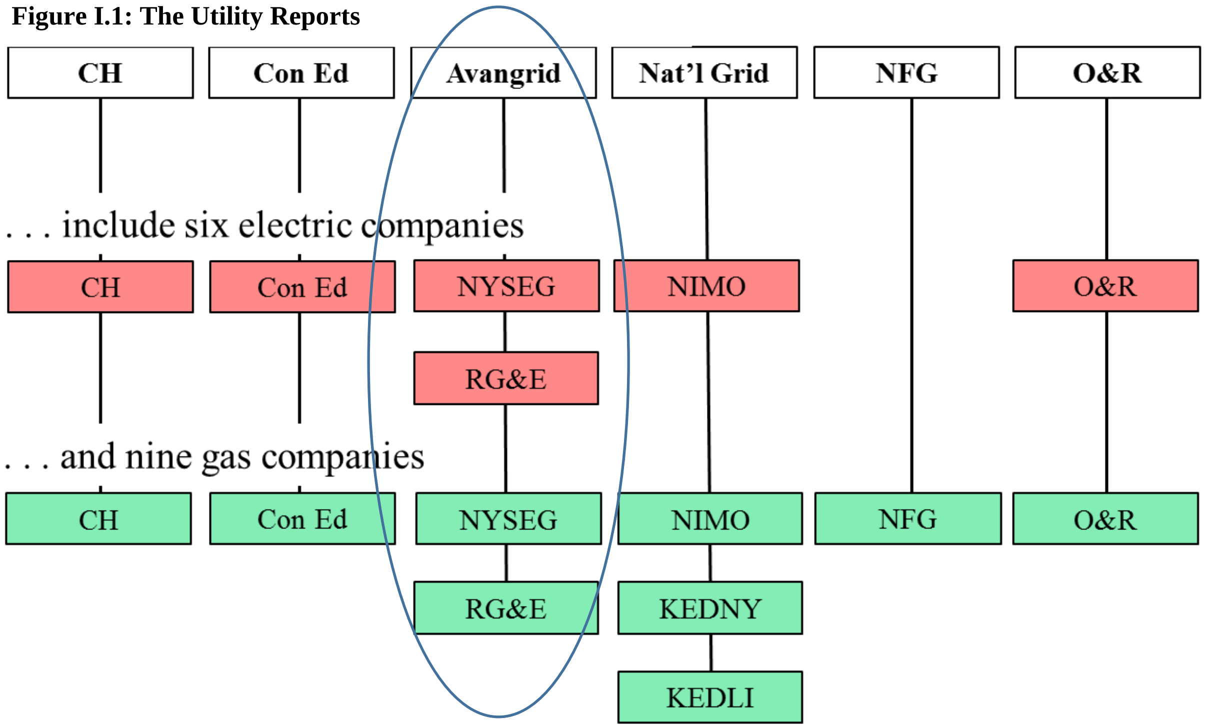
Chapter I: Background

The Liberty Consulting Group completed an extensive study of a prescribed set of staffing patterns and practices (the scope of which the Statewide section of this report addresses) at fifteen utility operations operating within six enterprises in New York State. The first part of this report addresses the results of our study from a statewide perspective. This report presents the analyses and results for the former Iberdrola USA (now Avangrid) operations in New York -- Rochester Gas & Electric (RG&E) and New York State Electric & Gas (NYSEG).

Figure I.1: The Utility Reports



Avangrid, Inc., the parent of NYSEG and RG&E and a diversified energy and utility company, operates in 25 states. Avangrid operates regulated utilities and electricity generation through two primary lines of business. One of those business lines, Avangrid Networks, includes eight electric and natural gas utilities (including NYSEG and RG&E), serving 3.2 million customers in New York and New England. The second business line, Avangrid Renewables, operates over six gigawatts of electricity capacity, primarily wind power. Of its 3.2 million customers, approximately 2.2 million take electric utility service and one million take gas utility service. Avangrid formed in 2015, through a merger between Iberdrola USA (which included NYSEG and RG&E USA) and UIL Holdings Corporation. Iberdrola S.A., located in Madrid, Spain, owns 81.5 percent of Avangrid.

NYSEG's approximately 875,000 customers represent approximately 40 percent of Avangrid's electric utility customer base. NYSEG's nearly 200,000 gas customers represent about 20 percent of Avangrid's gas utility customer base. RG&E's 370,000 customers represent approximately 17 percent of Avangrid's electric utility customer base and its nearly 230,000 gas customers represent about 23 percent of the gas utility customer base. Both companies on their own (and particularly when combined) represent a large and important component of the Avangrid Network electric and gas utility businesses.

NYSEG's customer base is notably smaller on a relative basis, representing only about 13 percent of New York State's electric utility customer total and a little over four percent of the state's gas utility customer base (both totals excluding Central Hudson). However, it is the third largest electric utility under some key measures, such as electric sales and peak demand. Given its expansive service territory (second only to NIMO), however, it has the lowest customer density of the state's utilities. NYSEG's gas business ranks with the smaller gas utilities, having relatively small numbers of customers, services and peak sendout. It does, however, have by far the largest service territory (almost 40 percent larger in square miles than NIMO, the second largest).

RG&E's customer base is even smaller on a relative basis. RG&E has only about six percent of the state's electric utility customer total (excluding Central Hudson), and just under five percent of the state's gas utility customer base (excluding Central Hudson). It is the second smallest electric utility under some key measures, such as electric sales, peak demand, and miles of overhead lines. Given its relatively small service territory, however, its customer density (significantly) trails that of CECONY and (barely) that of O&R. In gas operations, RG&E, as noted, ranks with the smaller gas utilities, having relatively small numbers of customers, services and peak sendout.

Our study examined staffing in quantitative and qualitative manners. This part of the report describes the results of our analyses regarding NYSEG and RG&E quantitative staffing data and a qualitative review of the processes associated with staffing in the electric and the gas utility. Understand that data and the comparisons we have made with other New York utilities requires a framework that explains the relevant characteristics in context with the other state utilities.

Our study examined a ten-year period - - five of them historical and five projected. We conducted field work in 2014, which presented a challenge in treating that year's data. We collected year-to-date actual data and budgeted or forecasted data for the remainder of the year. Differences in systems, fiscal years, reporting, and approaches to forecasting to-go data provide examples of the difficulties in identifying a way to split 2014 into actual and forecasted portions or to reflect it on an amalgamated basis. Those difficulties eventually led us to determine that we could not find a way to report 2014 data meaningfully for use in our study.

Progress on this project halted for a period of many months, during which we sought to resolve major difficulties regarding gaps and errors in data reporting. We observed that the hiatus in work and the need for data correction provided an opportunity to alter project scope to permit collection of actual data for all of 2014 and to update projections for future years. It was decided not to do so. Therefore, we continued to work with the split nature of 2014 data and with earlier forecasts for future years, which included 2015.

When making utility-to-utility comparisons one must remain mindful of the need to avoid comparing "apples to oranges." The complex analyses involved here and the unique circumstances of utilities even across the fairly narrow geographic range of a single state certainly do make it impracticable to reduce comparative evaluations of performance and results simply to algorithms.

Nevertheless, it is possible, with care, to provide data comparable enough to assist in the formation of useful judgments. They can have value even in complex circumstances, particularly when performed on a multi-dimensional basis and only when accompanied by the application of industry expertise in the underlying applications and activities.

We thus undertook our quantitative analyses recognizing the need to understand and reflect the differences that drive staffing among utilities. Among the challenges present in doing so, our work provided a significant advantage as well. Despite the differences among its members, this advantage arose from the ability to derive commonly defined, contemporaneous data sets from a utility population that: (a) number enough to allow the use of statistically derived measures, (b) operate under the authority of a single regulatory authority, and (c) encompass what is a remarkably, if not uniquely narrow geographic range (when contrasted with other comparative studies we have seen in the industry).

We operated nevertheless with the recognition that superficial application of data would not serve. We sought to understand and define the characteristics of the utility operations within the scope of our study and how they vary in the utility population. This starting point set the stage for effective structuring of the data to be collected and then analysis of that data.

In comparing the utilities, we begin with attributes of common interest that might have some impact on staffing levels. These initial attributes might be termed as potential "hard" drivers of staffing. These drivers correspond to system attributes that utilities generally cannot control. For example, the number of customers a utility has surely affects required staffing, but that parameter is a function of the environment in which the utility operates. The number of customers neither represents a performance statistic nor a value that management can influence. The relevance here of such factors lies in their ability to help clarify the "givens" that define a utility's relative size in the industry. That knowledge is critical to an understanding of relative staffing requirements.

We also examined "soft" drivers" of staffing. These are not "givens;" they do concern things that management decisions and actions influence, and those decisions and actions that do, or at least may, affect both staffing and performance. For example, a utility chooses the number of gas mains it will replace each year; that decision affects resource requirements.

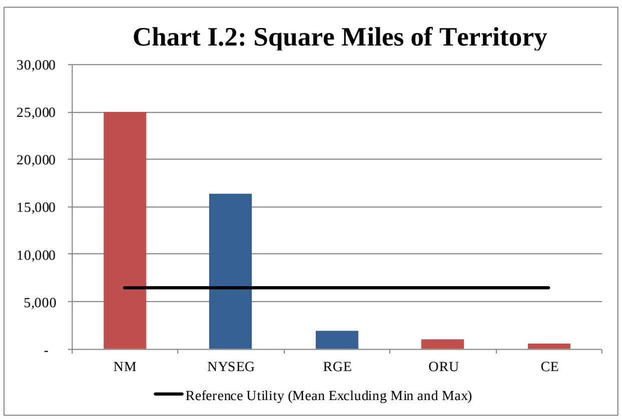
A. The Reference Utility

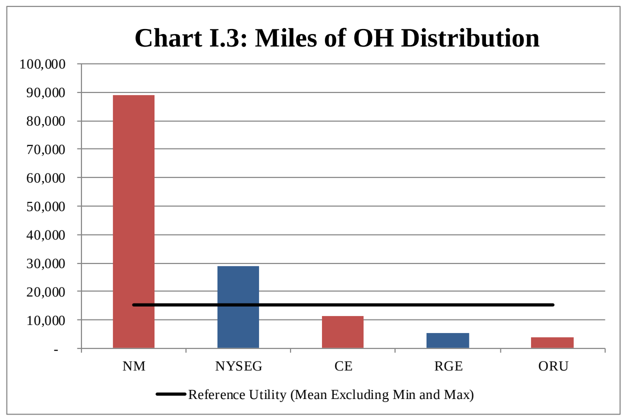
Our many comparisons of staffing frequently refer to "the Reference Utility." We combined data from all the operations we studied to produce a composite for comparative purposes. This part of the report sets forth many charts and accompanying discussions of particular attributes or sets of attributes related to staffing in comparison to the Reference Utility. These uses of a Reference Utility provide a common indicator for how the various utilities differ from the composite. For example, if a utility has the same number of customers as the Reference Utility, we can state that utility's number of customers as 1.0. If another utility has 50 percent more customers, we can state its customer count as 1.50. These measurements provide a way of illustrating the relative position of any utility in comparisons with others. This approach provides a dimensionless variable for selective use in other calculations. Comparison to the Reference Utility never provides a basis for conclusions, but rather a way to put each of the companies we studied in a statewide context and to assist in identifying areas useful for inquiry into staffing numbers, distribution, and adequacy.

In defining the value for the Reference Utility, one option would have been simply to use the average of the state utilities. Some circumstances, however, make this approach impractical. For example, one or two very large utilities can dominate the data, calling for mitigation of the impact of the outlier(s). This phenomenon encourages the use of a median rather than an average. A similar approach might use the average of the utilities, but calculated after removing the minimum and maximum values. For electric attributes, we used the median or average excluding the minimum and the maximum. After examining the gas attributes, we reached the same conclusion.

B. Specific Electric Attributes – Hard Drivers

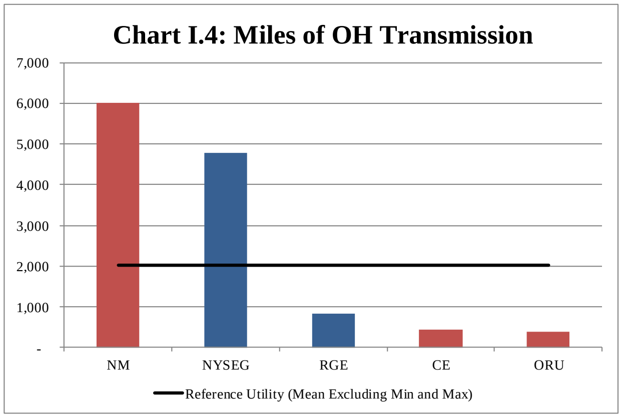
This section describes what we determined to be system attributes comprising hard drivers of staffing. The size of a utility's service territory, and quantities derived from it (such as customer density) should have some impact on staffing. The next two charts show NYSEG and RG&E service territories and overhead line miles compared to the other electric operations we studied. Sparse service territories likely experience higher costs as employees require greater travel times. Larger service territories can also require more distribution facilities, producing higher maintenance demands.

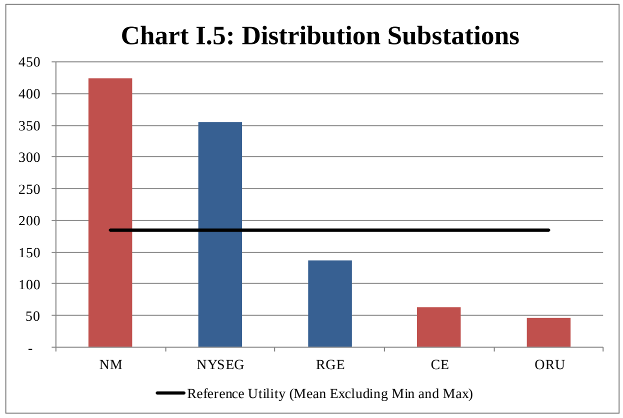




NYSEG has a large service territory, the second largest in New York and more than double the square miles of the Reference Utility value. By contrast, RG&E has a very small service area compared to the other operations we studied. Consistent with its relatively compact service territory, RG&E has a very small quantity of overhead distribution lines. NYSEG has many more, but still far short of state leader NIMO. Miles of distribution lines should be a driver of distribution work effort. One would expect relatively lower levels of staffing at RG&E and higher at NYSEG, all else equal. However, economies of scale will not exist to the same extent for the smaller firm.

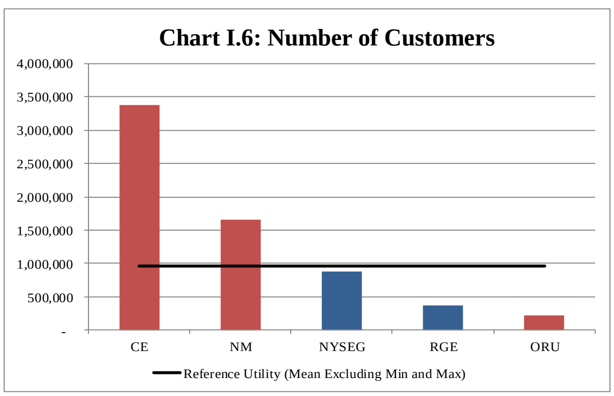
Similar patterns exist for transmission lines and substations, as the next two charts show. NYSEG and RG&E ranking second and third.

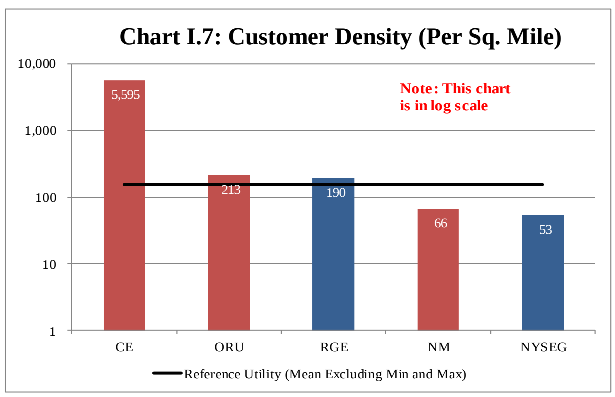




These first four parameters define the geographically related attributes. Avangrid's New York operations include one sprawling service territory (NYSEG) and one relatively compact area (RG&E). In today's consolidating industry, smaller firms face a special challenge. This factor does not necessarily mean that RG&E must be less efficient than NYSEG or any other company. Nevertheless, smaller firms start from a less advantageous position in some staffing areas than do their larger neighbors. Factors such as comparative size illustrate the value in examining multiple drivers when analyzing staffing drivers, rather than searching for a single "silver bullet."

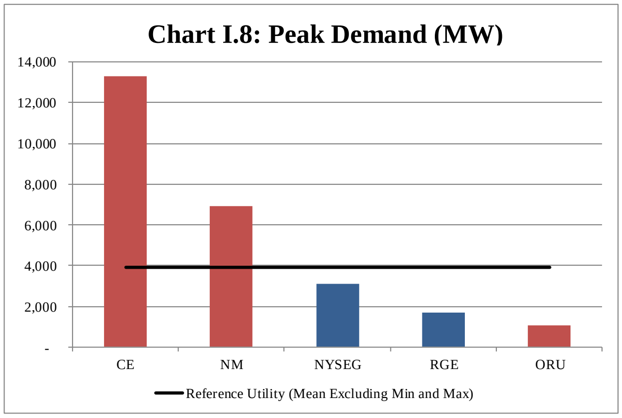
When moving to other geographically related parameters, the Avangrid companies look somewhat different. The next two charts compare NYSEG and RG&E customer numbers and density.

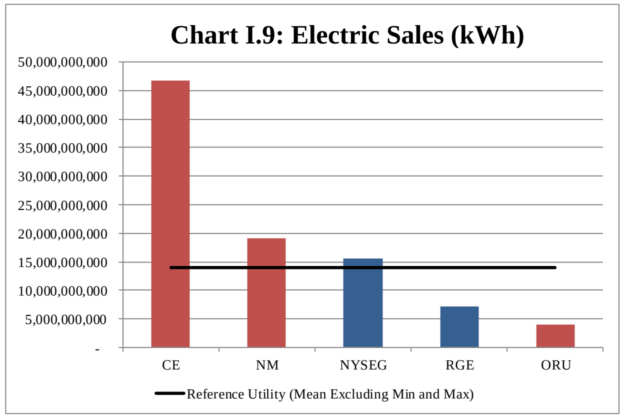


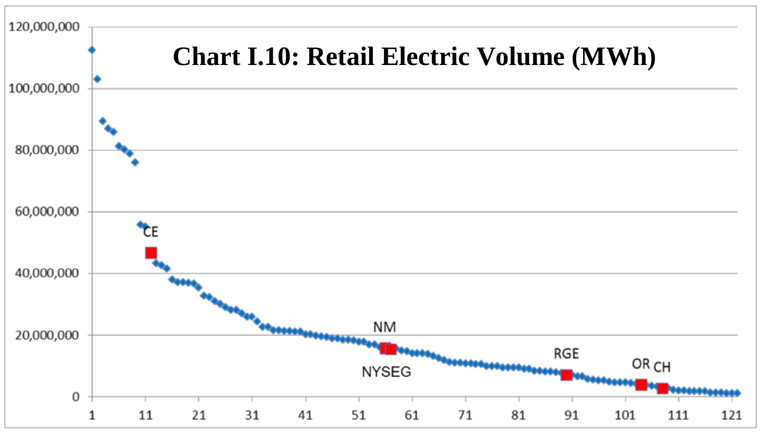


Customer density equals the number of customers per square mile of service territory. Intuitively, one would expect density to comprise an important attribute for staffing and other performance parameters. Staffing efficiencies likely exist for denser service areas, but those efficiencies can turn to penalties at very high densities, where work can become logistically more difficult and expensive. From a customer density perspective, NYSEG is the sparsest utility in the state, although it would not be considered so on a national scale. Sales provide a similar illustration of size. As the next two charts show, the pattern that the state utilities show in terms of peak demand closely follows the spread of their pattern for sales. In any event, like peak demand, sales likely have at best an indirect influence on staffing.

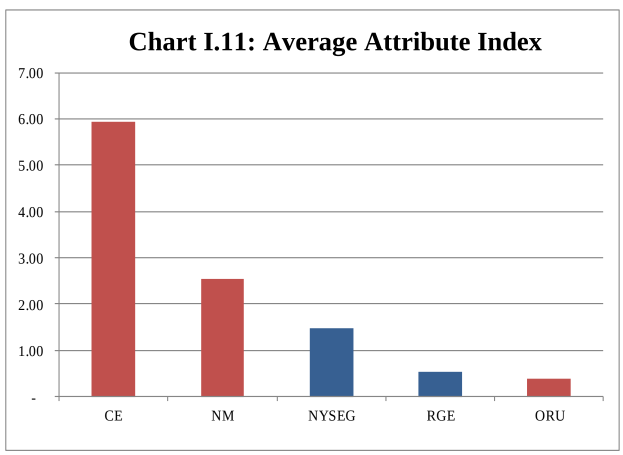
The next two charts compare NYSEG and RG&E on the basis of peak demand and sales. The Avangrid companies fall significantly below the Reference Utility values, except that NYSEG is very close to that value for sales.







The accompanying chart shows that, from a sales perspective, the state's utilities are not particularly large on a national scale, again with the obvious exception of CECONY. Five of the six lie at the national median or lower and three fall into the bottom quartile. Note that the state distribution mirrors the national distribution. NYSEG is about average while RG&E is relatively small.



The accompanying chart depicts the attributes discussed above, combined into an average. It then indexes that average, in order to provide an integrated, overall perspective on the relationship among the state's electric operations when considering all the hard drivers we have identified. We presented charts above illustrating the relative size of each utility based on different attributes. In each case, we quantified size as a function of the Reference Utility value. A utility with a measure of 1.5 would be 50 percent higher than the Reference Utility value, for that particular attribute. We can measure size on the basis of a single attribute, but we would also like to measure size based on *all* attributes. If we simply take the values for all of the attributes and average them, it provides us a rough indicator of a utility's overall size versus the other utilities. We call this the "average of all attributes index". This approach gives NYSEG a value of about 1.5 compared to the Reference Utility value (1.0), with RG&E about half of the Reference Utility value. The use of such a measure should not be rigidly applied. On the other hand, it emphasizes Avangrid's New York operations' relative position vis-à-vis the other state utilities, and that position should be expected to be an influence on the company's staffing levels. Analysis of Avangrid performance needs to consider the impact of company size on that performance.

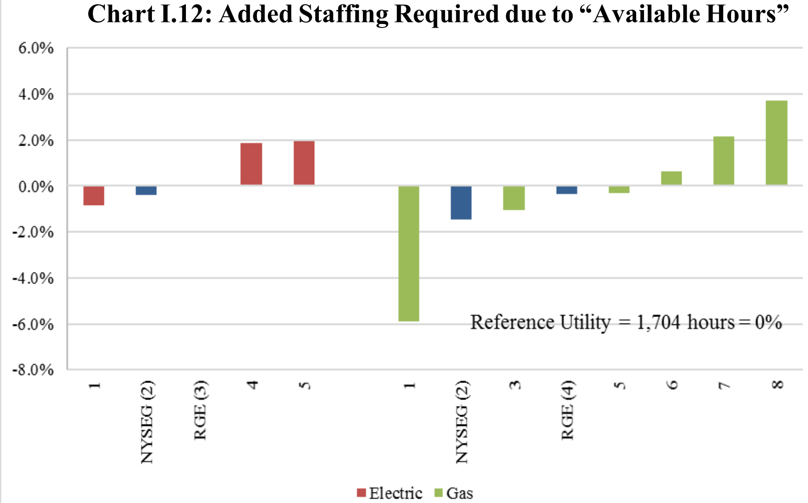
C. Full-Time Electric Resources

In order to provide a common parameter for the analysis of staffing levels, Liberty selected "full time equivalents," or FTEs. We defined this FTE parameter as follows for purposes of this study:

- For utility employees: reported hours divided by available hours
    - Using available hours provided by each Company
    - Available hours exclude holidays, vacation, training, and other off-the-job hours
- For contractors: reported hours divided by 2,080 (52 weeks per year multiplied by a 40-hour work week).

We chose to use this FTE approach to approximate the number of workers employed. It makes it easier to understand staffing data than other bases (*e.g.*, hours) would. While this approach provided a way to model numbers of applied FTEs, it remains important to consider differences among the operations we studied. The number of available hours per FTE varied among those companies. For example, one utility had available hours per employee of 1,800 per year, while another had 1,650. Theoretically, the first utility can provide the same number of available hours with 9 percent fewer employees. The following chart shows the variance of each operation we studied from the 1,706 hours we calculated for the Reference Utility (by averaging the available hours for all the electric and gas operations we studied).

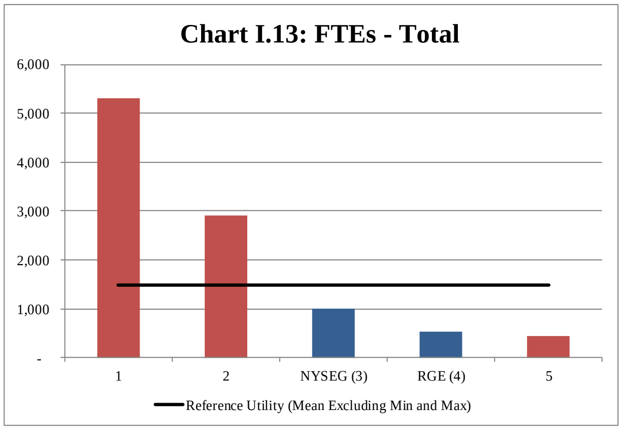
Chart I.12: Added Staffing Required due to "Available Hours"

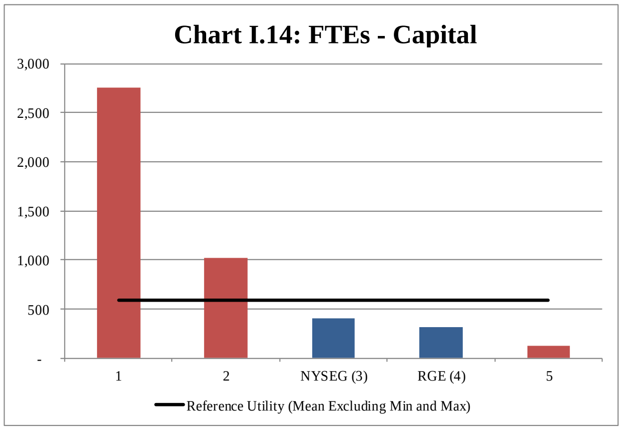


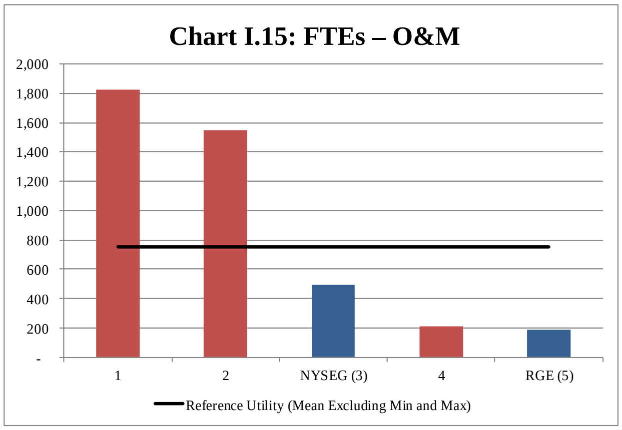
Most of the operations centered reasonably closely around the Reference Utility level. The gap between the high and low gas operations, however, showed a total value of 10 percent.

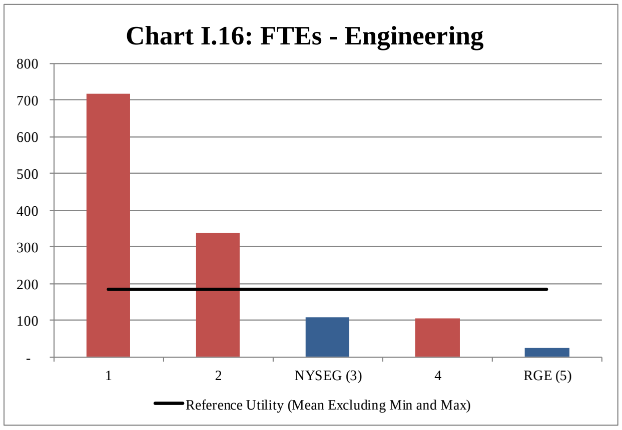
One cannot calculate contractor FTEs on the same basis as that applies to employees. Contractor employees certainly have off-the-job time as well. However, when contractor employees are off (for vacations or training, for example), contractors rotate and shift resources to keep crew (or other applicable group) complements full. Thus, 2,080 is a valid number to use for a contractor FTE. On the surface, that number appears to make a contractor FTE more effective. However, the hours advantage gets substantially mitigated by higher contractor costs. The rates a company pays for contractors builds in the costs of contractor-employee off-time. With all else equal, a contractor FTE, as we use the term in this study, is equivalent to about 1.22 utility FTEs in terms of hours worked. The FTE measure that we use provides a meaningful and intuitive understanding of staffing levels, but care in applying that understanding remains important.

Using this FTE approach, the next charts show that NYSEG and RG&E applied FTEs fell among those with lower staffing in the state.



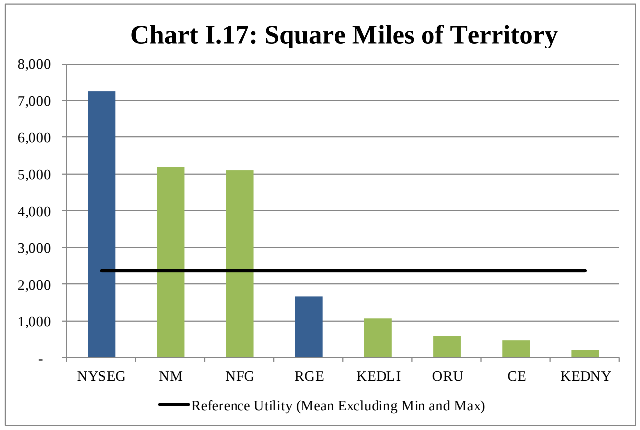






The size-related charts shown in the first part of this section suggest that the Avangrid companies are roughly third and fourth in terms of size. Their staffing generally conformed, thus raising no indications of concern by this measure. In terms of O&M personnel, however, RG&E fell below size-based indicators in staffing. While not conclusive, this rank order was a factor we kept in mind as our analyses proceeded.

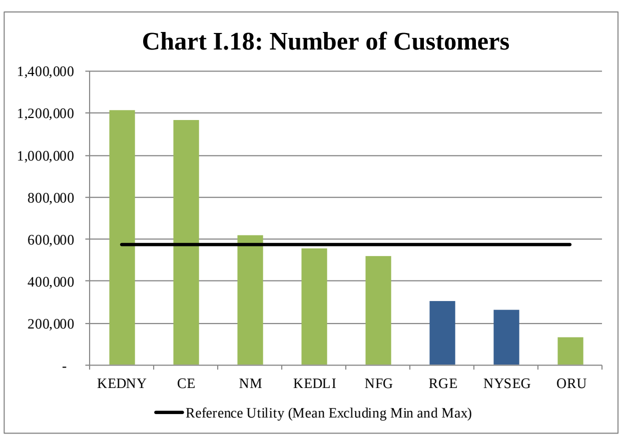
D. Specific Gas Attributes – Hard Drivers

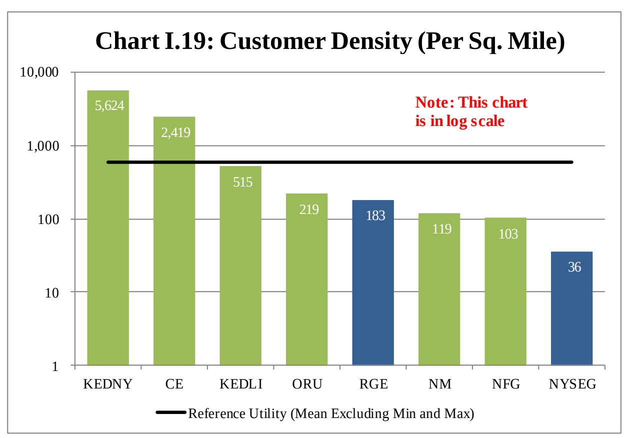


The size of a gas utility's service territory and its customer density can also be expected to influence its staffing. Travel times, the level of distribution facilities, and the number of service centers and crew support locations present examples of such impact. Additionally, the gas delivery business exhibits other variables (not present in the electric business) that affect staffing directly and indirectly. Virtually every occupied structure in an electric utility's service territory has electric service. This is not the case for gas distribution. Competition from oil, propane, electricity, and other fuels affects penetration rates for gas utilities. Moreover, many customers in the state do not have access to gas service, residing too far from transmission and distribution pipes to be served economically. Many electric customers do not have gas, because it is unavailable or because they choose not to take it. However, virtually every gas customer is an electric customer. For those reasons, there are many more electric than gas customers in the state.

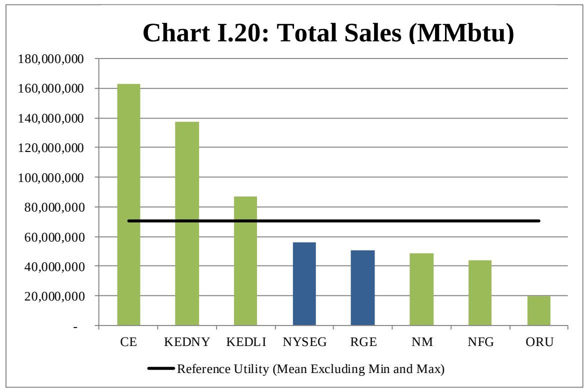
NYSEG not only serves the largest territory among the New York gas utilities, but its footprint is also the most geographically diverse and non-contiguous. It is largely rural, with a few small cities. These characteristics place NYSEG's position near the low end in number of customers, and makes it the lowest, by far in customer density. The next (Customer Density) graph's use of a logarithmic scale on the vertical axis obscures the gap, but the numbers in the bars show that NYSEG's customer density falls well under half that of the next lowest company.

RG&E, the largest of the "small footprint" gas companies, still falls well below the Reference Utility's customer density value. Its customer base of just over 300,000 also falls well below the Reference Utility value.

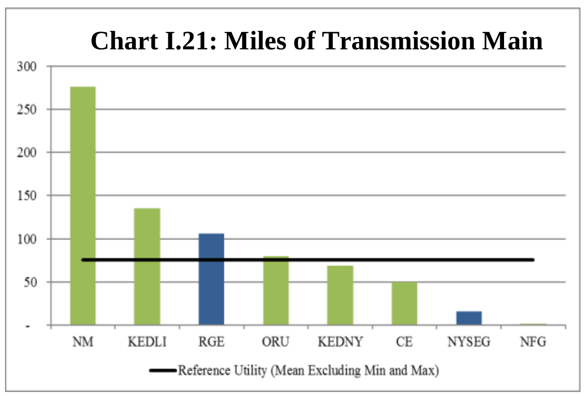




The state's gas operations include two very large companies, each with over one million customers. Three other mid-size companies cluster around the Reference Utility value of just under 600,000 customers. The three remaining, relatively small companies have three hundred thousand or fewer customers. NYSEG's values place second from the lowest. RG&E ranks as the largest among the state's smaller gas operations in terms of numbers of customers. As expected, the two metropolitan New York companies have comparatively very high customer densities. Upstate densities are correspondingly very low, particularly for those serving primarily rural areas.

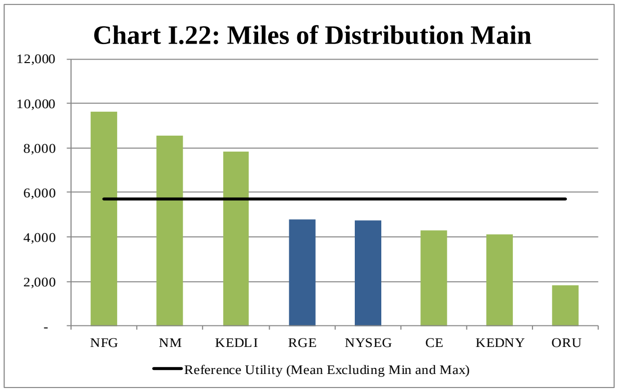


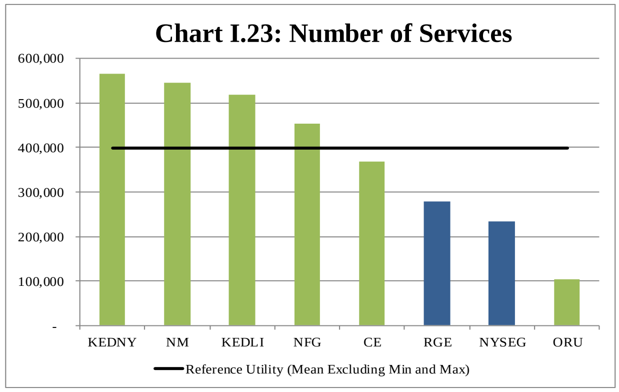
The accompanying chart compares NYSEG and RG&E on the basis of total sales. They comprise the largest of the Upstate utilities, but by only a small margin, if O&R is excepted. Customer mix explains why the companies with the largest and smallest numbers of customers frame the chart, but for the others, the ranking by number of customers does not match the ranking by level of sales. Companies with large commercial and industrial loads tend to have the highest levels of usage per customer. These large customers tend to concentrate in the major metropolitan areas today, but that has not always been the case. In decades past, Upstate regions housed many major industrial customers who are now long gone. Losing these large loads often allows Upstate gas companies to add new customers now without requiring significant capacity additions, thus, all else equal, reducing resources needed for capital work.



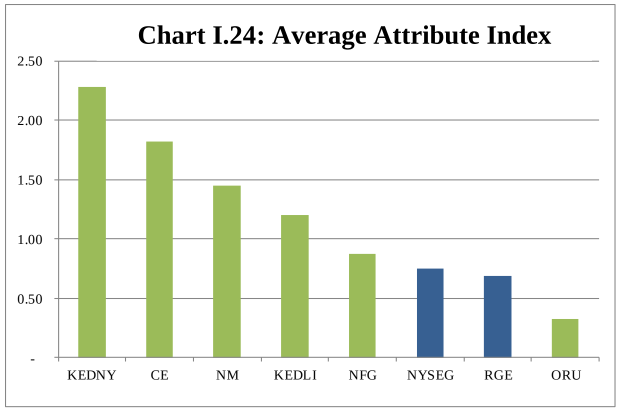
Transmission in the gas business more generally falls to pipeline rather than distribution companies. Most gas utilities, however, have some facilities classified as transmission under certain technical and operating characteristics of the facility (typically around 200 psi when measured by operating pressure). Transmission facilities in a distribution utility move large volumes of gas over relatively longer distances within service territory locations where transmission pipeline companies do not have facilities. Multiple pipeline company facilities traverse NYSEG's service territories, providing backbone facilities for its distribution systems, and in turn minimizing its own transmission infrastructure. NYSEG has been aggressive in acquiring new franchises located along pipeline corridors, where it has built new gate stations to create new gas customers. RG&E has a comparatively high number of transmission miles.

The next two graphs display numbers of distribution main miles and of customer services. NYSEG's miles of distribution main, shown below, lies somewhat higher than what might be expected due to the rural nature and very low customer density of its service territory.



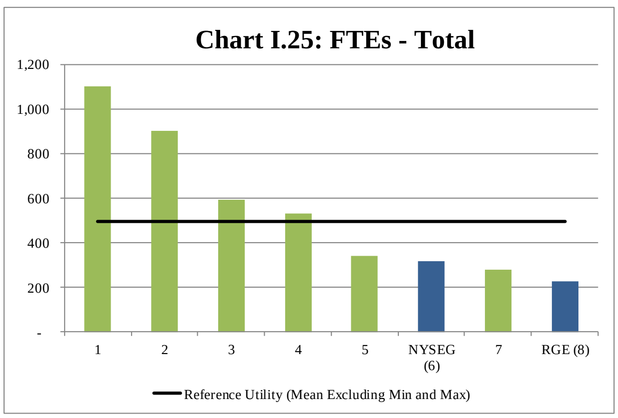


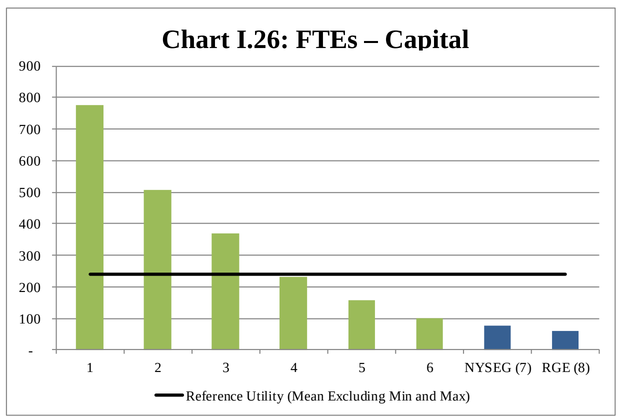
The chart to the right (Attributes Indexed to Reference Utility) depicts the attributes discussed above into an average, as we showed for electric operations. NYSEG places close to the lower bound, as expected, while RG&E places second from the low end. While a crude measure, as explained previously, it provides a good sense of where companies lie relative to the other New York utilities.

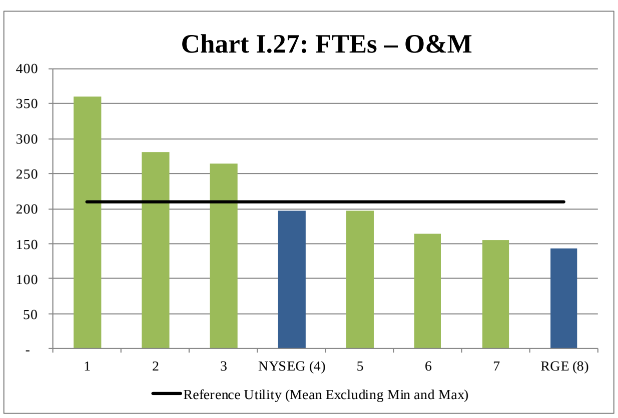


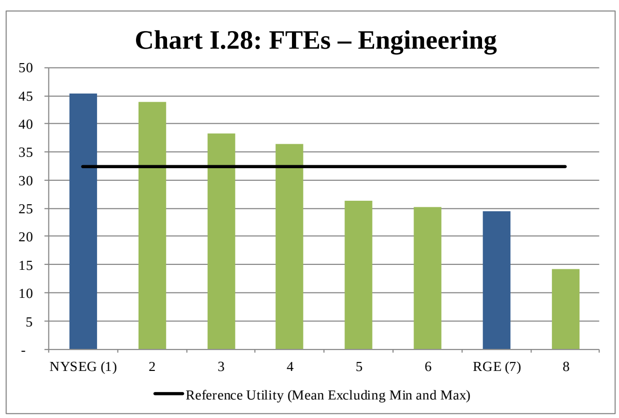
E. Gas FTEs

This section compares NYSEG/RG&E 2013 gas FTEs with those of the other state gas operations.









As seen from the preceding (FTEs - Total) graph, the three largely urban Downstate companies each had higher levels of FTEs with respect to the Reference Utility, one Upstate utility approximately equaled the Reference Utility value, and the remaining four Upstate Utilities fell well below, and all within the range of approximately 200 to 350 FTEs. A Downstate Utility led the state by a substantial margin in total FTEs, driven to a great extent by the high number of capital FTEs relative to the other companies. NYSEG's relative position on the Total FTE graph fell well below the Reference Utility, consistently with its placement on the Average Attribute Index chart shown earlier. RG&E placed at or close to the low end of the range in all three categories (capital, O&M, and engineering).

Chapter II: Data and Analysis

A. Resource Planning/Total Staff Assessment

1. Total Staff Assessment – Electric

This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for electric distribution, and transmission and substation functions. The first part of the section shows these functions at NYSEG, followed by the same analysis for RG&E.

a. Electric Distribution Staffing Trends

The following charts show historical and forecasted staffing resources for electric distribution functions for the period 2009-2019. The first breaks resources down by resource type (internal staff straight time, internal staff overtime, and contractors). The second breaks staffing down by capital, O&M, and engineering activities. We depict staffing resources in terms of Full Time Equivalents (FTEs). An FTE equates to the amount of work provided by one employee for a year, a common way of depicting staffing/workload levels for different types of staffing resources. We did not include data for 2014, during which we performed study fieldwork. The companies reported data on incompatible bases for 2014, which at the time required a combination of actual year-to-date and forecasted data. Each of the other study years for the 2009-2019 period used either fully actual or fully forecasted data.

Figure II.1: NYSEG Electric Distribution FTEs by Resource Type

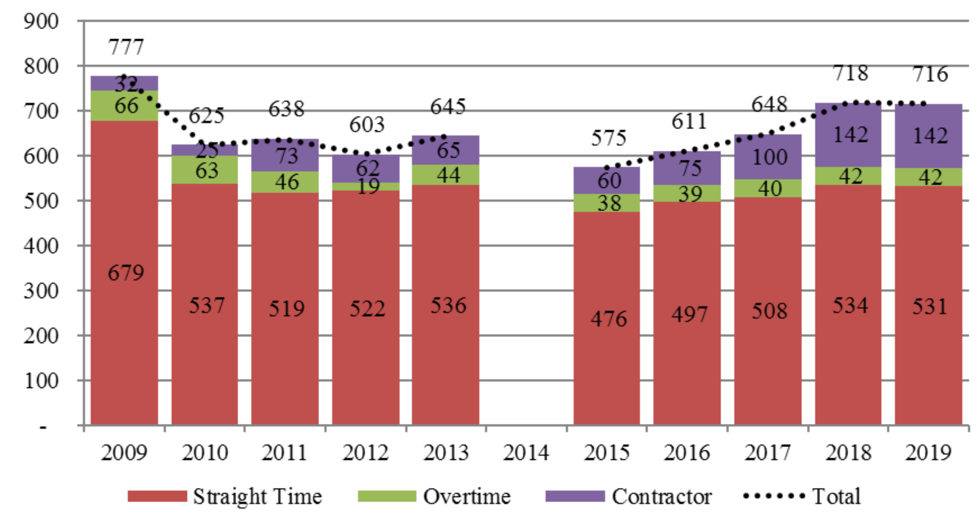
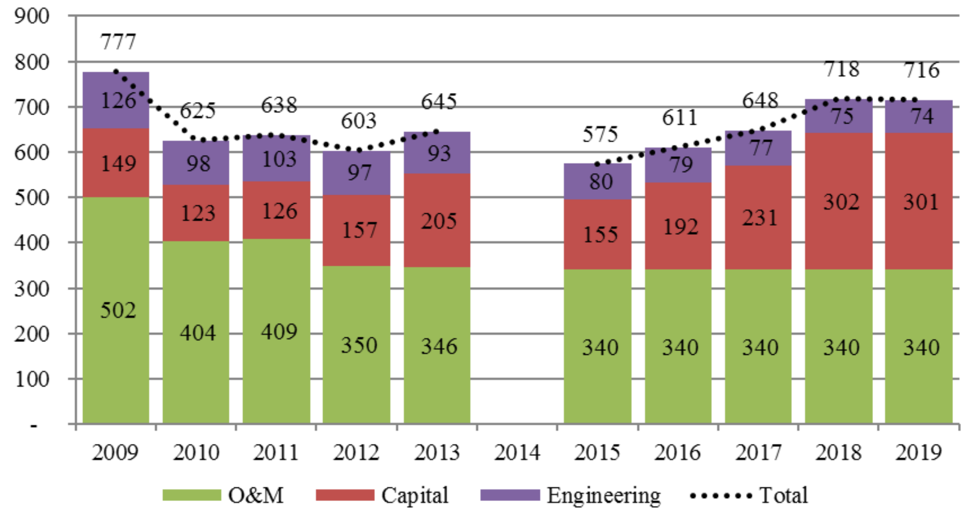


Figure II.2: NYSEG Electric Distribution FTEs by Work Type



We observed the following NYSEG trends of note:

- Following a significant reduction in internal staffing from 2009 to 2010 (approximately 140 FTEs), staffing resources during 2010-2013 remained relatively stable.
- The level of O&M fell very significantly (by 30 percent) during the 2009 – 2013 period.
- After a very large drop in the first year, internal FTEs remained stable for the rest of the historic portion of our study period.
- Contractor use doubled from 2009 to 2013, but represented only about 10 percent of total FTEs.
- During the 2015-2019 timeframe, the forecasts that management provided show a significant 2015 reduction from 2013 internal FTEs, but steady growth thereafter, to about 2013 levels by about 2019.
- Forecasted contractor FTEs more than doubled (from 2013 levels) by 2019.

The next two charts show the corresponding FTE information for RG&E.

Figure II.3: RGE Electric Distribution FTEs by Resource Type

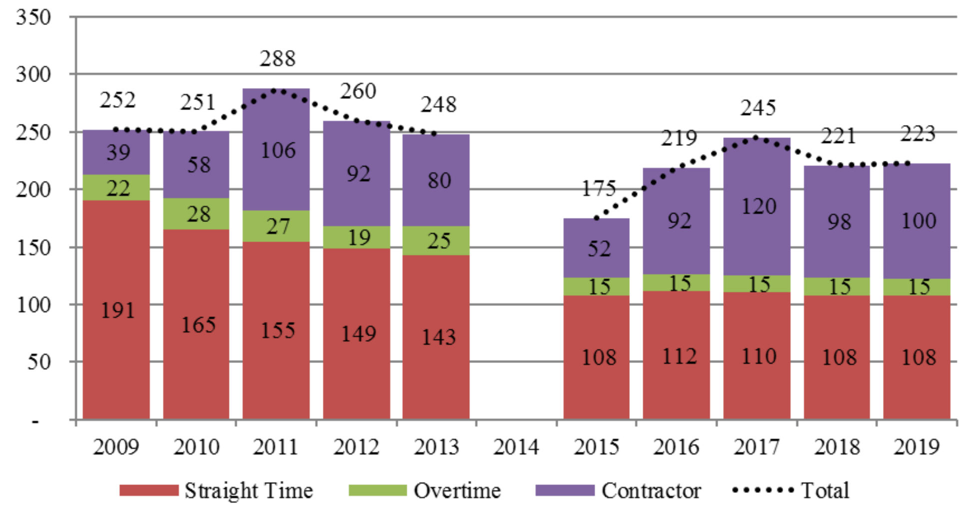
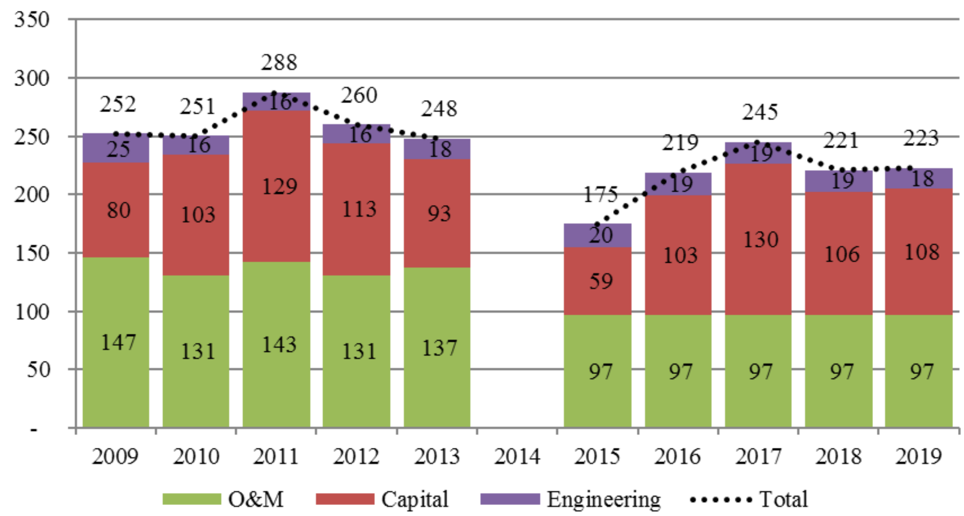


Figure II.4: RGE Electric Distribution FTEs by Work Type



We observed the following RG&E trends of note:

- Actual FTE levels began and ended the 2009-2013 period at roughly the same overall totals.
- A small shift occurred away from O&M and toward capital work in this historical period.
- From 2009 to 2013 internal resources dropped by about a quarter, with most picked up by contractors.
- Forecasts that management provided show internal resources at about two-thirds of the 2013 levels, and at closer to half of the 2009 levels.

- In the forecast period, contractors became roughly equivalent to internal resources in number.
- Total forecasted FTE work levels were about 10 percent below historical levels; capital FTE workloads remained close to historical levels; O&M work accounted for more than 100 percent of the forecasted FTE reduction
- The drop in forecasted O&M work load alone was about 30 percent from historical levels.

The shift in staffing from internal resources to contractors marked a shift in NYSEG staffing strategy, which we also observed from the RG&E forecasts. Projected further increases in contractor FTE levels through the 2015-2019 period suggested continuation of this approach into the future. NYSEG expected to use the flexibility to add contractors when workload changes, in order to manage significant, changing construction program demands. At the same time, it forecasted slightly increasing core internal staffing applied FTEs for O&M and engineering work requirements. RG&E forecasted maintenance of a much smaller contingent of internal staff resources, accompanied by an increase in reliance on contractors. Observing the 2010 and 2017 years highlights these rapid shifts.

The following charts compare the NYSEG and RG&E electric distribution resource balances to Reference Utility values. The charts show the strength of the shift to contractors, especially pronounced in the case of RG&E.

Table II.5: Electric Distribution Resource Mix

Actual Resource Mix - 2013		
Source	**NYSEG**	**RU**
Straight Time	83%	67%
Overtime	7%	13%
Contractor	10%	20%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**NYSEG**	**RU**
Straight Time	74%	65%
Overtime	6%	10%
Contractor	20%	25%
Total	100%	100%

Actual Resource Mix - 2013		
Source	**RGE**	**RU**
Straight Time	58%	67%
Overtime	10%	13%
Contractor	32%	20%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**RGE**	**RU**
Straight Time	48%	65%
Overtime	7%	10%
Contractor	45%	25%
Total	100%	100%

NYSEG's 2013 percentage of contractors amounted to about half the Reference Utility value. NYSEG's straight time percentage was above that of the Reference Utility. By 2019, forecasted Reference Utility contractor percentage increase from 20 to 25 percent. The forecasted NYSEG contractor percentage, by contrast, doubled. Forecasted straight time fell significantly, but remained above Reference Utility levels in 2019. RG&E's 2013 percentage of contractors was more than 50 percent higher than the Reference Utility value. RG&E's 2013 straight time percentage fell well below the Reference Utility value. By 2019, the forecasted Reference Utility contractor percentage increased to 25 percent. The forecasted RG&E percent contractor percentage increased by much more (to 45 percent of total workload). Percentage straight time dropped in 2019 even further below Reference Utility levels. In all cases, overtime percentages fell well below Reference Utility levels.

To summarize, the companies expected to: (a) decrease O&M work significantly from historical levels, (b) increase use of contractor resources in meeting changes in capital program demands, and (c) maintain smaller internal workforces, which have been decreasing since 2010.

b. Reliability Performance

We examined changes in reliability through 2014 (the year covered by the most recent reliability reports available from the Commission). We did so to determine whether any apparent correlations between reliability metrics and staffing might appear. In addressing the reliability of NYSEG and RG&E electric service, we looked at two measures for which the Commission has adopted standards and for which it requires reports. The electric industry commonly uses both as measures of service reliability. The first of those measures, SAIFI (System Average Interruption Frequency Index), consists of the average number (frequency) of interruptions that a customer could expect to experience. We chose not to use this measure, even though it does have, in our view, have some connection to staffing. Applying resources to inspect, maintain, and operate electricity delivery infrastructure clearly has a bearing on the frequency with which outages occur. The difficulty in using SAIFI for our purposes lies in the time lag involved; *i.e.*, the fact that systems decline over time when a company underperforms such activities.

With consequences of staffing curtailment in these areas delayed by some, perhaps many years, it becomes impossible to connect staffing changes over fairly short durations with outages. For example, following a period of short staffing, a utility may engage in a "catch-up" program designed to restore infrastructure to desired conditions. As that work proceeds, outages owing to work not performed years ago and still not "caught up" in a cycle of heightened activity may occur. While tempting, it could well be wrong to assign causation to current staffing levels. In addition, the scope of our study excluded vegetation management (*e.g.*, tree trimming) by design. The failure to provide proactive, comprehensive, and diligently executed vegetation management can also affect customer outages, particularly their frequency. An inability to consider this factor further diminishes the already tenuous value of using SAIFI as a way to gauge staffing in the areas our study was charged with examining.

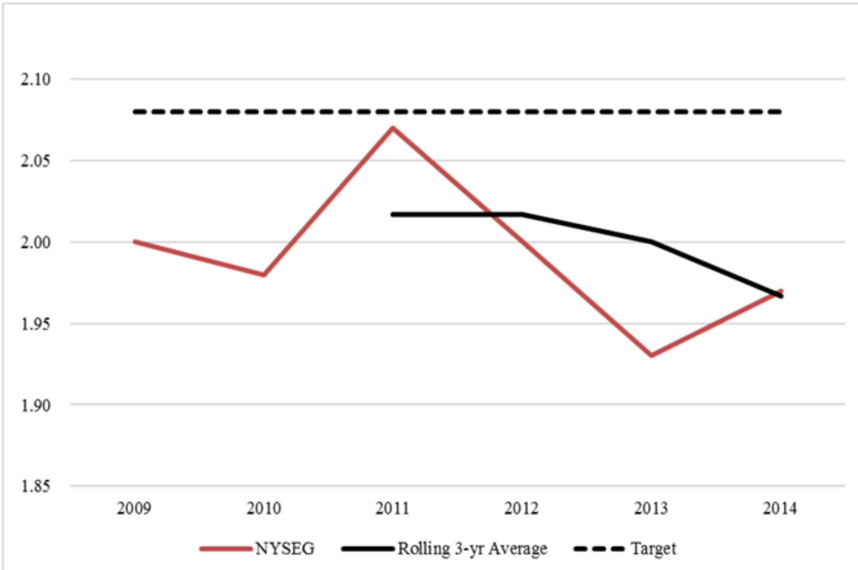
We found the second measure, CAIDI (Customer Average Interruption Duration Index), more pertinent to our purposes. The industry uses CAIDI commonly as a measure of reliability. It sums all the durations of all customer outages (usually across a period of a year), and divides that sum by the number of customer interruptions experienced. Restoration work is performed largely internally (often supplemented substantially in cases of widespread, severe outages by crews from outside those normally available to the utility) when it is of manageable scope. Measures of CAIDI generally exclude extreme events. Thus, longer outage durations do give reason to question the numbers of internal staff.

Vegetation management (outside the scope of our study) also can affect CAIDI (*e.g.*, spotty vegetation management can produce overgrown trees that take more time to clear in order to provide crews with the access needed to repair and replace the equipment needed to restore service). However, the exclusion of extreme events mitigates this effect. Moreover, the effect of vegetation management on CAIDI is less substantial than its effects on SAIFI, after exclusion of such events.

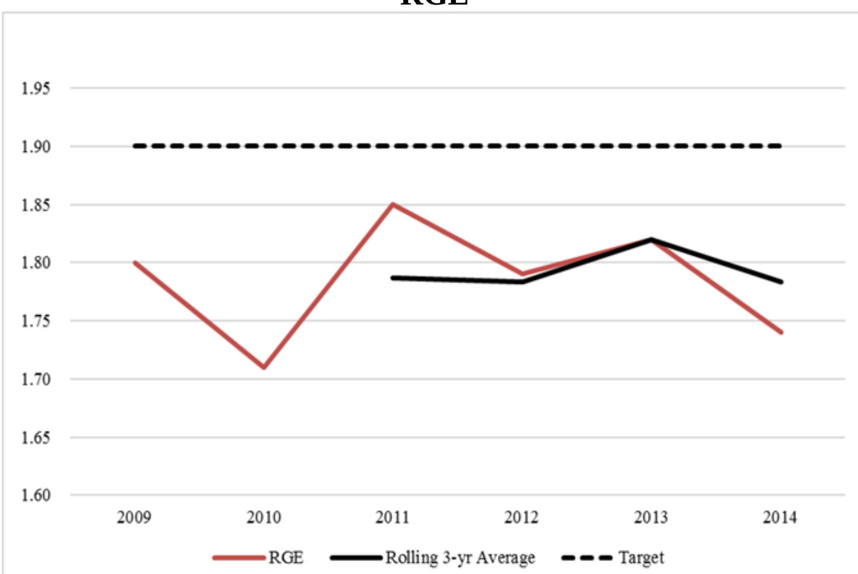
We therefore focused our review of reliability on CAIDI, as reported to the Commission. The last year covered by available reports was 2014. We examined how NYSEG's and RG&E's CAIDI values trended through the historical part of our period. The next charts show the results, which remained below the standard consistently.

Figure II.6: CAIDI – Excluding Major Storms

NYSEG



RGE



Save for modestly longer durations for a single year (2011), NYSEG and RG&E performance remained within the standard. NYSEG performance improved; RG&E performance remained stable. Despite O&M staffing, the data here shows no correlation in reliability performance.

c. Electric Transmission and Substation Staffing Trends

The following charts show historical and forecasted FTE levels for transmission and substation functions for the period 2009-2019. The first breaks down FTEs by resource type (internal staff straight time, internal staff overtime, and contractors), and the second by work type (capital, O&M, and engineering).

Figure II.7: NYSEG Transmission & Substation FTEs by Resource Type

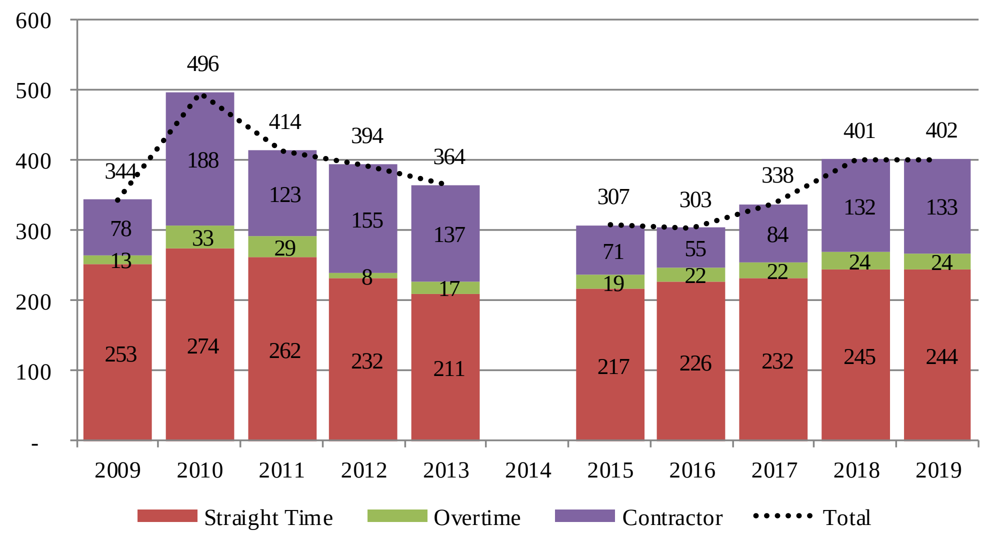
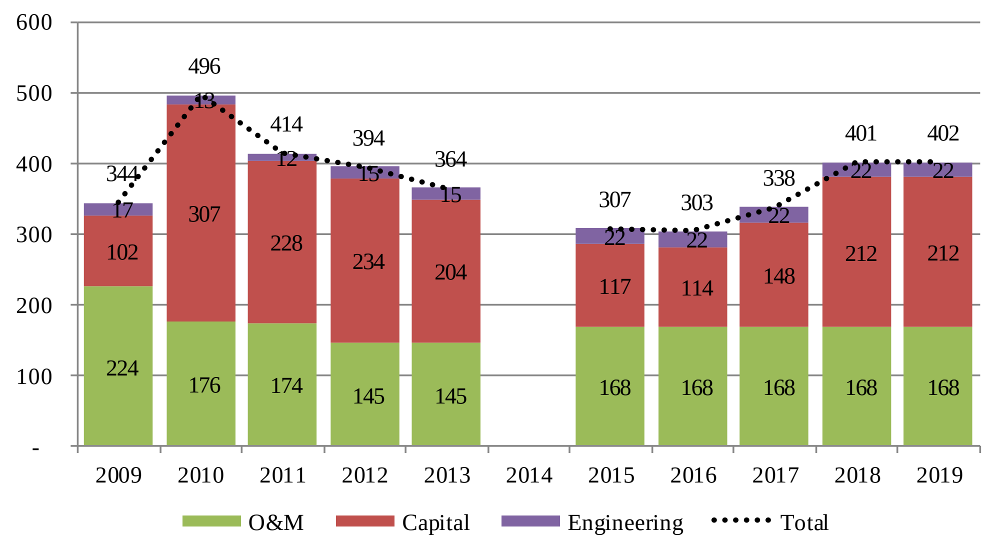


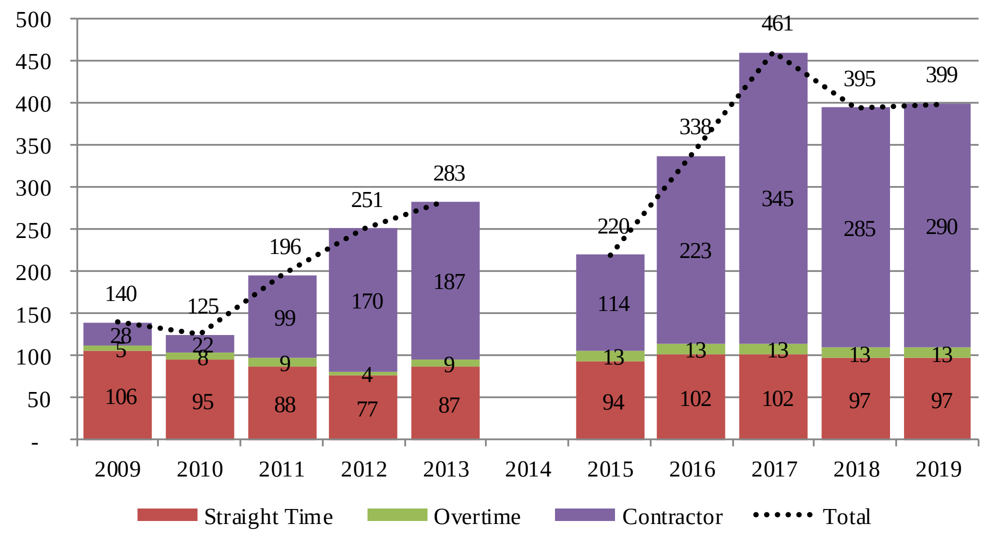
Figure II.8: NYSEG Transmission & Substation FTEs by Work Type

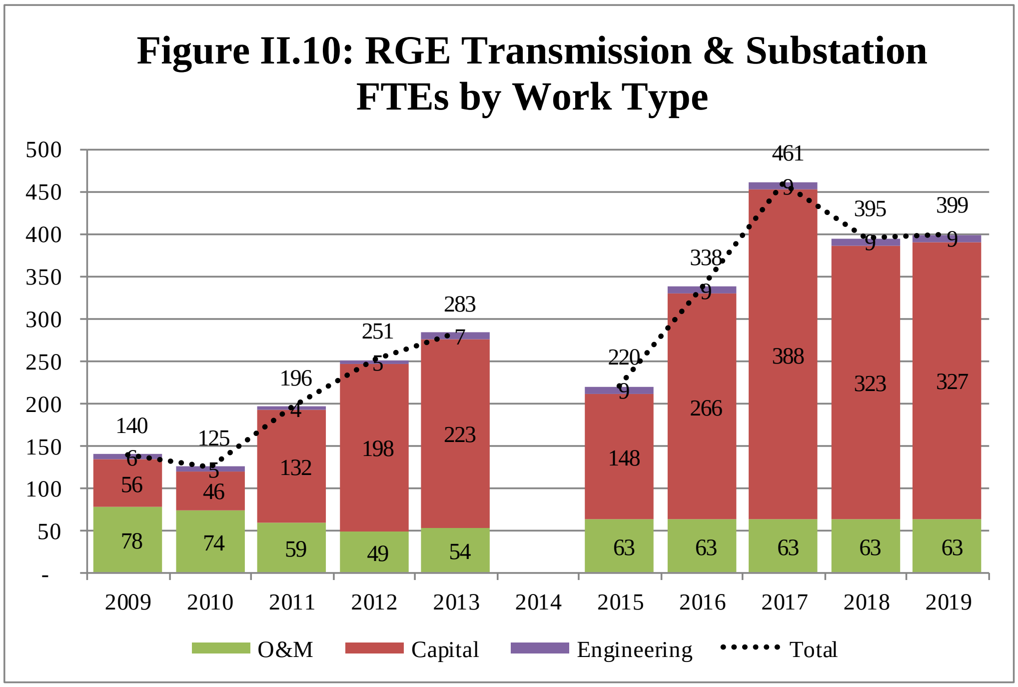


Key trends for NYSEG include:

- Following a spike in 2010, actual FTE levels for 2011-2013 decreased substantially, albeit remaining above 2009 levels.
- Internal FTEs decreased by over 15 percent in the historical portion of our study period, while contractors increased by over 75 percent
- Forecasted 2015–2019 total FTE levels increased significantly through 2018, driven by capital work.
- Forecasts of internal FTEs showed steady growth from 2013 level, eventually approaching 2009 levels by 2019.
- After dropping by 35 percent over the historical portion of our study period, O&M FTE work levels forecasted for 2015 jumped by 16 percent, with no change at all thereafter.

Figure II.9: RGE Transmission & Substation FTEs by Resource Type





Key trends for RG&E include:

- Historical FTE levels (2009-2013) increased substantially; the growth all came in the form of contractor FTE work levels (from 28 to 187), while internal FTEs actually decreased substantially (by 18 percent).
- Forecasts of internal FTEs remained essentially flat, while contractors increased vastly on both an historical and a forecasted basis; the internal/contractor ratio was 4:1 in 2009, became 1:2 by 2013, and was forecasted to be 1:3 by 2019.
- Growth in capital work drove large historical and forecasted total FTE growth.
- Compared to an increase in capital FTEs of four times in the historical period (followed by growth approaching 50 percent in the future), O&M FTEs did not show very much movement between 2009 and 2019.

NYSEG and RG&E both showed significant flexibility in adding contractors as required to manage significant, changing construction program demands. The companies also showed modest forecasted increases in internal staffing levels for O&M and engineering work requirements. The NYSEG and RG&E data for 2010 and for 2018 showed reductions that demonstrate the impacts of capital work spikes.

The next tables illustrate NYSEG's and RG&E's overall resource mixes (percentages of straight time, overtime, and contractors) compared to the Reference Utility. The data show that each took a different approach to resource balancing.

Table II.11: Electric Transmission & Substation Resource Mix

Actual Resource Mix - 2013		
Source	**NYSEG**	**RU**
Straight Time	58%	56%
Overtime	5%	8%
Contractor	38%	36%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**NYSEG**	**RU**
Straight Time	61%	53%
Overtime	6%	7%
Contractor	33%	40%
Total	100%	100%

Actual Resource Mix - 2013		
Source	**RGE**	**RU**
Straight Time	31%	56%
Overtime	3%	8%
Contractor	66%	36%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**RGE**	**RU**
Straight Time	24%	53%
Overtime	3%	7%
Contractor	73%	40%
Total	100%	100%

In the historical period, NYSEG's resource mix mirrored the Reference Utility value. RG&E's high use of contractors distinguished it significantly from the Reference Utility. By 2019, NYSEG forecasts showed the contractor percentage decreasing. By contrast, the Reference Utility use of contractors increased to 40 percent. RG&E's internal staffing level did remain stable at around 100 FTEs. At the same time, an increasing capital workload caused the forecasted relative percentage of contractor resources to increase.

NYSEG and RG&E thus appeared to operate under a strategy emphasizing reliance on contractors to meet workload demand variances driven by changes in the transmission/substation construction program. We did not find this factor to be of concern, because both maintained or slightly increased internal resources to meet core O&M and capital workload requirements.

d. Electric Staffing Levels

This section examines how NYSEG and RG&E FTE 2013 staffing levels compared to other state utilities in the study. Our comparisons used two approaches: ratios of staff to key system attributes and five-year average FTE levels compared to estimates from Liberty's staffing model.

The accompanying two charts show how NYSEG and RG&E 2013 FTE levels compared to other utilities in the study on a simple ratio basis for certain key system attributes. The "Per Average of All Attributes" parameter reflects the number of FTEs versus the Reference Utility value divided by the "all attributes" index from the "Hard Drivers" subsections earlier in this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. If the number of FTEs for each utility were

Table II.12: Electric T&S Resource Mix - NYSEG

		All NY Utilities		
Parameter	NYSEG	Low	RU (Median)	High
Distribution FTEs				
Per Customer	0.71	0.66	1.00	1.40
Per OH Line Mile	0.47	0.46	1.00	6.46
Per Unit Sales	0.57	0.47	1.00	1.43
T&S FTEs				
Per OH Line Mile	0.24	0.24	1.00	13.49
Per Substation	0.42	0.28	1.00	4.22
Total				
Per Customer	0.72	0.72	1.00	1.27
Per Unit Sales	0.59	0.59	1.00	1.43
Per Average of All Attributes	0.67	0.67	0.97	1.16

proportional to its size, and no other factors were considered, this index's value would be 1.0 for every utility. A higher index value suggests that FTEs higher than expected based on size alone.

For NYSEG distribution work, FTEs per OH line mile, FTEs per customer, and FTEs per unit of sales all fell much lower than the Reference Utility ratios. For transmission work, NYSEG's FTE per unit values were also much lower than the Reference Utility ratios.

The RG&E distribution work value of 1.00 FTE per overhead line made it the median. The RG&E FTE values per customer and per unit of sales were both much lower than the Reference Utility ratio. All else equal, these values conformed to the comparatively compact nature of the service territory and its relatively low percentage of underground facilities.

Table II.13: Electric T&S Resource Mix - RGE

Parameter	RGE	All NY Utilities Low	RU (Median)	High
Distribution FTEs				
Per Customer	0.66	0.66	1.00	1.40
Per OH Line Mile	1.00	0.46	1.00	6.46
Per Unit Sales	0.47	0.47	1.00	1.43
T&S FTEs				
Per OH Line Mile	1.10	0.24	1.00	13.49
Per Substation	1.20	0.28	1.00	4.22
Total				
Per Customer	0.92	0.72	1.00	1.27
Per Unit Sales	0.67	0.59	1.00	1.43
Per Average of All Attributes	0.97	0.67	0.97	1.16

Moving to transmission work, RG&E FTE per substation values fell modestly above 1.0, indicating slightly higher staffing levels than the Reference Utility value. This may be indicative of a mix of fewer, larger substations that are more common in a compact, urban service territory. By itself, the somewhat higher value is not a reason for concern.

Overall electric RG&E FTEs per customer were all less than 1.0. Again, this is consistent with the relatively compact, urban nature of the system and indicates lower overall staffing levels than other utilities in the state.

Together the values for the two companies did not raise any questions about overstaffing, but we did keep in mind the comparatively low NYSEG values in considering the sufficiency of staffing.

Next we examine how NYSEG and RG&E's average staffing levels for the historical portion of our study period compared to staffing level estimates from the model developed by Liberty. We developed that model using the data provided by all the utilities we studied. The model correlates actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produces staffing level estimates, broken down by capital, O&M and engineering, for each utility. The estimates consider how the utility's unique combination of attributes vary with staffing levels compared to how the other state utilities staffing levels vary for the same combination of attributes. The model provides a more sophisticated way to consider each utility's staffing levels normalized for each utility's unique mix of infrastructure. The model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Those variances provide one of the bases used to question issues and perform analyses of staffing.

The next table shows NYSEG five-year average actual FTEs vs. model results for both the electric distribution and electric transmission/substation capital, O&M, and engineering functions. Note the two instances (Substation Capital and Transmission Capital) where we show "No Model." In these cases, we report only NYSEG's actual values. Observing a very high level of volatility in all companies' year-to-year expenditures for transmission and substation capital functions, we determined that we could not construct a statistically valid model, for such work, given that we had only five years of data to use.

Table II.14: NYSEG Electric Distribution Five-Year Average FTES (2009-2013)

Distribution			Transmission & Substation				
Type	Actual	Estimate	Type	Function	Actual	Estimate	Note
Capital	152	104	Capital	Transmission	64	64	No model
				Substation	151	151	No model
O&M	402	384	O&M	Transmission	74	62	-
				Substation	99	101	-
Engineering	103	60	Engineering	T&S	14	13	-
Total FTEs	657	548	Total FTEs	T&S	402	392	-

For NYSEG electric distribution functions, results of modeling showed some significant variances between five-year average staffing levels and model estimates:

- For capital work, five-year average staffing levels were 50 percent higher than model estimates.
- For O&M work, five-year average staffing levels were four percent higher than model estimates.
- For engineering work, five-year average staffing levels were 71 percent higher than model estimates.

Electric distribution average staffing levels for O&M fell within model range for these functions, indicating a close match between resources and model attributes.

Electric distribution average staffing levels for O&M did not fall outside model range, indicating a close match between resources and model attributes.

Five-year average staffing levels for capital and engineering functions, however, varied significantly, proving much higher than model estimates. These variances taken alone raise a question about high staffing. The variances for capital work move significantly in the other direction from what we observed for NYSEG under the simple ratio analysis shown above. These ratio analysis results, specifically NYSEG's .47 FTEs per OH line mile and .71 FTEs per customer moderate the potential for concern raised by the model result alone. The model alone may not fully account for the widely dispersed nature of the NYSEG system compared to other state utilities, as demonstrated by the .47 FTEs per OH line mile.

We placed more emphasis on the mismatch shown for the engineering function. NYSEG's ratio of field personnel (capital and O&M personnel) to engineering personnel was 5 to 4. This ratio ranged between 6 to .8 and 7 to 5 for other electric utilities in the state. This variance, taken alone, raises a question about high staffing, as was true for capital work as well. Below, however, we observe the reverse situation at RG&E, which raises the question of whether the issue is not so much more workers than required, but rather the allocation of engineering time between the two operations.

In transmission and substation functions, we could develop models only for substation O&M, transmission O&M, and transmission/substation engineering. NYSEG's five-year average FTEs for these functions were:

- For substation O&M, five-year average staffing levels were within one percent of model estimates.
- For transmission O&M, five-year average staffing levels were within one percent of model estimates
- For transmission/substation engineering, five-year average staffing levels were within five percent of model estimates

Electric transmission/substation average staffing levels fell within the model's range for these functions. Based upon model results, five-year average staffing levels for these functions were within the range of expected staffing levels for NYSEG's facilities.

The next table shows the corresponding RG&E five-year average actual FTEs vs. model results.

Table II.15: RGE Electric Distribution Five-Year Average FTES (2009-2013)

Distribution			Transmission & Substation				
Type	Actual	Estimate	Type	Function	Actual	Estimate	Note
Capital	104	88	Capital	Transmission	13	13	No model
				Substation	118	118	No model
O&M	138	154	O&M	Transmission	18	21	-
				Substation	44	34	-
Engineering	18	62	Engineering	T&S	5	7	-
Total FTEs	260	305	Total FTEs	T&S	199	193	-

Much like the analysis of NYSEG's electric distribution functions, modeling results for RG&E showed some significant variances between five-year average staffing levels and model estimates:

- For capital work, five-year average staffing levels were 18 percent higher than model estimates.
- For O&M work, five-year average staffing levels were 10 percent lower than model estimates.
- For engineering work, five-year average staffing levels were 70 percent lower than model estimates.

Electric distribution average staffing levels for O&M fell within model range for these functions, indicating a close match between resources and model attributes.

RG&E's five-year average staffing levels for capital ran 18 percent higher than model estimates, but given the range of model accuracy, this was not a large variance. It is not surprising that this difference was smaller than the NYSEG variance, given the more urban, compact nature of RG&E's service territory.

Again, however, data for engineering raised a concern. RG&E's ratio of field personnel (capital and O&M personnel) to engineering personnel was 13 to 4, far outside the typical range of 6.8 and 7 to 5 for other electric utilities in the state. Coupled with the dramatically low ratio for NYSEG, the gap creates a concern about the accuracy of the data management provided. Returning to the allocation concern raised above, we calculated the data on a combined basis for RG&E and NYSEG. That ratio produced a result of 6.6, which corresponded generally to ratios at the other electric operations we studied.

In transmission and substation functions, RG&E five-year average FTEs for these functions were:

- For substation O&M, five-year average staffing levels were 29 percent higher than model estimates.
- For transmission O&M, five-year average staffing levels were within five percent of model estimates.
- For transmission/substation engineering, five-year average staffing levels were 28 percent lower than model estimates.

Substation O&M model analysis results were consistent with the simple ratio analysis for RG&E (see the second chart in this sub-section above). This data point from modeling, taken in conjunction with the ratio analysis, raises a concern about high staffing in this area.

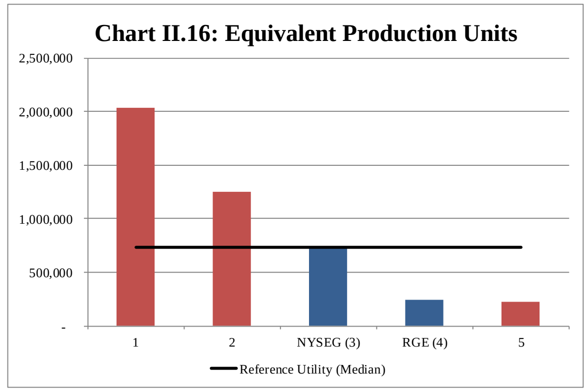
The transmission/substation engineering model analysis showed variances between five-year average staffing levels and model estimates in the low single digits. We therefore observed no staffing concern from model results.

2. Productivity – Electric

We addressed productivity from several perspectives. We undertook comparisons of the operations we studied as a function of staffing per unit of a variety of commodities or attributes. We also developed a concept we termed New York normalized unit rates (NYNURs or 9ers). The Productivity chapter of the Statewide report describes this concept. Our 9ers present a common measure of production (equivalent production units, or EPUs) that facilitates comparisons across commodities and organizations. The number of hours, or FTEs, or dollars expended per EPU therefore becomes one indicator of productivity.

In developing the 9ers concept we learned that the utility data available was not sufficiently comprehensive to allow us to apply it to all of the hours spent on the work activities within the scope of our study. We did, however, find sufficient data to develop usable measures for about half of the hours each utility actually expended. The partial nature of the results dictates caution in carrying any performance conclusions too far. Nevertheless, we believe the concept has value as another indicator which, when supported by others, can be informative.

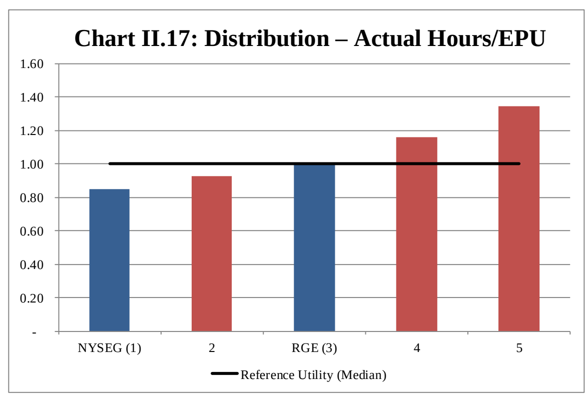
a. Equivalent Production Units



An EPU equals the number of hours the Reference Utility expended to produce one unit of a given commodity. Stated in another way, the EPU quantifies the Reference Utility actual unit rate value for that commodity. For example, if the Reference Utility unit rate for "widgets" equals 10 hours per widget, then installation of one widget earns a utility 10 hours. This process's creation of a common denominator for production permits adding EPUs together at any level of detail or for any organizational breakdown.

For the limited scope covered by our analysis, the total number of NYSEG and RG&E electric units fell at the smaller end of the scale. They represented 40 percent (two of five) of the operations in our population, but only about 20 percent of the total EPUs of the five. The absolute number of EPUs measures unit output, but means little on its own. It derives usefulness when constructed to represent a comparable production level among companies. The ability to measure the number of employees per EPU at a total company level may be the ultimate, but not perfect, measure of productivity.

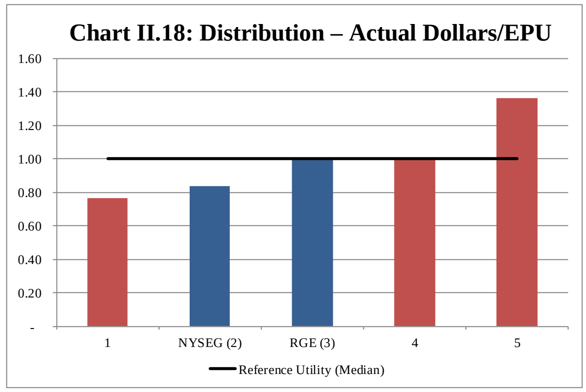
b. Productivity



We use the term physical productivity here to mean the actual hours per EPU. The next chart illustrates the hours each utility spent in the limited scope areas per EPU, which we term physical productivity. Note that the Reference Utility is 1.0 here by definition, because we defined an EPU by the Reference Utility's actual unit rate. Both NYSEG and RG&E showed productivity at or below the Reference Utility level, measured either by dollars or hours. NYSEG showed the best rates in each category.

Given the wide disparity among the characteristics of the state utilities, the distribution around the Reference Utility was surprisingly limited.

We define cost productivity as the dollars of labor cost expended to achieve an EPU. We normalized this data to the Reference Utility value, whose cost productivity was $81.13 per EPU. NYSEG's best ranking reflected its favorable physical productivity coupled with its relatively low composite hourly labor rate. The composite labor rate includes all internal straight and overtime and all contractor hourly rates, weighted by hours. RG&E's average physical productivity ranking and low composite hourly labor rate produced a cost productivity in line with the Reference Utility value. These indicators, taken individually, indicate favorable productivity compared with the operations we studied.

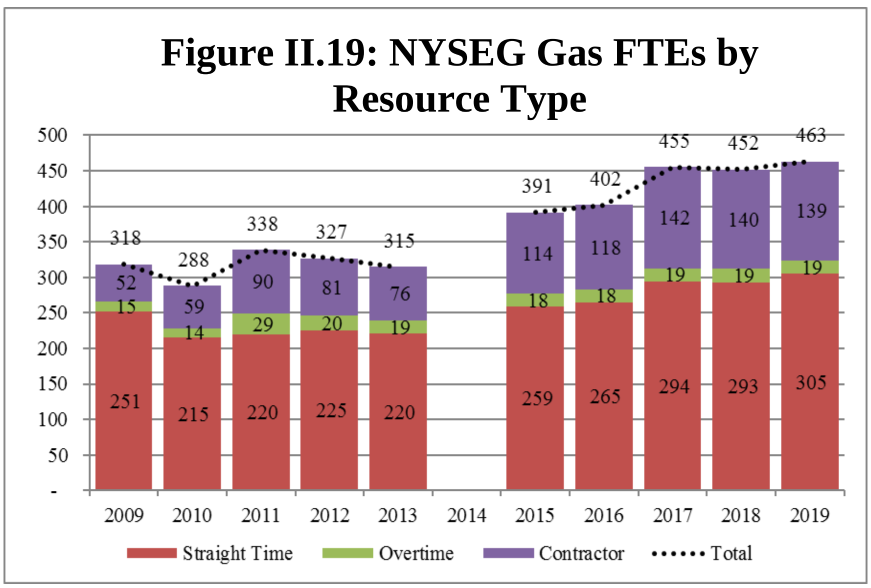


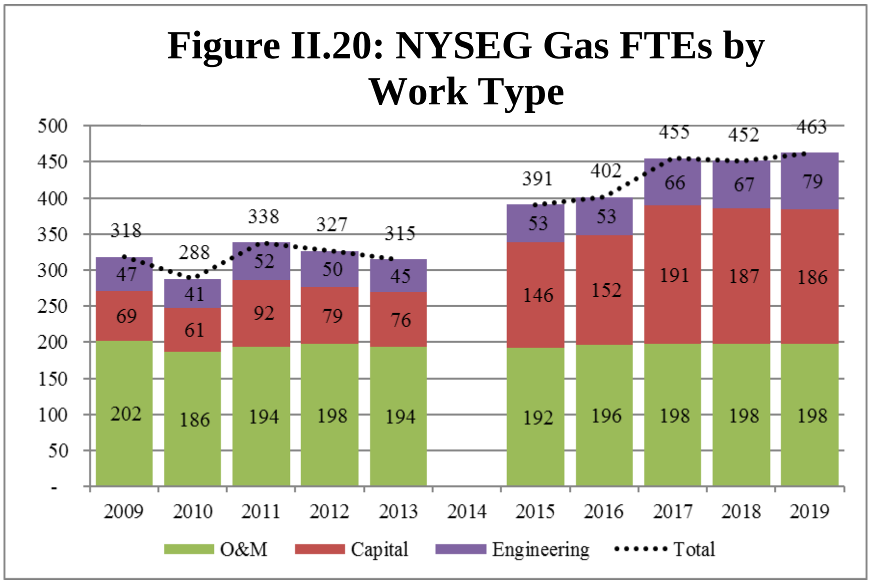
3. Total Staff Assessment –Gas

This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for gas operations functions at NYSEG and RG&E.

a. Gas Staffing Trends

The next chart shows the 2009 through 2019 historical and forecasted gas staffing resources in the areas encompassed by our study, broken down by resource type (internal staff straight time, internal staff overtime, and contractors). As was true for all of the state's utilities, we were not able to secure consistently derived data for 2014, which was in progress during our field work.





Key workload and resource patterns and trends we observed for NYSEG include:

- During the 2010-2013 historical period, internal staffing stayed relatively constant; internal FTEs dropped between 2009 and 2010, and then stayed close to the same amount.
- Contractor FTE growth compensated for this drop in historical period internal FTEs.
- The historical (2009 – 2013) portion of our study showed little change in the distribution of work between capital and O&M activities.
- The forecasted portion of our study period showed significant growth in both internal and contractor FTEs, with total FTEs peaking in 2019. The 2019 total of 463 FTEs represented a 48 percent increase from 2013 levels.
- Essentially all forecasted growth occurred in capital work, with the O&M work load (resourced primarily with internal FTEs) remaining flat through 2019, as it had during the historical portion of our study period (about 150 FTEs).
- Driven largely by capital work associated with accelerated pipe replacement, the forecasted growth in work requirements took more added straight time FTEs (approximately 85) than contractor FTEs (projected to grow by approximately 60). Engineering FTEs also increased by about 50 percent to support the program.
- O&M workload was highly stable throughout the 2009-2019 historical and forecasted periods. These activities were resourced primarily with internal resources.
- Use of overtime remained stable and modest (10 percent or less) throughout the period.

Figure II.21: RGE Gas FTEs by Resource Type

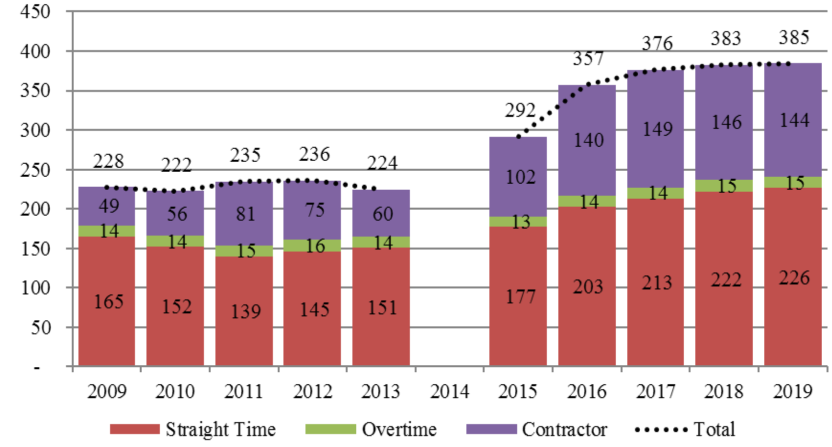
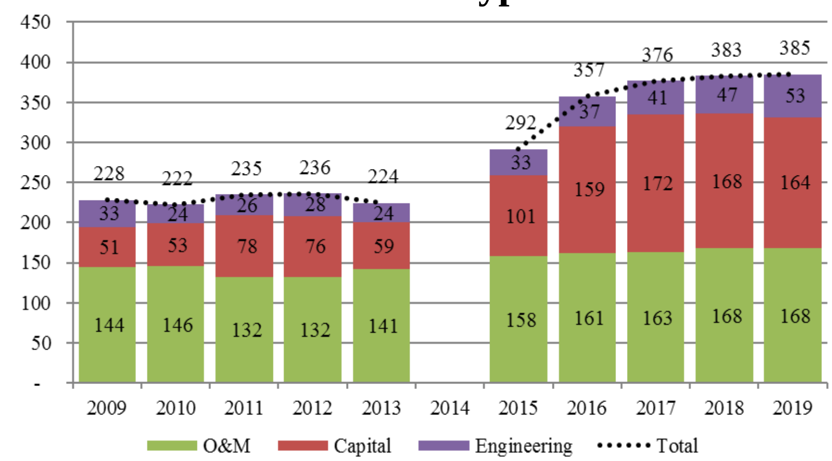


Figure II.22: RGE Gas FTEs by Work Type



For RG&E, workload and resource trends exhibited the same patterns we observed for NYSEG, including:

- Historical staffing stayed relatively constant, with small offsetting changes between internal FTEs (down) and contractor FTEs (up).
- The historical balance of work between capital and O&M also remained stable, but a drop (discussed below in connection with performance metrics) occurred for two years in O&M activity FTEs.
- The forecasts that management provided showed a significant ramp up in the period beginning in 2015 and peaking in 2019 at 385 FTEs (an increase of some 70 percent above 2013 levels).
- Forecasted O&M resource growth was fairly substantial (at close to 20 percent), but capital FTEs grew by much more (above 60 percent), showing pipeline replacement as the primary resource growth driver.

- RG&E planned to meet increased work requirements through a balance of increases in straight time (approximately 75) and contractor (approximately 80) FTEs.
- O&M and engineering workload patterns and increases at RG&E conformed closely to those seen for NYSEG.

In the historic period, the workload at both companies was stable, with changes met through minor adjustments to overtime and contractor levels. This approach typifies the route that many companies have taken. Stability, however, disappeared in the future for both NYSEG and RG&E. Each must deal with similar ramp-ups to their pipe replacement programs and moderate increases in O&M activities. The forecasts that management provided showed plans to meet increased 2015 – 2019 workloads through a combination of internal and contractor resources, with contractors performing an increasing percentage of work. The next two tables show the changing work proportions for NYSEG and RG&E, and compare them to those of the Reference Utility.

Table II.23: Gas Resource Mix

Actual Resource Mix - 2013		
Source	**NYSEG**	**RU**
Straight Time	70%	62%
Overtime	6%	8%
Contractor	24%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**NYSEG**	**RU**
Straight Time	66%	59%
Overtime	4%	8%
Contractor	30%	33%
Total	100%	100%

Actual Resource Mix - 2013		
Source	**RGE**	**RU**
Straight Time	67%	62%
Overtime	6%	8%
Contractor	27%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**RGE**	**RU**
Straight Time	59%	59%
Overtime	4%	8%
Contractor	37%	33%
Total	100%	100%

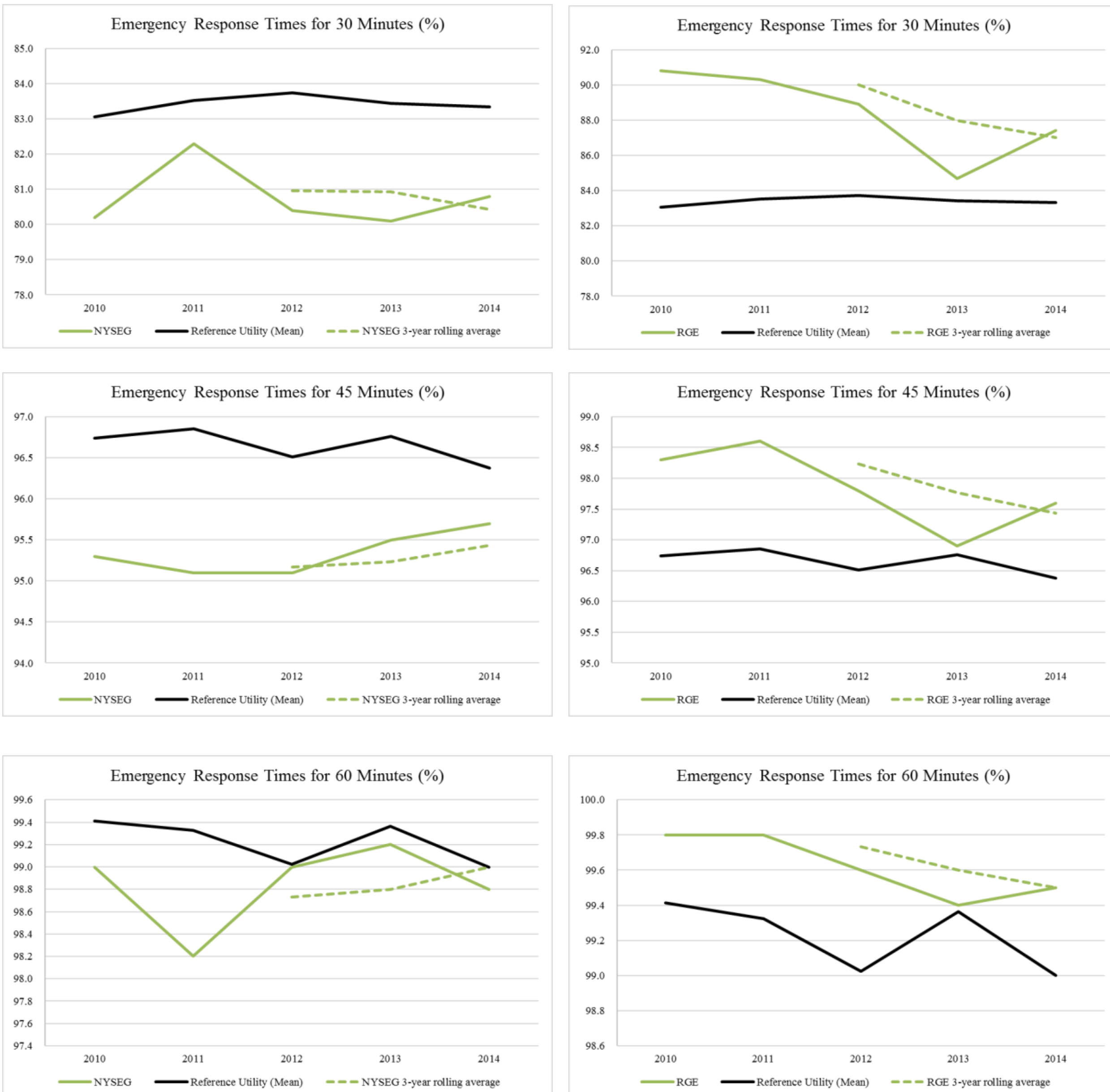
NYSEG and RG&E internal staff (straight and overtime) work shares for 2013 exceeded the Reference Utility value. The NYSEG and RG&E shares of 67 and 70 percent compared to a Reference Utility value of 62 percent. The forecasted 2019 levels showed both NYSEG and RG&E increasing the work shares of contractors. The same was true of the Reference Utility, but in its case by significantly less. NYSEG therefore approached, but remained moderately below the Reference Utility level, while RG&E came to exceed it, but again, only moderately.

b. Performance Metrics

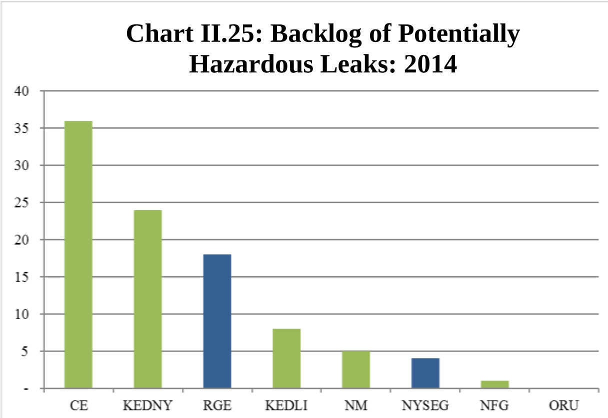
We charted historical changes in performance metrics as reported for leak-response times and backlogs of leaks as defined in 16 NYCRR Part 255; *i.e.*, Types 1, 2A, and 3. The next charts show response time results. NYSEG response times were either stable or improving. RG&E's time, however, declined for all three time windows. The decline was clear from 2011 to 2012 and 2012 to 2013. We observed above that RG&E's O&M FTEs dropped historically also. Management increased them in 2013, and forecasts showed plans for further increases in 2015 and continuing. Leak response times improved in 2014, following the increase in O&M activity FTEs.

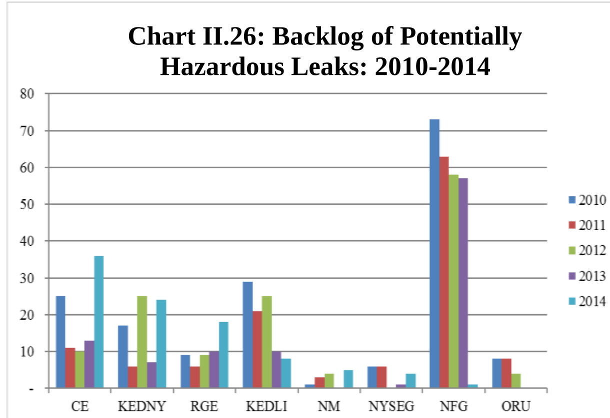
Chart II.24: Emergency Response Times

NYSEG **RGE**



The next charts show leak backlog data for NYSEG and RG&E.





NYSEG maintained steady and comparatively very low leak backlogs throughout the historical portion of our study period. RG&E experienced higher numbers and a growing trend in backlogs. When we combine the response time and backlog data, no questions arise in the case of NYSEG. There was a correspondence between performance and internal O&M resource declines at RG&E. On the other hand, performance improvements in response times also corresponded with an increase in internal resources applied to O&M activities late in the historical portion of our study period. Moreover, management's forecasts showed continuing increases into the future. Thus, we did not consider the data to raise questions about future staffing adequacy. However, trends across the second half of the historical study period showed the need for management to continue looking closely at resources applied to leak response and repair.

The preceding response time charts show the Reference Utility line. Caution is required in using it to form firm judgments about NYSEG and RG&E. NYSEG consistently underperformed and RG&E consistently over-performed the Reference Utility values. This result is directionally unsurprising. NYSEG has a large territory and a low customer density. RG&E has a compact territory and high customer density. These factors influence response times, all else being equal.

c. Gas Staffing Levels

The next tables compare NYSEG and RG&E 2013 FTE levels with those of the other gas operations we studied. As we did for electric FTE levels, the comparisons use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index described in the "Hard Drivers" subsection of this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. A higher index suggests higher FTEs than might have been expected based on size alone.

Chart II.27: NYSEG Gas Staffing Ratios

Parameter	NYSEG	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	1.35	0.70	1.00	2.32
Per Mile of Main	0.95	0.49	1.00	3.60
Per Unit Sales	0.76	0.60	1.00	1.82
Per Average of All Attributes	0.99	0.80	0.96	1.49

As we observed earlier in discussing NYSEG's electric distribution ratios, its gas FTEs per mile of main and gas FTEs per unit of sales fell below the corresponding Reference Utility values. However, NYSEG's FTEs per customer were higher than the Reference Utility value (1.35 versus 1.00). Comparatively low customer density was a contributing factor.

Chart II.28: RGE Gas Staffing Ratios

Parameter	RGE	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	0.82	0.70	1.00	2.32
Per Mile of Main	0.66	0.49	1.00	3.60
Per Unit Sales	0.60	0.60	1.00	1.82
Per Average of All Attributes	0.80	0.80	0.96	1.49

Not surprisingly all RG&E values fell significantly below those of the Reference Utility. RG&E's results reflected a combination of relatively modest staffing levels to serve the relatively higher customer density of its service territory.

Next we examine how the NYSEG and RG&E five-year average staffing levels for the period 2009-2013 compare to staffing level estimates from the model developed by Liberty. The next table shows five-year average actual FTEs versus model results for gas capital, O&M, and engineering functions.

Table II.29: Gas Five-Year Average FTEs (2009-2013)

NYSEG

Type	Actual	Estimate
Capital	75	72
O&M	195	182
Engineering	47	54
Total FTEs	317	309

RGE

Type	Actual	Estimate
Capital	63	47
O&M	139	151
Engineering	27	24
Total FTEs	229	245

NYSEG gas function five-year average staffing levels show a reasonable level of consistency with model estimates:

- For capital work, five-year average staffing levels were four percent higher than model estimates.

- For O&M work, five-year average staffing levels were seven percent higher than model estimates.
- For engineering work, five-year average staffing levels were 13 percent lower than model estimates.

Average staffing levels for all NYSEG gas functions fell within model range for these functions, indicating a reasonable match between resources and model attributes. These modeling results were also consistent with the ratio analysis discussed above.

For RG&E gas functions, results of modeling showed some significant variances between five-year average staffing levels and model estimates:

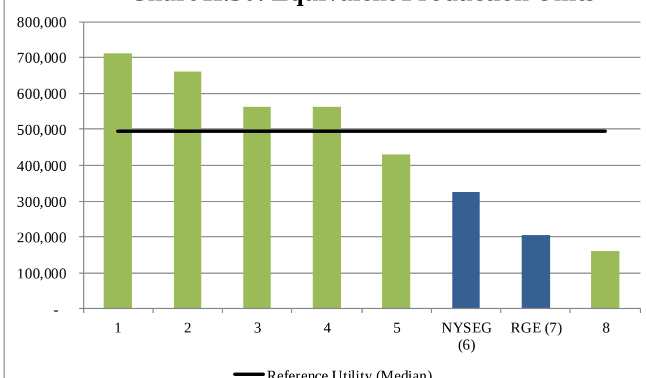
- For capital work, five-year average staffing levels were 34 percent higher than model estimates.
- For O&M work, five-year average staffing levels were 8 percent lower than model estimates.
- For engineering work, five-year average staffing levels were 13 percent higher than model estimates.

The five-year average staffing levels for capital function fell far above model estimates. The simple ratio analysis discussed above provided a contrary indication. That ratio analysis combines all types of work into a single ratio. By itself, the difference from model estimates raises some concern about staffing levels for capital. While the results of these two analyses produced counterbalancing observations, the size of the gap from model estimates leaves the high indicated RG&E applied FTEs for capital work in question.

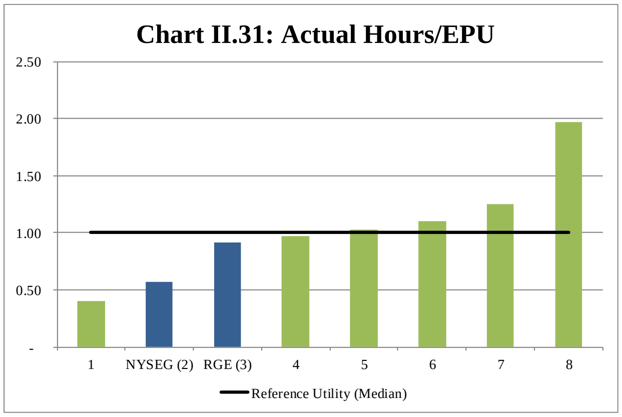
4. Productivity – Gas

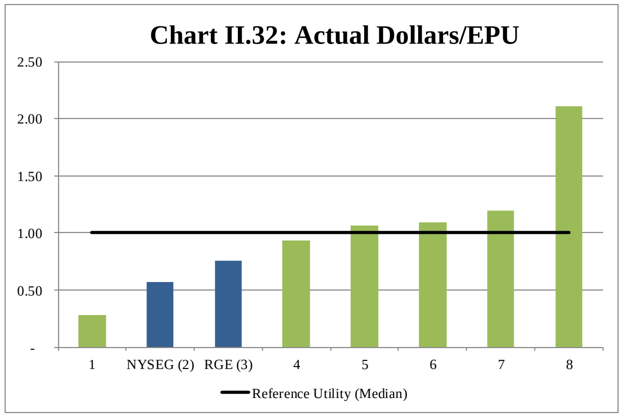
The accompanying chart shows that NYSEG and RG&E gas operations made up an even smaller portion of the production units in our sample than did their electric operations counterparts. Only one other operation of those we studied had a smaller number of units. Although small in terms of production, we will see below that each compared favorably under our 9ers approach to measurement.

Chart II.30: Equivalent Production Units



The charts below show that physical and cost productivity for NYSEG and RG&E compared favorably with the other gas companies. NYSEG and RG&E had lower unit rates than all but one other utility. Their comparably strong physical productivity extended to cost ($ per EPU) as well. RG&E had a low composite hourly labor rate. NYSEG's was only slightly higher. The median cost productivity for the gas utilities was $94.69 per EPU.





B. Internal Staffing

This section considers analyses related to internal staffing issues at NYSEG and RG&E. The companies shared senior management and followed similar approaches at the functional level; therefore, we analyzed internal staffing issues for both companies together at the functional level; *i.e.*, electric distribution, electric transmission and substation, and gas.

1. Electric Distribution

The next charts show overall internal staffing levels for NYSEG and RG&E electric distribution, separating O&M, capital, and engineering resources.

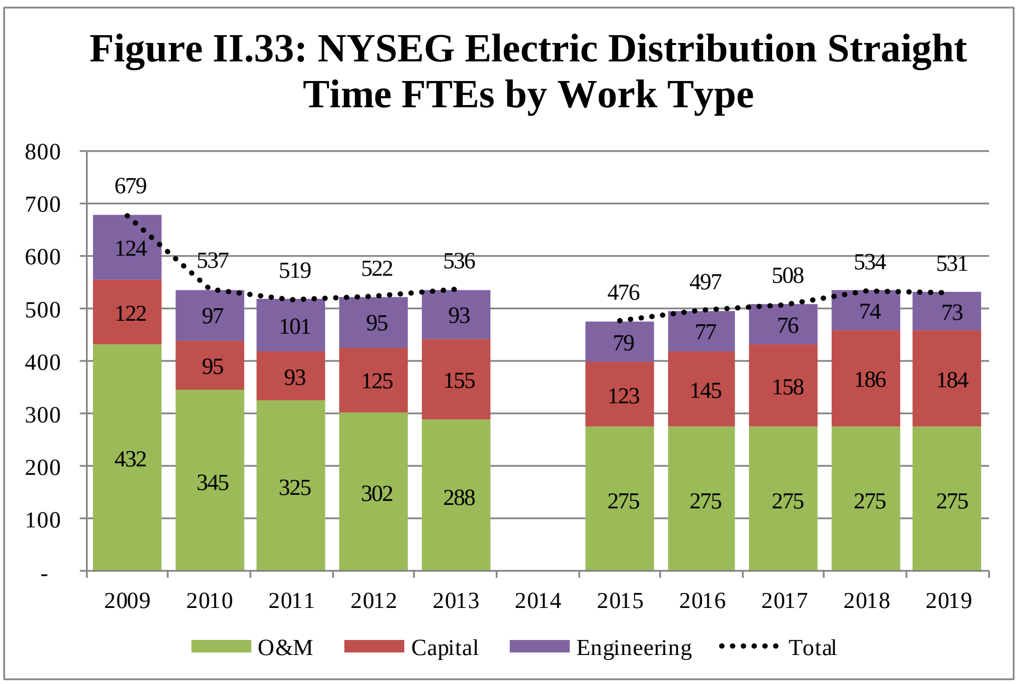
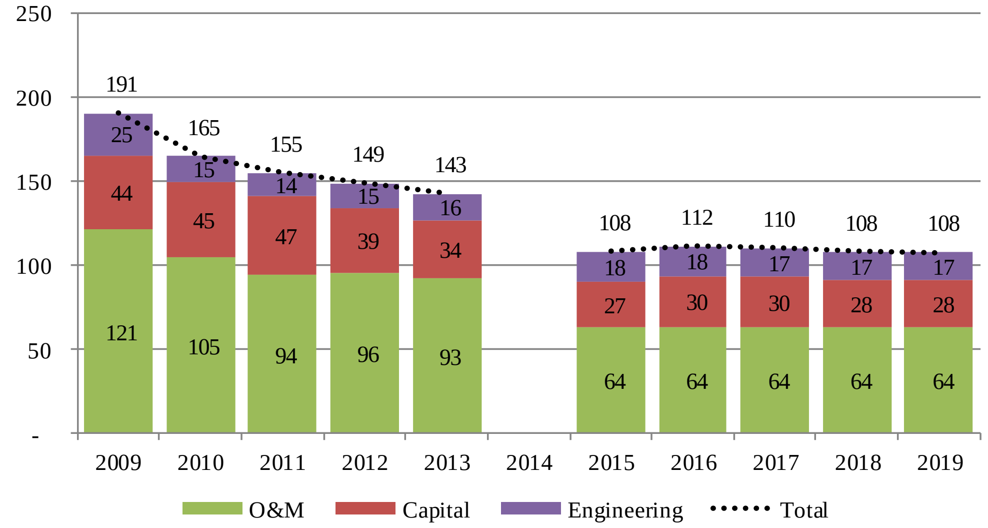


Figure II.34: RGE Electric Distribution Straight Time FTEs by Work Type



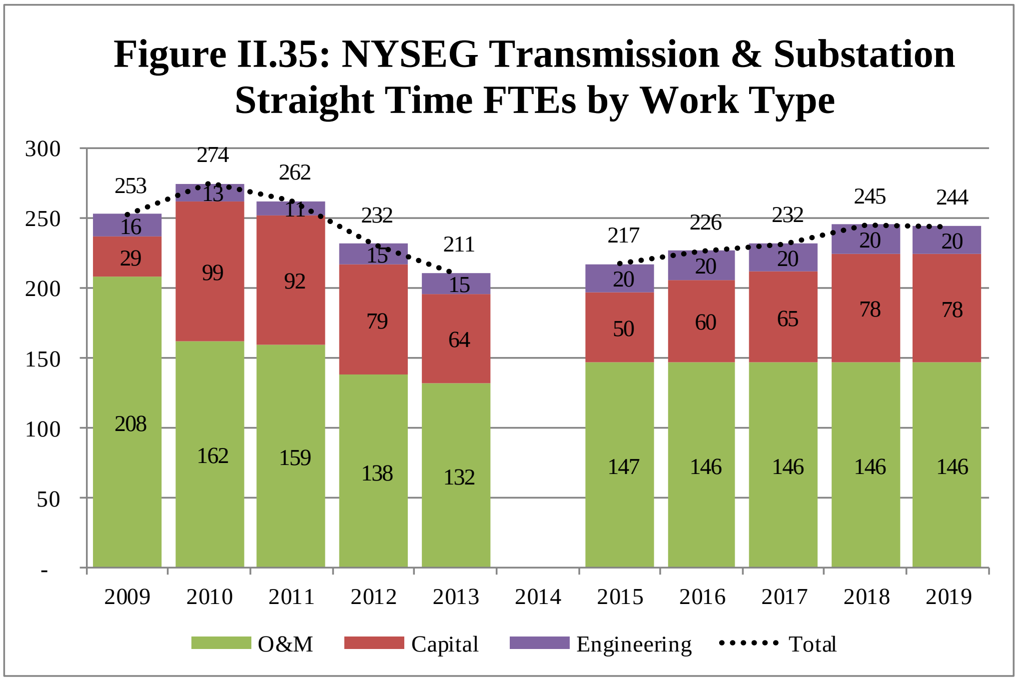
During the 2009-2011 historical period, electric distribution operations at both Avangrid companies dropped significantly. NYSEG FTEs fell from 679 to 519 and RG&E FTEs fell from 191 to 155. NYSEG's O&M, capital, and engineering FTEs all dropped by 20 percent or more. RG&E experienced a similar pattern. Internal FTEs at both operations then remained stable through 2013, although some with some rebalancing between capital and O&M work activities.

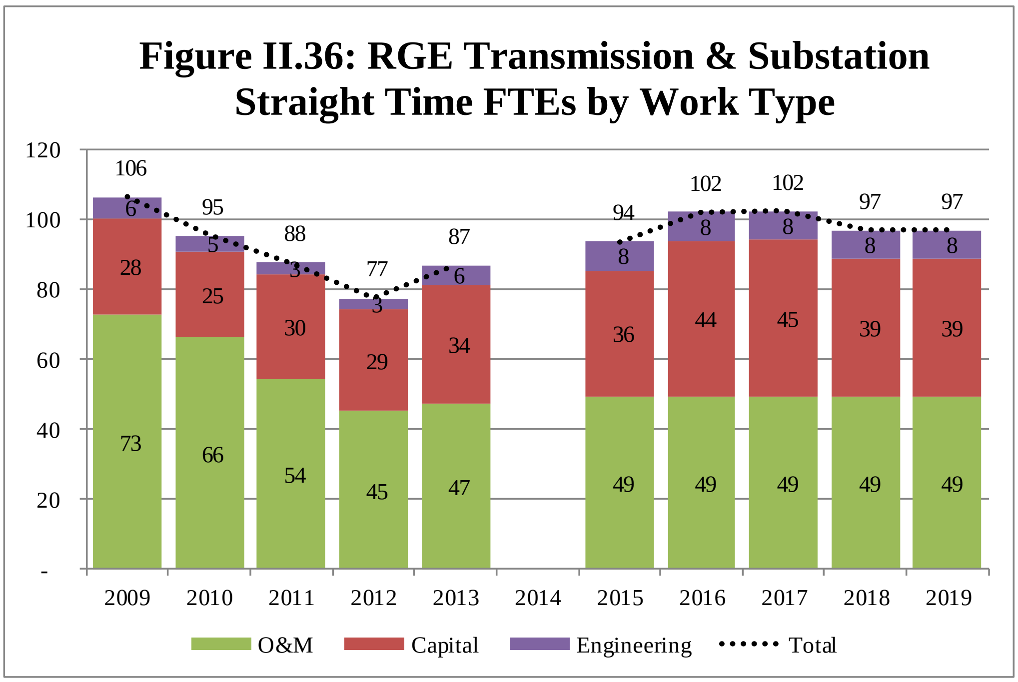
The forecasts that management provided show another 13 percent reduction between 2013 and 2015 at NYSEG, predominantly in capital work. Resources then grew through the remainder of the forecast portion of our study period, essentially getting back to 2013 levels by 2019. Capital work accounted for essentially all that growth.

The forecasts of internal FTE activity for RG&E differed very substantially from those of NYSEG. Management's forecasts showed its internal FTE work activity dropping by about a third between 2013 and 2015, and then remaining flat through the remainder of the forecast portion of our study period. Most of that reduction occurred in O&M activities, where forecasts of internally performed activity continued at about two thirds of their 2013 levels. How management expects to perform O&M adequately at these reduced levels calls for an explanation.

2. *Electric Transmission and Substations*

The next charts show NYSEG and RG&E internal staffing levels for electric transmission and substations, breaking the totals down by O&M, capital, and engineering resources.





Transmission/substation internal FTE work at each company fell by virtually the same degree (17 to 18 percent) through 2013. Most of the drop came in O&M activity, with internal FTE activity falling at each by somewhat more than a third. Particularly at NYSEG, capital work fluctuated widely, involving from 29 to 79 FTEs at NYSEG. Capital work variation at RG&E was much more moderate. The net effect of these two workload patterns was to reduce total FTEs by about 10 percent from 2009 to 2019.

The forecasts that management provided showed a steady increase from 2013 levels at NYSEG. Forecasted O&M FTEs jumped by 11 percent in 2015, then remained flat through 2019, while capital FTEs showed a drop in 2015, but then increased through 2019. RG&E forecasts showed 2013 levels essentially continuing, with no year-to-year change through 2019. Overall, capital FTEs showed the same pattern, with some year-to-year fluctuation, as typifies electric utility capital needs.

3. Staffing Ratios

The next tables compare NYSEG and RG&E internal FTE levels to the Reference Utility value. NYSEG values were lower than the Reference Utility consistently. RG&E fell close to Reference Utility values in each category.

Table II.37: Electric Straight Time Staffing Ratios

		All NY Utilities					All NY Utilities		
Parameter	NYSEG	Low	RU (Median)	High	Parameter	RGE	Low	RU (Median)	High
Distribution FTEs					Distribution FTEs				
Per Customer	0.99	0.63	1.00	1.71	Per Customer	0.63	0.63	1.00	1.71
Per OH Line Mile	0.68	0.50	1.00	6.70	Per OH Line Mile	1.00	0.50	1.00	6.70
Per Unit Sales	0.79	0.45	1.00	1.49	Per Unit Sales	0.45	0.45	1.00	1.49
T&S FTEs					T&S FTEs				
Per OH Line Mile	0.42	0.42	1.00	29.16	Per OH Line Mile	1.00	0.42	1.00	29.16
Per Substation	0.65	0.42	1.00	8.35	Per Substation	1.00	0.42	1.00	8.35
Total					Total				
Per Customer	0.83	0.62	1.00	1.36	Per Customer	0.62	0.62	1.00	1.36
Per Unit Sales	0.66	0.44	1.00	1.30	Per Unit Sales	0.44	0.44	1.00	1.30
Average of Total	0.75	0.53	1.00	1.33	Average of Total	0.53	0.53	1.00	1.33
Per Average of All Attributes	0.67	0.57	0.77	1.09	Per Average of All Attributes	0.57	0.57	0.77	1.09

4. Gas

The next figures show internal FTE activity levels for gas, breaking the totals down by O&M, capital, and engineering related work activities.

Figure II.38: NYSEG Gas Straight Time FTEs by Work Type

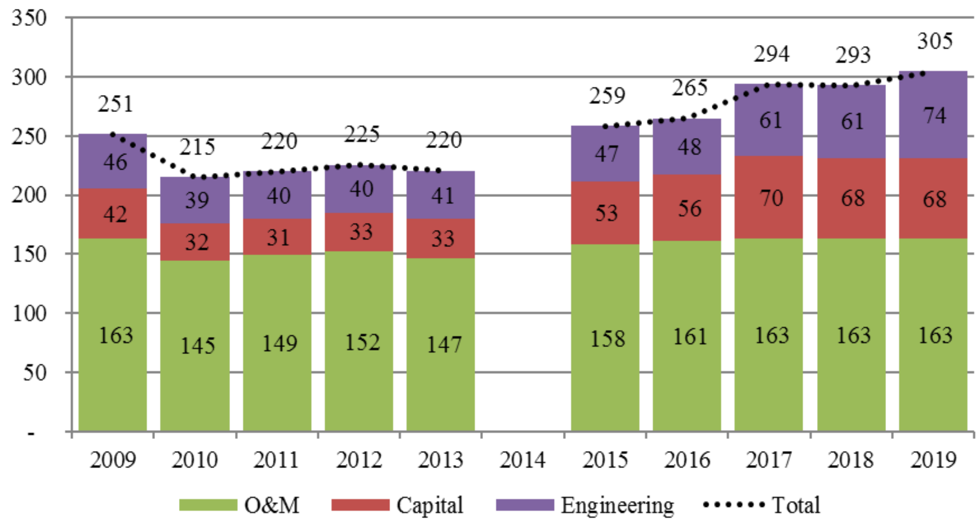
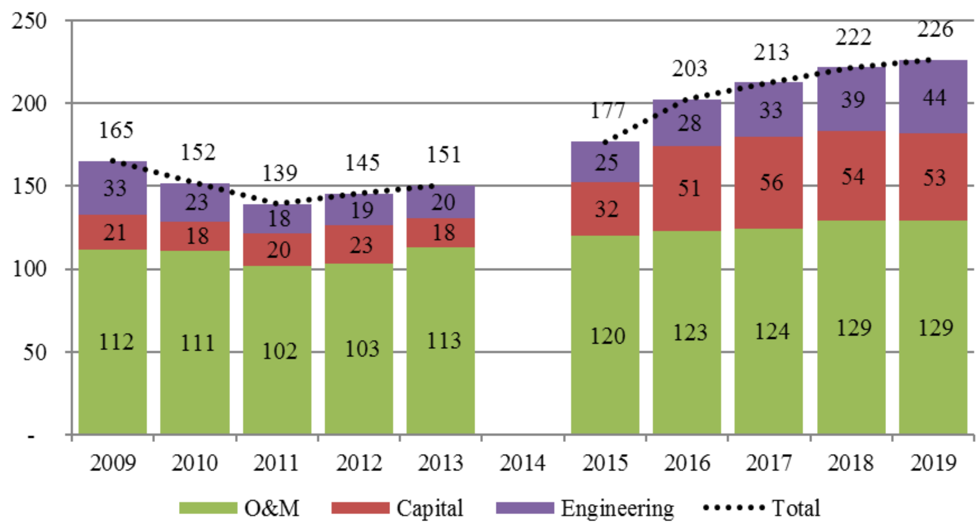


Figure II.39: RGE Gas Straight Time FTEs by Work Type



Both NYSEG and RG&E gas operations showed drops in internal FTE work activity through 2013, followed by forecasts calling for large increases. The drops came in all three work areas (capital, O&M, and engineering). The forecasts that management provided showed 2015 increases (over 2013 levels) within a half of one percent of each other (about 17 percent). Forecasts for both continued to increase through 2019, but at a higher rate for RG&E (28 versus 18 percent). Both showed moderate forecasted increases in O&M and much higher forecasted increases in capital work. That differential reflected the primacy of pipe replacement work as a source of growth in forecasted work requirements.

The next tables show the results of our comparison of straight-time gas operations at NYSEG and RG&E to Reference Utility values. RG&E's values were consistently at or significantly below Reference Utility values. Its very low value in FTEs per main mile reflected the nature of its territory and customer characteristics. We found no surprises in the NYSEG values. Its high value in FTEs per customer was also consistent with its service territory and customer characteristics, which differ from those of RG&E.

Table II.40: Gas Straight Time Staffing Ratios

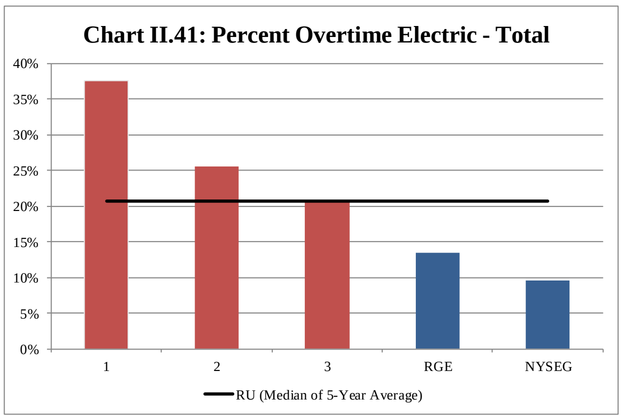
Parameter	NYSEG	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	1.55	0.52	1.00	2.46
Per Mile of Main	1.03	0.54	1.00	2.94
Per Unit Sales	0.86	0.44	1.00	1.90
Per Average of All Attributes	1.15	0.50	1.00	2.43

Parameter	RGE	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	0.91	0.52	1.00	2.46
Per Mile of Main	0.69	0.54	1.00	2.94
Per Unit Sales	0.65	0.44	1.00	1.90
Per Average of All Attributes	0.75	0.50	1.00	2.43

C. Overtime

1. *Electric*

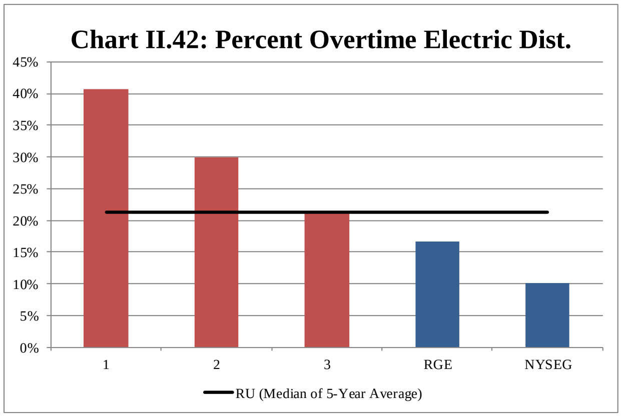
The accompanying chart illustrates Avangrid operations' electric overtime average over the 2009-13 period.[1] The remaining bars represent the other electric utilities we studied. Both NYSEG and RG&E reported electric overtime at levels well below the Reference Utility value, and much more in line with what we had previously found to be typical utility levels (10-15 percent). RG&E's rate was somewhat higher than NYSEG's, but not to an extent we found material.

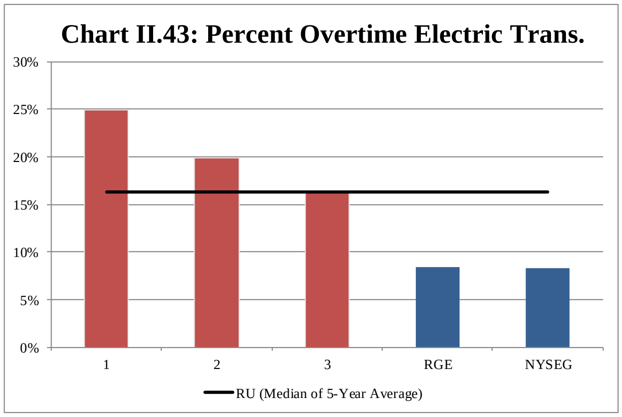


The charts below depict the same comparative performance broken down between electric distribution and transmission. The same pattern exists. Distribution had higher rates, but not to a

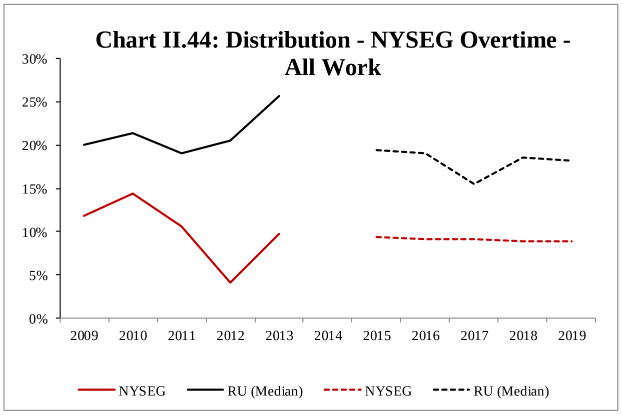
[1] All overtime reported in this chapter excludes any engineering functions.

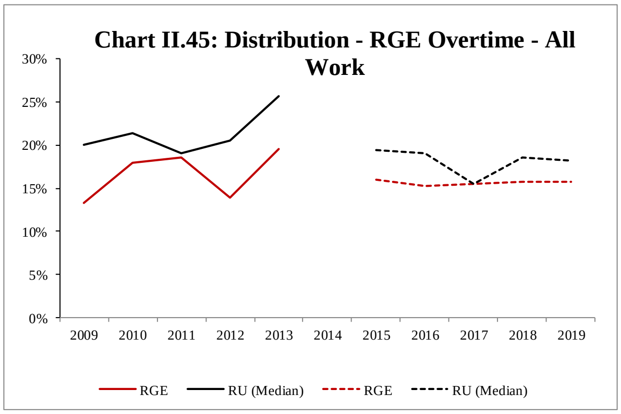
significant degree, given the already low comparative levels.





The next set of tables shows NYSEG and RG&E overtime changes throughout our study period. The first two show total distribution overtime.





Management had used 20 percent as an upper overtime limit, and succeeded in remaining well below that limit at NYSEG through 2013. Moreover, overtime had been falling at NYSEG, even as the Reference Utility rate increased. NYSEG also forecasted a steady future rate of 10 percent. RG&E had higher levels. While approaching the 20 percent limit at times, management kept overtime below that limit. RG&E overtime moderately increased through 2013. The long term forecast nonetheless indicated a reversal of the uptrend, with overtime settling at 15 percent, well above NYSEG but still below the Reference Utility value.

The next two charts show distribution overtime for O&M work. We generally observed rising overtime in this category among the operations we studied. However, NYSEG and RG&E kept capital and O&M distribution overtime generally in line with each other.

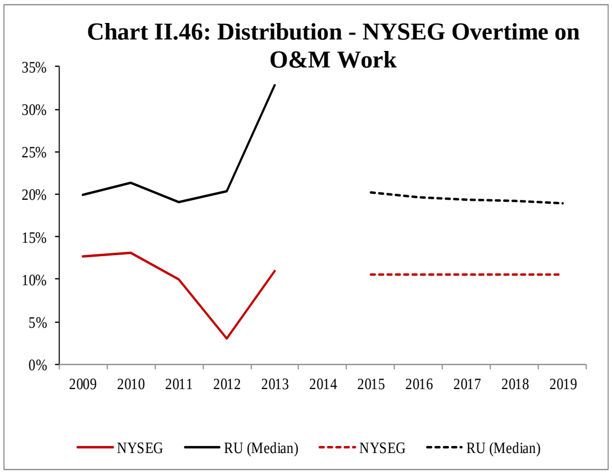


Chart II.46: Distribution - NYSEG Overtime on O&M Work

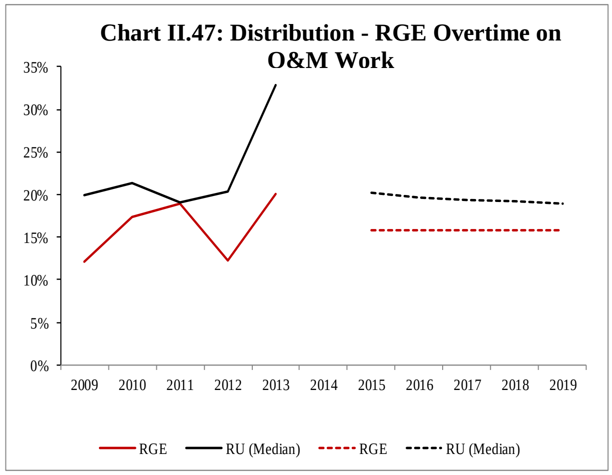


Chart II.47: Distribution - RGE Overtime on O&M Work

The next two charts, which address transmission overtime on all work (capital and O&M combined) show rates, patterns, and projections in common with those of distribution.

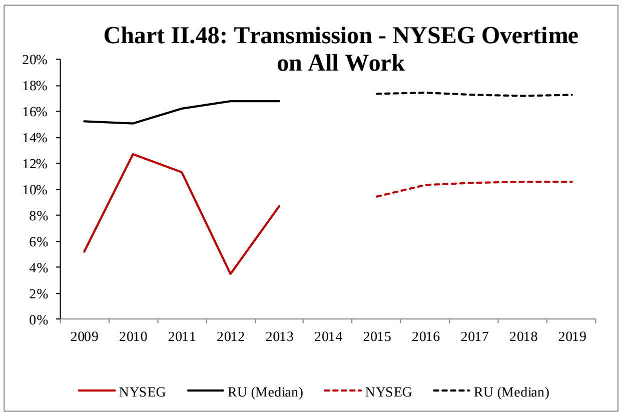


Chart II.48: Transmission - NYSEG Overtime on All Work

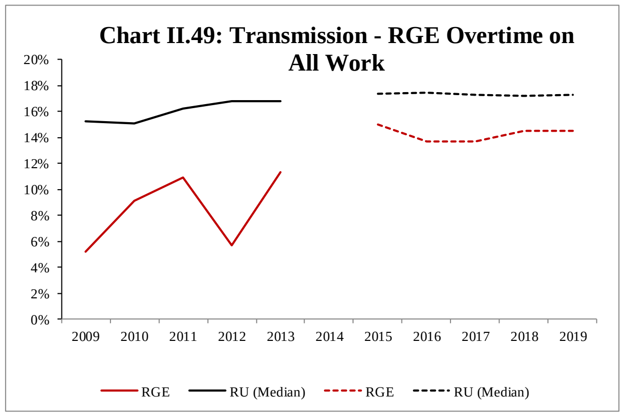


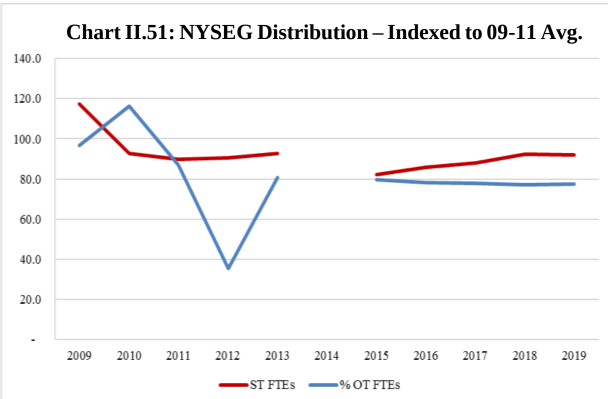
Chart II.49: Transmission - RGE Overtime on All Work

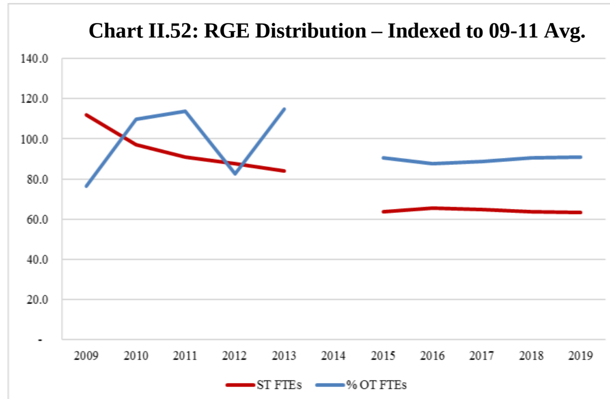
The table below (distribution and transmission) shows the degree of dependence on overtime to meet resource requirements. The percentages in this table differ from those previously used in this section (overtime in relation to straight time). The table presents overtime hours as a percent of total hours to get work done (straight time plus overtime plus contractors). Overtime comprises an important element in using resources effectively, but becomes a poor choice when used to excess, as the statewide report discusses in more detail. The tables show well-contained overtime levels in the NYSEG and RG&E resource mixes.

Chart II.50: Overtime Percent of Total FTEs

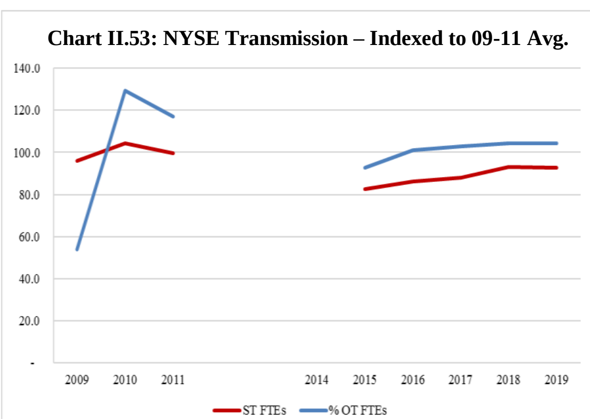
Function	NYSEG	RG&E	Median
Distribution	8%	11%	14%
Transmission	5%	3%	9%

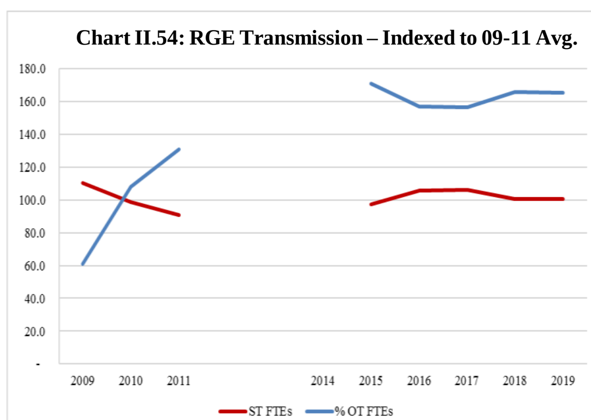
The next two charts examine relative trends in staffing and overtime for NYSEG and RG&E distribution. These charts examine whether and to what degree there may exist a correlation between adequacy of staffing and levels of overtime. On a statewide level, we observed some limited correlation between staff reductions and increases in overtime, and vice versa. While not determinative, it is reasonable to question whether a particularly high-overtime utility is understaffed. The relatively small amounts of overtime for NYSEG and RG&E do not rise to a level that makes such a correlation observable. Their overtime surely results from considerations other than resource shortages. In any event, relations between staffing and overtime showed nothing material in their cases.





Similar results appeared for transmission overtime. The NYSEG data showed too much variability to reveal any trends, which is not surprising with such small numbers. Historical RG&E data, however, did exhibit the pattern in which staffing moves in one direction (down in this case) while overtime moves in the other. Forecasts, however, did raise an issue, given that management projected a significant, sustained increase in overtime at RG&E through the end of our study period. The forecasted RG&E levels were twice the historical levels for RG&E, although they remained less than the Reference Utility value.



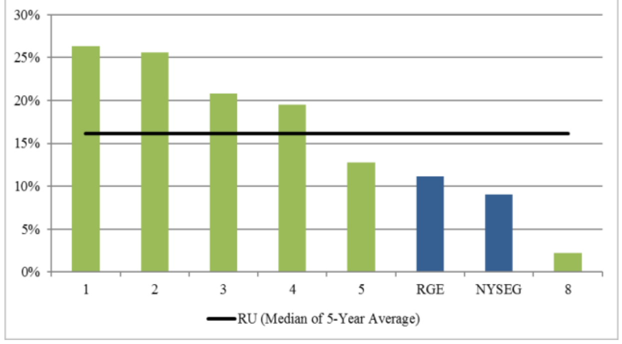


We ultimately did not see much room for improvement in electric overtime, given comparatively low rates, success in achieving targets, continuation of comparably low targets into the future, and comparatively moderate year-to-year fluctuations.

2. Gas

NYSEG and RG&E gas operations' use of overtime had much in common with that of their electric counterparts. One difference was that the gas overtime target was 10 percent, compared to electric operations's 20 percent. Only one of the gas operations we studied had lower levels. Moreover, that company's levels in the range of two percent were extraordinary. We found no basis for questioning the NYSEG and RG&E overtime rates on an absolute level, or as compared to the other state utilities.

Chart II.55: Percent Overtime: Gas - Total



Minor differences did exist in how overtime is used in capital versus O&M work, as the acompanying chart demonsrates. The next two bar charts below provide greater detail about the splits of NYSEG and RG&E overtime. The following two line graphs show trends in NYSEG and RG&E historical and forecasted overtime.

Chart II.56: Percent Overtime: Gas - Capital

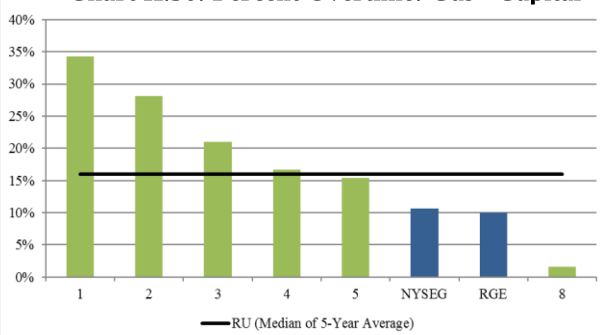


Chart II.57: Percent Overtime: Gas – O&M

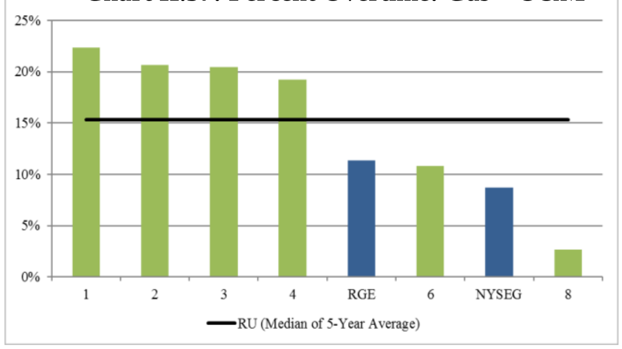


Chart II.58: NYSEG Gas OT on All Work

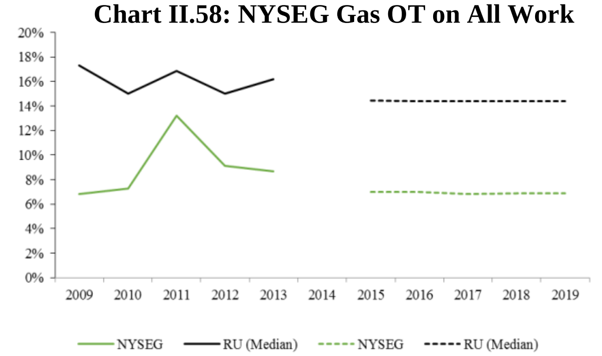
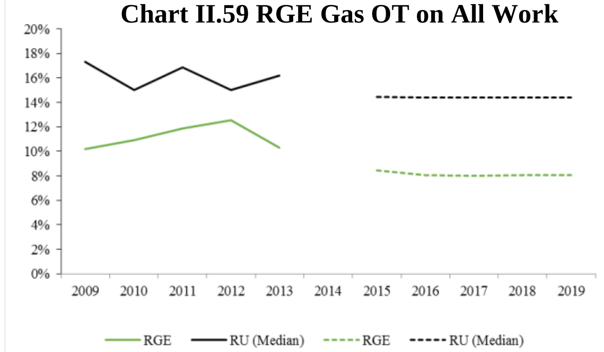


Chart II.59 RGE Gas OT on All Work



The two preceding charts show that NYSEG and RG&E each experienced a slight upward trend in the 2009-13 period. Nevertheless, both remained near the 10 percent target established by management. In all years, their overtime levels fell well below the Reference Utility values. Both operations projected overtime rates of under 10 percent.

The next charts examine the relative trends in staffing and overtime. The charts depict the relationship between changes in levels of staffing and overtime. On a statewide level, we observed some limited correlation between staff reductions and increases in overtime, and vice versa. We chose the 2009 through 2011 averages as a baseline for our index approach, assigning that average a value of 100. We then plotted the other data of interest on the same basis.

Chart II.60: NYSEG OT Indexed to 2009-2011 Average

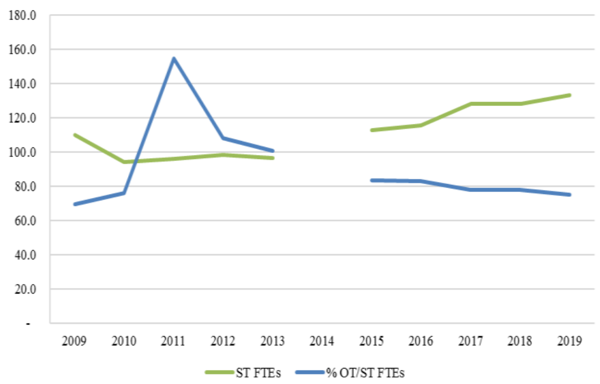
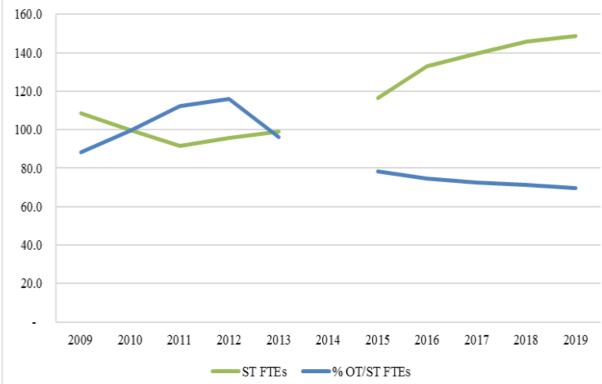


Chart II.61: RGE OT Indexed to 2009-2011 Average



Testing the inverse relationship between staffing and overtime did not present itself as an option here, because staffing remained generally constant. Significant staffing increases were projected for both gas companies and a corresponding decrease in overtime was forecast for both. Accordingly, the later years did exhibit the expected pattern of an inverse relationship between staffing and OT - - in this case, higher staffing and lower OT.

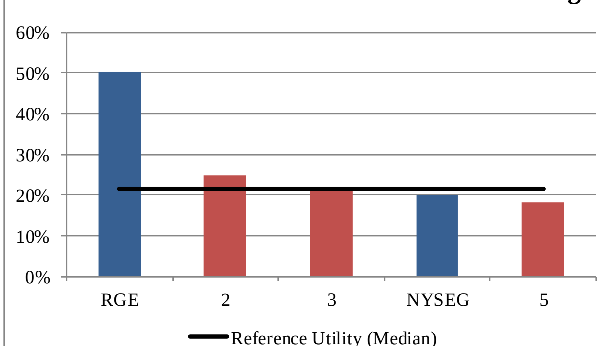
D. Contractors – Electric

NYSEG's contracting levels were in line with the industry; however, RGE contracted a much higher portion of the work than any other state electric utility, surpassing the nearest utility by more than a factor of two.

1. Level of Contracting - 2013

The accompanying chart shows NYSEG and RG&E percentages of 2013 electric work contracted in relation to the other electric operations we studied. Management set for RG&E and NYSEG the goal of performing 70 percent of work in-house and 30 percent with contractors. Management described this as a combined goal in two respects: (a) for NYSEG and RG&E together, and (b) for distribution and transmission/substations work together.

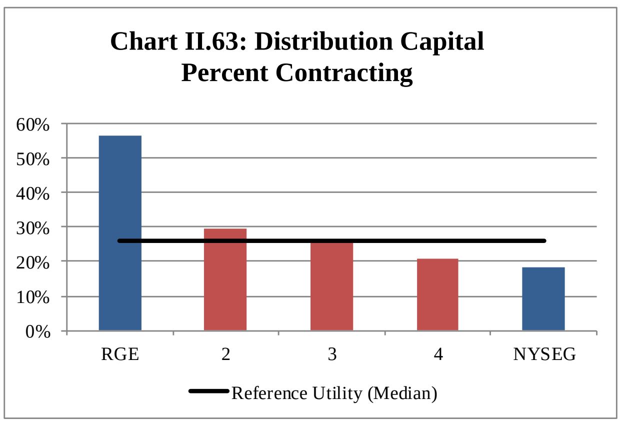
Chart II.62: Total Electric Percent Contracting

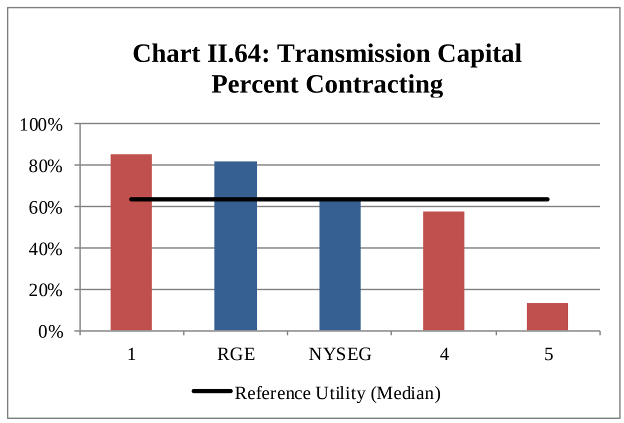


NYSEG's 20 percent fell just below the median. Equally interesting is the fact that eliminating the single large outlier, which was RG&E at about 50 percent, left the percentages of all the remaining four electric operations we studied in a narrow range.

RG&E contracted in 2013 at over 2.5 times both the Reference Utility level and the level of any of the other electric operations we reviewed. RG&E did have features distinguishing it from the other Upstate electricity providers. The Rochester area dominates the service territory. About half of RG&E's total line miles are underground, residential development facilities. RG&E also experienced significant workload increases in capital and in distribution O&M work. RG&E experienced large contracting increases over the 2011 to 2013 period.

The next two charts break capital contracting down between the distribution and transmission/substation categories. NYSEG fell at the low end of the distribution range and at the median for transmission/substations in 2013. RG&E was again a far outlier on the high side for distribution and very close to the highest for transmission/substations. RG&E's 2013 distribution capital contracting levels about doubled the Reference Utility value. Transmission/substations contracting, while not an outlier, was still close to the highest. A substation upgrade program begun in 2011 formed a large contributor to RG&E's contracting levels. Management's strategy was to contract all new substation work.

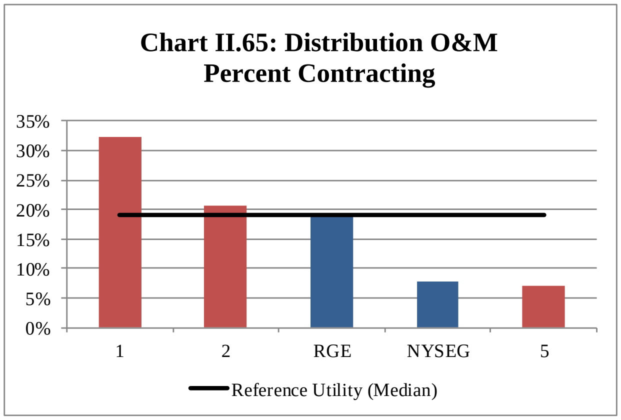


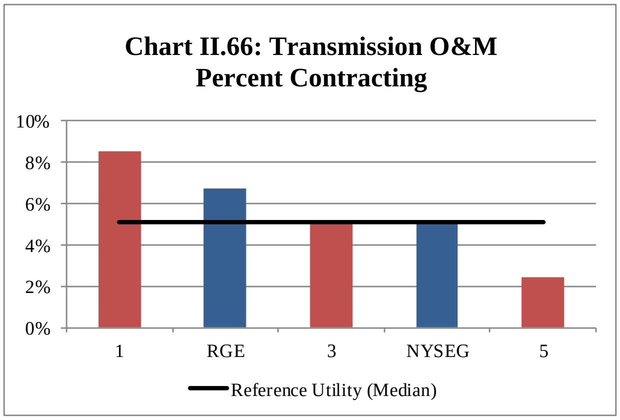


NYSEG employed a workforce structural feature that affected its comparatively low contracting rates. Its internal, "Mobile Work Force" had for major projects a right of first refusal exercisable before work was put out for bid by contractors. RG&E did not have a corresponding structure.

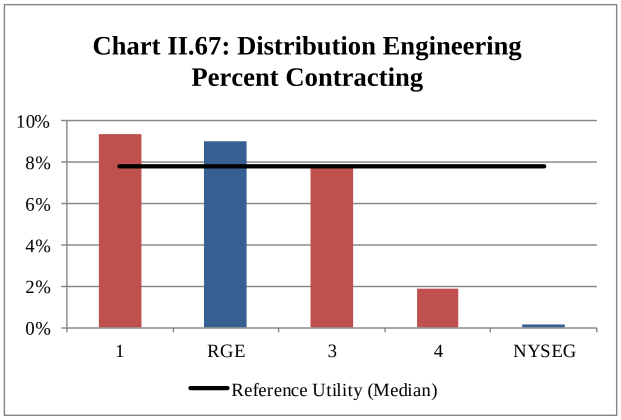
The next two charts address O&M contracting. Similarly low percentage levels applied for NYSEG's 2013 O&M contracting. Distribution contracting levels were essentially equivalent to the lowest of those we studied. Transmission and substation contracting fell at the median. RG&E's levels were at the median for distribution. While above the median for transmission and substation, contracting for such work was very small in total magnitude and only nominally different from the median value.

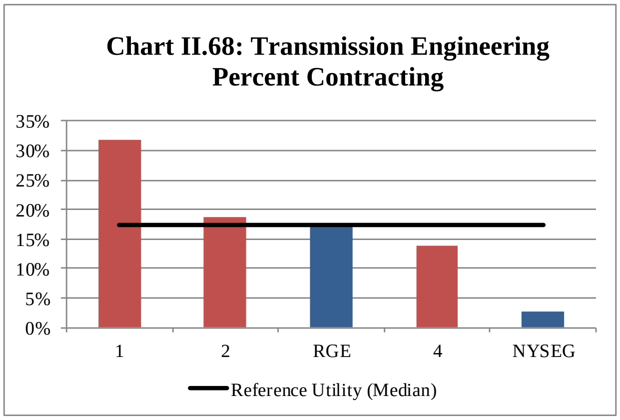
RG&E's 2013 distribution contracting reflected the Reference Utility value, while transmission/substation O&M contracting levels exceeded that value. In the latter case, however, all the operations we studied were in the single digit range. RG&E's 2013 levels resulted primarily from decreases in internal FTEs, while workload levels remained largely flat. RG&E also conducted incrementally funded preventative maintenance programs mandated by the Commission to be performed by contract labor.





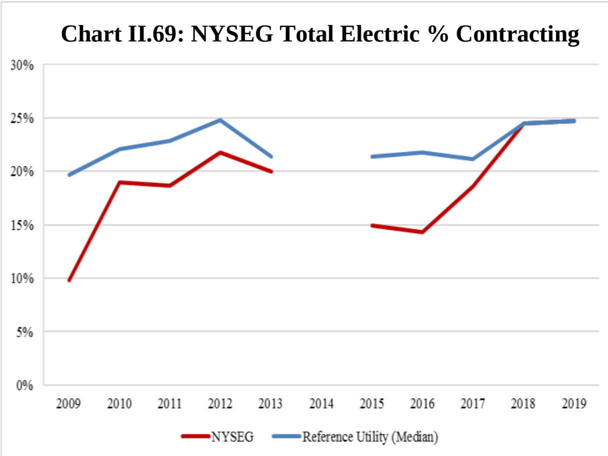
The next two charts show 2013 engineering contracting levels for the Avangrid companies. NYSEG was the lowest of the group we studied. This result on the surface comports with the comparatively high levels of internal engineering staffing we observed earlier in this report. However, RG&E, again as we observed, had comparatively very low levels of internal engineering resources. Even so, its engineering contracting percentages were not materially different from the median. Again, this raises the question of whether there is a problem in the allocation of engineering resources between the two Avangrid New York electric utility operations.

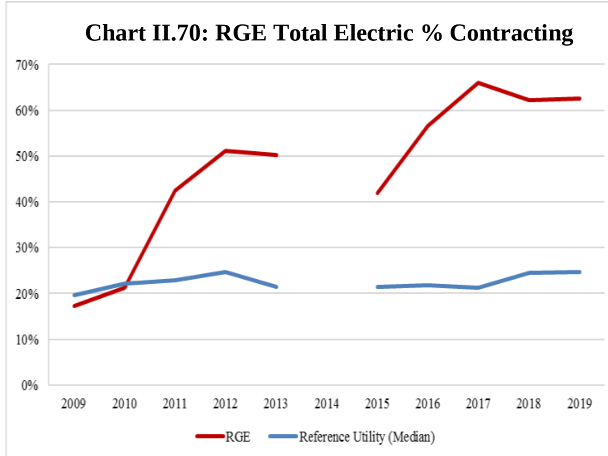




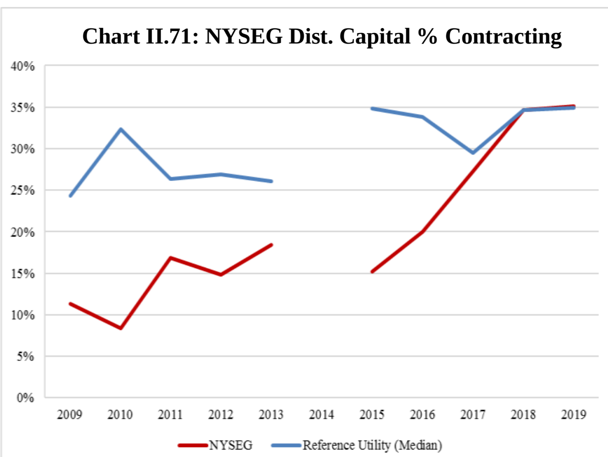
2. *Contracting Trends*

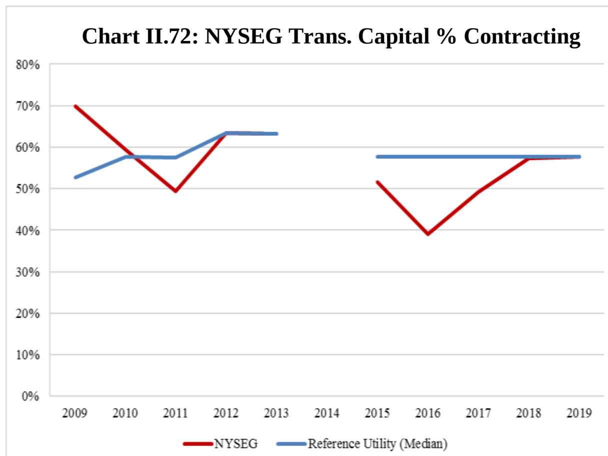
The next two charts show trends in contracting at NYSEG and RG&E. The share of work NYSEG contracted increased early in the historical portion of our study period, and then leveled off through 2013. The increase came largely in transmission/substations capital work. From the 2010 to 2013 period the levels remained flat. In the 2009 to 2013 period RG&E's contracting level rose much more substantially, driven by capital work associated with a substation upgrade program which increased contracting levels for the capital programs. RG&E also increased its distribution O&M contracting levels steadily, as internal distribution FTE work levels decreased. The forecasts that management provided showed moderate increases in NYSEG contracting, and a significant jump above already high RG&E levels. Over the 10-year period, NYSEG contracting levels approached the Reference Utility value, while RG&E consistently exceeded them, and by a very large and increasing margin.





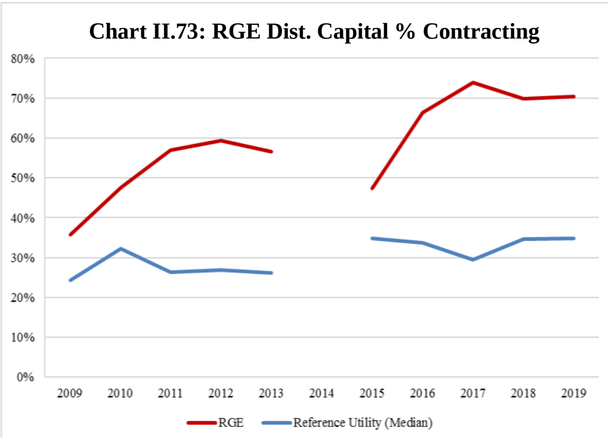
The next two charts break NYSEG's capital contracting down into distribution and transmission/substations categories.

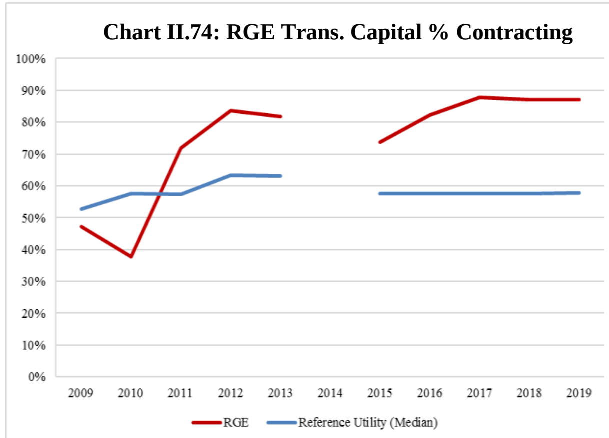




NYSEG's 2011 to 2013 distribution capital workload level increased, accompanied by increases in both internal and external work efforts. NYSEG contracting levels increased moderately in this historical period, remaining below Reference Utility levels. A continuing rise generally at historic rates brought them to the Reference Utility value by the late years of the forecast portion of our study period. By contrast, NYSEG's historical transmission/substations capital work load, and correspondingly contracting, declined. Except for a single-year turndown in 2016, forecasted transmission/substations contracting remained at or near Reference Utility values, as was true late in the historical period.

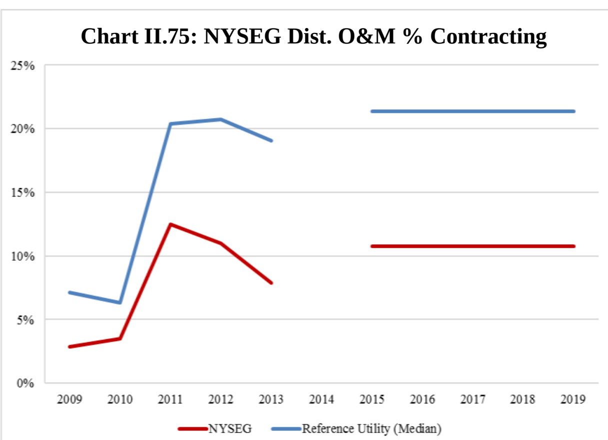
The next two charts break RG&E's capital contracting down into distribution and transmission/substations categories. They show that the large growth in RG&E capital contracting exceeded the Reference Utility, and was particularly evident in distribution activity, in both the historical and forecasted portions of our study period. Clearly, however, both distribution and transmission/substations capital work increased substantially in the 2009 to 2013 period. Under its approach of contracting all new and major substation and transmission line capital work, RG&E had limited in-house ability for work beyond small substation projects.

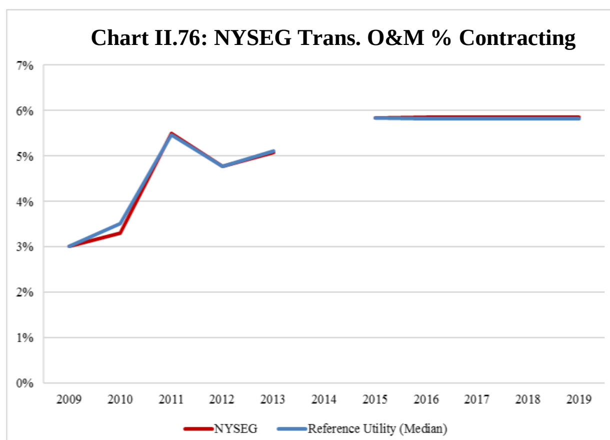




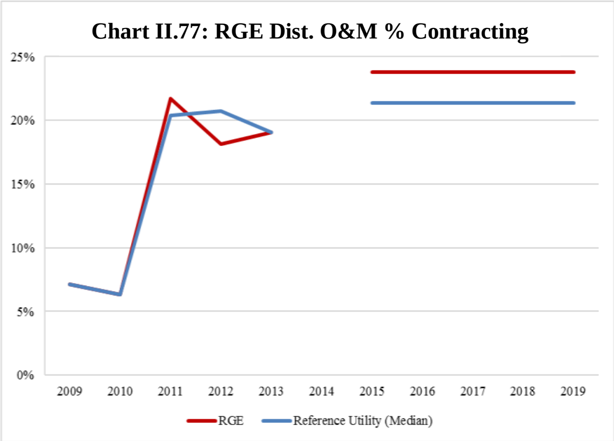
With overall transmission/substation work levels increasing greatly in the past, internal resource levels remained steady. This combination of trends drove the contracting percentages upward. Forecasted RG&E distribution capital contracting levels showed a steady increase, reaching a level at about twice the Reference Utility value. Transmission/substations contracting leveled off halfway through the forecast period at the point when the internally performed share dropped to a minimum, 10 percent or so level.

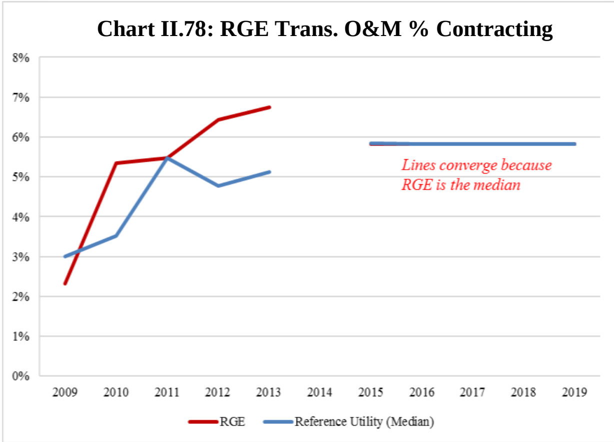
The next two charts show the categorical breakdown in NYSEG O&M contracting. Both categories showed roughly similar growth in the 2009 to 2013 period. The overall workload levels declined steadily, with declines in internally provided work creating a greater share of contracted work. In both cases, O&M contracting remained at moderate levels and below the Reference Utility values. NYSEG's flat forecasts in both areas maintained its relationship relative to the Reference Utility value.





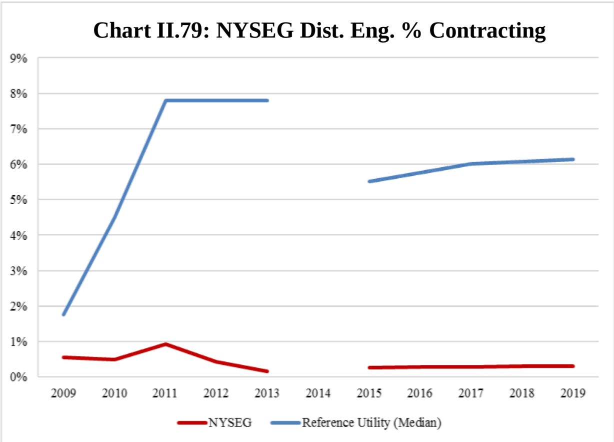
The next two charts break RG&E's O&M contracting into distribution and transmission/substations components.

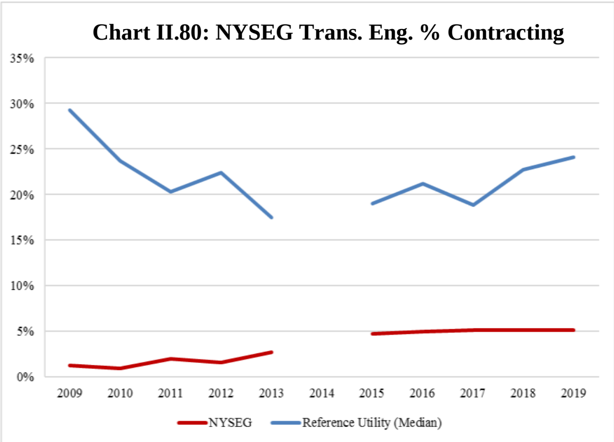




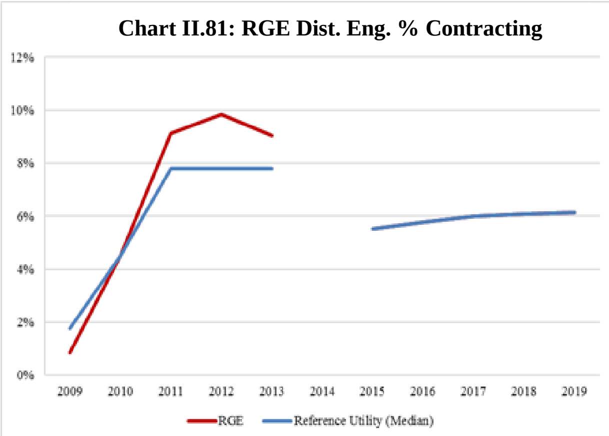
RG&E's distribution O&M workload levels remained essentially flat in the 2009 to 2013 period. Drops in the levels of internal personnel applied served to increase the share of work performed by contractors. Historical levels were near the Reference Utility values, with management's forecasts for the remainder of our study period showing them remaining steady, following a five percent increase. RG&E's transmission/substations O&M workload levels decreased between 2009 and 2013. Again, decreases in internally performed work levels drove contractor percentages upward. Management's forecasts showed contracting levels through 2019 essentially at the Reference Utility values.

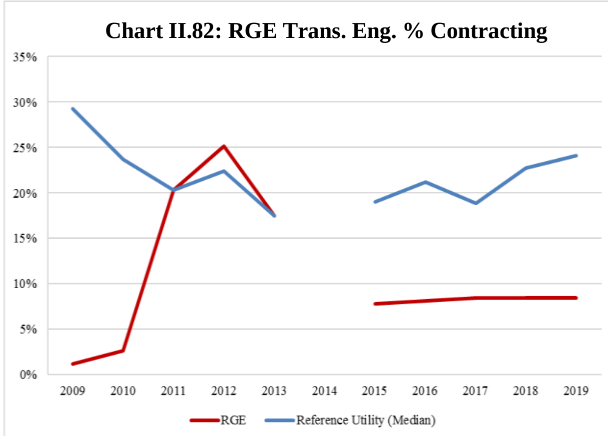
The next two charts show NYSEG's engineering contracting trends. Both transmission and engineering showed flat levels historically and as forecasted by management. Moreover, those levels approached nominal amounts, and fell far below Reference Utility values.



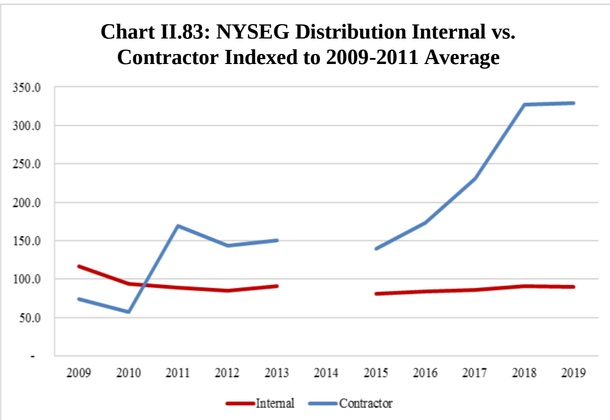


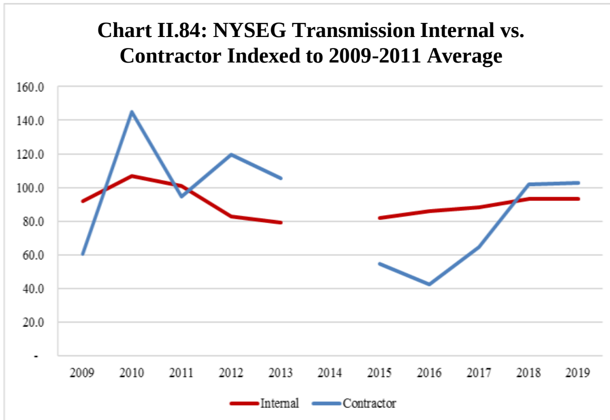
The next two charts show RG&E's engineering contracting trends. Distribution engineering closely tracked the Reference Utility values, historically and as projected by management. Contracting level trends did not seem out of bounds when compared to the Reference Utility value. The large percentage variations can be deceiving, because of the low numbers of personnel involved. For example, a change of only one FTE caused the 2011 jump in transmission/substations contracting from three to 20 percent





The next two charts plot distribution and transmission/substation contractor use on an index basis, in order to show how they have moved relative to each other over history and how they are expected to so move through the forecasted portion of our study period. We assigned an index value of 100 to the 2009 to 2011 average for each.





The distribution staffing index essentially remained flat at the hundred percent level. Forecasts showed it remaining flat in future years. The contracting index increased in the 2009 to 2013 period, and was expected to continue this increase in future years. The transmission/substation staffing index and the contracting index both jumped up in 2010, driven by the capital numbers. Since then they have both declined steadily as the overall workload level declined.

The next two charts plot RG&E's contractor use on the same, indexed basis.

Chart II.85: RGE Distribution Internal vs. Contractor Indexed to 2009-2011 Average

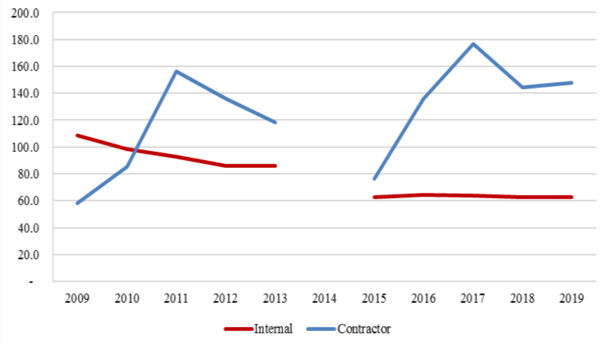
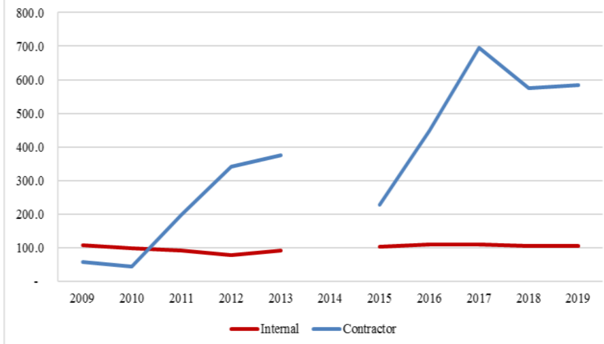


Chart II.86: RGE Transmission Internal vs. Contractor Indexed to 2009-2011 Average



The 2009 to 2013 period shows an internal resource drop that roughly corresponds to the contractor increase. This complementary change in both reflected an overall flat level of workload in this historical period. In future years, the staffing index was anticipated to remain flat and the contracting index continued to climb. For the transmission/substations area, the staffing index remained flat through the 2009 to 2013 period and management forecasts showed it remaining so. The contracting index climbed throughout all 10 years of our study period.

E. Contractors – Gas

There was nothing unusual in either of the Avangrid companies' gas contracting patterns. They fell in line with industry averages.

1. Level of Contracting - 2013

The next four charts summarize NYSEG's gas contracting ratios for 2013. We observed a single, very large outlier in total contracting percentage. Excluding it, the remainder of the gas operations we studied fell into a reasonably narrow range, with NYSEG just under and RG&E at the Reference Utility value.

Chart II.87: Gas Total Percent Contracting

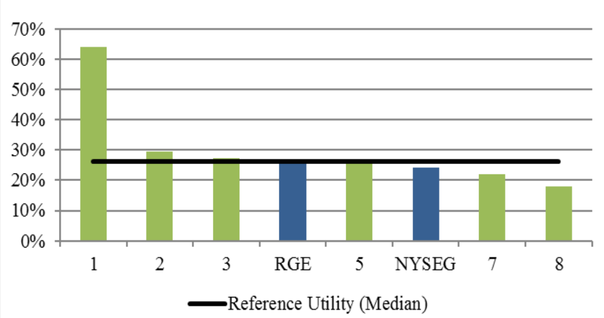
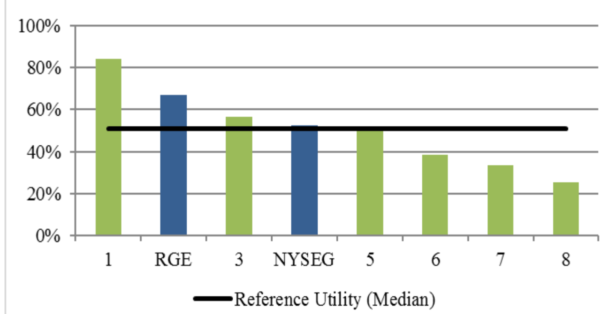
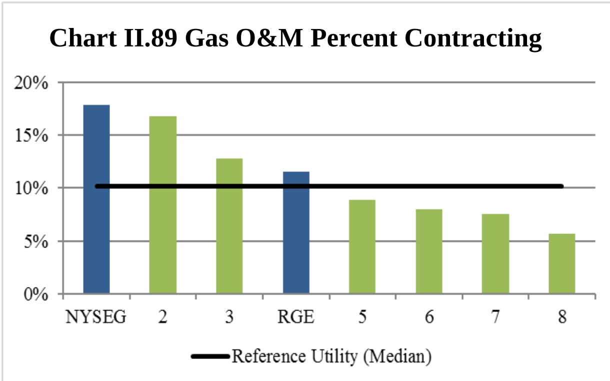
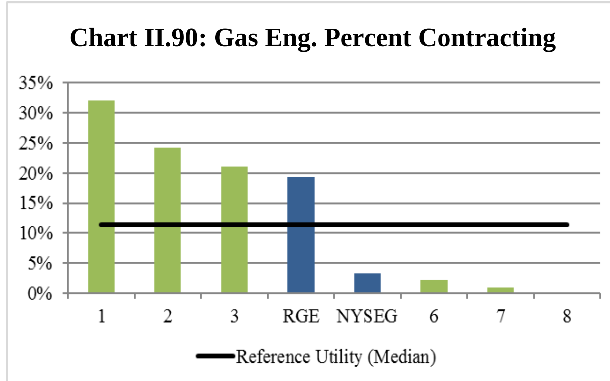


Chart II.88: Gas Capital Percent Contracting



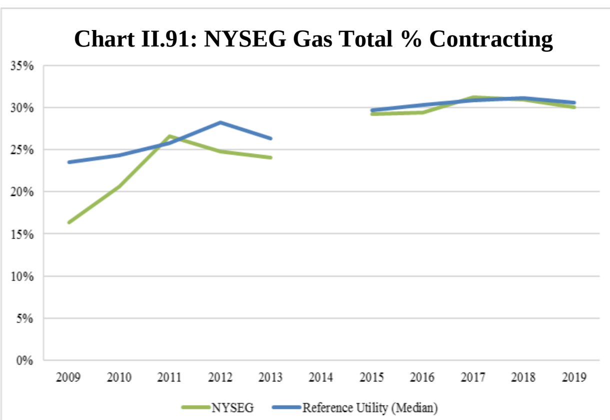


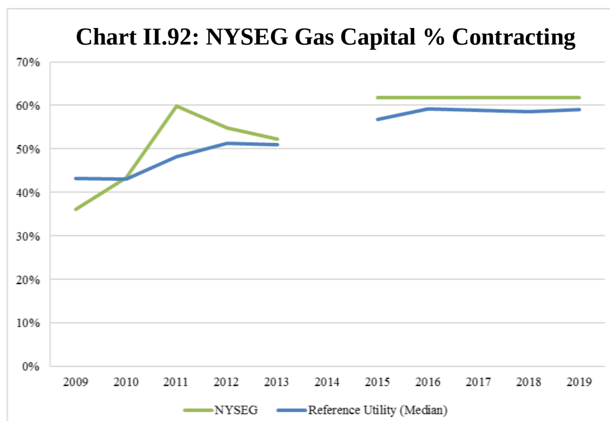


In capital work, the contracting range was much greater, with NYSEG remaining at the Reference Utility value and RG&E above it (and second highest among the operations we studied). NYSEG O&M contracting was below 20 percent, but nevertheless the highest. NYSEG's scattered, non-contiguous service territory segments no doubt affected the economic trade-offs of contracting O&M activities in more remote areas. NYSEG did almost all engineering in-house, which the charts show was the case for half of the state's gas operations we studied. RG&E's capital contracting percentages fell somewhat above Reference Utility values, but were consistent with them overall.

2. *Contracting Trends*

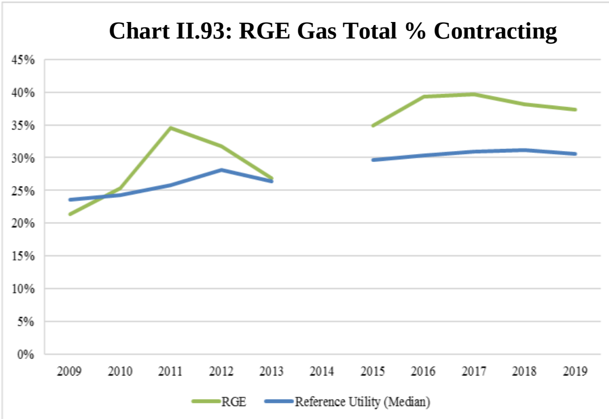
The next charts summarize trends in NYSEG gas contracting.

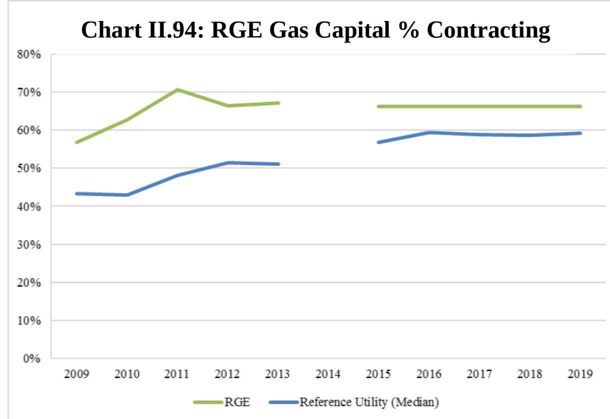




NYSEG's overall and capital contracting percentages increased modestly over the historic period, remaining overall in line with Reference Utility values. Also like the Reference Utility, the forecasts that management provided showed those percentages at increased and fairly stable percentages. Again, the NYSEG and Reference Utility forecasted values were very close. Pipe replacement comprised the principal driver of the increases.

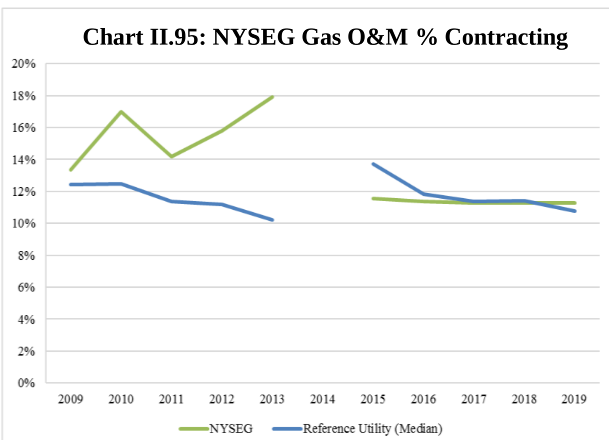
The next two charts show the corresponding RG&E total and capital contracting trends.

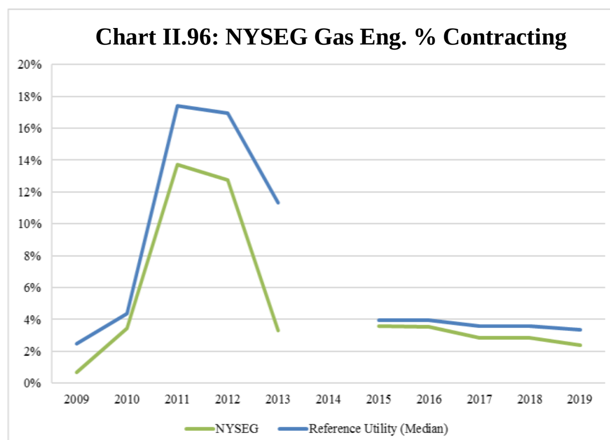




Except for a spike in the historical period, RG&E's overall and capital contracting percentages remained relatively stable through 2013. Management's forecasts projected the overall contracting percentage to remain stable (at about 10 percent above the 2013 contractor percentage). The forecasted capital percentages remained above Reference Utility values, but by a narrowed margin when compared to historical data. Forecasted contractor work shares remained at about historic period levels. Unlike some of the state's other gas operations, expected pipe replacement levels remained stable here. The strong influence that pipe replacement had on contracting meant that stable future replacement levels promoted constancy in contractor use.

The next two charts show trends in NYSEG O&M and engineering contracting.





Contracting percentages generally and at NYSEG and RG&E were much lower in these two categories, as compared with capital work. NYSEG continued to increase its share of contracted O&M work across the 2009 – 2013 period, but management's forecasts showed it falling and tracking Reference Utility levels through 2019. Engineering contracting shares moved dramatically in the historical portion of our study period, during which NYSEG underwent downsizing and an early retirement program. The transitory effects of such events included temporary replacement of in-house resources with contactors. Management forecasts showed close conformity in total values and trends with the Reference Utility.

The next two tables show the corresponding RG&E O&M and engineering contracting shares.

Chart II.97: RGE Gas O&M % Contracting

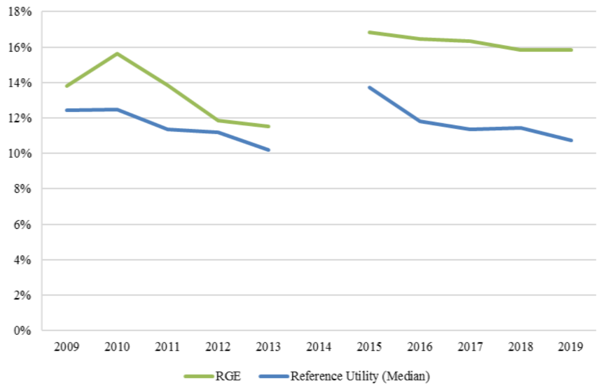
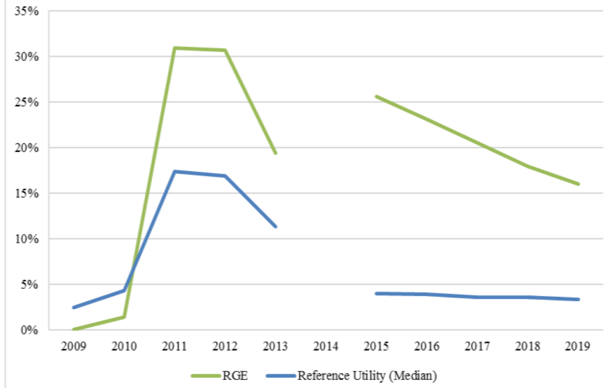


Chart II.98: RGE Gas Eng. % Contracting



The small 2009 – 2013 decline in contractor-provided percentages of O&M work showed fairly close conformity to Reference Utility values. Management's forecasts showed a higher percentage than the Reference Utility indicates, but the gap was less than five percent. These observations show that RG&E and the other operations we studied generally planned to continue making modest use (as a share of total O&M work) of contractors. RG&E's historical changes in engineering also reflected downsizing and an early retirement program. RG&E did, however, expect to use engineering contractors at a significantly larger percentage than the Reference Utility value indicated. Nevertheless, while much higher comparatively, RG&E's forecasted 2015 contractor use rate was still only 25 percent of total engineering work, and was forecasted to fall steadily through 2019.

As we did for electric operations, we also plotted (see the next two charts) gas contractor and internal resource use on an index basis, in order to show how they move with respect to each other.

Chart II.99: NYSEG Gas Contractor FTEs

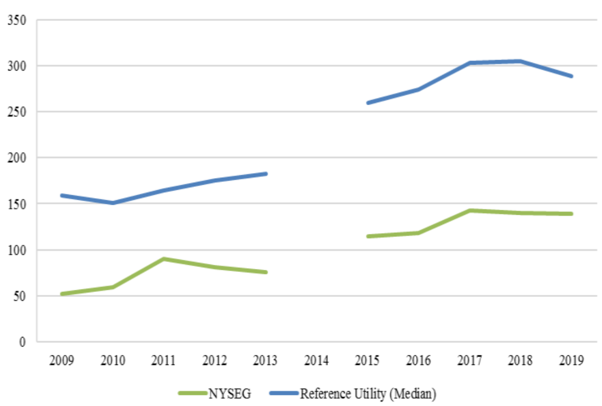
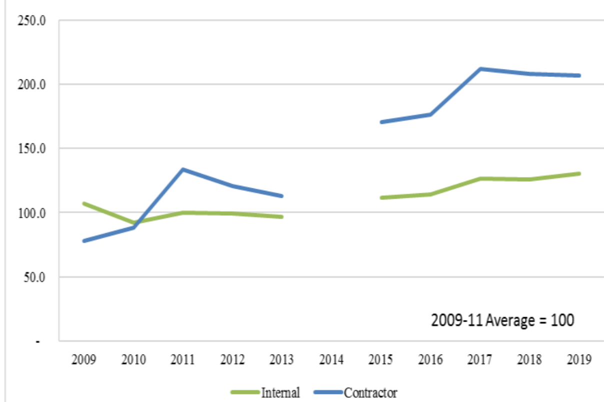
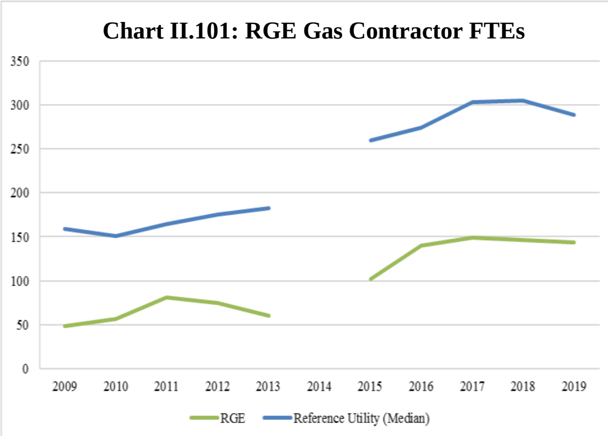


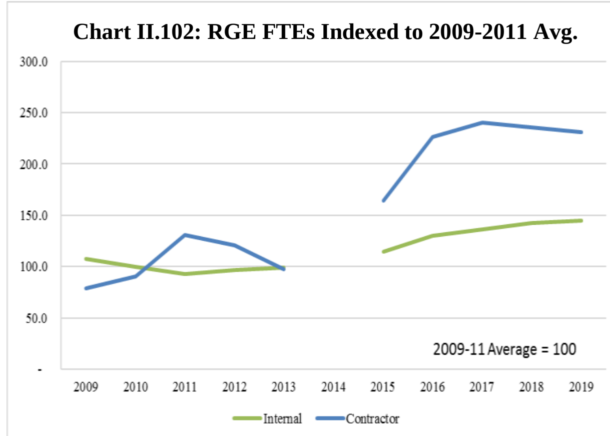
Chart II.100: NYSEG FTEs Indexed to 2009-2011 Avg.



The historical and forecast trend lines (see the chart to the left) for NYSEG contractor use are proportional to those of the Reference Utility. The chart to the right shows forecasted values (using the index approach) growing for both internal and contracting FTEs, weighted significantly toward contractors.

The next two charts show RG&E values under this indexing approach.





Its contractor lines are also proportional to those of the Reference Utility values. As was true for NYSEG, the forecasted values (using the index approach) showed steady growth for both internal and contracting FTEs, weighted significantly toward contractors.

F. Conclusions

In addressing staffing adequacy, we begin from the premise that there is no one indicator and certainly no simple algorithm that can provide a definitive answer. We approached the question of adequacy by weighing the contributions of multiple perspectives, which we found on many occasions support inferences in opposite directions. We formed judgments about staffing adequacy, considering the balance of the weight of the "evidence."

Some of our bases for making such judgments had mathematical underpinnings, but our conclusions on adequacy do not approach (nor could they have) anything like mathematical certainty. They represent our best judgments based on the data we had and our analysis of that data. They are informed as well by the results of our process reviews.

We offer these judgments about adequacy as our best contribution to a process that the companies and their stakeholders should (and do, from all that we have seen) agree is critical - - continually seeking out all means possible to ensure that staffing decisions result from the broadest possible range of insights, challenges, and perspectives.

These conclusions reflect our contribution to what will certainly remain an ongoing, dynamic, and fluid staff optimization process, as infrastructure needs, customer expectations, workforce demographics, technological advancements, and policy changes continue to bring opportunity and risk to the electric and gas utility businesses.

1. Liberty's analyses of staffing on balance suggest that staffing at NYSEG and RG&E, in both electric and gas, was reasonable and adequate, but forecasts of required RG&E electric O&M resources appeared anomalous.

Our various quantitative approaches did not disclose any overall concerns about staffing at NYSEG and RG&E. An exception relates to engineering, discussed below. In addition, management should explain the reduced electric O&M levels forecasted for RG&E.

2. Distribution engineering staffing levels appeared too low at RGE and too high at NYSEG, raising questions of adequacy or cost allocation.

Our model produced extreme results in opposite directions for engineering at the companies. This oddity was confirmed by examining the ratio between engineers and field positions, which also showed extreme and opposite deviations. Combining the staffing levels of the companies produced an unsurprising ratio. To the degree resources were shared, one might question the accounting treatment. In any event, the current data is problematic, and should be reviewed by management.

3. Measures of workforce efficiency suggested that both NYSEG and RGE were efficient in comparison to their peers.

We based our productivity and efficiency evaluation on three measures: the FTE per attribute analysis, our model, and our 9ers analysis. NYSEG and RGE generally compared favorably in most categories and in the aggregate. The consistency of the results indicates, on balance, a comparatively high level of efficiency in the functions analyzed in this study.

4. NYSEG and RG&E planned and managed overtime effectively on: (a) an absolute basis, (b) in comparison to their peers, and (c) versus internal targets; NYSEG overtime levels were especially well contained.

A few companies in our study seemed to operate under a different, and far more conservative, overtime paradigm. NYSEG was in this population. RGE was also a relatively strong performer in this regard, although more average than its sister company

5. NYSEG and RG&E adopted a 30 percent target for electric contracting (contract hours as a percentage of total straight time, overtime, and contractor hours) which was not consistent with the staffing plans available during our study.

During the interview process we learned of a contracting target of 30 percent for the Avangrid electric companies. Subsequent discussions confirmed this target, but we found little evidence of such a target in the past or in future projections for contracting. NYSEG did appear to be moving towards 30 percent, forecasting an increase to 20 percent at the end of our study period (2019) in distribution and a decrease to 33 percent in transmission. RGE, contracting, however, had already exceeded 30 percent, and management projected 45 percent for distribution and 73 percent for transmission/substations. The value of the 30 percent target as an assumed optimum level was obviously in question, as was management’s commitment to it.

6. RGE electric contracted more work on a percentage basis than other state electric utilities, and planned to widen that gap in the years ahead.

We noted above the high percentage contracting levels for RGE which were the highest among electric utilities in the historical analysis. RGE was more than double its nearest utility in this regard. Management was operating at a different level from everyone else, including its sister company. On the surface, one cannot conclude that this is good or bad, but it is quite clear that it reflected an oddity. The question of how one utility’s optimum level can be higher in the extreme than all others begs the question and inevitably hints that RGE might be too high.

G. Recommendations

1. **Avangrid should: (a) review comparative distribution engineering staffing at NYSEG and RG&E, (b) determine the optimum level at each company, (c) assure adequate cost allocations between the companies, and (d) justify forecasts for lower electric O&M resources at RG&E.**

2. **Avangrid should: (a) determine the optimum level of contracting at each company, (b) replace the 30 percent target as appropriate, and (c) adopt measures to manage to the new level.**

3. **Avangrid should evaluate the relatively high levels of contracting in RGE electric and, if such levels are deemed appropriate, explain why RG&E's circumstances differ to this degree from the other state companies.**

Chapter III: Process Analysis

A. Resource Planning

1. Summary of Improvement Opportunities

RG&E and NYSEG employed resource planning processes, organizational support, and tools that we found mature and sophisticated. Centralized control promoted a standardized approach to resource planning, but planning and forecasting tools varied, based upon the nature of the work. The organization, staff, tools, and information available were sufficient to support a data-driven annual resource planning cycle. We found them on a par with the other, larger operations we studied.

Like other utilities in the study, Avangrid did not develop quantitative FTE or person-hour estimates for forecasted workloads during the bottom-up development of work plans. The resource planning process can be enhanced by developing these estimates, either by using historical person-hour amounts from past contracts to project unit rates or by using engineering estimates to quantify these workloads at the program level.

Finally, there is an opportunity to improve processes for evaluating the trade-offs between straight time, overtime, and contractors at the functional/work group level into resource plans, based on developing resource plans that state all forecasted work for straight time, overtime, and contractors in person-hours and FTEs. Avangrid can then further develop ongoing data-driven methods for comparing the equivalent cost of each of these resources for accomplishing different types of work in the resource plan.

2. Findings

a. <u>Overview/Summary</u>

Avangrid employed a mature and sophisticated Resource Planning process. Organization, processes, and information for resource planning were well developed and used consistently throughout the electric and gas organizations at both operating companies. Capital and O&M forecasts, both electric and gas, identified and prioritized work using rigorous analytical frameworks and risk analyses. Forecasts considered overall guidance, past spending levels, identified future capital projects (on a risk-prioritized basis), and incremental O&M spending requests. Dedicated finance staff support building of resource plans by building bottom-up workload plans, tied to capital and O&M forecasts.

b. <u>Assessment of Key Resource Planning Elements</u>

i. Organization

Avangrid Networks Finance staff and the Finance group within the state utilities provided organizational support for resource planning. Finance group staff coordinated the annual process, implementing top-down guidance during the annual budget cycle. Dedicated Operations staff throughout the operating units in electric and gas supported work plan/budget development. Human Resources support staff located within the state utilities provided internal staffing information such as attrition projections, projections on new hires, and training requirements. Finance, operating staff, and HR support personnel were very experienced in the process and use of tools to support budget/resource planning information requirements.

ii. Information

Sophisticated information tools and processes existed for analyzing data relating to workloads and future budget requirements. Key resource planning information came from a series of automated tools, including:

- SAP financials and budget modules provided extensive access and analysis capabilities for historical cost information, and provided the vehicle for loading budgets during the development and review process. Information was analyzed on both a functional and operational organizational basis and tools allowed integrated views of costs and workloads throughout the budget development cycle.
- The 10-Year Workforce Plan annual update included headcounts for each organization, adjusted for attrition.
- A payroll simulation program turned headcount, wages, and benefits into dollars for integration into budget forecasts.

Notably, management developed a wide array of information to support the development of the initial "control draft" budget requests, including:

- All work was tracked and forecast using dollars.
- Staffing work plans drove budgets developed at functional level for each work group.
- Forecasted staffing workload levels for internal resources were projected based on workload estimates.
- Determination of needed staffing levels considered attrition forecasts.
- However, initial resource plans for work groups/work functions were stated in dollars, not person-hours or FTEs.

Like all the other utilities we studied, planning information for work to be performed by contractors was largely limited to cost information. In some cases, units for work assigned to contractors in the past were available, but historical workloads (in person-hours or FTEs) were not tracked. Future workloads were not developed from unit rates and forecasted in person-hours in the manner that internal workload forecasts were developed. Avangrid was able to estimate for us historical contractor hours using the expertise of engineering estimators in electric and gas by using average labor hours per dollar contracted for different types of work and applying these average unit rates to contractor expenditure levels.

iii. Processes and Tools

Avangrid's annual resource planning budgeting cycle was well understood and mature. It began in late spring with the development of guidance developed by Avangrid Finance and Senior management about financial constraints and key issues or initiatives. After development of work plans and budgets in the June/July timeframe, submissions underwent a series of presentations, reviews, and challenges (with increasing roll-ups and organizational levels). At various points throughout this process, line management had the opportunity to make its case for funding changes and increases, especially when requests exceeded guidance or past spending levels. The process culminated in the November to December timeframe with presentation of the proposed budget for state utilities to Avangrid Networks.

Avangrid's resource planning process employed sophisticated tools and capabilities common to the larger state utilities in the study. Characteristics of this approach included:

- A highly structured capital planning process based upon levels of dollar spends. Future capital requirements were determined by extensive system planning and gas engineering studies. Forecasts for electric and gas capital work identified future work requirements under rigorous frameworks that identified and prioritized work and associated risks. Both electric and gas capital analyses set priorities using these risk-based analyses.
- O&M spending forecasts were less rigorous than their capital counterparts. They began with analysis of historical costs and associated work requirements. Identification of future O&M work requirements used an incremental approach to identifying anticipated changes to spending levels. A notable exception to the incremental approach to forecasting O&M work requirements, gas operations used well developed benchmarks; *i.e.*, the number of gas techs per thousand customers (urban vs. rural), to support its field work resourcing.
- Management developed forecasts on a bottom-up basis, using the tools cited in the resource planning information section to develop future budgets, stated in dollars.
- Forecasts addressed anticipated cost increases and inflation.
- Budget forecasts considered top-down overall guidance on funding levels and corporate initiatives, past spending levels, identified future capital projects (on a risk-prioritized basis) and incremental O&M spending requests.
- Gas and electric operations reviewed priorities at the project (capital) and program (O&M) level for each division throughout budget development.
- Management measured current budget year capital program and O&M program progress monthly throughout the year, reforecasting as required. These current year adjustments also provided input for adjusting future years' forecasts.

iv. Resource Planning for Overtime and Contractors

Resource planning for overtime relied heavily on historical use for certain functions and plans reflected past usage levels. Resource plans for different work groups and types of work did recognize different levels of planned overtime and contractor use. While we found a qualitative understanding and recognition that excessive overtime reduces productivity, we did not find evidence of ongoing data-driven analysis to determine whether overtime levels had been appropriate compared to contractor and straight time levels. We found no one-time studies examining the cost-effectiveness of overtime as a resource planning method.

More attention was paid to the cost-effective use of contractors for different types of work functions. Management provided focused studies, conducted in 2012, looking at the trade-offs/balance of contractor versus in-house resources for a limited number of work functions. Management had also performed extensive work in developing unit rate contracts for electric distribution and gas capital work. This unit rate contract approach proved effective for assigning and managing capital work allocated to contractors in the resource plan, and had the capability to provide valuable data for analyzing tradeoffs between contractors and internal resources in the future. However, analyses comparing the cost-effectiveness of contractors versus the use of straight time employees or overtime for this (or other types of work) did not form an on-going part of the resource planning process.

Resource plans underlying the annual budgets identified future contractor workloads on a total dollar basis only, including all labor, materials, vehicles, and administrative costs. Historical data for work done by contractors measured on the basis of expenditures, but did not include any information about hours worked to accomplish the work. Unlike budgets for internal resources (straight time and overtime), contractor budgets were not built from person-hours, FTEs, units of work, or unit rates required for each functional work requirement. Without this data, it was not possible to have visibility into the trade-offs between the use of straight time, overtime, or contractor resources to perform the work.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Resource Planning criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The organization for coordinating and supporting manpower Resource Planning should be treated as a specialized activity, with dedicated resources.
2. Complete and accurate Information about units of work performed and costs by work function, by region, and by staff resource type should be available.
3. Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.
4. Overtime should form a clear part of the process of identifying required resources, and should rely on an analytically supportable method for determining optimum levels for each work function.
5. Contractor use should form a clear part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

1. The Avangrid state utilities used a sophisticated approach to resource planning and applied processes to such planning.

We found the resource planning information and tools and capabilities typical of the larger state utilities. Organization, processes, and information for resource planning at RG&E and NYSEG were well-developed, and used throughout electric and gas operations. Centralized control promoted a standardized approach to resource planning, and planning, and forecasting tools varied consistently with work nature.

2. The Avangrid planning processes for identifying and understanding overall workload, including reliance on cost data as a measure of contractor work load, did not optimize the process of balancing resources.

While resource plans were driven by work activity requirements at a functional level, management converted them to expenditures at an early point in the review process (*i.e.*, the “Control Draft”), obscuring the amount of work represented by the budget during the subsequent review process.

This approach inhibited an objective management review of the relative amounts of work to be performed by internal resources (straight time FTE and overtime FTE) versus contractor FTE during the evaluation of proposed work group/functional plans and budgets.

Identification of contractor workloads (historical and forecast) on a total dollar basis did not provide sufficient information for effective resource planning. Historical information for work done by contractors, based only upon expenditures, did not provide sufficient information for understanding the scope and magnitude of past capital and O&M workloads. If forecasted contractor workloads cannot be understood in terms of person-hours or FTEs, it is not possible to compare the amounts of work forecasted for contractors to work forecasted for internal resources (straight time or overtime) and effectively make decisions for balancing these resources.

3. Avangrid was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use at the functional level.

The effective use of overtime and contractors at the functional/work group level in resource plans cannot be accomplished without ongoing, data-driven analysis. While management had performed some focused studies of the effectiveness of contractor use in the past, use of one time, limited scope studies for accomplishing these types of analyses and reviews during the resource planning process was not sufficient for determining the most effective balance of internal staff, overtime and contractor resources for each type of work.

4. Recommendations

1. Avangrid resource planning processes should include a more complete understanding of total workload, including expanded measures of contractor workload that include FTE- or person-hour based values.

The resource planning/budgeting process should be enhanced by modifying the initial budget draft (the "Control Draft") and reviews to include manpower estimates for straight time, overtime, and contractor person-hours/FTEs for each type of work underlying the forecasted dollar amount being requested. This early view would create an integrated resource plan/budget request that not only shows the dollars requested, but also the underlying staffing resources required to accomplish this work. This type of resource-based budget would provide the basis for an objective management review of the total amount of work being proposed and of the relative amounts of work to be performed by internal resources (straight time FTE and overtime FTE vs. contractor FTE) in each proposed work group/functional work plan and budget request.

Avangrid should develop quantitative FTE or person-hour estimates for forecasted workloads within each major program and organizational unit in electric and gas operations. These workload person-hour/FTE forecasts of the amount of work to be performed by contractors are crucial to understanding total work proposed during the bottom-up development of work plans that feed budget requests for each organization. The resource planning process can be enhanced by developing these estimates, either by using historical person-hour amounts from past contracts to project unit rates for the work or by using engineering estimates to quantify these workloads at the program level.

2. Avangrid resource plans should include data-driven analyses that help management evaluate the trade-offs for overtime, contractors, and internal staff at the functional and work group levels.

Avangrid should enhance its ability to incorporate the use of comprehensive workload and expenditure data into an ongoing, data driven process for evaluating the trade-offs for overtime, contractors, and internal staff at the functional / work group level. Management should formalize the annual process to require each organizational unit to develop these "total workload" bottom-up workload forecasts, and link them to budget expenditure requests.

Avangrid should develop methods for comparing the equivalent cost of each of these three resource types in accomplishing the different types of work by work group. Meaningful comparisons of the equivalent cost of each of these three types (on a work type by work type basis) will enable a more informed resource plan for optimizing straight time, overtime, contractor mixes for each organization. Such comparisons also support evaluation of requests for changes to internal staffing levels.

B. Work Force Management and Performance Measurement

1. Summary

a. Work Force Management

The two New York Avangrid utilities, RG&E and NYSEG, used the same Work Management system and tools in both gas and electric operations. The system operated as part of an SAP global platform, managed at the holding company level and used by the other Avangrid utilities in the US and abroad. Liberty found work management processes and support tools particularly strong. They met all criteria by which we evaluated them. In the area of training and documentation, they reflected best practice. Liberty found no material opportunities for improvement in work management related to identifying, planning, and optimizing staffing numbers and balance.

b. Performance Measurement

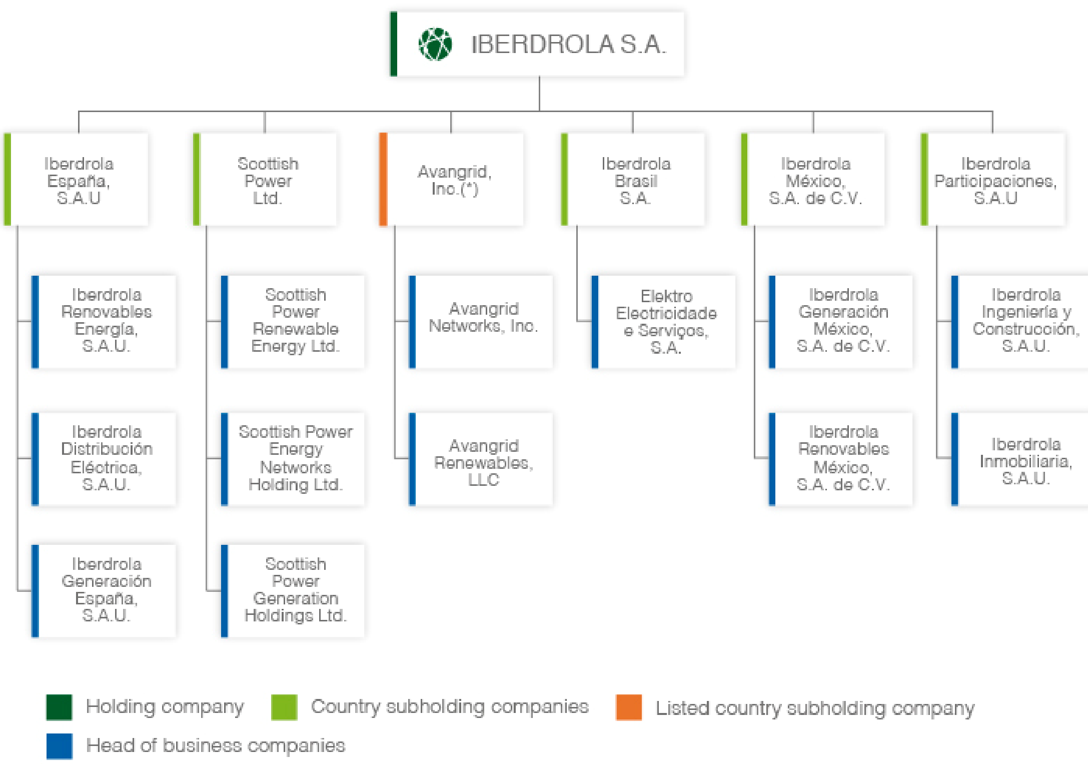
NYSEG and RG&E employed a series of key performance indicators that, while fairly broadly scoped, did capture a high percentage of the electric work that our study addressed. We did not find a similar approach for gas. Those measures taken, however, addressed only costs, not hours of work, and management did not use them to identify and plan for resource requirements in a structured way. As a matter of first priority, the Companies need to develop performance measures for replacement and installation of pipe, and structure, and use them to forecast and determine how to optimize resource requirements and balances. Then, both electric and gas operations need to develop plans for similarly instituting and using performance measures across the spectrum of functions and activities that our study addressed.

2. Findings

a. Work Management Systems

RG&E and NYSEG, used the same Work Management processes and support tools, for electric and gas operations. Management applied these processes and tools to capital and to maintenance work. The Work Management System operated as part of an SAP system managed by the holding company. NYSEG and RG&E had access through SAP to a fully integrated enterprise system. The next chart illustrates the massive reach of Iberdrola's energy operations, which extend to many countries across three continents. These operations include three principal business lines: Network (utility distribution), Wholesale and Retail, and Renewable Energy. Avangrid's dimensions give its utilities an unusually strong leverage to invest in leading systems, such as those finding increasing use in the utility industry for work management.

The use of SAP, a German-based, international leader in providing integrated platforms for performing enterprise resource planning and data management reflected this leverage. The capabilities that a large-scale SAP application provide permit an organization to employ a system of integrated applications to manage the business, and automate and integrate many functions related to technology, services and human resources. SAP and Oracle together are considered dominant in the field of providing enterprise-level approaches and integrated capabilities.



NYSEG and RG&E had been using SAP since 2004, predating the 2007 acquisition of their then-parent, Energy East, by Iberdrola. SAP provides a very broad suite of applications; NYSEG and RG&E began using SAP's Work Management modules in 2005/2006, which eased the integration of the two into broader Iberdrola operations.

As part of an enterprise platform, the Avangrid Work Management System tied directly with many other databases and applications related to the Work Management process. Ties existed, for example, in the areas of materials management, distribution line design, field design, financial, inspections, GIS, customer billing and human resources systems.

b. Work Management Documentation and Training

Management explained and guided work management processes through sufficient documentation. Training material used for Work Management focused primarily on Work Management processes. Every employee receiving work management training got exposure to the systems and tools supporting these processes. Management also provided formal training for and documentation of the *tools* used to support the Work Management processes. A comprehensive training plan and materials for Work Management existed, and were used. Designed for teaching in a classroom environment, they could also be used interactively. The material available included descriptions of the processes used for Work Management. They also detailed the SAP and other tools used to support these processes. Management employed a matrix identifying those positions requiring training, listing the required modules by position.

c. Program and Project Scheduling

Planners used MS Project to schedule long-term major capital projects (with a five-year horizon). This widely-used application supports analysis of resources, budgets and timelines. It provides the capability to customize a range of reports that support measurement of project progress and the identification of resource needs at project initiation and through the course of its execution. The Companies used SAP (on the basis of Compatible Units) to schedule small projects (with durations typically less than one year). Upon approval of major projects (> $250,000), management entered them into the Work Breakdown System. This system provided a budget breakdown by skill (*e.g.*, engineering, design, labor), material, and external services. These data were then entered into the schedules.

Short-term schedules issued every three months, produced using MS Project and entered manually into SAP. At the time of our field work, Avangrid had pending for management approval a project to automate this schedule transfer.

The Companies used SAP to schedule Electric Maintenance programs automatically. The two utilities scheduled mandated gas inspections and surveys in the field, and adjusted them as required.

d. Program and Project Monitoring

Monthly meetings of a Steering Committee (managers and directors) reviewed project status. Projects assigned to project managers underwent formal review by them on a weekly basis. Available SAP capabilities sufficiently supported timely and efficient production of schedule and budget status information. The Steering Committee reviewed each week any requested changes to project schedules or budgets.

The SAP-based WMS and integration with the other enterprise-level systems used by the NYSEG and RG&E utilities provided a suite of tools to support work management. SAP modules, programs, and adjunct programs (*e.g.*, MS Project) drove a comprehensive set of work management processes.

e. Program and Project Management

A Project Management organization housed project managers aligned with each operating group. Full-time employees filled the Project Manager positions. If not already certified when assuming a project manager position, incumbents were required to obtain certification from the Project Management Institute within one year. Projects above $500,000 fell under the formal Project Management procedures. Management also had flexibility to assign a project manager to projects or programs with high visibility or impact. A supervisor or principal engineer managed projects with values between $200,000 and $500,000. At the time of our field work about 80 projects (NYSEG and RG&E combined) fell under this form of project management, outside the Project Management organization. See, however, the "Contractor Use" section below, which addresses intentions regarding adoption of a central contractor management organization following completion of our field work.

f. Treatment of Overtime and Contractors

Contracting and overtime polices guided work planning. On a short-term basis, schedules informed the Steering Committee of any peaks or other needs implicating overtime and contracting. The use of SAP enabled automation of performance data capture, storage, and analysis. Management used the data to improve the level of certain skills, identify the level of effort needed to complete certain tasks, and better identify the proper level of contractors.

g. Quality Assurance and Control

In the spring of 2015 NYSEG and RG&E USA's COO created a new QA/QC group within the Operations & Engineering group. These functions existed before this organizational change, but then became a centralized group. This group covered both electric and gas operations. It had responsibility for all QA functions including: gap analyses, training, reporting and other administrative issues. The group also ensured that all gas main welds were X-rayed, inspected and documented per safety regulations.

h. Electric Operations Performance Measurement

NYSEG and RG&E measured, within broadly defined categories (*e.g.*, new services, pole sets, substation maintenance/inspection/troubles, and transmission and distribution maintenance) a number of electric work units. The units covered address about 80 percent of the electric work time in the areas of concern to our study. The electric measures addressed cost per unit for defined work units. Management had not yet incorporated hours (total and per unit) into the systems. Two factors affected the ability to measure units on an hourly basis: (a) lack of a fully automated time recording system, and (b) challenges in defining standard times for the activities involved. While not atypical of experience across the state, the lack of standard time measures for work units restricted the ability to measure productivity in ways useful for assessing staffing requirements.

Management was examining during our field work means for measuring labor-only time for the defined work units (*e.g.*, excluding travel time). Following conversion to the SAP enterprise system, management had yet to find a means for addressing the measurement issue in that context. Efforts were continuing to establish standard times.

i. Gas Operations Performance Measurement

Management was in its second year of KPIs use to provide overall performance measures. Management had been collecting costs in several "cost collector buckets." These KPIs measured a number of activities, using categories that broke cost contributors into components (*e.g.*, labor, materials, contractors, and vehicles). Management had developed the ability to report some cost averages (*e.g.*, cost per emergency response, per leak repair, per mandated valve and regulator inspection, and per new service). As for the electric operations KPIs, these reports addressed only cost, but did not measure hours per work unit.

Migration from paper records and separate databases to the new SAP system remained in process in some areas. Completion of this migration will allow continuation of ongoing efforts to develop additional KPIs. Management expected this development process to require three to five years for completion.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Work Management and Performance Measurement criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These seven criteria are:

1. The systems and tools used to support Work Force Management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.
2. Comprehensive, adequate documentation of the Work Management processes, systems and tools should exist and be supported by appropriate training.
3. Management should have and regularly employ well defined processes for the short- and long-term planning and scheduling of capital and O&M.
4. Management should apply an appropriate approach, resources, and methods to program and project management.
5. Systems and tools should capture and enable the analysis of data respecting use of all types of staffing resources.
6. There should exist an appropriate approach to and organization for Quality Assurance and Control.
7. Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness resource use and balancing.

1. NYSEG and RG&E employed a work management approach, systems, processes, and tools that appropriately supported staffing optimization.

Management employed an appropriate approach to work management, and had access to comprehensive and sound systems, tools, and processes possessing the capabilities to support the optimization of staff resources. These factors placed NYSEG and RG&E among the few operations we studied whose systems, tools, and processes had essentially full capability. The strength of the Work Management System provided a sound foundation for optimizing resource levels and balance.

Use of a system-wide business enterprise system (founded on SAP) provided Work Management System capabilities beyond those of most other New York Utilities. Operation as stand-alone utilities would not provide nearly the same economic leverage (created by the large number of NYSEG and RG&E SA operations using commonly developed systems and tools) that justifies investment in what are costly capabilities to develop and maintain.

2. NYSEG and RG&E WMS documentation and training were appropriate.

The documentation and training programs for the Work Management system for both processes and tools reflected a best state practice. We found the documentation and training materials the most comprehensive, and the training materials clear and readily understandable. Although designed primarily for classroom use, the training modules could also be taken on-line. Management used a matrix specifying the training modules required for each position. The SAP enterprise system allowed automated updating of employee training records.

3. NYSEG and RG&E electric and gas operations performed scheduling effectively.

Management used well-defined processes for long-term and for short-term scheduling of resources. The sophisticated tools provided an integrated basis for developing schedules, and reporting on progress against them. Appropriate approaches existed for supporting short- and long-term scheduling in both electric and gas operations.

4. NYSEG and RG&E electric and gas operations used methods that supported effective monitoring of program and project performance effectively.

Substantial feedback and reporting mechanisms existed to inform management and other affected organizations of project progress, providing a basis for adjusting resources to meet capital and maintenance program requirements. An appropriate cycle of meetings addressed project and program status against clear goals and milestones. SAP system capabilities provided means for producing schedule and budget status information at an appropriate level of detail.

5. NYSEG and RG&E electric and gas operations employed an effective approach, structure, and resources for project management.

Management employed a formal organizational approach to project management. A structured Project Management organization existed and project manager positions were full-time. Formal project management guidelines applied to projects meeting defined criteria or whose importance otherwise warranted including them under formal project management. There remained pending, however, an intention to create a central contractor management organization (discussed further below in the “Contractor Use” section.

6. NYSEG and RG&E electric and gas operations appropriately located and addressed the roles of quality assurance and control.

About a year ago, management created a new QA/QC group, providing a centralized approach for both electric and gas operations. The group acted with sufficient independence in the exercise of a full range of QA/QC activities.

7. NYSEG and RG&E performance measurement were strong in overall comparison with the operations that we studied, but did not fully support staff optimization.

The measurement of costs per work unit had an extent consistent with or beyond levels observed across the state, but did not yet measure hours by work unit, or fully cover work activities at a sufficiently granular level to serve as a basis for optimizing staffing resources or balancing. Until this gap is closed, it will not be practicable to apply performance measures to work load projections and performance, comprehensively incorporate performance measures into staffing decision-making, or to maintain on a routine, continuing basis performance measures to determine production and productivity levels comprehensively.

It is the case, however, that the data and metrics that management did maintain, was collected timely, at an appropriate level, and communicated to the appropriate individuals in the organization. These strengths lay a foundation for moving forward in improving work unit measurements, as management appears to intend over the next several years.

4. Recommendations

a. Work Force Management

Liberty has no recommendations regarding the Work Management System, processes, and tools of NYSEG and RG&E.

b. Performance Measurement

1. As a first priority, NYSEG and RG&E should develop and employ comprehensive performance measures for replacement and installation of pipe and use the information they provide to plan for the levels and balance of resources required to complete replacement timely and efficiently.

Pipe replacement and installation is a dominant contributor to capital cost, and current high levels of expenditure are expected to continue at approximately the same level through 2018. They are likely to continue further, given an estimate of a 10-year replacement duration for NYSEG and a 13-year duration for RG&E. Costs will run into the hundreds of millions of dollars. The market for skilled engineering, management and labor to perform those activities has already changed, as other utilities in New York and across the country face the same issues and problems associated with replacement of leak-prone pipe. Thus, market conditions affecting labor availability, skills, and experience will remain challenging in the future.

2. NYSEG and RG&E should improve performance measurement across the electric and gas functions.

This effort should first include a comprehensive plan for capturing work unit measurements using the data capabilities of the existing SAP global platform. Work unit measurements should include both the number of units, cost per unit and hours per unit. A comprehensive work unit measurement system will track and inform productivity levels, inform current staffing level needs and allow for better forecasts of future staffing needs.

The following list typifies the types of measures that should be subject to regular reporting and that should be used not only to assess the effectiveness and efficiency of staffing resources, but also to help in driving forecasts of resources required to meet forecasted requirements in a manner that optimizes the balance among straight internal time, overtime and contractor use.

Monthly Overall Staffing Monitoring – Actual versus Planned (FTE):

(a) Straight Time
(b) Overtime

(c) Contractors
(d) Total Company – ST, OT, Contractors displayed as stacked bars

Internal / Contractor Mix – Actual versus Planned (Functions with major contractors), as appropriate:

- Construction – Main Renewals, Replacements and Upgrades
- Construction – Services Renewals, Replacements and Upgrades
- Construction – New Customer Additions – Services
- Construction - System Additions - Mains

Internal Resource Replenishment (Headcounts) – Actual versus Planned:

(a) Total Workforce
(b) Attritions (based on historical data, adjusted for anticipated future conditions)
(c) Retirement (based on potential retirees, adjusted for anticipated future conditions)
(d) New Hires (based on qualifications and training duration required to become fully qualified)

High-level Performance Indicators on Gas Productivity:

- Hours per Mile of Main Replaced
- Hours per Service Replaced
- Hours per Meter Replaced
- Hour per Mile of Main Installed
- Hours per Leak Repaired
- Hours per Trouble Job Ticket Responded

C. Internal Staffing

1. Summary

NYSEG and RG&E shared the same approach to internal staffing which, given their centralized nature, provided both with standardized procedures and processes to staffing. We found them well understood, effectively implemented, and based on reasonably sophisticated processes and tools. Overall, as shown previously, NYSEG is projected moderately higher FTE levels in its Electric business, notwithstanding its targeted contractor use of 30 percent for Electric T&D capital work. (It was reported to be around eight percent in 2015). RG&E meanwhile projected dramatically lower internal staff FTE levels in electric distribution relative to the period 2009 – 2013, and moderately higher FTE levels in the electric transmission/substation area.

In the gas business, however, NYSEG FTE forecasts for the 2015 – 2019 period showed a significant jump over current levels, particularly in engineering. RG&E also showed significant increases in engineering and in capital work. These resource increases may prove difficult to address given other utilities' similar focus on capital program expansion during the same period.

The companies had well-developed and documented forecasts of potential losses of internal staff through attrition and retirements for functions, regions, and work types. Both NYSEG and RG&E showed a high percentage of retirement eligible staff over the coming years, likely creating pressure to find competent and skilled replacements, particularly in a changing utility market.

2. *Findings*

a. General

Internal staffing planning at NYSEG and RG&E operated on a centralized basis. Both employed the same staffing processes for electric and for gas operations. Management identified internal staffing needs as part of an annual strategic planning process, Human Resources personnel facilitated the formulation of staff plans by each functional business area. The process produced a one-year budget and a five-year forecast, but NYSEG and RG&E also produced a 10-year workforce plan. This instance was the only one we found to operate over so long a horizon. SAP served as the core system, enabling access to staff information by affiliate, line of business, and title. Staff planning was not zero based, but employed initial drivers such as historic cost and expense levels. Nevertheless, management planned on a highly structured basis. Internal versus external staff decisions were made at the business area, where managers used a number of structured considerations. They included work type (seasonal, routine), core versus non-core, costs and union considerations. Processes application occurred reasonably consistently across all business units. Notably, management did not distinguish between the productivity of internal staff and contractors, but assumed them to be equal. This assumption provided a foundation for numerical goals for contracting percentages. Management reached this position without an apparent factual, analytical foundation.

b. Process

A central Control Department directed and coordinated the annual budgeting process. The budgeting process formed the basis for internal staff projections, using the enterprise software system (SAP). Based on identification of annual workload, business area leads quantitatively determined the number, composition, and timing of staffing resources for their areas. Historical staffing and expense levels served as the initial driver for all staffing and external resource decisions. Management determined internal and external resources at the business area level, applying a number of considerations. These considerations included core vs. non-core tasks, work requiring special skills, and relative costs of internal versus external resources.

In addition to the annual budget, management also developed a five-year plan. That plan's first year served as the approved budget, with the remaining four years representing forecasts only. Management had also recently implemented a 10-year workforce plan considering factors (including, for example, headcount at the end of prior year, retirements, productivity improvements, bargaining unit agreement provisions, new technologies) in formulating long-term staff forecasts. The annual budgeting process activities did not encompass the 10-Year Workforce Plan. Human Resources coordinated the latter, developing it on a timeline differing from that of the annual budget. The 10-Year plan translated collective projected workload into equivalent FTEs.

SAP provided the main source of systems supporting staff planning This enterprise software platform permitted capturing, tracking and monitoring of employee training, retirements, and other useful demographic information. SAP uses compatible units (CUs) in terms of tracking work accomplished, but management did not have processes in place to allow measurement of labor at the unit of work level as defined by the CUs.

Management used different drivers to set staff complements for its various work groups. For example, Engineering staff levels were driven by current and forecasted capital expenditures, while Electric Operations used a tool known as RPT, the Resource Planning Tool, that considered the previous five years of capital and O&M work history. Gas operations, on the other hand, used current and forecasted capital investment, required inspections, and maintenance and required surveys. Further, internal policy and procedures limited overtime hours, and required prior approval of all scheduled OT, both capital and O&M. In aggregate, internal resources were used to develop strategy, manage core businesses, manage contractors for routine, repetitive non-core tasks and for seasonal, peak or temporary work. However, management did not track units of work or rate data for contractors, except in electric transmission and distribution.

SAP provides a powerful platform to manage the business. Avangrid took advantage of some of SAP's more useful characteristics, employing that platform to provide staffing information, as needed, by job title, function, and area. System capabilities also permitted forecasts of attrition by affiliate and by line of business. Decisions as to whether to source work internally or externally got made at the business area level, applying considerations that included work type (seasonal, routine), core vs. non-core, costs, and bargaining unit factors.

Management anticipated that automation will lead, long term, to lower head count (*i.e.,* FTEs), but did not believe that there will be significant gaps in skill sets or numbers in the near future. We found this belief paradoxical, given that increased automation will lead to a greater need for specialized skills, some of which are not currently in-house, at least not in concentrations. The resolution of the paradox likely related to the temporal consideration that no new skill sets were required in the immediate future. Also, in terms of planning, management made no differentiation in assumed productivity when comparing internal staff versus contractors.

The processes and tools employed to develop long-term internal staff forecasts were the same for electric and gas operations. Management expressed no need to make near-term modification or change in organizational responsibilities, processes, or procedures underlying the planning and execution of internal staffing strategies.

c. Demographics

Concern about the rate at which the utility workforce is "graying," or getting, on average, uniformly older, has been an industry-wide issue for many years. The phenomenon threatens the loss of skill sets, earned over many years, if not decades, that become increasingly difficult to replace as retirements increase. Utilities not only face the loss of resources with traditional core competencies, but must address the dual challenge of replacing core competencies and attracting additional, younger staff with new skill sets in areas such as data analytics, advanced digital technologies, cyber security, and business development. A simultaneous, slow drain of critical skills and need to attract new skills cannot be easily or fully addressed by the use of contractors.

i. NYSEG

The next chart and table show annual changes in retirement eligibility and actual annual retirement rates for NYSEG. Combining the two sets of data provides an ability to gauge likely losses of skills and experience through retirement. The data show that NYSEG faced significant losses from retirement. The data management provided shows that the percentage of salaried NYSEG electric operations employees eligible for retirement increasing from 45 to over 60 percent from 2016 to 2019. The numbers of eligible who actually retired each year has changed at NYSEG, as it has for others. NYSEG experienced a general decline in actual retirement percentages. Electric operations craft staff trends were similar to those for salaried staff but began with a lower percentage eligible to retire in 2016. Even should the decline in retirements among those eligible prove sustained, the numbers of salaried (particularly) and craft personnel eligible to retire portend potentially significant staff replacement needs.

Chart III.1: NYSEG Electric – Percent of Current Staff Retirement Eligible as of Year End

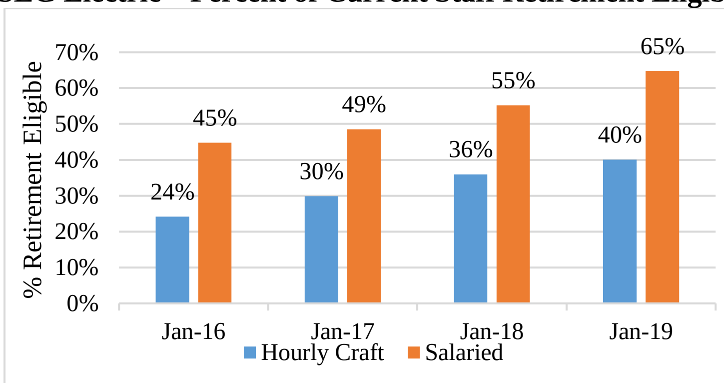


Table III.2: NYSEG Electric – Rates of Actual Retirement

Type	2009	2010	2011	2012	2013	2014
Hourly Craft	18%	45%	4%	9%	9%	12%
Salaried	16%	2%	15%	0%	9%	6%

The next chart and table show more sobering numbers for gas operations staff. A total of 65 percent of salaried staff (measured by those employed as of 2015) were eligible to retire in 2016. The total numbers were small (17 eligible of 26 total), but the percentages were nonetheless notably high. The expected percentage grew to 81 percent by 2019. The percentages of eligible gas operations craft personnel were lower, but still notable. The 2016 percentage of 34 percent was expected to grow to 51 percent by 2019. These high levels of eligibility are worrisome in an industry with increasing demand for resources.

Chart III.3: NYSEG Gas – Percent of Current Staff Retirement Eligible as of Year End

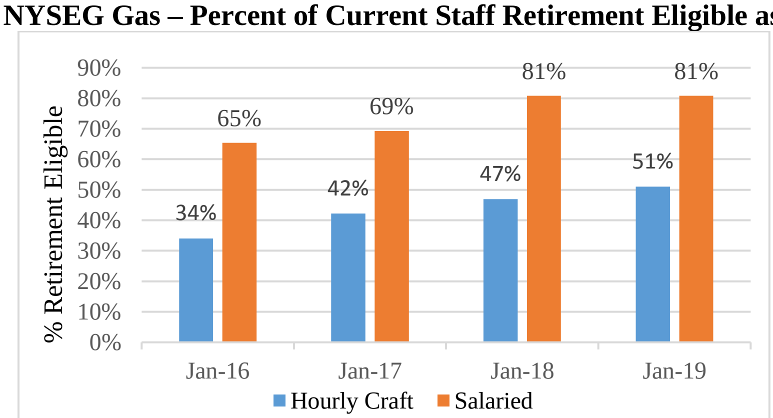


Table III.4: NYSEG Gas – Rates of Actual Retirement

Type	2009	2010	2011	2012	2013	2014
Hourly Craft	11%	45%	0%	10%	12%	13%
Salaried	0%	8%	0%	14%	18%	0%

The next two charts show changes in age and tenure for electric operations staff. NYSEG experienced a modest but increasing trend in average age for electric craft and salaried staff over the 2009 – 2014 period. Craft tenure remained constant, but tenure decreased for salaried personnel. Between 2009 and 2014 the average age of salaried employees in electric operations increased by two years while the average tenure decreased by five years. Craft average age increased by two years during the 2009 – 2014 period, while average tenure changed little.

Chart III.5: NYSEG Electric – Average Age

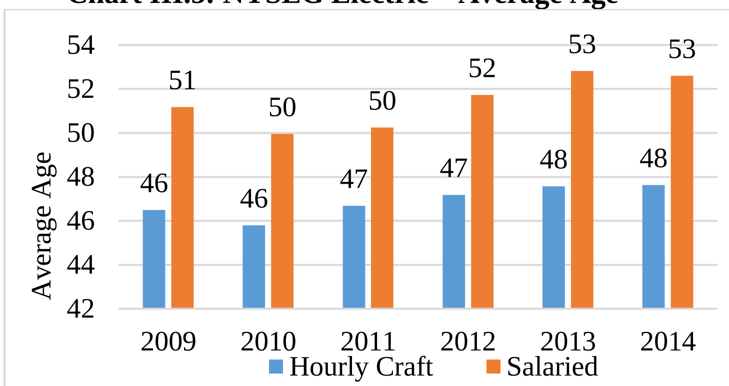
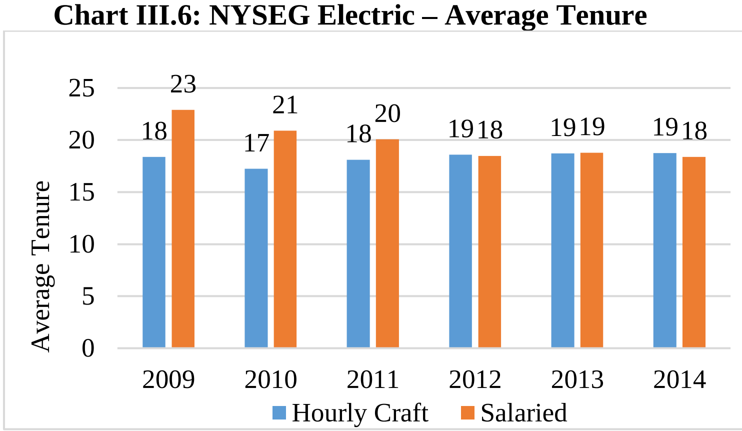


Chart III.6: NYSEG Electric – Average Tenure



The next charts show similar information for gas operations. There, salaried employees average age decreased by three years (from 53 to 50) over the period 2009 to 2014. Average age for craft resources remained essentially flat at 51. Average tenure over the period also differed between gas and electric operations. Gas operations salaried staff average tenure decreased from 24 to 13 years, while craft average tenure remained flat at 20 years. A significant tenure drop can prove problematic, particularly in cases where substantial resource growth is anticipated. The consequences of reducing the pool of those who can serve as sources of institutional knowledge, mentoring, and guiding of less experienced fellow workers rise in proportion to the number newer personnel.

Chart III.7: NYSEG Gas – Average Age

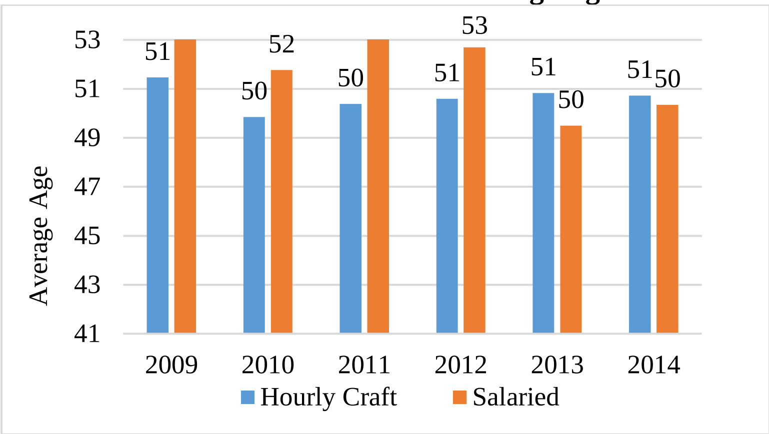
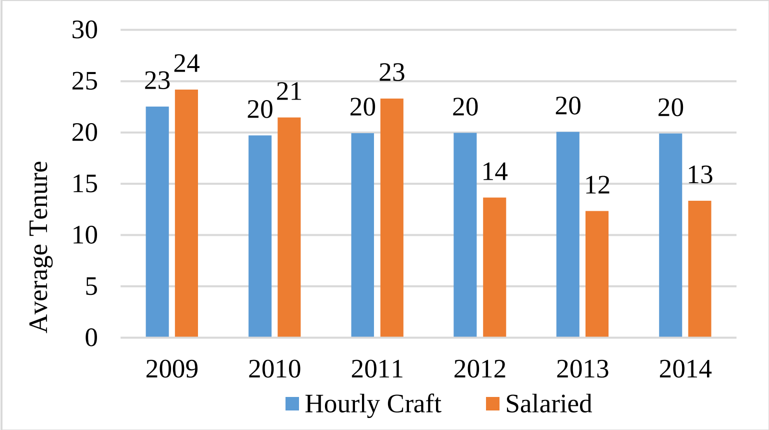


Chart III.8: NYSEG Gas – Average Tenure



ii. RG&E

The next chart and table show retirement data that management provided for RG&E electric operations personnel. The data showed increases in RG&E's retirement eligible salaried employees, from a 2016 level of 47 percent to a 2019 level of 60 percent. There had been a general downward trend in actual retirements. Craft retirement eligibility was at similar levels. RG&E data showed the potential for significant staff replacement needs.

Chart III.9: RGE Electric – Percent of Current Staff Retirement Eligible as of Year End

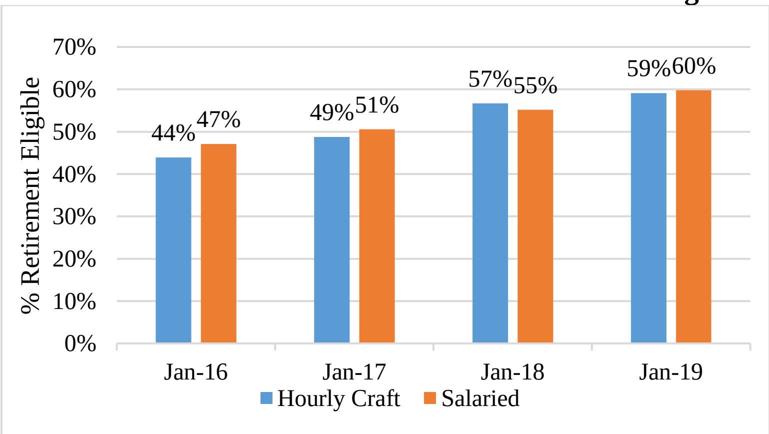


Table III.10: RGE Electric – Rates of Actual Retirement

Type	2009	2010	2011	2012	2013	2014
Hourly Craft	13%	6%	26%	5%	2%	2%
Salaried	4%	24%	5%	10%	12%	3%

The next chart and table summarize the retirement eligibility profile of gas operations staff, with 50 percent of craft staff eligible to retire in 2016, growing to 64 percent by 2019. Salaried gas operations staff numbers were lower, with 33 percent eligible to retire in 2016 and 44 percent by 2019.

Chart III.11: RGE Gas – Percent of Current Staff Retirement Eligible as of Year End

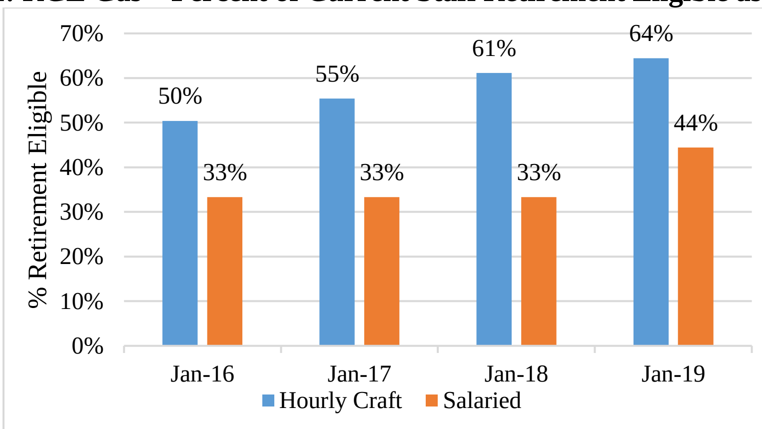


Table III.12: RGE Gas – Rates of Actual Retirement

Type	2009	2010	2011	2012	2013	2014
Hourly Craft	0%	3%	0%	5%	8%	3%
Salaried	0%	0%	0%	0%	0%	22%

The next tables summarize average age and tenure at RG&E. Electric operations craft and staff increased moderately over the 2009 – 2014 period, while tenure remained relatively flat.

Chart III.13: RGE Electric – Average Age

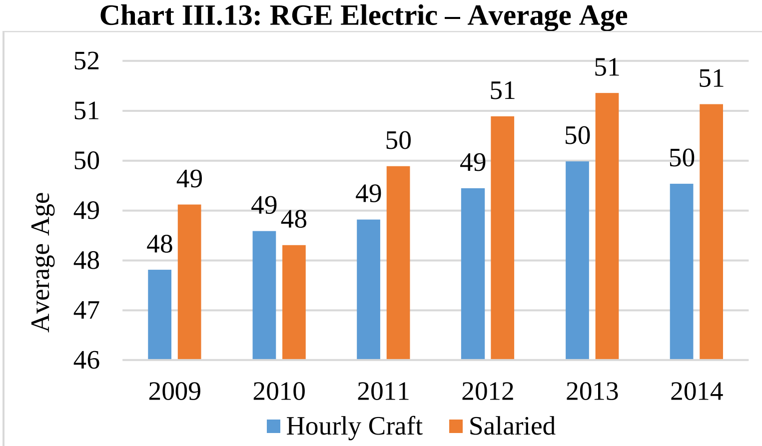
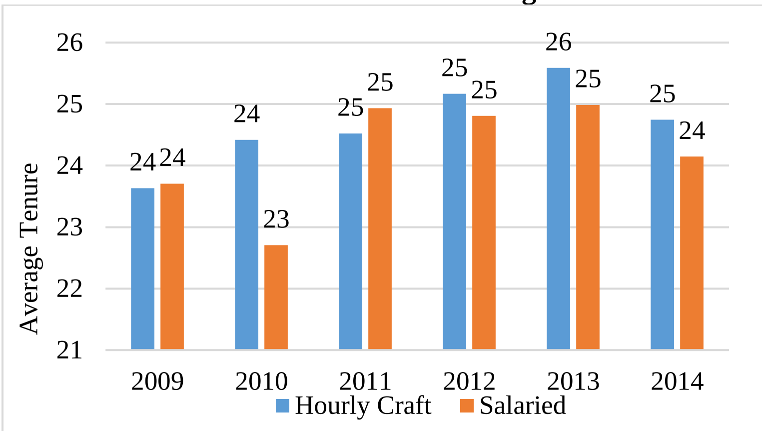


Chart III.14: RGE Electric – Average Tenure



Gas operations showed similar age and tenure trends at RG&E. The next tables summarize the data management provided. Average electric operations ages remained relatively constant, at 50 for craft through 2014. Average age for salaried resources remained essentially flat at 51 years until a large increase in retirements in 2014 contributed to a drop to 47 years. Average tenure remained relatively constant for craft resources at 25 years, but declined from 29 years to 25 years for salaried staff.

Chart III.15: RGE Gas – Average Age

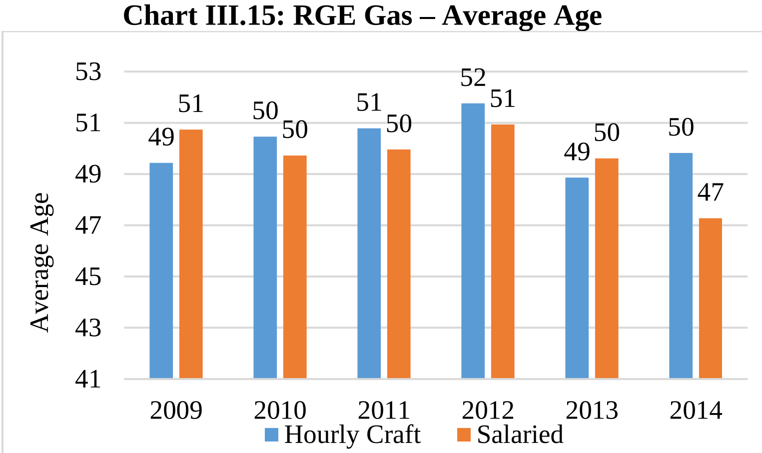
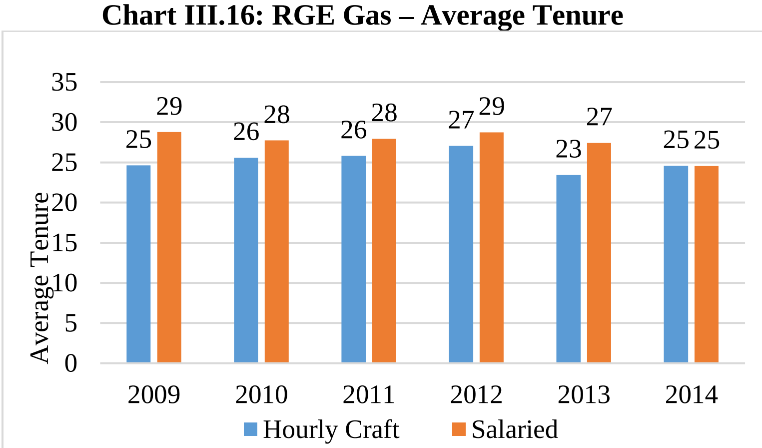


Chart III.16: RGE Gas – Average Tenure



d. Monitoring, Training and Development of Critical Skills

NYSEG and RG&E management had not observed the existence of significant resource gaps in either skill sets or numbers of resources. Consequently, monitoring, training, and development of incumbent skills offered the means most directly available to sustain the ability to fulfill their missions and adapt to changing circumstances and markets. Each year Human Resources, a centralized organization, worked with the business areas to identify the training needs for the next year, developing offerings of specific programs. HR discussed with businesses the availability of training resources, and identified the need for external vendors. Technical training in Gas and Electric operations used, for the last three years, contract workers, contractors, and business area staff to assist and supplement HR training staff as needed. It was unclear if this staff augmentation in the training function would continue or whether HR planned to supplement its staff with additional FTEs.

Training was required for all electric and gas line workers not already fully qualified. Progression training was conducted by training department and field management. Employees could create Personal Development Plans (a voluntary program) either in the global HR platform for non-union staff, or paper based plans for union staff. Management focused on what it describes as the "70-20-10 model for development. This model focused on 70 percent of development on the job, 20 percent from networking, coaching/mentoring, and 10 percent from formalized training (*e.g.*, classroom, webinar). SAP tracked all training, whether conducted by vendors or internal delivery.

In terms of future development, NYSEG and RG&E were looking to implement very near term a Graduate Engineering Program. New engineering hires would rotate through business units for two years. Management had reached out to local institutions to find potential candidates, but none took in company personnel for training. Based on documentation provided, the effort to create institutional affiliations did not appear intensive or aggressive.

In terms of reaching out to industry organizations to further develop training offerings, gas training was investigating bringing in the Northeast Gas Association (NGA) to assist with OQ refresher training each year in the first quarter, and Electric training was researching companies to provide hot-stick training – possibly on an annual basis. The efforts appeared new and as yet unfilled.

NYSEG and RG&E (and other Avangrid affiliated companies) were asked in 2015 to participate in a Center for Energy Workforce Development (CEWD) survey for CEWD 2015. Previously, Human Resources was not made aware of, nor had it participated in previous survey requests. Moving forward, management planned to continue to participate in future surveys. Regarding recruitment of experienced craft positions, management cited use of a variety of means to attract a diverse group of talent, depending on the skill set needed. These efforts included working with Center for Energy Workforce Development on the Troops to Energy initiative (seemingly a new effort as it had little familiarity with the CEWD), outreach to associations/organizations where the required skill set is a focus, outreach to community associations/organizations, job boards, social networking sites and the company website, among other things.

Management also noted that its collective bargaining agreements had provisions related to the recruitment, training, and development of craft personnel. The provisions included language on how jobs get posted, awarded, and the overall framework for training and development of employees. The contractual provisions were widely applied at each Company and there had not been any specific analysis done with regard to these provisions.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Internal Staffing criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These six criteria are:

1. There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.
2. Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.
3. There should exist sufficient sources of complete, accurate staffing information by region and by function
4. Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.
5. Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.
6. Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

1. NYSEG and RG&E had comprehensive and sufficiently detailed forecasts of medium- and longer-term capital and O&M work requirements; they were comprehensive enough to identify likely resource requirements over those time frames.

Management employed structured, well-understood work plan development process based on the identification of work to be performed, translated into hours and costs and resource targets.

2. NYSEG and RG&E's capital and O&M work forecasts had an adequate factual and analytical foundation to support staffing projections.

The identification of work requirements resulted from a multi-step process driven by significant line organization input and subject to multiple layers of review and examination. Conversion of those work requirements into resource needs occurred under a structured, straight-forward process that proceeded directly from the work forecasts.

3. NYSEG and RG&E had a source of complete and accurate information about staffing by region and by function.

Management used Oracle and VEMO systems focused on budgeting and attrition-related information, respectively. These systems provided sufficient data at an appropriate level of detail to allow wide and deep coverage of staffing related information. VEMO's capabilities represent what constitutes a best-in-class system for tracking attrition-related information.

4. Forecasts existed of likely losses through attrition and retirement of internal resources by function, region, and work type.

Management maintained a sound accounting of demographic trends and information of internal staff. Attrition and retirement forecasts were consistent with its experience, and management had a grasp on likely skills and experience gaps. Management demonstrated a sound and comprehensive understanding of areas where losses in key personnel could have most significantly affected work performance. Management did not believe that losses in key personnel, in skills, or numbers, have affected work performance and there is no indication to the contrary that such an event had occurred.

Management also demonstrated a sound and comprehensive understanding of areas where losses in key personnel were most likely to have material impacts on future work performance. NYSEG and RG&E had a clear understanding of the criticality of certain skill sets and the need for a certain number of staff with those skill sets, but did not consider either to be subject to near term loss.

5. Training and development programs were sufficiently robust to provide adequate support for long term staff requirements, but some key performance indicators were lacking.

Internal training programs were well developed and oriented toward effective support of the line organizations. NYSEG had a few, but not well established, relationships with schools, associations, and a nascent relationship with the Center for Energy Workforce Development.

4. Recommendations

1. Particularly for NYSEG, management needs to address the availability of sufficient numbers of seasoned gas salaried employees to serve in mentoring and similar roles for an internal staffing complement forecasted to expand greatly.

Should loss in long-tenured gas salaried staff continue over the next several years, the challenges in integrating new resources will become greater. Management needs to address that possibility carefully. Should analysis show it to be of significant risk, management needs to find ways to ensure that it mitigates that risk through programs that will accelerate knowledge and experience transfer now by those who possess it to those who will follow them in the ranks of the more seasoned contributors and managers.

2. Management should develop key performance indicators that measure the effectiveness of efforts to achieve NYSEG and RG&E staffing targets and accountability should be assigned for them.

Management should develop metrics that permit management continually to track success in meeting resource recruitment, acquisition, development, and training targets.

D. Overtime

1. Summary

NYSEG and RG&E were effective in establishing reasonable targets for overtime and managing to those relatively low targets. Processes relating to overtime were good and we saw little room for significant improvements. The processes lacked the structure, formality, and analytical support we favor, but they appeared to function effectively.

2. *Findings*

Liberty has often found in other work that overtime among utilities does not receive a degree of organizational attention commensurate with its importance in cost and staffing analysis and planning. The magnitude of work done on overtime, the negative impacts on personnel from high overtime, the reduced productivity associated with overtime, and issues of control, especially with emergency requirements, argue that overtime planning and management should get more attention in most organizations.

Our examination of NYSEG and RG&E overtime processes did not reveal any areas that represent significant weaknesses, either on an absolute basis or relative to the other state utilities. Management was attentive to overtime, employing a strategy to limit it to 20 percent for electric and 10 percent for gas operations. Actual use for the historical portion of our study fell below established budget levels. Both NYSEG and RG&E required overtime to be pre-approved except during emergencies. RG&E also operated under a bargaining agreement that overtime must be offered to internal crews before requesting contractors. Since 2013, NYSEG and RG&E crews have had the ability to work in each other’s territories, beneficially affecting overtime requirements.

For electrical operations, overtime was projected in the annual manpower plan based on historical usage and established guidelines for the use of overtime. Each business area reviewed overtime usage on an ongoing basis. Management typically used overtime for trouble work or reliability issues requiring immediate response.

For gas operations, overtime budgeting relied on historical usage and management measured it against key performance indicators. Overtime use came mostly in emergency work, such as storms, emergency response to gas leaks, and emergency gas leak repairs.

Both NYSEG and RG&E used performance indicators to measure production. For capital work, the Quality Management System established a baseline for performance requirements, and measured progress based on Cost Performance Index and Schedule Performance Index. This system applied to electric and to gas work.

NYSEG and RG&E monitored productivity of some activities, but had not performed analysis on how overtime affected productivity. Management did not consider such analysis necessary. We found no analyses performed to study the impact of overtime use on costs.

Both gas and electric operations considered overtime use as a formal part of identifying potential resource addition during the budget preparation process. During the year, the overtime policy of requiring director’s approval was observed. There were monthly reviews of overtime information via weekly, biweekly or monthly reports. Management operated under the approach of reallocating personnel in the event overall overtime levels became too high, supplemented by resource addition if warranted.

Both NYSEG and RG&E managers considered historical overtime levels in their long-term resource planning strategy and trending, adequately considering overtime parameters and integrating them into budgets and plans.

Managers described the balancing process between internal and external resources and the effects of overtime, whose use was essentially in line with the budget. The resource balancing process among the internal workforce, overtime, and contractors is difficult, calling for determination of an optimum overtime rate and considering the impacts of overtime on productivity and costs to be more quantitatively driven and supported by insightful analysis.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Overtime criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. There should exist an analytically supportable method for determining optimum levels of overtime.
2. Planning should appropriately consider the relationship between amounts of overtime use and productivity and costs developed separately for the different work functions and types.
3. Overtime use should comprise a formal part of the process of identifying required resources.
4. Overtime use should conform as closely as practicable to well-founded assumptions used for determining resource requirements.
5. Overtime use should comprise part of an integrated process for balancing internal, overtime, and contractor resources across all functions at issue.

1. NYSEG and RG&E performed a significant level of planning, monitoring, and oversight to the management of overtime, and demonstrated good analytical capabilities.

The degree of attention to overtime as a management parameter varies among the utilities. It was not neglected here. Budget targets and caps existed. NYSEG and RG&E were able to meet the targets consistently, providing an indicator of effective management of overtime. Tradeoffs in staffing decisions received an appropriate level of analysis and management consideration. The skills and capabilities applied to analysis and decision-making were sound.

2. NYSEG and RG&E did not employ an analytically supportable method for determining optimum levels of overtime.

Management did not have an analytically supportable process to determine optimum overtime level, but did have a method to establish the 20 percent target for electrical work and 10 percent for gas work. Managers expressed confidence that the 20 percent target established could be considered the optimum level. We were somewhat skeptical of this belief, given management's regular plan for and achievement of far lower levels.

Management used three analytical tools, namely the Quality Management System for capital work, the Gates Model for transmission and distribution work, and a manual process to minimize overtime to meet budget in gas work. While these tools might have had some overtime features and application, we did not see how they could work together to support the determination of an optimum overtime rate analytically. To ensure future success in overtime and resource management, we believe that management should document its current overtime determination process, and employ a more structured approach. We acknowledge, however, that the results achieved do not suggest immediate concern.

3. NYSEG and RG&E did not routinely consider the interrelationships among overtime, cost, and productivity in decision-making related to overtime.

We found no quantitative analyses for either gas and electric operations assessing whether and how overtime affected productivity. We did observe some qualitative discussions on the benefits gained from overtime. The three existing tools discussed above would not be able to provide how overtime use would affect productivity. We also found no analyses of overtime use's impact on costs.

4. NYSEG and RG&E did not apply overtime planning and analysis at the functional level.

We found no established optimal overtime determination process. Hence, there was no application of such a process at the functional levels. Management recognized that different work groups or work types should and do have different levels of overtime based on the nature of the work. This level of planning did not go down to the functional level. Most utilities see the functional level as the ultimate basis for effective planning and control of costs in general, although the abilities to implement such a strategy vary widely. Liberty considers it appropriate to apply more, not less, attention at the functional level. The degree to which such functional attention is desirable with respect to overtime needs to be evaluated and determined at the individual utility level. We did not find reason to conclude that such added detail is appropriate here.

5. NYSEG and RG&E made overtime use a formal part of the process of identifying required resources.

Management considered historical overtime levels in long-term resource planning strategy and performance trending. Overtime parameters were adequately considered and integrated into budgets and plans. Management used the Gates Model to manage resources in Electric T&D work, while a manual process applied in managing gas work. Management cited examples of analyses that led to resource changes; *e.g.*, adding single worker as emergency trouble-shooters. We did confirm, for example, the addition of workers as trouble shooters in RG&E.

6. NYSEG and RG&E overtime use conformed to assumptions used for determining resource requirements.

Management established a budgeted overtime level of 20 percent in electric and 10 percent in gas operations. Actual usage was below these levels. Management applied a policy requiring overtime pre-approval, except during emergencies. In general, this practice was collaborated by the actual data, with over half the overtime charges expended on emergency responses, both in gas and electric operations.

7. NYSEG and RG&E appropriately considered overtime as an element of the resource stack, and appropriately planned its use on an integrated basis with the other resource elements.

Management described the resource determination process among internal and external resources during the budgeting season, indicating some consideration of historical overtime levels. Management also considers current productivity, training requirements, amounts of unproductive time, and workload demands to establish baseload internal resource levels. External resources were generally considered for routine, repetitive, non-core tasks, and seasonal, peak, or temporary work.

Management exercised flexibility in allowing business areas to consider and use a blended approach for certain work functions where a combination of resources could be utilized. In some cases, contractual, legal, or regulatory obligations could preclude outsourcing or using contractors. Decisions concerning staffing and overtime resulted from management knowledge of needs. For contractors, performance pursuant to master service agreements or other applicable agreements was considered as part of this management analysis.

8. NYSEG and RG&E overall management of overtime was sound, producing performance better than aggressive targets, and results among the lowest in New York.

4. Recommendations

1. Management should seek more analytically supported methods for determining optimum overtime levels.

Each utility's circumstances will dictate its needs for an analytically optimized solution for overtime. Such sophisticated approaches will be more appropriate in cases where: (a) overtime expenditures are large, both absolutely and relative to other staffing related costs, (b) planned levels of overtime are relatively high, (c) productivity issues exist, (d) non-economic issues exist, or (e) control issues exist.

On the surface, the companies met none of these criteria, suggesting that they were not logical candidates for a more robust analytical determination of an optimized level and strategy for overtime. Nevertheless, while we believe that management should consider alternate schemes and, if appropriate, modify its approach, we cannot recommend any significant initiatives.

NYSEG and RG&E have had success in setting overtime targets. Management should document the existing process, and enhance it with the necessary quantitative tools to fine-tune the process. Armed with the knowledge of optimum overtime level, in conjunction with an effective integrated process of balancing internal and external resources, management will be able to effectively predict quantitatively the magnitude of the types of resources required.

2. Management should adopt an approach ensuring that it includes all relevant factors in its decision-making vis-à-vis overtime.

We have stressed that each utility's circumstances will dictate the level of effort appropriate for managing various elements of its work. We do not recommend expensive analytical exercises that may offer no real return. Management should assure that it has a strong understanding of the negative impacts of overtime and considers those impacts as practical in its decision-making processes. The two most obvious relevant factors that need to be considered are how extensive overtime is impacting productivity and costs.

NYSEG and RG&E need to develop and equip managers and supervisors the necessary quantitative monitoring tools, such as relevant and complete productivity measurements, hourly labor cost, overtime charts, contractor production rates, unit cost of main installation, unit cost of services installation, etc.

E. Contractor Use

1. *Summary*

Management of electric operations established target contracting percentages combining distribution and transmission/substations work, measured on a combined NYSEG/RG&E basis. Functional and company differences, however, make it appropriate to disaggregate targets in order better to promote resource optimization. For electric distribution work, we believe that management's use of time and equipment pricing took an approach less likely to optimize costs, when compared with more prevalent pricing in the industry. Management also departed from what we believe to be the best practice of using a stronger core of expertise in-house for distribution engineering.

In gas operations, the overall contracting approach conformed generally to industry practice in terms of work types contracted, and forms of solicitation. However, management had not sufficiently explored and tested through negotiations the ability to optimize contractor cost and performance through contract linkages of performance with compensation.

In some areas, we made similar observations for electric and gas operations. Management had established relationships with an appropriate range of contracting firms for both. However, for gas operations, a dynamic and risky market for resources made it important for management to investigate and develop more robust plans for ensuring continuing access to resources needs for large pipe replacement efforts. There was also a need for establishment of a centralized contractor oversight resources for electric and for gas operations. Substantial steps in this direction may already be well underway by now, but they had not occurred before the completion of our field work. Those steps also need to include creation of a comprehensive contractor performance evaluation process.

2. *Findings*

a. Electric Operations

NYSEG and RG&E operated under guiding principles for electric contracting. Principal strategy elements we observed include:

- Management contracted most transmission/substations capital work, leaving internal resource to focus on smaller work.
- Management bid out all detailed engineering work in transmission and substations, including most conceptual engineering.
- Substation engineering employed a master service agreement for substation engineering contracts.
- Contractors performed distribution line inspections on a five-year, line-patrol cycle.
- Contractors performed stray voltage testing during line inspection work.
- Management bundled distribution repair work for contracting.
- Management contracted rebuilds of large line sections.
- RG&E contracted all street light work.
- Internal resources generally performed underground (URD) work, given difficulties associated with coordinating the electric work required with gas crews working in the same areas.

Management reported the existence of a number of incremental preventative maintenance programs that contractors were performing under a mandate of the Commission. Examples of these programs included wood pole inspection and treatment, insulator replacement at RG&E, load tap changer replacement in substations, animal fencing, and relay work. Management cited incremental maintenance costs from the latest rate case agreement at $4.9 million for NYSEG and $2.28 million for RG&E.

Transmission/substations capital work typically used solicitations seeking pricing on a not-to-exceed basis. Most line contracting was priced based on agreed upon time and equipment rates that form part of current, Framework Agreements. We do not consider time and equipment rates as cost efficient as other approaches, for example unit prices. Time and equipment pricing does not normally permit price of cost identification by activities (units of work). Management was at the time of our field work transitioning to a unit pay system (Pay ID), which had been used then only on a limited number of complete pilot projects. Jobs below $300,000 could be done without a formal bid process using the time and equipment rates.

RG&E agreed in January 2015 to an agreement requiring maintenance of a minimum staffing level of 334 line workers. Discussions about a similar agreement with NYSEG workers was underway. The goal of these agreements was to replace bargaining unit ability to challenge decisions to contract with guaranteed assured staff levels.

Management did not routinely compare contractor versus internal costs. An operational excellence team did perform a one-time contractor cost comparison study.

We found a lack of clarity with respect to management's goal in electric transmission and distribution of a 30/70 mix of contractor/internal resources for RG&E and NYSEG. Management observed that combining capital and O&M work categories produced a level of contracting below 30 percent for the two operations combined historically. Our measurement of the combined contracting percentage over the 2009 to 2013 period is 24 percent, which does comport with the goal when measured this way. However, the shift in contracting levels in 2011 has produced a combined rate of over 31 percent for 2012 and 2013. A high level of RG&E contracting drove this increase.

Management used framework agreements to keep a pool of contractors available. The 30/70 work mix goal supported the maintenance of a ready pool of overhead line contractors for storm assistance.

Management did not employ a central contractor management organization in place during our field work. We observed two different contractor oversight processes. Management hired a third-party field construction coordinator for large jobs. This contract resource worked in the field as a working foreman. For small jobs, division personnel and local line foreman provided oversight. We did not find a formal process for performing inspections at work completion. We understood management to agree with the need to create a central oversight organization.

We did observe a formal contactor invoice approved process, which operated through SAP. Management was employing contractor performance scorecards that require weekly logging of performance. Contractor safety performance played a role in determinations about awarding future work.

b. Gas Operations

NYSEG and RG&E also operated under clear guidelines for contracting work. NYSEG contracted approximately forty to sixty percent and RG&E sixty to seventy percent of construction. These contracts included over ninety percent of pipe replacement for both companies. Both companies performed inspections and emergency response activities in-house.

Management contracted all line locating and mark-outs under a three-year contract with one vendor. Management also used three-year contracts with a single vendor for leak surveys, with about 20 percent of such work left to be performed with internal resources.

Management stated that its primary consideration in determining what work to contract was to ensure that employees performed high-value work, recognizing the challenges of operating in a large, scattered territory with thirty offices around the state. Management maintained a group of five or six generally local firms available for capital construction, which provided a reasonably broad base of firms.

Employees typically were Operator Qualified for all tasks, while contractors generally were qualified in one or several narrow tasks or areas. This qualification differential often made employee costs higher, making it less expensive to hire contractors for many activities.

For capital construction, management cited factors, not always complementary, considered in making decisions about contracting:

- Limiting the number of construction employees to those that can be kept busy during the off-season, when weather conditions prohibit construction.
- Retaining a number of contract firms and crews sufficient to promote availability during emergencies, recognizing that contractors give preference to regular clients when their resources are strained.

As a first step in the contracting process, NYSEG and RG&E evaluated the technical qualifications of bidders. Subsequently, Corporate Procurement maintained lists of qualified bidders, and handled bid packages through the normal procurement process. For those interested and qualified, Procurement prepared Master Services Agreements, which were required for blanket contracts. Invoicing and payment processing were handled through normal Procurement channels after approval from Operations. As with electric operations, establishment of a contractor oversight organization was in progress when we completed our field work.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Contractor Use criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The level of contractor use and the types of contractors retained should be supported by a contractor strategy that considers work volume, quality, timeliness, costs, and other relevant considerations.
2. There should exist a data-driven understanding of the comparative costs of using contractor versus internal resources, and apply a good qualitative rationale for choosing between contractor and internal resources.
3. Management should retain a sufficiently broad base of firms should remain under contract, pre-screened or pre-qualified for activities and tasks for which contractors are regularly used or anticipated to be used.
4. (Gas only) Where contractor resources are limited in terms of numbers of crews available or skill sets to meet anticipated future needs, the utility should be working to promote development of a skilled pool of resources.
5. Contractor strategy should be supported by appropriate contractor management processes.

1. The combined NYSEG/RG&E contractor/internal mix goal for electric work did not support an informed, balanced contracting strategy.

RG&E employed high levels of contracting in recent years. An overall combined goal of 30 percent contracting was in place. Measuring it only at the RG&E level would cause that goal to have been exceeded. RG&E's contracting percentages were the highest rates among the electric operations we studied. A 30/70 contractor/internal split makes sense at the distribution functional level. It would not be sound at the transmission/substations functional level. For example, the Reference Utility capital rate was 60 percent, and transmission capital needs vary considerably from year to year, given the effect that large individual projects have, as they come due for construction.

2. NYSEG's and RG&E's use of contracted services in gas operations was generally consistent with industry practice.

NYSEG and RG&E were contracting out almost all of pipe replacement, which formed a major portion of its construction activity. It also was contracting out most line locating and leak surveying. Internal resources conducted inspections, leak repair, and emergency response activities. This split conformed to general practice.

For project work, defined as a package over $250,000, management used a solicitation for a lump sum bid, open to all contractors, both with and without Master Service Agreements (MSA). For "blanket" or unit price contracts, contractors were required to have MSAs.

Management used appropriate rationales for contracting for those services. The factors considered by NYSEG and RG&E were consistent with those considered by the industry in New York. Two of the more important factors were the distributed service territory and the fact that NYSEG had a floor number of union employees to maintain.

Management had performed an informal study comparing the costs of in-house vs. contractor labor, but it was not rigorous and the results were inconclusive.

3. The NYSEG and RG&E use of time and equipment rates for distribution line contractors did not tend to optimize cost performance.

Management predominately used time and equipment rates for distribution line contracts. We find them the least cost-effective type, which should tend to limit their use, and certainly not commend them for linear, repetitive work. Management was conducting a pilot program involving unit rates (PayIDs), but had only completed a few jobs under that approach by the end of our field work. We observed also that the distribution unit rate structure was common among other New York operations and in our experience, elsewhere.

4. RG&E's lack of a strong in-house core of distribution engineering was anomalous.

The core function of distribution engineering is to prepare and administer distribution engineering standards, including construction and material standards. Except for the smallest of electric utility companies, it is common industry practice to retain this function in-house. Management had to contract out this core function.

5. NYSEG and RG&E employed a reasonable number of electric contractors.

It appropriately considered availability for emergency work in doing so.

6. The NYSEG and RG&E base of contractors for gas construction was adequate for current circumstances, but management had not taken steps to increase the number of resources required to support its expected construction program.

Management was using a field of five to six contractors to cover its diversified territories. Its pipe replacement programs were projected to continue at current rates or increase modestly, under program durations estimated at ten and thirteen years, respectively, for NYSEG and RG&E. However, the tightening of the markets for contractors in New York and the Northeast as many utilities ramp up their programs will tend to drive prices up, make it more difficult to attract qualified employees and contractors, and potentially putting the program durations in jeopardy.

7. NYSEG and RG&E did not have a contractor oversight organization in place for electric or for gas operations.

Management did not have a central contractor management organization in place at the conclusion of our field work, although it did express agreement with the value of creating one. Combining the lack of an oversight organization coupled with the use of distribution time and equipment rates produce an important gap in ensuring effective resource use. Time and equipment rates require more extensive contractor oversight than other alternatives (such as unit or lump sum pricing).

Management was also not employing a strong system of contractor evaluation. There were no formal evaluation reports at job completion. Our review of gas operations, for example, did disclose reports for non-conformities (*e.g.*, QC), review of change orders, and lessons learned reviews for projects over $300,000. That review also disclosed a monthly safety review of each project, utilizing a field checklist. However, we did not find regular performance reports or regular review meetings with contractors, which we would expect to form part of a well-structured contractor management process.

8. NYSEG and RG&E did not link gas contractor compensation to performance.

Ultimately, if a contractor met minimally acceptable performance, it remained on the approved vendor list. Compensation was at contract price, with no incentives or disincentives related to performance, and future work depended, absent some unusual conditions, on bid price.

4. Recommendations

1. Management should disaggregate the combined NYSEG/RG&E contractor/internal mix goal for electric work.

Combining distribution transmission/substations into a single goal at the combined company level tends to make it meaningless. It can produce severe imbalance among functions or between the two companies (as has been the case with NYSEG and RG&E) even though adding up the components shows satisfaction of the goal. The combined approach does not promote a balanced contracting strategy for NYSEG and RG&E.

Management should address goals at a more detailed functional level, and should not be satisfied that meeting them on a combined basis proves success, particularly when one of the two is far above the goal and the other far below. Only where the reasons for such differences are substantial and contribute to resource optimization is such a result encouraging, which provides another way of stating why disaggregated functional and company views are required. Operating under a disaggregated view could well produce increased internal staffing for distribution and capital construction work at RG&E.

2. NYSEG and RG&E should solicit unit pricing for distribution line contracts.

The unit price contracts should result in lower contractor costs. In any event, soliciting them will provide a more informed basis for determining what will optimize costs, considering performance timeliness and quality. Our experience indicates a likely savings and contractor motivation to increase productivity. Unit price contracts also require less field supervision than do time and equipment rates.

The results of management’s pilot will hopefully prove informative, depending on how it was operated and what responses it received.

3. NYSEG and RG&E should comprehensively and formally analyze the costs and benefits of expanded in-house, core distribution engineering expertise.

Management was contracting what is generally considered the core function of distribution engineering, the preparation and maintenance of distribution. This role is generally performed with internal resources in the industry. Doing so can improve the distribution engineering function by producing a closer understanding and incorporation of line worker, power quality, tooling, distribution control system, distribution automation, and smart grid needs into the engineering and construction standards.

4. NYSEG and RG&E should develop and implement plans that fully support pipe replacement resource needs.

The pipe replacement programs were relatively stable in recent years, but will increase modestly over the next few years. However, many of the other companies in New York State and the Northeast are ramping up their programs over the next several years, which will tend to drive up contractor costs and limit their availability. Management needs to analyze fully current and future needs, account for risks and uncertainties in the marketplace for resources, develop robust plans for ensuring resource adequacy, and continually monitor success in acquiring resources and changes in conditions, in order to support flexibility in addressing an uncertain, risky future.

5. NYSEG and RG&E should implement a centralized contractor oversight organization.

A centralized contractor oversight and management organization is a normal function at medium to large utility companies. It provides a uniform structure for contractor processes. It improves most aspects of contractor management, including the consistency and quality of contractor safety, monitoring, evaluations, inspections, work quality, invoice processing and training. It allows for easier incorporation of new contractors coming on the system. We understood management to agree, and to have initiated steps in that direction. Considering the time involved in transitioning to this approach, management should detail its plans and schedules for doing so.

The program should include formal contractor review and evaluation. Performance evaluation is a critical element of project and construction management. While NYSEG and RG&E performed a number of reviews, there were no formal performance evaluations of construction contractors.

6. NYSEG and RG&E should pursue an incentive/disincentive system linking gas contractor compensation to performance.

Other operations we studied here and have examined elsewhere have employed such systems, and have reported success with them. To the extent that such mechanisms would bring a new element to the negotiation process, we understand the need to consider them holistically (*i.e.*, as part of all the trade-offs that contracting parties make to reach an agreement). Identifying options and finding ways to introduce them to negotiations regarding existing and potential future relationships offers the best method of assessing their contribution to cost and performance optimization.

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

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Liberty Consulting Group

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279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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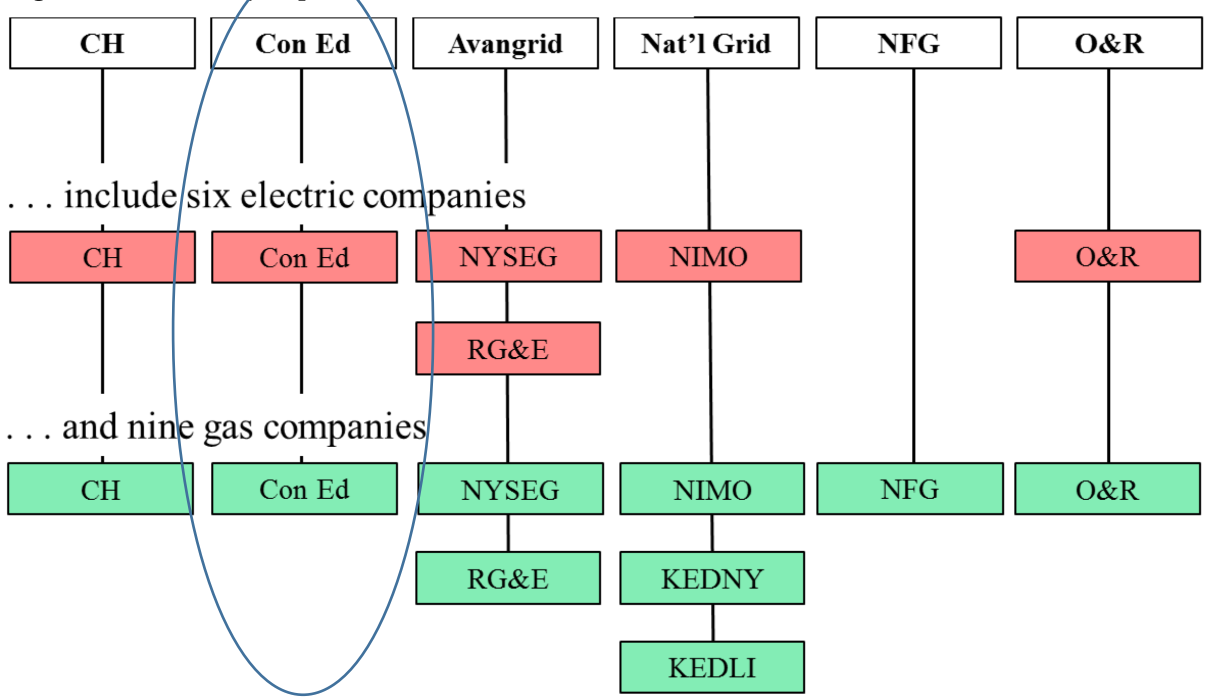
Chapter I: Background

The Liberty Consulting Group completed an extensive study of a prescribed set of staffing patterns and practices (the scope of which the Statewide section of this report addresses) at fifteen utility operations operating within six enterprises in New York State. The first part of this report addresses the results of our study from a statewide perspective. This part describes our study and presents its results as they relate directly to the two utilities (electric and natural gas) of Consolidated Edison Company of New York (CECONY) (electric and gas) examined.

Figure I.1: The Utility Reports



Our study examined staffing in quantitative and qualitative manners. This part of the report describes the results of our analyses regarding CECONY quantitative staffing data and a qualitative review of the processes associated with staffing in the electric and the gas utility. That data and the comparisons we have made with other New York utilities require a framework that explains the relevant characteristics in context with the other state utilities.

Our study examined a ten-year period - - five of them historical and five projected. We conducted field work in 2014, which presented a challenge in treating that year’s data. We collected year-to-date actual data and budgeted or forecasted data for the remainder of the year. Differences in systems, fiscal years, reporting, and approaches to forecasting to-go data provide examples of the difficulties in identifying a way to split 2014 into actual and forecasted portions or to reflect it on an amalgamated basis. Those difficulties eventually led us to determine that we could not find a way to report 2014 data meaningfully for use in our study.

In 2015, progress on this project halted for a period of many months, during which we sought to resolve major difficulties regarding gaps and errors in data reporting. We observed that the hiatus in work and the need for data correction provided an opportunity to alter project scope to permit collection of actual data for all of 2014 and to update projections for future years. It was decided not to do so. Therefore, we continued to work with the split nature of 2014 data and with earlier forecasts for future years, which included 2015.

When making utility-to-utility comparisons one must remain mindful of the need to avoid comparing "apples to oranges." The complex analyses involved here and the unique circumstances of utilities even across the fairly narrow geographic range of a single state certainly do make it impracticable to reduce comparative evaluations of performance and results simply to algorithms. Nevertheless, it is possible, with care, to provide data comparable enough to assist in the formation of useful judgments. They can have value even in complex circumstances, particularly when performed on a multi-dimensional basis and only when accompanied by the application of industry expertise in the underlying applications and activities.

We thus undertook our quantitative analyses recognizing the need to understand and reflect the differences that drive staffing among the state's group of utilities. Among the challenges present in doing so, our work provided a significant advantage as well. Despite the differences among its members, this advantage arose from the ability to derive commonly defined, contemporaneous data sets from a utility population that: (a) number enough to allow the use of statistically derived measures, (b) operate under the authority of a single regulatory authority, and (c) encompass what is a remarkably, if not uniquely narrow geographic range (when contrasted with other comparative studies we have seen in the industry).

We operated nevertheless with the recognition that superficial application of data would not serve. We sought to understand and define the characteristics of the utility operations within the scope of our study and how they vary in the utility population. This starting point set the stage for effective structuring of the data to be collected and then analysis of that data.

In comparing the utilities, we begin with attributes of common interest that might have some impact on staffing levels. These initial attributes might be termed as potential "hard" drivers of staffing. These drivers correspond to system attributes that utilities generally cannot control. For example, the number of customers a utility has surely affects required staffing, but that parameter is a function of the environment in which the utility operates. The number of customers represents neither a performance statistic nor a value that management can influence. The relevance here of such factors lies in their ability to help clarify the "givens" that define a utility's relative size in the industry.

We also examined "soft" drivers" of staffing. While these are not "givens," they concern things that management decisions and actions influence and those decisions and actions that do, or at least may, affect both staffing and performance. For example, a utility chooses the number of gas mains it will replace each year; that decision affects staffing requirements.

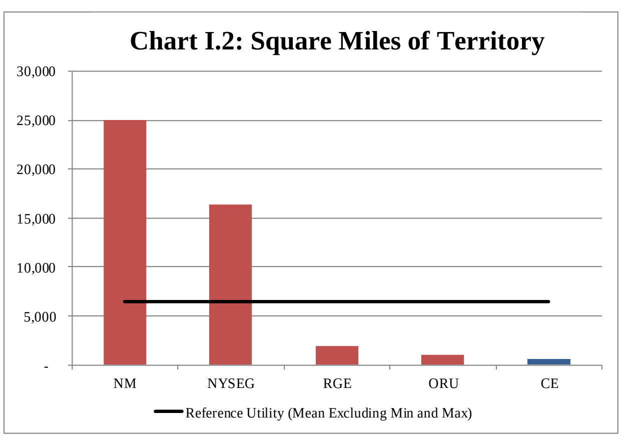
A. The Reference Utility

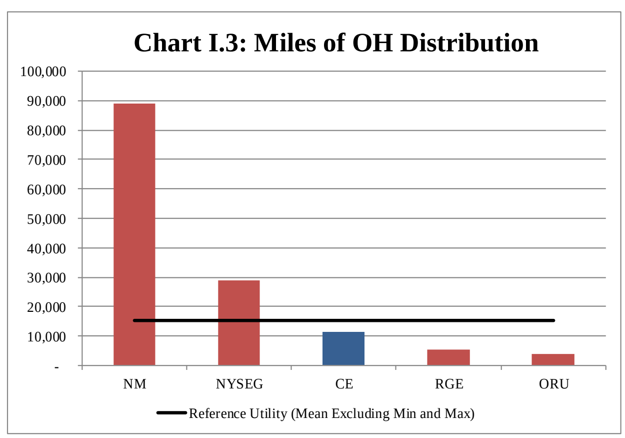
Our many comparisons of staffing frequently refer to "the Reference Utility." We combined data from all of the operations we studied to produce a composite for comparative purposes. This part of the report sets forth many charts and accompanying discussions of particular attributes or sets of attributes related to staffing in comparison to the Reference Utility. These uses of a Reference Utility provide a common indicator for how the various utilities differ from the composite. For example, if a utility has the same number of customers as the Reference Utility, we can state that the utility's number of customers as 1.0. If another utility has 50 percent more customers, we can state its customer count as 1.50. These measurements provide a way of illustrating the relative position of any utility in comparisons with others. This approach provides a dimensionless variable for selective use in other calculations. Comparison to the Reference Utility never provided a basis for conclusions, but rather a way to put each of the companies we studied in a statewide context, and to assist in identifying areas useful for inquiry into staffing numbers, distribution, and adequacy.

In defining the value for the Reference Utility, one option would have been simply to use the average of the state utilities. Some circumstances, however, make this approach impractical. For example, one or two very large utilities can dominate the data, calling for mitigation of the impact of the outlier(s). This phenomenon encourages the use of a median rather than an average. A similar approach might use the average of the utilities, but calculated after removing the minimum and maximum values. For electric attributes, we used the median or average excluding the minimum and the maximum. After examining the gas attributes, we reached the same conclusion.

B. Specific Electric Attributes – Hard Drivers

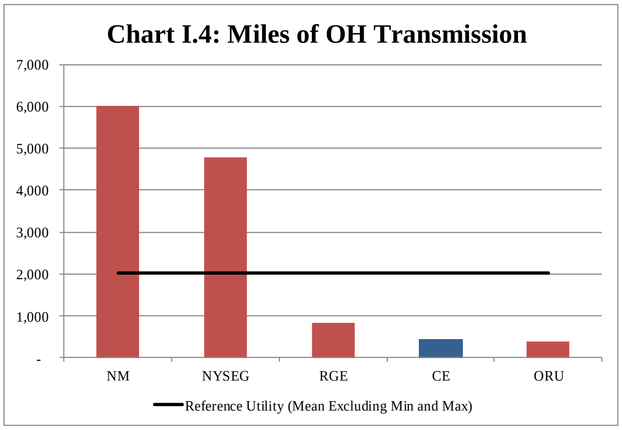
This section describes what we determined to be system attributes comprising hard drivers of staffing. The size of a utility's service territory and quantities derived from it (such as customer density) should have some impact on staffing. Sparse service territories likely experience higher costs as employees require greater travel times, with resources spread over a greater area. A larger service territory can also require more distribution facilities, producing higher maintenance demands.

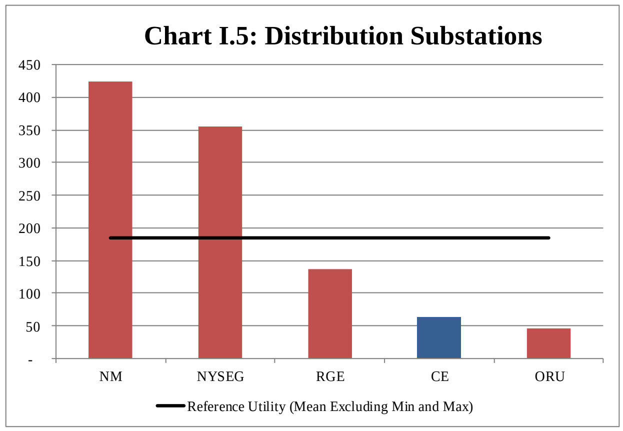




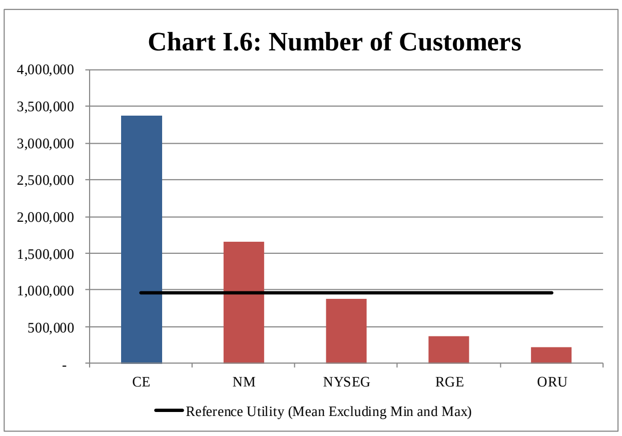
CECONY has a small service territory, compared specifically to New York, and more generally to companies elsewhere. The fact that the company is not spread out to the same degree as others can provide some strategic advantages with regard to distribution staffing, which are offset by the challenges of working in a dense environment and a network system. CECONY is at the median in terms of overhead distribution at the company-wide level. However, one finds almost all of its overhead in Staten Island and Westchester, making those two areas the overwhelming driver of CECONY's position with respect to this attribute.

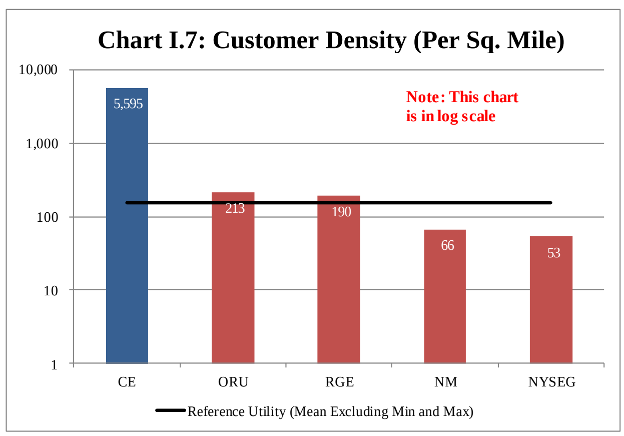
CECONY has very limited overhead transmission assets. On a national scale, the company is in the smallest decile in terms of overhead transmission miles. Similar results appear in the number of substations.





These first four parameters define the geographically related attributes. Interestingly, in isolation they would produce the clearly incorrect impression that CECONY might be a small utility. As we shift to customer and usage (sales and demand), the true picture of one of the largest utilities in the nation emerges. Factors such as comparative size illustrate the value in examining multiple drivers when analyzing staffing drivers, rather than searching for a single "silver bullet."





On a customer count basis, CECONY is relatively large. With the acceleration of industry consolidation, CECONY's relative national ranking may be declining, but with several million customers, it remains large by any measure. Measuring the high customer count against the relatively small service territory produces a customer density perhaps two orders of magnitude above that of a more typical utility. That density, combined with unique infrastructure consequences (*e.g.*, a proportionately very high percentage of underground lines and a proportionately much smaller number of substations), produces for CECONY unique defining characteristics of staffing significance. Such characteristics become a primary consideration in many staffing comparisons, illustrating the risk in over-relying on simple bases for comparisons among companies.

Peak system demand offers a typical indicator of utility size, although one having at best an indirect influence on T&D staffing. This factor also shows the dominance of CECONY among the state's utilities. Sales also provide a similar illustration of size. The closeness of the pattern among the companies when measured by demand or sales is as one would expect, if the operations share similar load factors. In any event, like peak demand, sales likely have, at best, an indirect influence on staffing.

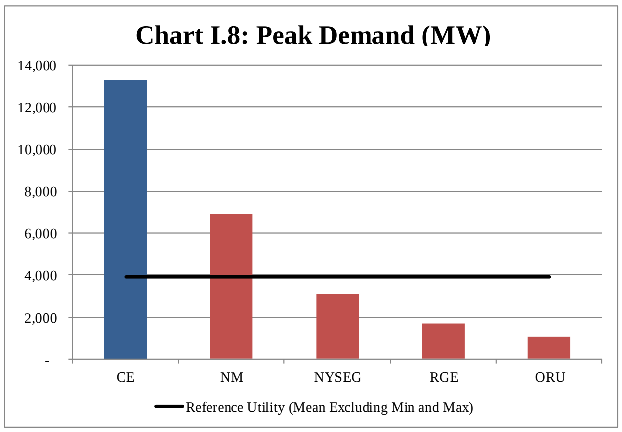


Chart I.8: Peak Demand (MW)

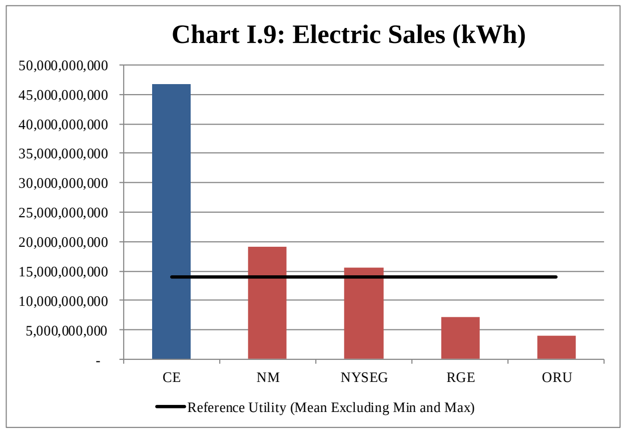


Chart I.9: Electric Sales (kWh)

From a sales perspective, the state's utilities are not particularly large on a national scale, again with the obvious exception of CECONY. Five of the six lie at the national median or lower and three fall into the bottom quartile.

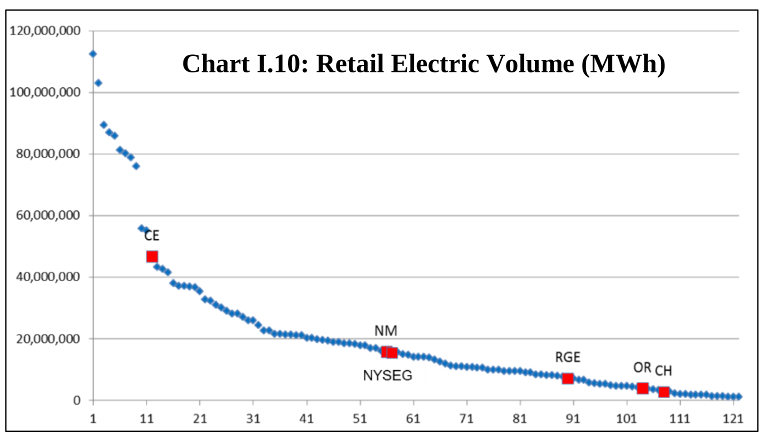
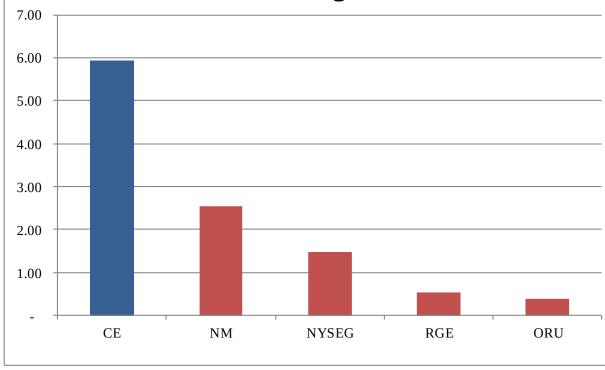


Chart I.10: Retail Electric Volume (MWh)

The chart below (Average Attribute Index) illustrates the attributes discussed above, combined into an average. It then indexes that average. We presented charts above illustrating the relative size of each utility based on different attributes. In each case, size was quantified as a function of the Reference Utility. A utility with a measure of 1.5 would be 50 percent higher than the Reference Utility, for that particular attribute. We can therefore measure size on the basis of a single attribute, but we would also like to measure size based on *all* attributes. If we simply take the values for all of the attributes and average them, it provides us a rough indicator of a utility's overall size versus the other utilities. We call this the "average of all attributes index".

Chart I.11: Average Attribute Index



This chart confirms the size dominance of CECONY in the state. Its downstate operations are more than six times larger than the Reference Utility and more than double the next largest operation. While not offering much in directly analyzing New York electric utility staffing, this amalgamated measure of hard drivers does emphasize CECONY's relative position vis-à-vis the other state utilities. It is reasonable to expect that this position has a material influence on the company's staffing levels. Any analysis of CECONY's performance should consider the impact on that performance of the disproportionate nature of the Company's size.

C. Full-Time Equivalent Electric Resources

In order to provide a common parameter for the analysis of staffing levels, Liberty selected "full time equivalents," or FTEs. We defined this FTE parameter as follows for purposes of this study:

- For utility employees: reported hours divided by available hours
    - Using available hours provided by each Company
    - Available hours exclude holidays, vacation, training, and other off-the-job hours
- For contractors: reported hours divided by 2,080 (52 weeks per year multiplied by a 40-hour work week).

We chose to use this FTE approach to approximate the number of workers employed. It makes it easier to understand staffing data than other bases (*e.g.*, hours) would. While this approach provided a way to model numbers of applied FTEs, it remains important to consider differences among the operations we studied. The number of available hours per FTE varied among those companies. For example, one utility had available hours per employee of 1,800 per year, while another had 1,650. Theoretically, the first utility can provide the same number of available hours with 9 percent fewer employees. The following chart shows the variance of each operation we studied from the 1,706 hours we calculated for the Reference Utility (by averaging the available hours for all the electric and gas operations we studied).

Chart I.12: Added Staffing Required due to "Available Hours"

Most of the operations centered reasonably closely around the

Reference Utility level. The gap between the high and low gas operations, however, showed a total value of 10 percent.

One cannot calculate contractor FTEs on the same basis as one would for internal resources. Contractor employees certainly have off-the-job time as well. However, when contractor employees are off (for vacations or training, for example), contractors rotate and shift resources to keep crew (or other applicable group) complements full. If they do not, they are not paid. Thus, 2,080 hours is a valid number to use for a contractor FTE. On the surface, that number appears to make a contractor FTE more effective. However, the advantage in hours gets substantially mitigated by higher contractor costs. The rates a company pays for contractors builds in the costs of contractor-employee off-time. With all else equal, a contractor FTE, as we use the term in this study, is equivalent to about 1.22 utility FTEs in terms of hours worked. The FTE measure that we use provides a meaningful and intuitive understanding of staffing levels, but care in applying that understanding remains important.

Using this FTE approach, the next two charts show that, CECONY, the largest state electric operation, also had the highest total 2013 staffing in the functions covered by this study.

Chart I.13: FTEs - Total

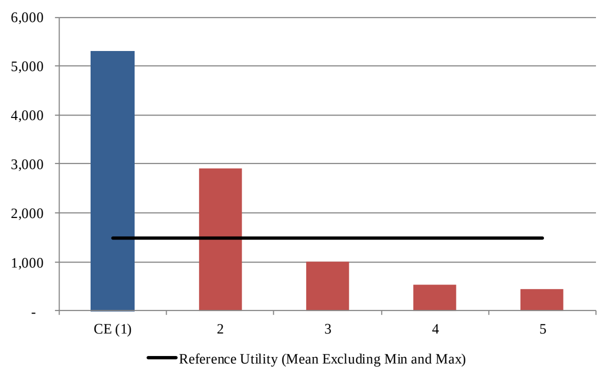
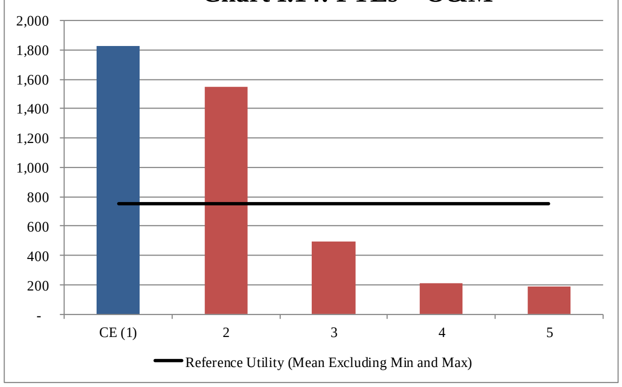
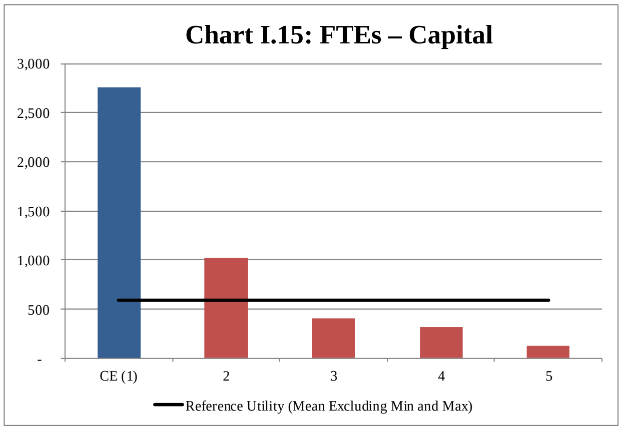


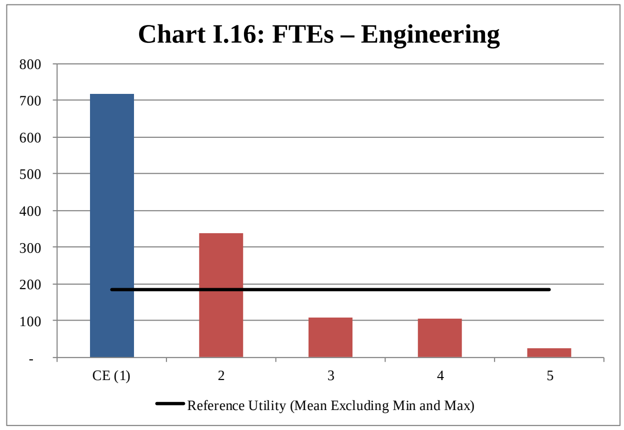
Chart I.14: FTEs – O&M



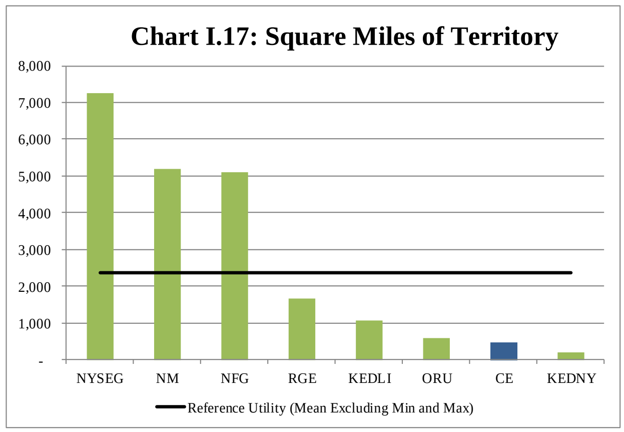
The resulting combination of internal straight time, internal overtime, and contractor data to produce a total FTE number provides an approximation of the overall or total number of people required to support particular programs or activities. It also provides a staffing-based expression of workload, and lays the foundation for a comparison of contractor and internal resource levels.

The next two charts show the range of FTEs applied to capital and to engineering activities in the areas that our study addressed. At this point, they are not pertinent for the absolute numbers they illustrate, but for their relationship to utility size rankings. It is not surprising to find CECONY, the largest state electric utility operation by far, at the top of the list, and well above the number of FTEs applied by the state's other utilities in our study areas.



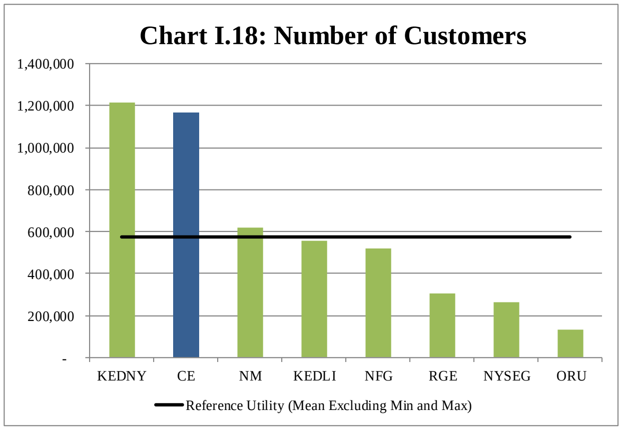


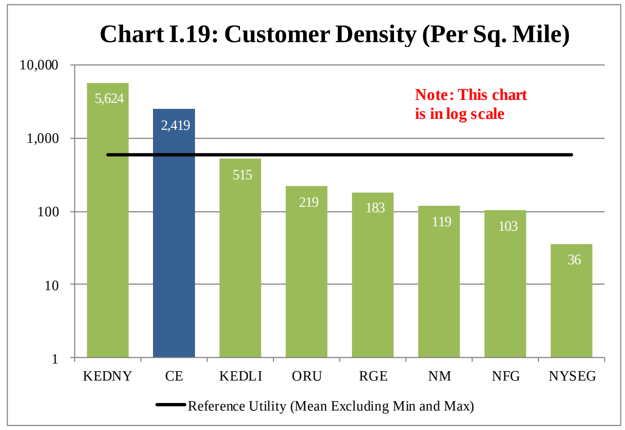
D. Specific Gas Attributes – Hard Drivers



The size of a gas utility's service territory and its customer density can also be expected to influence its staffing. Travel times, the level of distribution facilities, and the number of service centers and crew support locations present examples of such impact. Additionally, the gas delivery business exhibits other variables (not present in the electric business) that affect staffing directly and indirectly. Virtually every occupied structure in an electric utility's service territory has electric service. This is not the case for gas distribution utilities. Competition from oil, propane, electricity, and other fuels affects penetration rates for gas utilities. Moreover, many customers in the state do not have access to gas service, residing too far from transmission and distribution pipes to be served economically. Many electric customers do not have gas, because it is unavailable, or because they choose not to take it. However, virtually every gas customer is an electric customer. For those reasons, there are many more electric than gas customers in the state.

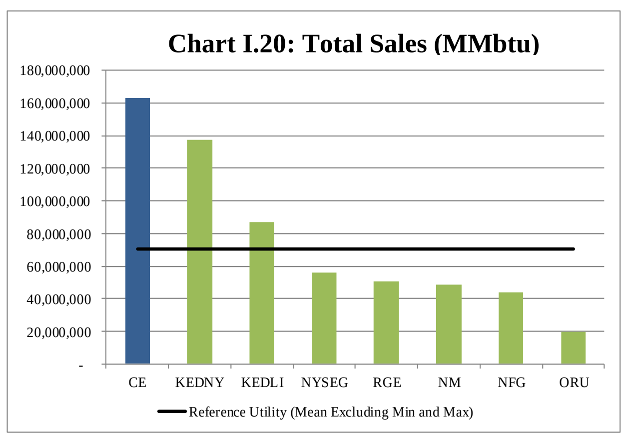
CECONY serves a small footprint in a densely populated area. It has the second smallest area (behind KEDNY), and the second largest number of customers (again behind KEDNY). CECONY therefore has a very high customer density -- close to 2,400 customers per square mile.



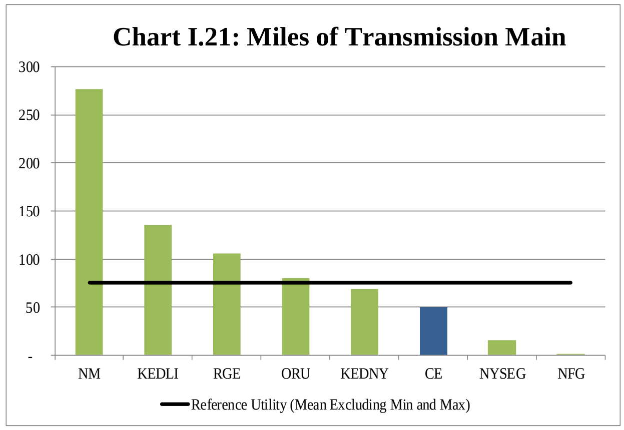


The state's gas operations include two very large companies, each with over one million customers. Three other mid-size companies cluster around the Reference Utility value of just under 600,000 customers. The three remaining, relatively small companies have two hundred thousand or fewer customers. CECONY lies near the upper end, as noted earlier. As expected, the two metropolitan New York companies have comparatively very high customer densities. Upstate densities are correspondingly very low, particularly for those serving primarily rural areas. The remarkable difference in customer density between KEDNY and CECONY raises the natural question of why KEDNY has more than twice the customer density of CECONY. The answer lies in the unusual mix of KEDNY's customer base. KEDNY has over half a million "cooking gas" customers. Cooking gas customers (as the name implies) use a minimal volume of gas each month for cooking. Such customers frequently reside in a centrally heated apartment building. Thus, a 100-unit apartment building in Manhattan with a single gas master meter represents one customer, while a similar 100 unit building in Brooklyn may have 100 separate cooking gas customers.

The cooking gas phenomenon also explains, in part, the disparity between total sales of CECONY and KEDNY, which experiences only nominal usage from cooking gas customers.

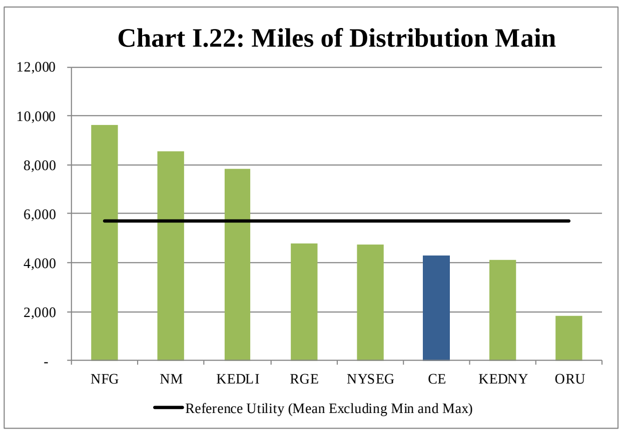


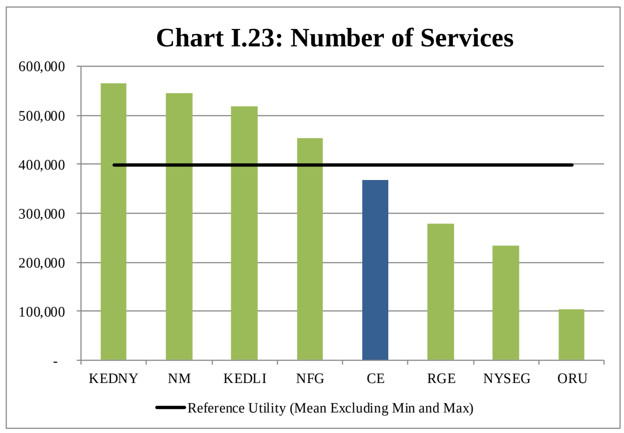
Customer mix explains why the companies with the largest and smallest numbers of customers frame the chart, but for the others, the ranking by number of customers does not match the ranking by level of sales. Companies with large commercial and industrial loads tend to have the highest levels of usage per customer. These large customers tend to concentrate in the major metropolitan areas today, but that has not always been the case. In decades past, Upstate regions housed many major industrial customers who are now long gone. Losing these large loads often allows Upstate gas companies to add new customers now without significant requiring capacity additions, thus, all else equal, reducing resources needed for capital work.

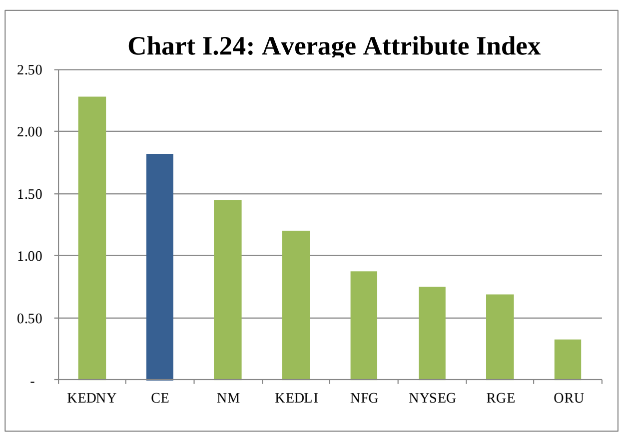


Transmission in the gas business more generally falls to pipeline rather than distribution companies. Most gas utilities, however, have some facilities classified as transmission under certain technical and operating characteristics of the facility (typically around 200 psi when measured by operating pressure). Transmission facilities in a distribution utility move large volumes of gas over relatively longer distances within service territory locations where transmission pipeline companies do not have facilities. CECONY's very high sales volume and strategic location relative to KEDNY (the company with the second highest level of sales) have produced about 50 miles of CECONY transmission main to move large volumes of gas within and through its system.

The next two graphs display CECONY's numbers of distribution main miles and of services to customers. Its second highest number of customers is offset by the high customer density and multiple services, and by its relatively high ratio of customers per service line, which places it toward the lower end of both graphs.





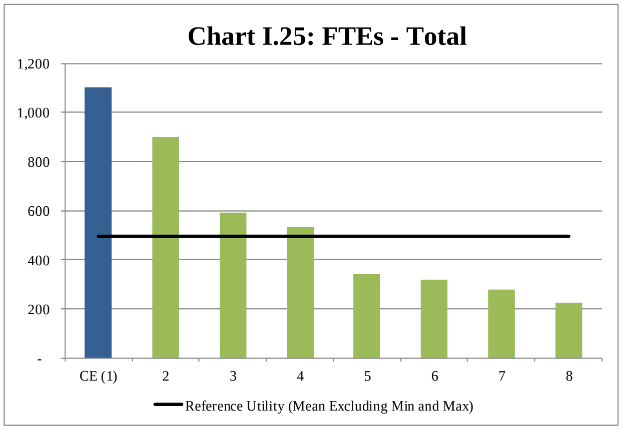


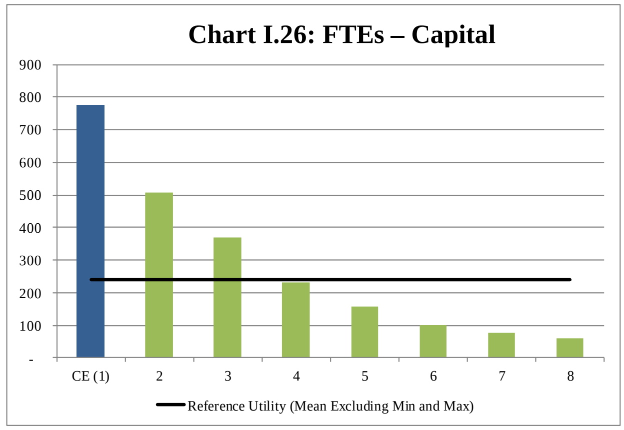
The chart to the right (Average Attribute Index) illustrates the attributes discussed above into an average, similar to what we showed for the state's electric operations. CECONY lies at the high end as expected.

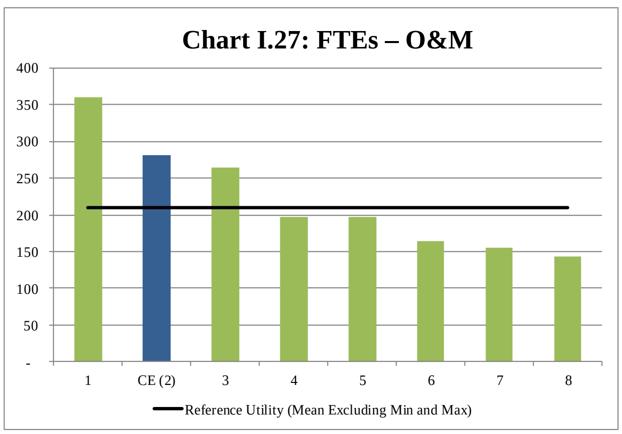
E. Gas FTEs

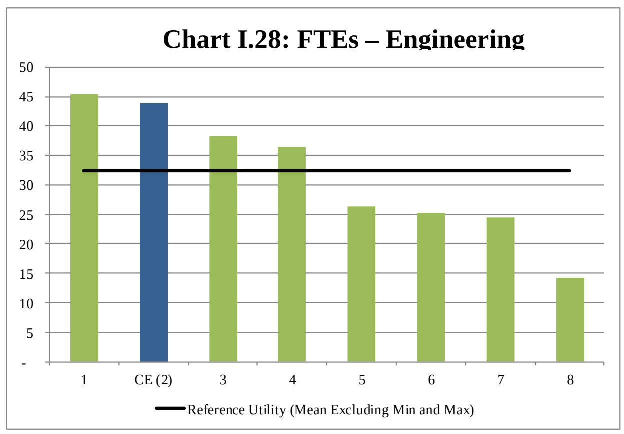
This section compares CECONY's 2013 gas FTEs with those of the other New York gas operations. A chart below (FTEs – Total), shows that CECONY's urban, Downstate gas operations had the highest number of total FTEs by a substantial amount. CECONY's FTEs were particularly high in comparison with the Upstate operations, but exceeded as well the Reference Utility value and the numbers of the other Downstate companies. CECONY's comparatively high FTE numbers were driven to a great extent by its high number of capital FTEs relative to the other companies. Main replacement has operated as a significant driver of capital work. In addition, increased availability of natural gas, its significantly lower price, and incentives to convert from fuel oil, have increased demand for natural gas, and in turn spurred capital work associated with system growth.

The following four charts show that CECONY was closer to the RU in O&M and engineering FTEs, in contrast with capital FTEs. Generally, the Upstate operations fell at the lower end of the ranges in all categories.









Chapter II: Data and Analysis

A. Resource Planning/Total Staff Assessment

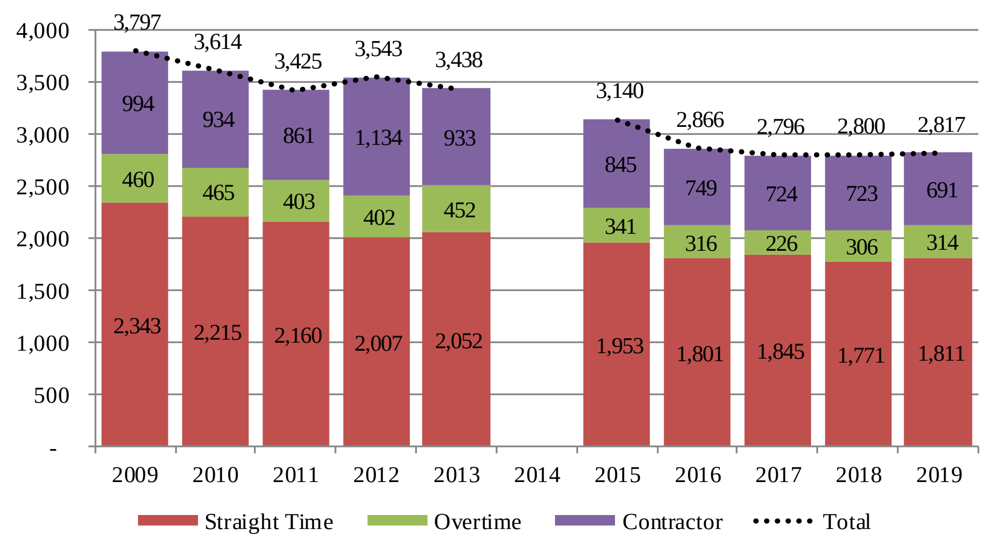
1. Total Staff Assessment – Electric

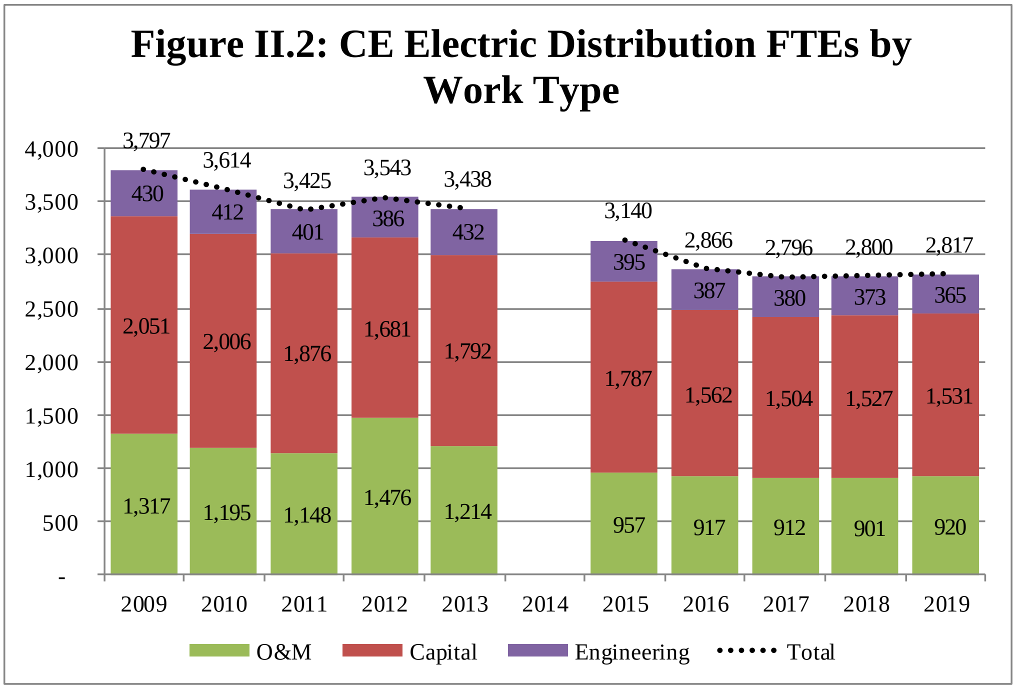
This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for electric distribution, and transmission and substation functions of CECONY.

a. <u>Electric Distribution Staffing Trends</u>

The following chart shows historical and forecasted staffing resources for electric distribution functions for the period 2009-2019, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors. Staffing resources are depicted in terms of Full Time Equivalents (FTEs). An FTE equates to the amount of work provided by one employee for a year, a common way of depicting staffing/workload levels for different types of staffing resources.

Figure II.1: CE Electric Distribution FTEs by Resource Type





The first chart shows a steady drop through the historical period of our study. We did not include data for 2014, during which we performed study field work. The companies reported data on incompatible bases for 2014, which at the time required a combination of actual year-to-date and forecasted data. Each of the other study years for the 2009-2019 period were either fully actual or fully forecasted data.

CECONY's drop in total electric distribution FTEs was 9.5 percent from 2009 to 2013. Resource reductions produced sizeable drops in both internal and contractor resources, more pronounced for internal resources (12.4 percent for internal straight-time resources versus 6.1 percent for contractors). The drop was most evident through 2011. Stability returned, briefly influenced by a storm-activity-induced rise in electric distribution FTEs in 2012. Overtime FTEs increased slightly as a percentage of straight-time FTEs from 2009 to 2013 (20 to 22 percent). Management attributes the drop from 2008 in electric distribution resources to its introduction of the new work management system, which introduced organization change in 2012 and to new work management software in 2013 and 2014.

The magnitude of the overall decline in electric distribution total FTEs calls significant attention to staffing sufficiency. When combined, as we will discuss below, with a coincident decline in CAIDI performance (an increase in restoration times), it became a significant area of interest. The decline in FTEs on electric distribution work corresponds roughly with the Commission's "fiscal belt-tightening" required in 2009. The Commission applied it specifically to CECONY in the March 26, 2010 "Order Establishing Three-Year Electric Rate Plan." That plan imposed "continued austerity measures" and a "2% productivity imputation."

Particularly interesting on a going-forward basis, CECONY projected at the time of our field work a significant and sustained reduction, in total electric distribution staffing continuing through 2019. The dominant portion of that drop was forecasted to occur in 2016. Those projected declines continued to affect both internal and contractor resources. The weighting of the decline (internal versus contractors) however, reversed from its historical pattern. Management projected a contractor FTE drop significantly greater than that for internal resources (25.9 percent versus 11.7 percent for internal straight-time resources).

Combining the historical and forecasted portions of our study showed a drop in internal straight-time FTEs of 22.7 percent versus 30.5 percent for contractors. Thus, the change is better described not as a rebalancing of resources but as a very substantial total reduction. In fact, while internal resources showed a very substantial drop in their own right over the 10 years, contractors experienced a more significant percentage reduction.

The second of the two preceding charts illustrates the same resource profile, but broken down by capital, O&M, and engineering. CECONY's reductions showed in each of the three resource categories. The drop in O&M is especially concerning and raises questions as to potential effects on quality of service.

The accompanying table compares CECONY's electric distribution resource balance to that of the Reference Utility. As forecasted for 2019, its balance in all three principal resource types closely mirrored that of the Reference Utility. If achieved, this mix will bring CECONY's proportional use of internal resources to essentially the Reference Utility level. Even so, the key question that remains is the ability to maintain sufficiently reliable service in the face of a long-term reduction in resources performing electric distribution activities.

Table II.3: Electric Distribution Resource Mix

Actual Resource Mix - 2013		
Source	**CE**	**RU**
Straight Time	60%	67%
Overtime	13%	13%
Contractor	27%	20%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**CE**	**RU**
Straight Time	64%	65%
Overtime	11%	10%
Contractor	25%	25%
Total	100%	100%

b. Reliability Performance

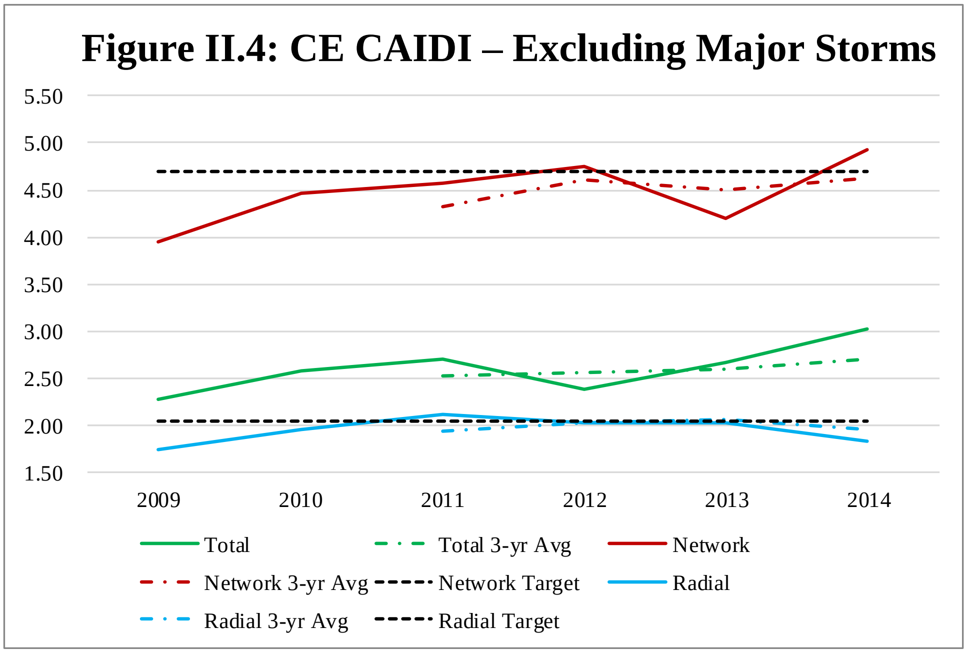
We examined changes in reliability through 2014 (the year covered by the most recent reliability reports available from the Commission). We did so to determine whether any apparent correlations between reliability metrics and staffing might appear. In addressing the reliability of CECONY's electric service, we looked at two measures for which the Commission has adopted standards and for which it requires reports. The electric industry commonly uses both as measures of service reliability. The first of those measures, SAIFI (System Average Interruption Frequency Index), consists of the average number (frequency) of interruptions that a customer could expect to experience. We chose not to use this measure, even though it does have, in our view, some connection to staffing. Applying resources to inspect, maintain, and operate electricity delivery infrastructure clearly has a bearing on the frequency with which outages occur. The difficulty in using SAIFI for our purposes lies in the time lag involved; *i.e.*, the fact that systems decline over time when a company underperforms such activities.

With consequences of staffing curtailment in these areas delayed by some and perhaps many years, it becomes impossible to connect staffing changes over fairly short durations with outages. For example, following a period of short staffing, a utility may engage in a "catch-up" program designed to restore infrastructure to desired conditions. As that work proceeds, outages owing to work not performed years ago and still not "caught up" in a cycle of heightened activity may occur. While tempting, it could well be wrong to assign causation to current staffing levels. In addition, the scope of our study excluded vegetation management (*e.g.*, tree trimming) by design. The failure to provide proactive, comprehensive, and diligently executed vegetation management can also affect customer outages, particularly their frequency. An inability to consider this factor further diminishes the already tenuous value of using SAIFI as a way to gauge staffing in the areas our study was charged with examining.

We found the second measure, CAIDI (Customer Average Interruption Duration Index), more pertinent to our purposes. The industry uses CAIDI commonly as a measure of reliability. It sums all the durations of all customer outages (usually across a period of a year), and divides that sum by the number of customer interruptions experienced. Restoration work is performed largely internally (often supplemented substantially in cases of widespread, severe outages by crews from outside those normally available to the utility) when it is of manageable scope. Measures of CAIDI generally exclude extreme events. Thus, longer outage durations do give reason to question the numbers of internal staff.

Vegetation management (outside the scope of our study) also can affect CAIDI (*e.g.*, spotty vegetation management can produce overgrown trees that take more time to clear in order to provide crews with the access needed to repair and replace the equipment needed to restore service). However, the exclusion of extreme events mitigates this effect. Moreover, the effect of vegetation management on CAIDI is less substantial than its effects on SAIFI, after exclusion of such events.

We therefore focused our review of reliability on CAIDI, as reported to the Commission. The last year covered by available reports is 2014. The networked and underground configurations that dominate significant parts of CECONY's service territory have the advantage of making interruptions to customers far less frequent than for utilities with a much higher preponderance of overhead and radially fed systems. On the other hand, systems like those of CECONY face conditions that have the effect of extending outage durations significantly. CECONY separately reports CAIDI, and operates under separate standards for the network and the radial portions of its system. The next chart shows results for the radial (the blue-line series) and the network portion (the red-line series). The dotted black lines show the standard applicable to each. The chart's green-line series shows combined results for the two portions.

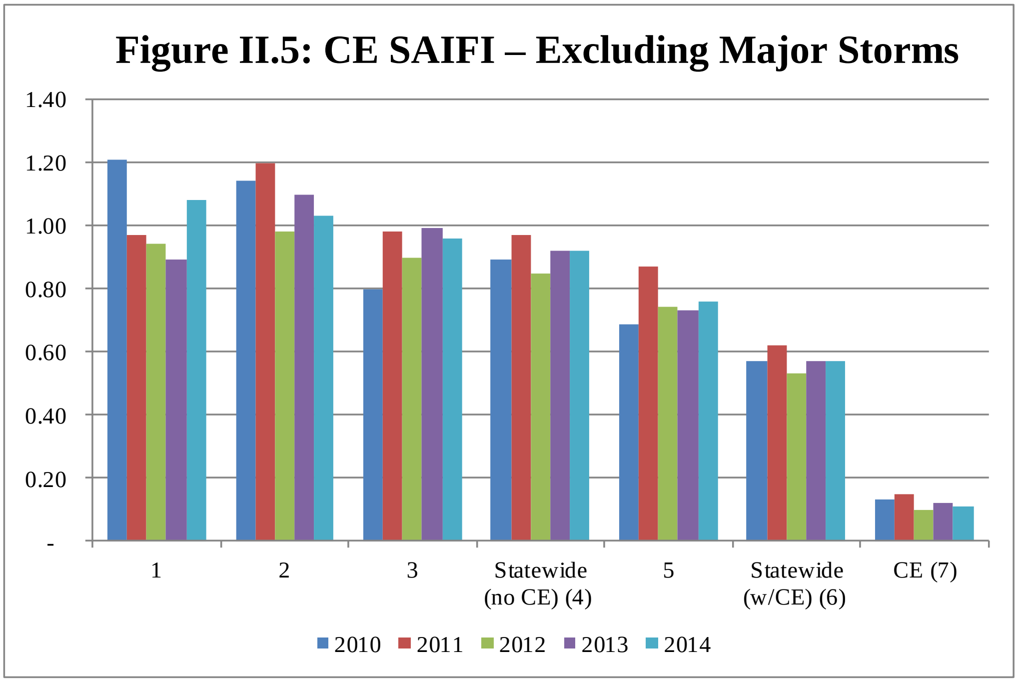


The chart shows adverse results when measured against the Commission standards. Perhaps more significantly, it shows steadily declining performance for the network portion. Material reductions in electric distribution resources took place during the historical portion of our study period. The charts show a generally corresponding worsening of CAIDI performance. An increase in the durations that CAIDI measures indicates a performance decline. Over the entire period, network CAIDI performance has declined by 25 percent and radial performance by 5 percent.

CAIDI measurements for the radial portion hovered at the standard before improving in 2014. Performance was roughly at the standard (and outside it for one year) for most of the historical portion of our study period. Network CAIDI has steadily worsened across the period, increasing in every year but one. Network CAIDI exceeded the standard in two of the most recent three years, and by a notable margin in 2014.

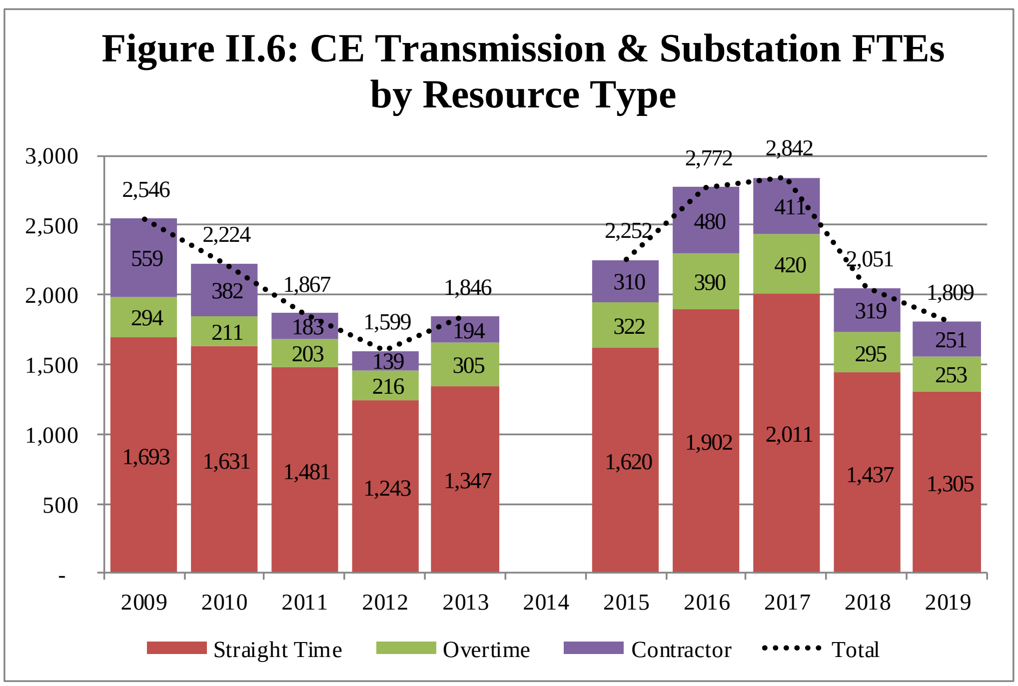
We observed a general state pattern that shows improved CAIDI performance (*i.e.*, lower outage durations). By contrast, CECONY's increased durations on average and for the network portion of its system were at their highest historical levels in 2014, the last year for which state-reported data existed at the time of our field work (2014). While not alone a conclusive data point, the coexistence of declining performance with the decline in electric distribution FTEs indicates a need for CECONY to look carefully at where and how reductions in applied personnel may have contributed.

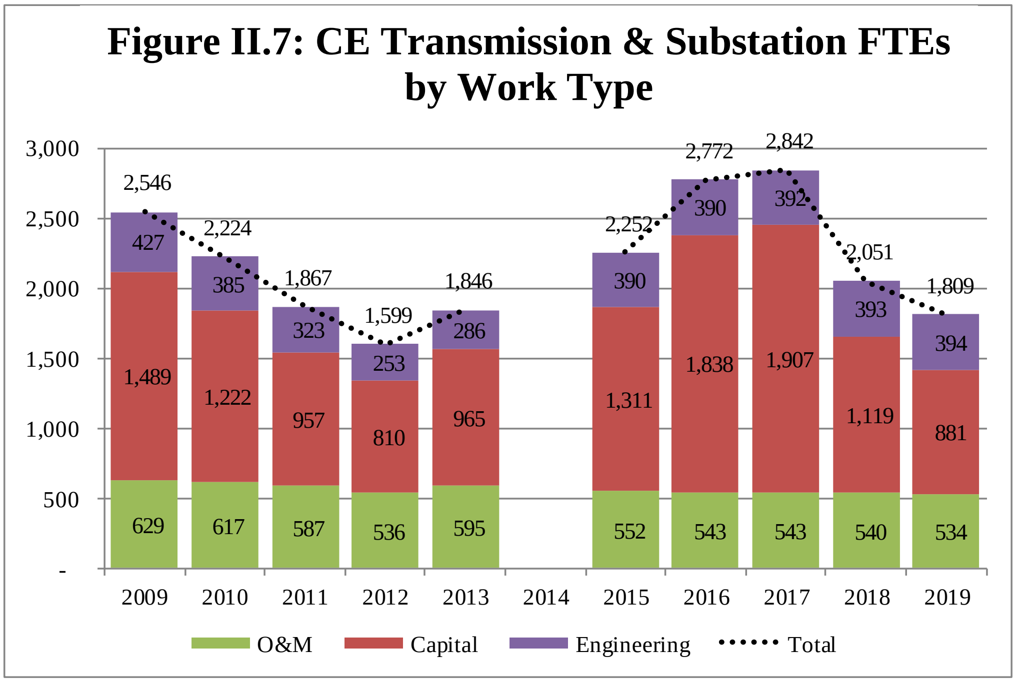
While we did not consider SAIFI useful for numerical comparisons, it does nevertheless comprise an important reliability metric for the Commission. The next chart shows CECONY's historical SAIFI performance. The extraordinarily low frequencies demonstrate the reliability strength of the Company's system, and certainly give no reason to indicate lack of attention to other capital and maintenance factors affecting reliability. An already low SAIFI value even improved marginally through 2014. Noting again our decision not to use SAIFI as a useful benchmark for our study, CECONY's performance under this metric nevertheless does not signal a general inattention to maintenance.



c. Electric Transmission and Substation Staffing Trends

The next chart shows historical and forecasted staffing resources for electric transmission and substation functions for the period 2009-2019, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors.





Transmission and substation FTEs show the same large drop from 2009. The drop here, unlike that for distribution, continued through 2012, followed by recovery to roughly 2011 levels in 2013. Nevertheless, the decrease across the period remained very large. The numbers (in the range of 350 FTEs were the same for both straight-time internal and contractor resources, but the percentage decreases between 2009 and 2013 greatly diverged - - 65 percent for contractor and 20 percent for internal straight time.

Projections for transmission and substation FTEs, on the other hand, differ greatly from those reported for distribution. CECONY projected a very large growth of 700 (38 percent above 2013 levels) total FTEs by 2017. That level would also bring transmission and distribution resources to 12 percent above 2009 levels. A significant reduction followed in both 2018 and 2019, bringing projected resources to within about 2 percent of the 2013 levels. The projections showed very unusual (for the industry) vast short-term fluctuations in internal resources. For example, straight-time FTEs were projected to grow by over 650 (close to 50 percent) from 2013 to 2017. Management then forecasted them to fall by even more (about 700 FTEs) over the final two years in our study.

Certainly, raw internal staffing numbers cannot be expected to show such large changes over so short a period. We looked at changes in capital work to see if we could identify potential causes. The preceding chart shows the breakdown of FTEs between capital and O&M work.

Our review showed that the wide 2009-2013 fluctuations in transmission and substation total FTEs resulted primarily from transmission and substation capital work. The second chart above illustrates the resource split among capital, O&M, and engineering. The chart shows that CECONY projected O&M workforces to remain relatively stable, while capital expenditures fluctuated. CECONY also has an unusual ability to make relatively large shifts in internal resources for construction through the use of a central construction organization. This organization is assigned work based upon construction program requirements and, in effect, performs as an internal contracting organization. CECONY can effectively use this technique across a wide array of functional construction requirements (electric, gas, steam) because of their overall scope and scale and flexible work rules that allows assignment of these resources to the utility business areas, as required.

The next table illustrates that CECONY's overall resource mix (percentages of straight time, overtime, and contractors) provides the ability to rely more heavily on internal resources, compared to the Reference Utility.

Table II.8: Electric T&S Resource Mix

Actual Resource Mix - 2013		
Source	**CE**	**RU**
Straight Time	73%	56%
Overtime	17%	8%
Contractor	11%	36%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**CE**	**RU**
Straight Time	72%	53%
Overtime	14%	7%
Contractor	14%	40%
Total	100%	100%

While other utilities rely more heavily on contractor resources, particularly for construction, CECONY has a significantly higher percentage of internal resources than the Reference Utility (86 versus 61 percent in 2019). Management also projected a continuation of the same rough balance, while moderating overtime through a somewhat increased use of contractors.

d. Electric Staffing Levels

This section examines how CECONY's FTE staffing levels compare to other state utilities in the study. Our comparisons used two approaches: ratios of staff vs. key system attributes and 5-year average FTE levels compared to estimates from Liberty's staffing model.

The next table compares CECONY's 2013 FTE levels with those of the other electric operations we studied. The comparisons shown in the chart use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility value, divided by the "all attributes" index described in the "Hard Drivers" subsection of this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. If the number of FTEs for each utility were proportional to its size, and no other factors were considered, this index's value would be 1.0 for every utility. A higher index value suggests that FTEs are higher than might have been expected based on size alone.

Table II.9: Total Electric Staffing Ratios

Parameter	CE	All NY Utilities Low	RU (Median)	High
Distribution FTEs				
Per Customer	1.00	0.66	1.00	1.40
Per Unit Sales	1.00	0.47	1.00	1.43
Total				
Per Customer	1.00	0.72	1.00	1.27
Per Unit Sales	1.03	0.59	1.00	1.43
Per Average of All Attributes	0.88	0.67	0.97	1.16

We did not chart CECONY's FTEs per overhead line mile or per substation. Those data points would not be informative here, given the unique configuration of CECONY's electrical system, when compared with those of all the state's other electric operations. The dense and congested nature of CECONY's service territory in Manhattan, the Bronx, and Queens requires a high percentage of networked underground distribution facilities and underground transmission facilities, resulting in a relatively low number of overhead miles of facilities (about 2 percent of the statewide total). Load density also leads CECONY to use many fewer, but larger-capacity substations in comparison to other state utilities. The combination of these factors means the facility-based ratios we use to compare other state utilities in this study are not informative for CECONY.

However, the ratios that compare overall electric FTEs per customer and per unit of sales do seem to provide insight about CECONY relative FTE levels on a Reference Utility basis. CECONY's 1.0 FTEs per customer and of 1.03 FTE per unit of sales compare favorably to the RU median value of 1.0, indicating a level of staffing consistent with other state utilities for serving customers.

Next we examine how CECONY's average staffing levels for the historical portion of our study period compared to staffing level estimates from the model developed by Liberty. We developed that model using the data provided by all the utilities we studied. The model correlates actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produces staffing level estimates, broken down by capital, O&M and engineering, for each utility. The estimates consider how the utility's unique combination of attributes vary with staffing levels compared to how the other state staffing levels vary for the same combination of attributes. The model provides a more sophisticated way to consider each utility's staffing levels normalized for each utility's unique mix of infrastructure. The model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Those variances provide one of the bases used to question issues and perform analyses of staffing.

The next tables show five-year average actual FTEs versus model results for distribution and for transmission and substation activities. The tables break the results down by capital, O&M, and engineering functions. Note the two instances (Substation Capital and Transmission Capital) where we show "No Model." In these cases, we report only CECONY's actual values. Observing a very high level of volatility in all companies' year-to-year expenditures for transmission and substation capital functions, we determined that we could not construct a statistically valid model for such work, given that we had only five years of data to use.

Table II.10: CE Electric Distribution Five-Year Average FTES (2009-2013)

Distribution			Transmission & Substation				
Type	Actual	Estimate	Type	Function	Actual	Estimate	Note
Capital	1,881	1,895	Capital	Transmission	635	635	No model
				Substation	454	454	No model
O&M	1,270	1,292	O&M	Transmission	60	60	-
				Substation	533	477	-
Engineering	412	417	Engineering	T&S	335	334	-
Total FTEs	3,563	3,604	Total FTEs	T&S	2,016	1,960	-

The results of modeling show a strong level of consistency between CECONY's actual numbers and the model's results. The model generated electric distribution staffing levels within 1 and 2 percent of actual CECONY levels for all key functions. Five-year transmission and substation average FTE levels conformed almost exactly to model estimates except for substation O&M (12 percent higher than the model estimate). The data raised no questions about CECONY staffing.

The substation operation and maintenance variance in FTEs is not extreme, and moreover is an isolated case in our model runs. This divergence is consistent with the observation that CECONY's fewer, larger substations serving a very densely populated, high load density area produced slightly higher staffing levels.

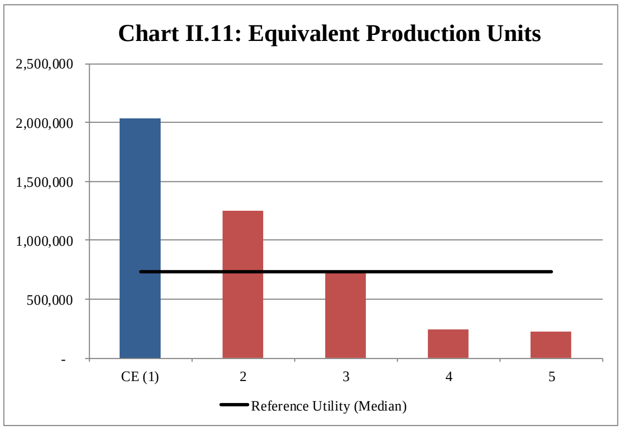
2. Productivity – Electric

Liberty has addressed productivity from several perspectives. We undertook comparisons of the operations we studied as a function of staffing per unit of a variety of commodities or attributes. We also developed a concept we termed New York normalized unit rates (NYNURs or 9ers). The Productivity chapter of the Statewide report describe this concept. Our 9ers present a common measure of production (equivalent production units, or EPUs) that facilitates comparisons across commodities and organizations. The number of hours, or FTEs, or dollars expended per EPU therefore becomes one indicator of productivity.

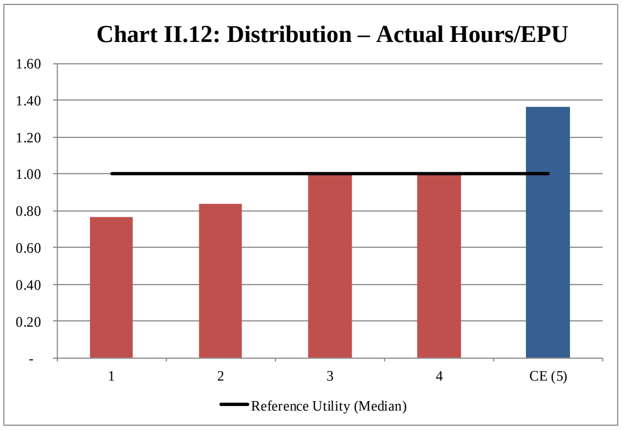
In developing the 9ers concept we learned that the utility data available was not sufficiently comprehensive to allow us to apply it to all of the hours spent on the work activities within the scope of our study. We did, however, find sufficient data to develop usable measures for about half of the hours each utility actually expended. The partial nature of the results dictates caution in carrying any performance conclusions too far. Nevertheless, we believe the concept has value as another indicator which, when supported by others, can be informative.

a. Equivalent Production Units

An EPU equals the number of hours the Reference Utility expended to produce one unit of a given commodity. Stated in another way, the EPU quantifies the Reference Utility actual unit rate value for that commodity. For example, if the Reference Utility unit rate for "widgets" equals 10 hours per widget, then installation of one widget earns a utility 10 hours. Examining production this way creates a common denominator for production, allowing us to add EPUs together at any level of detail or for any organizational breakdown.

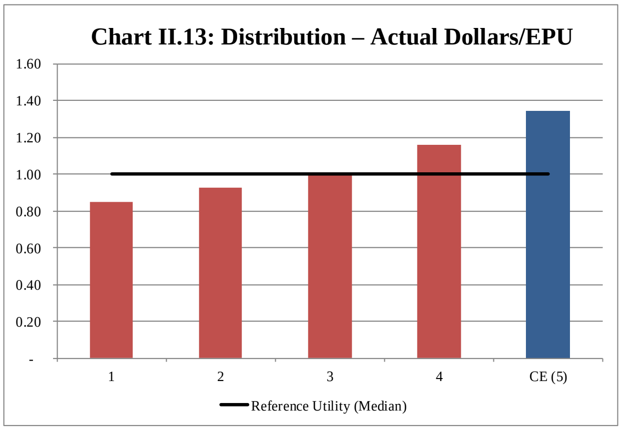


For the limited scope covered by our analysis, CECONY earned the largest production value of the utilities in the extreme. The Company's EPUs about equal all the other utilities combined. This observation adds to the popular argument that it is hard to compare CECONY to others. The absolute number of EPUs measures unit output, but means little on its own. It derives usefulness when constructed to represent a comparable production level among companies. The ability to measure the number of employees per EPU at a total company level may be the ultimate, but not perfect, measure of productivity.



b. Productivity

We use the term physical productivity here to mean the actual hours per EPU. The next chart illustrates the hours each utility spent in the limited scope areas per EPU. Note that the Reference Utility is 1.0 here by definition, because we defined an EPU as the Reference Utility's actual unit rate. CECONY offers the most unfavorable physical productivity, with unit rates nearly 40 percent above the reference utility, and all the other state utilities. While CE's relative performance might be explained by the Company's unique service territory and system, the deviation nonetheless warrants management attention.



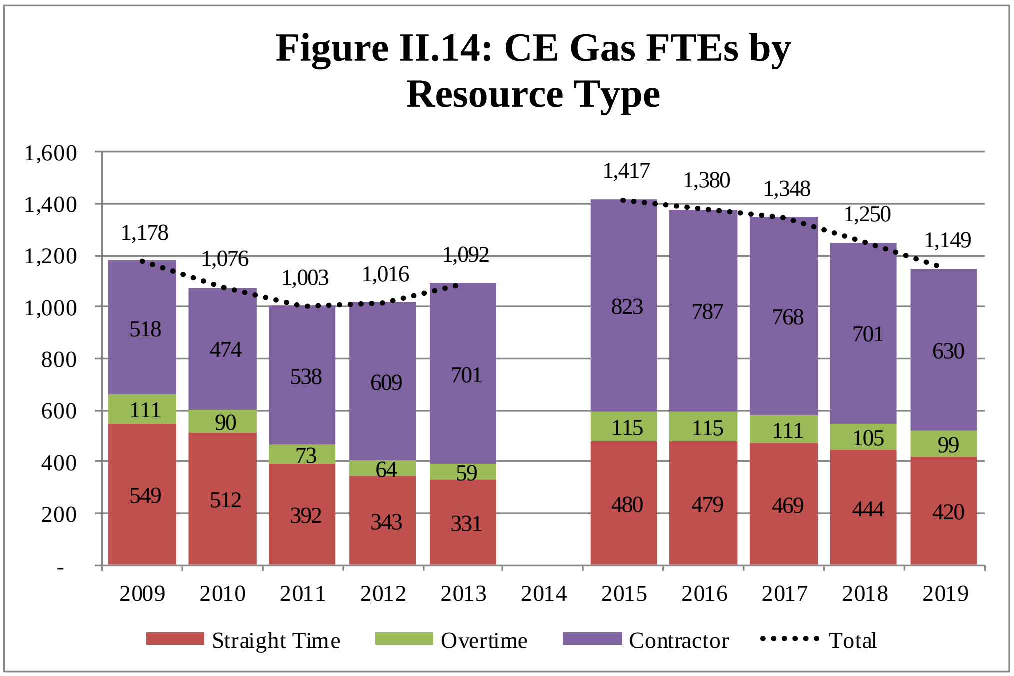
We define cost productivity as the dollars of labor cost expended to achieve an EPU. We normalized this data to the Reference Utility value, whose cost productivity is $81.13 per EPU. CECONY has the lowest composite hourly labor rate,[1] but its comparatively low rate of physical productivity still pushes it to the highest end of the ranking again.

3. Total Staff Assessment - Gas

This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for gas operations functions at CECONY.

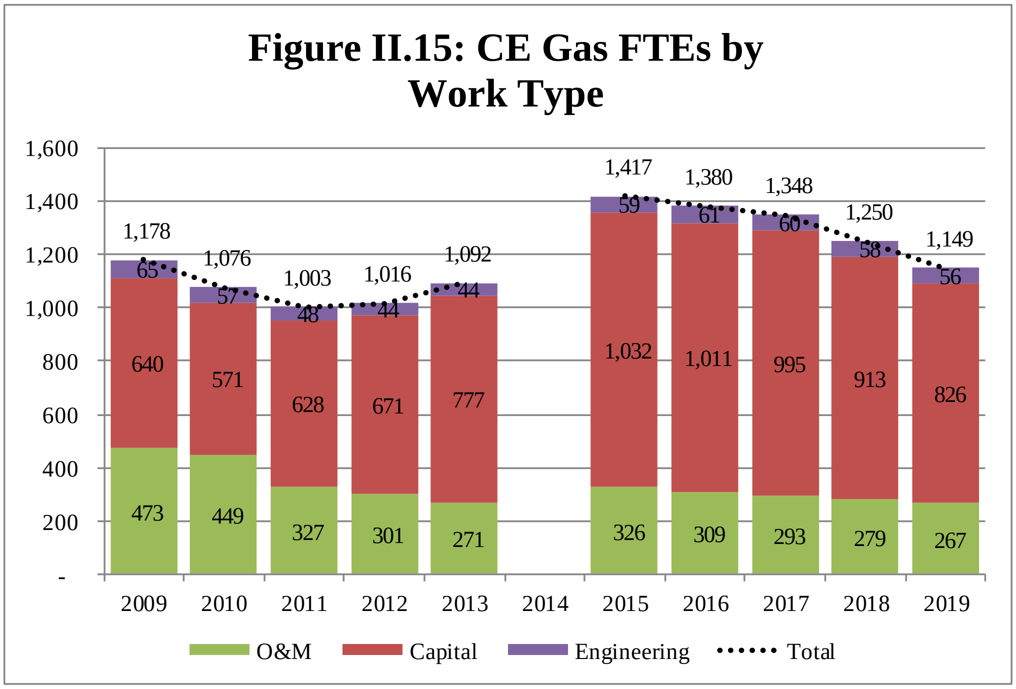
a. Gas Staffing Trends

The next chart shows the 2009 through 2019 historical and forecasted gas staffing resources in the areas encompassed by our study, broken down by resource type (internal staff straight time, internal staff overtime, and contractors). As was true for all of the state's utilities, we were not able to secure consistently derived data for 2014, which was in progress during our field work.[2]



[1] The composite labor rate includes all internal straight time, overtime, payroll loadings, and all contractor rates, weighted by hours.

[2] Management observed in August 2016 comments on a draft of this report that, since providing us with 2015 - 2019 forecasts for gas O&M, capital and engineering used for this report, it initiated efforts to increase leak-related work volumes, following recent gas distribution events and increased odor awareness campaigns. It reports that its resource forecasts now reflect resource additions to address increases in leak-related work and main replacement acceleration.



We observed for natural gas FTEs the same large drop seen on the electric side in applied FTEs from 2009 through 2011. The 15 percent drop occurred entirely among employees, where FTEs dropped by 34 percent (straight time) and 29 percent (overtime). By contrast, contractors remained generally the same, actually increasing by 4 percent. By 2013, staffing in total had returned to 2009 levels, driven entirely by growth in contractor FTEs (163, or 30 percent). Internal staffing continued to fall, by 16 percent in straight time FTEs and 19 percent in overtime by employees. As we will discuss, these changes occurred during a period of declining performance, as measured by leak backlogs and leak response times.

CECONY forecasted a large total FTE increase from 2013, peaking in 2015, and then steadily declining through 2019. By then, total forecasted FTEs returned to a level within 2 percent of 2009 FTEs. The forecasted increase was weighted somewhat toward internal resources (growing roughly by about 45 percent on a straight time basis), with contractor resources projected to grow by about 17 percent. Achieving the forecasted 2015 - 2019 reductions would require a 23 percent drop in 2015 forecasted contractor FTEs and a smaller (but still substantial 13 percent) drop in straight time internal resources. In total, from 2009 to 2019, total FTEs, based on the forecasts that CECONY provided during our field work, dropped by about 2 percent, with the contractor share of FTEs growing by about 10 percent from their 44 percent share of total 2009 FTEs.

The biggest driver of forecasted workload increase is capital program requirements - - mainly stemming from accelerating the pipeline replacement program. New customer addition work is also increasing capital workload. The second chart above shows the breakdown between capital and O&M work.

The forecasted growth in FTEs through 2015 conforms to expectations for significant capital work. What is less clear is what underlies the reduction from 2015 onward, which is substantial. Moreover, it will have a significant impact on both internal and contract resources, with each falling significantly, despite the continuation of a large pipe replacement program and despite an historical decline in leak backlog and response time performance, as discussed below.

CECONY's overall resource mix (percentage of straight time, overtime, and contractors) tended very strongly toward contractors through 2013, when compared to the Reference Utility mix. CECONY's use of contractors was double that of the Reference Utility value. As replacement programs ramp up across the state in the future, the Reference Utility shows a moderate increase in contractor use. CECONY, by contrast, forecasts about a 10 percent gain in internal FTEs, and its use of contractors as a share of total FTEs remains much higher as forecasted. By 2019 CECONY's percentage contractor use remains 20 percent higher than the Reference Utility, despite the ramp-up of use of contractor resources for accelerating main replacement programs by other utilities across the state.

Table II.16: Gas Resource Mix

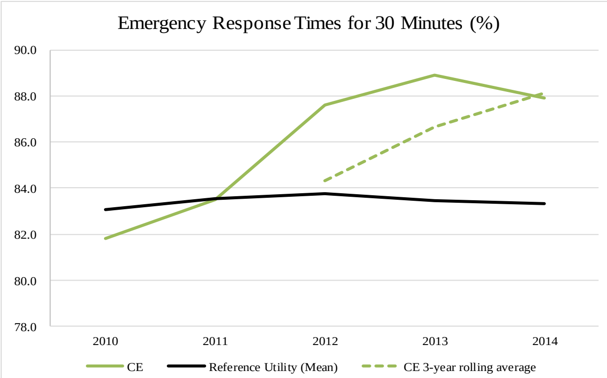
Actual Resource Mix - 2013		
Source	**CE**	**RU**
Straight Time	30%	62%
Overtime	5%	8%
Contractor	64%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**CE**	**RU**
Straight Time	37%	59%
Overtime	9%	8%
Contractor	55%	33%
Total	100%	100%

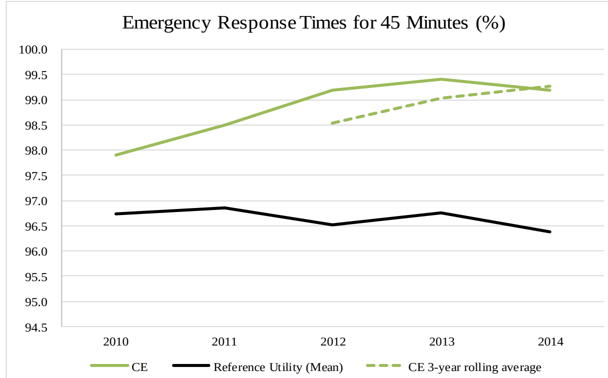
This continued high reliance on contractors is a cause for concern. Gas utilities throughout the Northeast are ramping up their use of contractors for accelerating their pipe replacement programs. Conversely, it would be difficult to ramp up internal resources at a higher rate than anticipated in the forecast that CECONY provided during our field work for this study.

b. Performance Metrics

The drop in gas FTEs did not correspond with performance as measured by Commission standards for response times. Backlogs of potentially hazardous leaks present a more complex picture. We considered leak-response times and backlogs of leaks as defined in 16 NYCRR Part 255; *i.e.*, Types 1, 2A, and 2. The next charts show that the percentage of leaks responded to within the 30- and 45-minute windows has improved, and remained well above Reference Utility levels. Response within the 60-minute window remained steady. CECONY had by far the highest leak backlog of as of the end of 2014. The large 2014 spike may not be determinative; however, (particularly when viewing it in connection with an increasing trend over the two preceding years) it becomes interesting, in that it shows contemporaneous declines in performance and O&M FTE reductions.

Chart II.17: Emergency Response Times





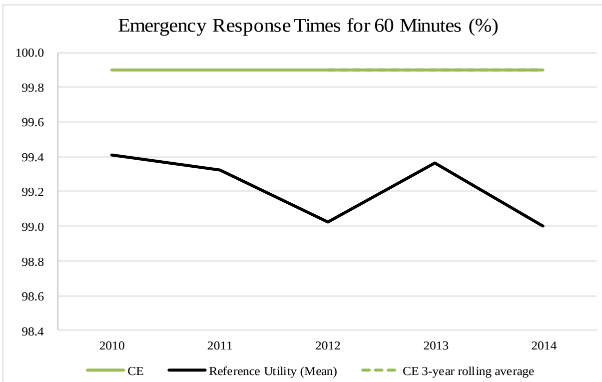


Chart II.18: Backlog of Potentially Hazardous Leaks: 2014

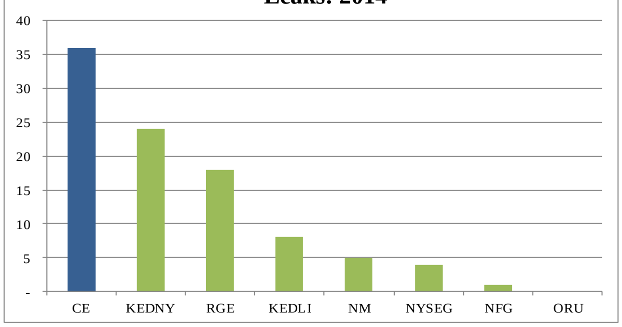
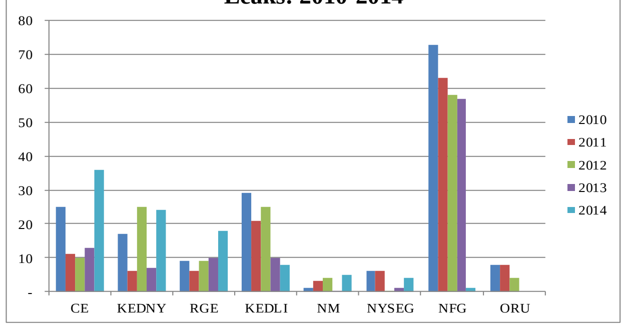


Chart II.19: Backlog of Potentially Hazardous Leaks: 2010-2014



c. Gas Staffing Levels

The next table compares CECONY's 2013 FTE levels with those of the other gas operations we studied. As we did for electric FTE levels, the comparisons used a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index described in the "Hard Drivers" subsection of this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. An index value above 1.0 suggests that FTEs are higher than might have been expected based on size alone.

Table II.20: Gas Staffing Ratios

Parameter	CE	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	1.05	0.70	1.00	2.32
Per Mile of Main	3.60	0.49	1.00	3.60
Per Unit Sales	0.90	0.60	1.00	1.82
Per Average of All Attributes	1.42	0.80	0.96	1.49

Similar to CECONY's electric distribution ratios, gas FTEs per customer (1.05) and gas FTEs per unit of sales (.90) conform fairly closely to the Reference Utility ratios. Also similar to electric system ratios, CECONY's much higher ratio of FTEs per mile of main is expected, given the dense urban service territory and high customer density.

Next we examine how CECONY's five-year average staffing levels for the period 2009-2013 compare to staffing level estimates from the model developed by Liberty. The next table shows five-year average actual FTEs versus model results for gas capital, O&M, and engineering functions. As was true on the electric side, we found an extremely close correlation between CECONY's actual numbers and those produced by the model.

Table II.21: CE Gas Five-Year Average FTEs (2009-2013)

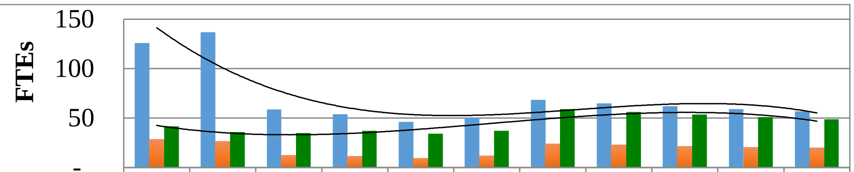
Type	Actual	Estimate
Capital	657	667
O&M	364	370
Engineering	52	48
Total FTEs	1,073	1,085

In each functional area, five-year average FTEs fall within four to eight FTEs of model estimates. Total average FTEs lie within one percent of model estimates. This result is consistent with simple ratios that compare FTE levels to sales and customers. Together, these analyses indicated CECONY gas staffing levels for 2009-2013 consistent with other state utilities, normalized for its level of infrastructure.

4. *Leak Repairs*

The next chart shows a particularly notable drop in gas staffing performing leak repairs. This occurred as the number of leaks repaired dropped as well. We included the combined actual/forecasted data in this instance (as opposed to our more general approach of excluding it) given the 2014 backlog data.

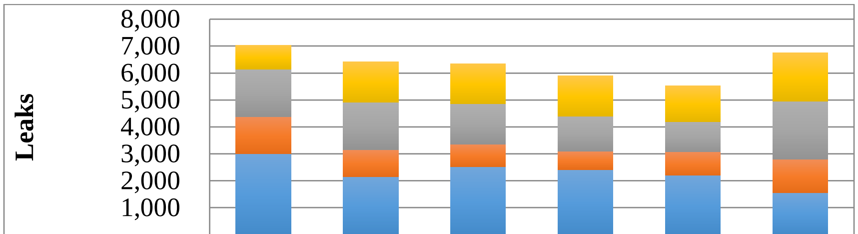
Table II.22: CE FTEs for Leak Repairs



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Straight Time	126	137	59	54	46	50	69	65	62	59	57
Overtime	29	27	12	11	10	12	24	23	22	21	20
Contractor Labor	42	36	35	37	34	37	59	56	53	51	49
Totals	**196**	**199**	**106**	**103**	**90**	**99**	**152**	**144**	**137**	**131**	**125**

The next chart shows leak repairs through the first nine months of 2014.

Table II.23: CE Leaks Repaired (2009-2014)



	2009	2010	2011	2012	2013	2014
Bronx	890	1,506	1,499	1,500	1,332	1,794
Manhattan	1,764	1,755	1,491	1,303	1,130	2,162
Queens	1,383	1,009	841	686	872	1,230
Westchester	3,002	2,151	2,523	2,408	2,198	1,561
Totals	**7,039**	**6,241**	**6,354**	**5,897**	**5,532**	**6,747**

The forecasts for 2015 through 2019 show three significant factors:

- A dramatic decline in total resources through 2014, expected to reverse significantly, starting in 2015.
- An increase in productivity (FTEs divided by Leaks Repaired) that mitigated, but did not fully match the resource decline
- A strong shift in the overall balance of resources, from the historical use of employees on a straight-time basis as the largest resource type. A combination of greater numbers of contracted resources and increases in overtime (as a percentage of straight time) comprised the majority of FTEs expected to perform leak repairs.

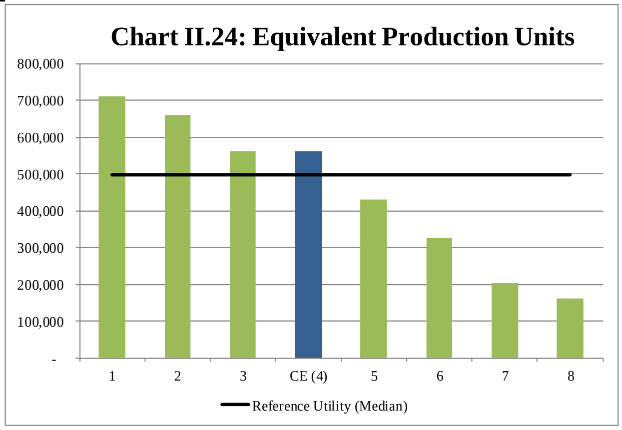
CECONY has thus planned to materially increase leak repair resources, but its plans show steady moderation following an expected 2015 peak. The ability to sustain the productivity increase witnessed in recent years will enable a sustained high rate of leak repairs. Its plans to do so assume a steady ratio (60 percent of total FTEs) of internal (straight plus overtime) resources.

5. *Productivity – Gas*

As we did for electric operations, we addressed productivity from a number of perspectives, including comparing utilities as a function of staffing per unit of various commodities or attributes.

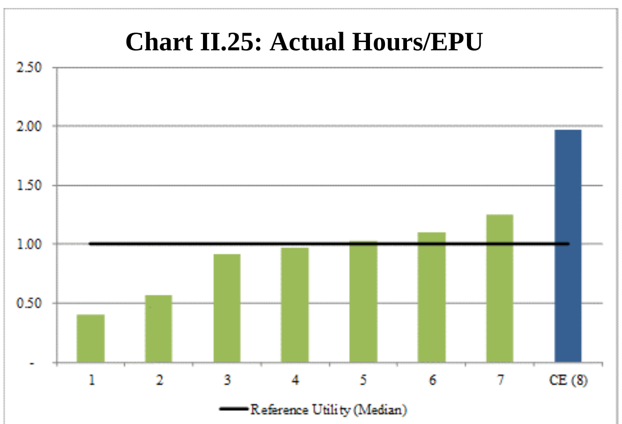
a. Equivalent Production Units

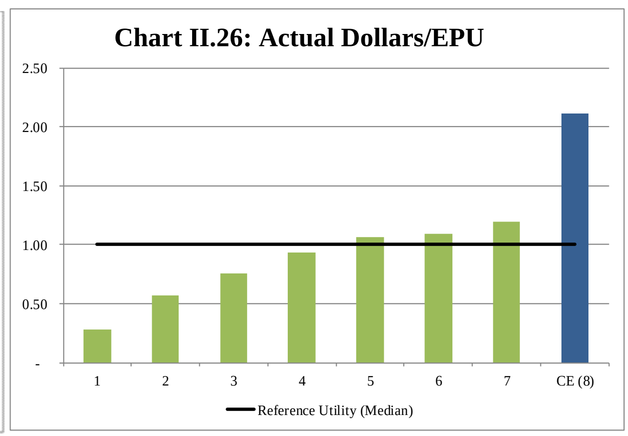
Although CECONY expended the most hours in our sample, it produced the fourth highest EPUs. This is an immediate signal that unit rates are likely to be a problem. For the functions we could measure, the units produced by the four gas utilities with the largest total production fell within a reasonably close range.



b. Productivity

As illustrated in the hours/EPU chart below, physical productivity for CECONY was the most unfavorable among all state gas utilities, by an extreme margin. With the next highest unit rates at only about 25 percent above the reference utility, the argument that CECONY's performance is defined by its urban circumstances is considerably weakened. There are several urban utilities in the sample and obviously none of them approach CECONY's position in terms of physical productivity in the selected functions.



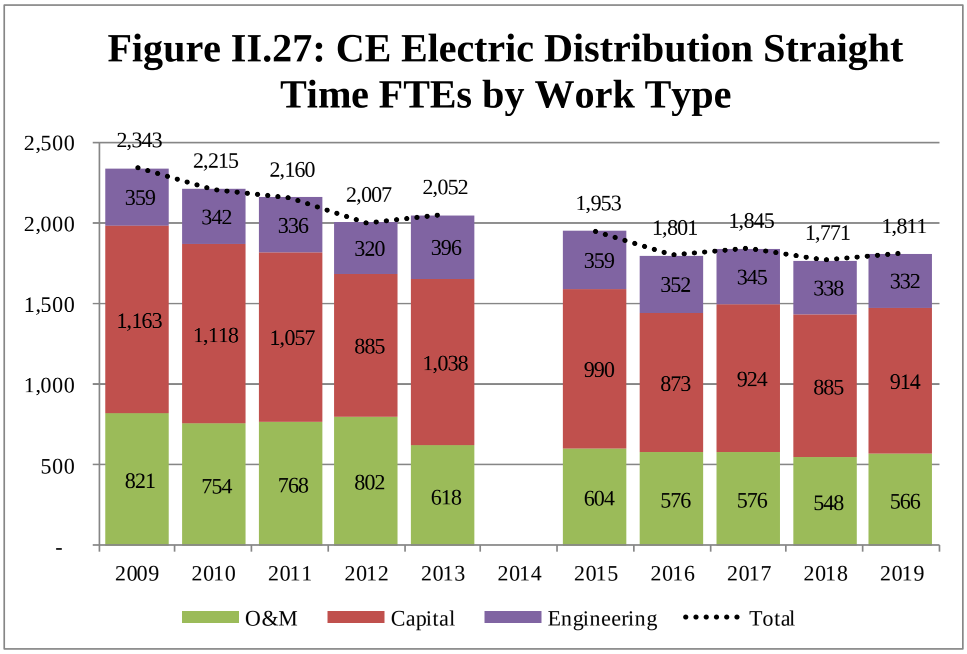


When we consider cost productivity ($ / EPU), CECONY's poor ranking was actually a little worse. This result arose from the high physical unit rates coupled with a high hourly composite labor rate. The median cost productivity of CECONY was more than twice the level of the gas Reference Utility, which is $94.69 per EPU. The productivity rate variances we observed indicate the need for more analysis by CECONY as well as management attention.

B. Internal Staffing

1. Electric Distribution

The next figure shows CECONY's overall internal staffing levels for electric distribution, which includes O&M, capital and engineering related resources. Those levels steadily decline, with few exceptions, over the 10-year study period.



The preceding chart shows the significant 2009-2011 drop in internal staffing discussed in the Resource Planning/Total Resource Assessment section earlier in this report. The drop in internal resources continued through 2012, but rebounded somewhat in 2013. O&M experienced a much greater drop from 2009 through 2013 (25 percent) than did capital work (11 percent). Engineering actually increased by 10 percent. This change in the balance of O&M, capital, and engineering FTEs, as the total dropped, reflects a significant shift in internal resources from O&M to capital work. That shift underscores the staffing questions raised by the adverse trends in CAIDI performance during the historical period of our study.

Moreover, forecasts that CECONY made available during our field work projected a continuing decline in O&M FTEs. The decline from 2013 to 2015 (2 percent) was small, but projected to fall by another 23 percent drop through 2019. Capital FTEs were projected to fall by 25 percent from 2015 through 2019 and engineering FTEs by 23 percent. The ability to sustain reliability, or any other operational attribute, with these reductions bears attention.

To summarize, the 2009 - 2019 drop in straight time internal FTEs in the functions we examined would take CECONY from 2,343 FTEs, the largest such complement in the state, down to 1,811 FTEs (over 22 percent). The decline was most notable in O&M, where FTEs were projected to decline from 821 in 2009 to 566 in 2019 (over 30 percent). CECONY did plan to moderate the decline in O&M internal FTEs between 2015 and 2019 to 6 percent, compared with the 2009 - 2013 decline of almost 25 percent.

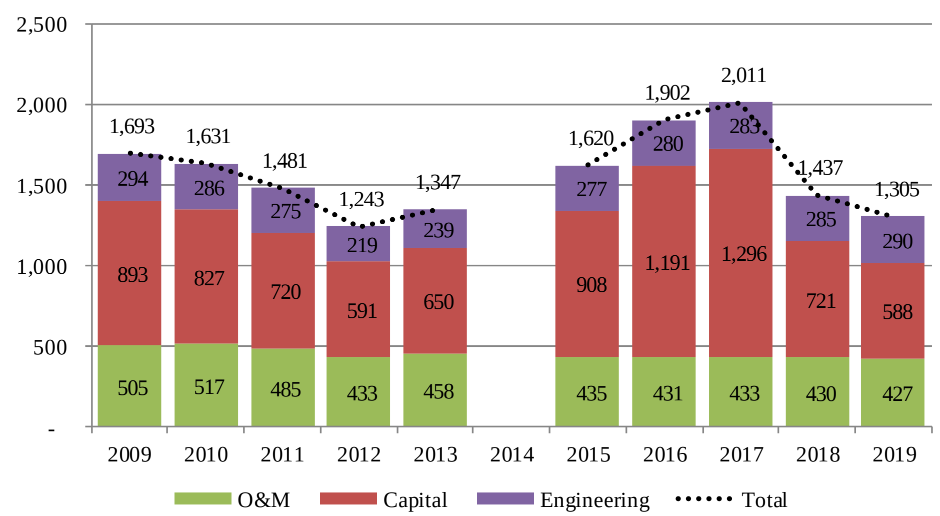
While smaller, the decline in capital-related FTEs was still forecasted to fall by 21 percent over our 10-year study period.

Distribution engineering internal straight-time FTEs, despite intra-year variations, were projected to be the same in 2015 as they were in 2009. Their projected drop of eight percent from 2015 through 2019, however, is interesting, given the acknowledged, but not yet quantified impact of REV on state utilities. The pattern in transmission and substation engineers follows a different projected course. It calls for significant increases in internal engineering FTEs. The combined effect of changes in distribution and transmission/substation engineering FTEs would leave total 2019 electrical engineering resources near 2009 levels of 653 FTEs (636 in 2015 and 622 in 2019).

2. *Electric Transmission and Substation*

The next table shows changes in electric and substation internal staffing.

Figure II.28: CE Transmission & Substation Straight Time FTEs by Work Type



The significant 2009 – 2013 drop in transmission and substation internal FTEs corresponds to a significant reduction in capital work. Internal FTEs performing capital work fell by 19 percent. Reductions in engineering were also large. O&M reductions occurred at more moderate levels. Following 2013, O&M FTEs remained essentially flat through the forecasted portion of our study period, while forecasted spikes in capital and engineering internal FTEs showed variability consistent with the fluctuating nature of capital work in transmission and substations.

Projected engineering and capital FTEs appear to be associated with a sizeable jump in future capital work, which will moderate substantially after 2017. As noted earlier, the combined effect of changes in distribution and transmission/substation engineering FTEs would leave total 2019 electrical engineering resources near the 2009 level. The changes to combined electrical engineering internal FTEs over a 10-year period do not appear remarkable, and reflect an ability to support increased work with proportionately fewer numbers of engineering resources.

3. Electric Staffing Ratios

The next table compares CECONY's internal 2013 FTE levels for the distribution and transmission and substation areas to the Reference Utility. Again, we excluded comparisons based on overhead line miles or substations, recognizing that CECONY's vastly greater use of networked delivery systems and underground facilities produce inordinately high values there. In the areas that the chart addresses, CECONY is the median. The comparisons shown in the chart use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index described in the "Hard Drivers" subsection of this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. An index value greater than 1.0 suggests that FTEs are higher than might have been expected, based on size alone.

Table II.29: Electric Straight Time Staffing Ratios

		All NY Utilities		
Parameter	CE	Low	RU (Median)	High
Distribution FTEs				
Per Customer	1.00	0.63	1.00	1.71
Per Unit Sales	1.00	0.45	1.00	1.49
Per Average of All Attributes	0.77	0.57	0.77	1.09

4. Gas Internal Staffing

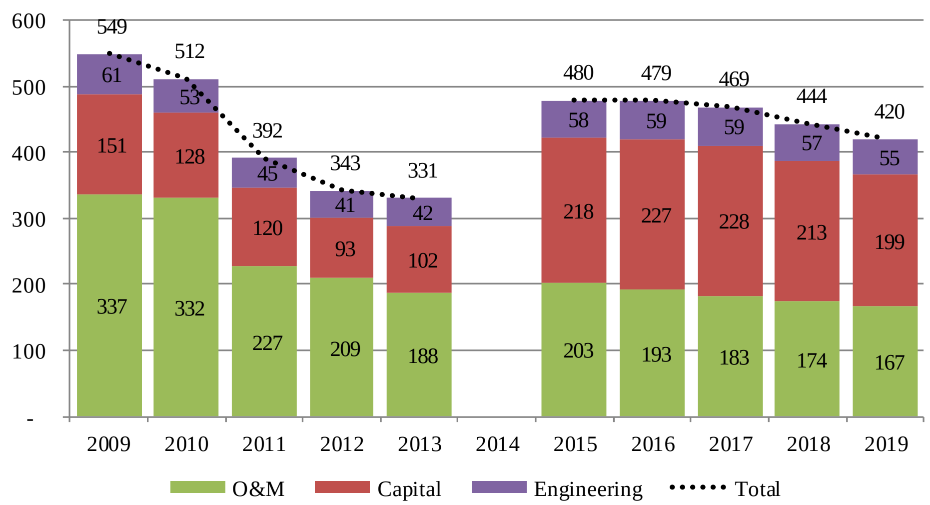
The next figure shows internal FTE levels in gas operations. As observed in the preceding section on total gas staffing, the historical period (2009 – 2013) and the forecasted period (2015 – 2019) were significantly disjointed. Internal FTEs were forecasted to increase in 2015 by a particularly remarkable 45 percent above those in 2013. Most of the increase was expected to come in capital work, where internal FTEs somewhat more than doubled (from 102 to 218). This increase reflected substantial expansion of the capital program. O&M and engineering staff were expected to increase notably as well between 2013 and 2015, but by smaller margins (in the range of 15 percent).

As observed earlier in the sections addressing total staffing, gas FTEs experienced a very large drop in resources from 2009 through 2011. The drop in internal FTEs for gas, however, continued into 2012. Between 2009 and 2012, internal FTEs for capital, O&M and engineering all fell by about a third. This drop coincided with a decline in performance as measured by leak response times and backlogs of leaks.

Accordingly, while notable, the increased forecasted resource levels would still leave gas operations well short of total 2009 staffing levels. The gap becomes even more notable when recognizing that capital FTEs (reflecting increased capital work principally affected by accelerated main replacement) were forecasted to remain well above historical levels and engineering resources to remain at 90 percent of the 2009 level. The disproportionate effect on O&M internal resources were forecasted to leave 2015 levels marginally below 2013's already substantially reduced levels. Through 2019, management forecasted a continuing, large reduction of 18 percent (from the 2015 level of 203 to 167).

The drop in internal FTEs for capital work is also noteworthy. With a large main replacement program and with increasing competition (likely to continue indefinitely) for skilled resources in the state, region, and country, we find development of internal resources an important means for ensuring access to sufficient resources. The more than 20-year expected duration of CECONY's replacement program strengthens further the opportunity to attract, train, and effectively use internal resources long term.

Figure II.30: CE Gas Straight Time FTEs by Work Type



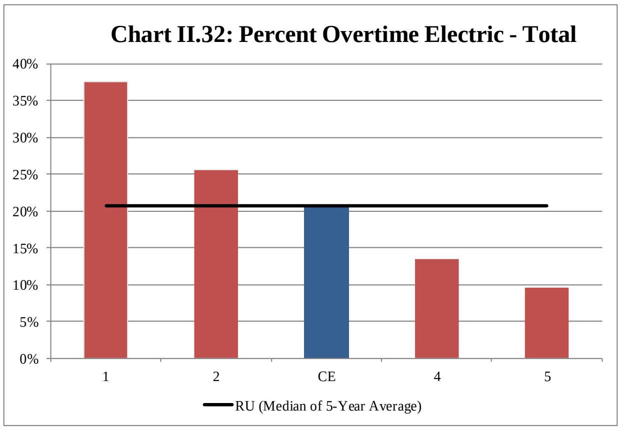
The next figure shows the results of our comparison of CECONY's straight-time gas operations FTEs to the other state utilities. The Company lies far below the Reference Utility value in two of the measures (and is in fact the low), and is higher than the Reference Utility value when measuring FTEs per mile of main.

Table II.31: Gas Straight Time Staffing Ratios

Parameter	CE	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	0.52	0.52	1.00	2.46
Per Mile of Main	1.70	0.54	1.00	2.94
Per Unit Sales	0.44	0.44	1.00	1.90
Per Average of All Attributes	0.89	0.50	1.00	2.43

C. Overtime

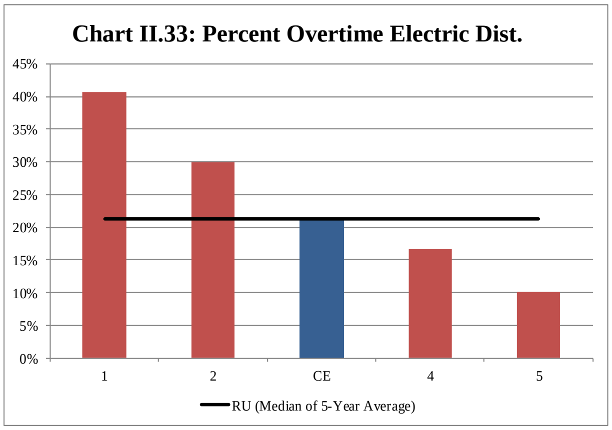
1. Overtime – Electric

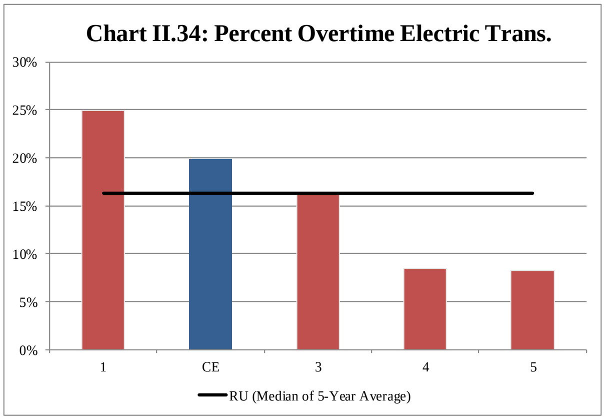


The accompanying chart illustrates CECONY's electric overtime average over the five-year period 2009-13[3]. The remaining bars represent the four other state electric utilities. CECONY's reported electric overtime was the median (Reference Utility) of state electric operations.

In Liberty's experience, 20 percent represents a significant level of spending for overtime, although not necessarily in New York State where this figure proved the norm for the electric operations we studied. The Reference Utility value does not set an absolute standard for judging overtime levels. Nevertheless, the Reference Utility overtime value for all electric attributes exceeded 20 percent, which itself is considerable. The Reference Utility value equates to an extra day per week, and while not important in isolation, is significant when observing that it represents the average for the total force for 52 weeks per year. Accordingly, materially exceeding the Reference Utility value raises a concern

The charts below separate CECONY's comparative overtime performance between electric distribution and transmission. CECONY showed roughly the same percent in both cases, but its nearly 20 percent rate in transmission was high in comparison to its state peers.





The next charts plot CECONY's actual and forecasted overtime across our study period. The historical data shows that distribution overtime, while averaging about 20 percent, grew significantly above that rate through 2013. Forecasts reflected plans to bring it back to roughly 20 percent in the future. Whether the required reduction will occur remains to be seen, but we view the Company's recognition of the need to reduce overtime as positive. Recent overtime levels in

[3] All overtime reported in this chapter excludes any engineering functions.

O&M ran to about 35 percent and forecasts still showed those rates (at 25 percent) ahead of capital overtime. These data make O&M overtime the primary area of focus. The charts show the large reduction required to move CECONY into alignment with the Reference Utility.

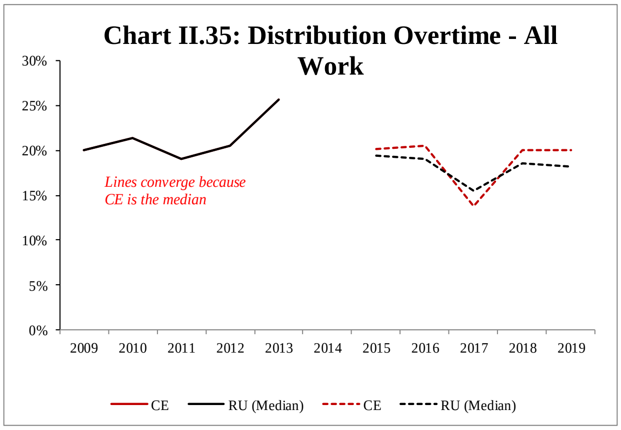


Chart II.35: Distribution Overtime - All Work

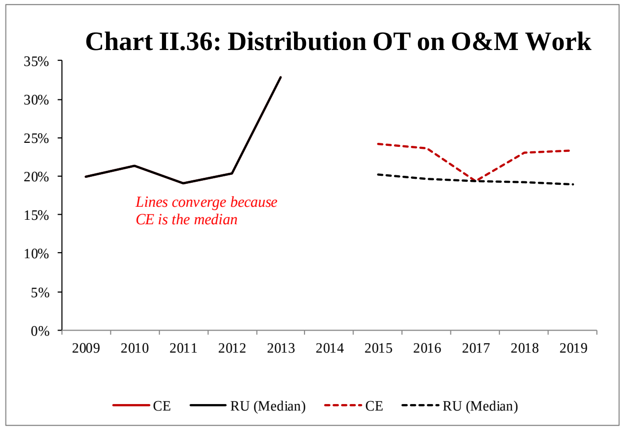


Chart II.36: Distribution OT on O&M Work

The accompanying chart shows electric transmission overtime, where the five-year historical trend shows significant growth. Moreover, forecasts showed an expectation that it will remain comparatively very high. CECONY's forecasted 25 percent overtime in transmission makes it a significant outlier.

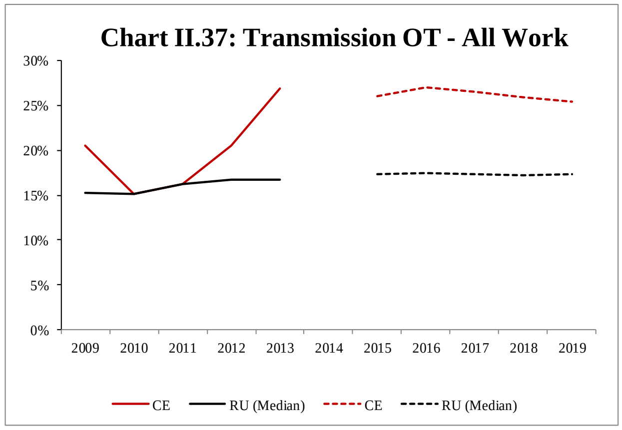


Chart II.37: Transmission OT - All Work

This discussion focuses on how overtime relates to the resource mix or stack. In this context, the stated percentage is the fraction of total resources (straight time, overtime, and contractors). This contrasts to our "percent overtime" parameter, which expresses overtime hours as a fraction of only straight time hours. Recognizing the unfavorable nature of excessive overtime use, it is not desirable to depend too much on that resource. CECONY's rate of 14 percent for distribution matched the Reference Utility value, and did not seem unreasonable. The resource mix in transmission differed, however. The CECONY rate of 19 percent was more than double the Reference Utility value of 9 percent.

The accompanying chart examines the relative trends in staffing and overtime for CECONY distribution. This chart depicts the relationship between changes in levels of staffing and overtime. On a statewide level, some correlation existed between staff reductions and increases in overtime, and vice versa. This next analysis seeks to answer that question for CECONY.

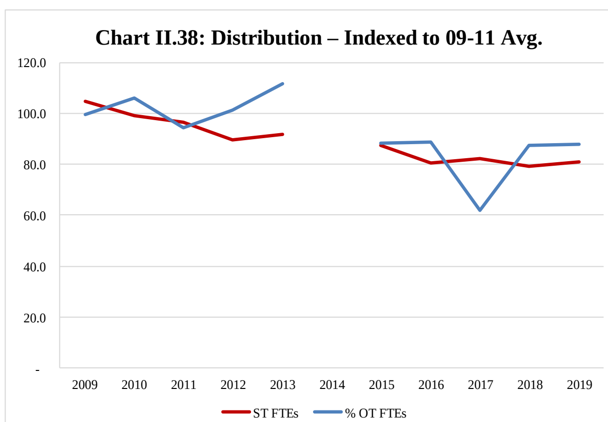
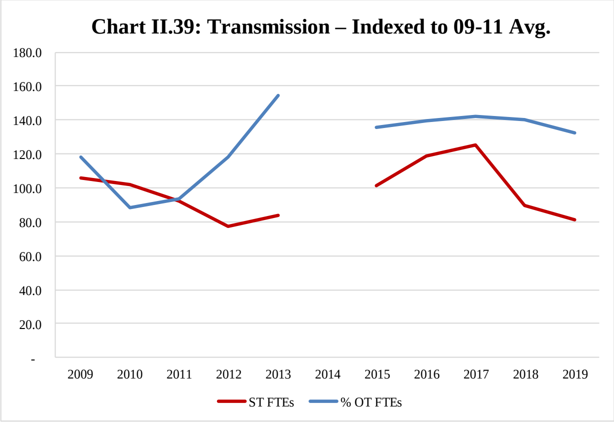


Chart II.38: Distribution – Indexed to 09-11 Avg.

We chose the 2009-2011 averages as a baseline for our index approach, assigning that average a value of 100. We then plotted the other data of interest on the same basis. The chart does show a pattern of increased overtime when staffing fell. The implication is that overtime could be a "forced" substitution for lost staff, rather than a deliberate preference for the use of overtime in defined instances.

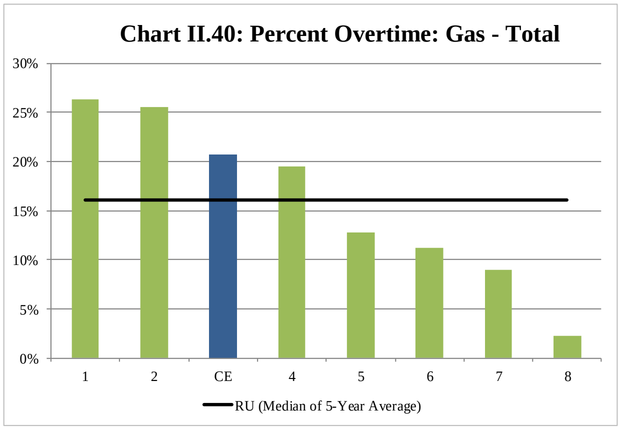
The long-term view of CECONY distribution suggested a further decline in internal staffing coupled with a substantial drop in overtime. Projecting a substantial drop in overtime at the same time as a drop in personnel might have a foundation, but raises questions. CECONY needs to reconsider the achievability of a large overtime cut without a corresponding increase in head count.



CECONY transmission overtime historically showed the same pattern of less staff and more overtime, but the future relationship was less clear. Nevertheless, the sharp forecasted increase in overtime merits attention.

2. *Overtime - Gas*

CECONY used less overtime in its gas business than it does in its electric business. The accompanying chart, however, shows that it is one of only three that used more than 20 percent, and its overtime use ran well above that of the Reference Utility. Again, a 20 percent marker itself reflects a number traditionally considered high in our experience. The Reference Utility for New York gas overtime is 16 percent, as compared with the 20 percent for electric operations in the study. Two state utilities found it possible to operate with less than 10 percent overtime use.



The next two charts show similar patterns for capital and O&M work, but higher overall values generally for capital work. CECONY use fell well above the median in both work categories. There also existed a sizeable gap between the high and low overtime use groups, more noticeably in O&M activities, but clear in both. The split highlights the signficicant differences among the companies. We make this particular observation (it is not a criticism) in the context of a basic premise that the ideal resource mix will vary among utilities. Differences among neighboring companies can result for good reasons. Our process analysis (provided later in this report) describes the value of taking a structured approach to defining optimum overtime levels, and making judgments after, and not before, that optimization process.

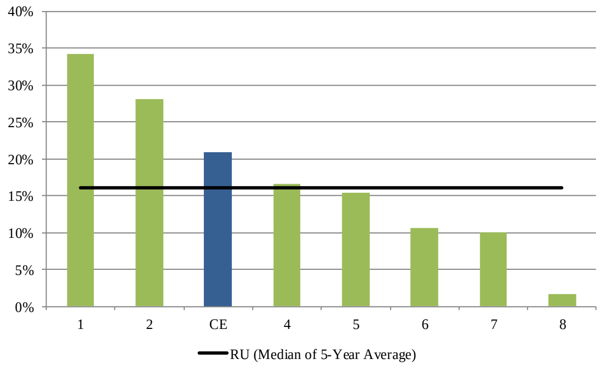


Chart II.41: Percent Overtime: Gas - Capital

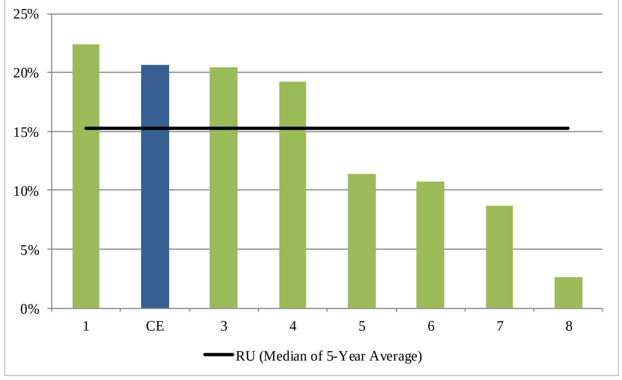


Chart II.42: Percent Overtime: Gas – O&M

The next two charts show CECONY's yearly overtime levels historically and projected across the 2009 - 2019 study period. Historical rates were already higher than those of the Reference Utility, yet forecasts showed them rising even higher. Again by contrast, the forecasted Reference Utility rate showed that the state's other gas operations were seeking to lower their already lower (compared to CECONY) gas overtime rates. These pheonomena also point to the need for management to address both the effectiveness and the achievability of its projected internal resource/overtime mix.

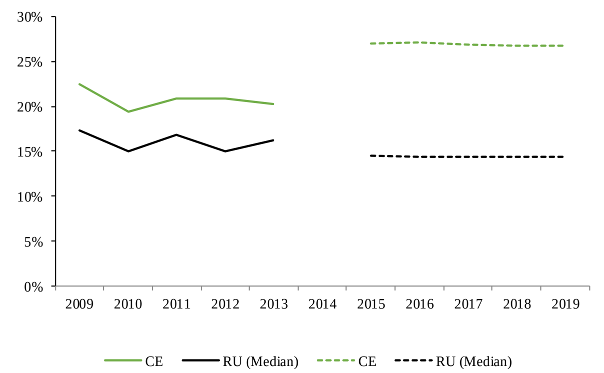


Chart II.43: Gas Overtime on All Work

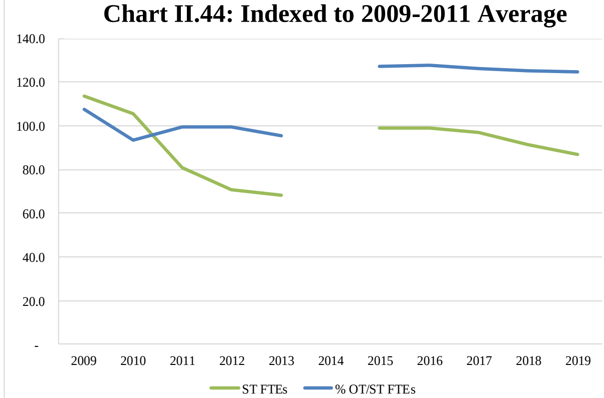


Chart II.44: Indexed to 2009-2011 Average

D. Contractors - Electric

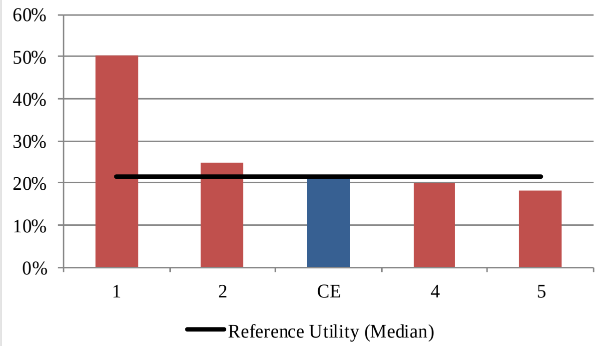
CECONY's use of contractors in the electrical area was, on balance, typical with the notable exception of transmission capital work. In that category, CECONY had considerable internal construction capabilities that others did not, allowing a far lower level of contracting. It does not appear that the Company planned any notable changes in its contracting practices as both historical data and future projections were generally stable.

1. Level of Contracting - 2013

This report has described a number of the system characteristics that distinguish CECONY substantially from the state's other electric operations. They form an important element of management's approach to contractor use. Examples include widespread undergrounding of transmission and distribution facilities and the use of totally-enclosed substations.

We compared total 2013 contractor use with that of the other New York electric operations we examined. The next graph summarizes the results. It shows that one very large outlier made far greater use of electric contractors than the others. Those others produced a fairly narrow range, with CECONY and one other in the middle.

Chart II.45: Total Electric Percent Contracting



The next two charts separate contracting data between distribution versus transmission and substations combined. These two charts show that, despite contracting overall at levels comparable to others, CECONY used far less contracting for transmission work. On the whole, the rest of the state's electric utilities we reviewed contracted a majority of transmission/substation capital work. CECONY, in stark contrast, contracted at a 2013 level more in the 10 percent range. CECONY's 2013 distribution capital contracting, however, exceeded the levels of all the other electric operations, except for the single outlier.

Chart II.46: Transmission Capital Percent Contracting

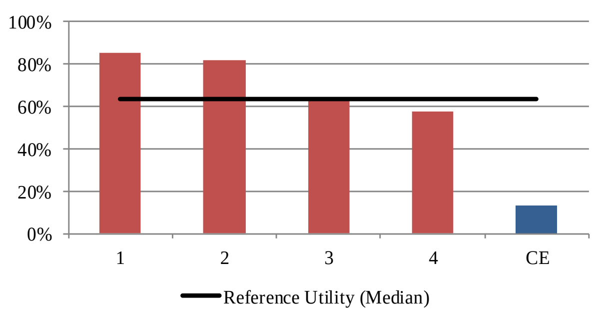
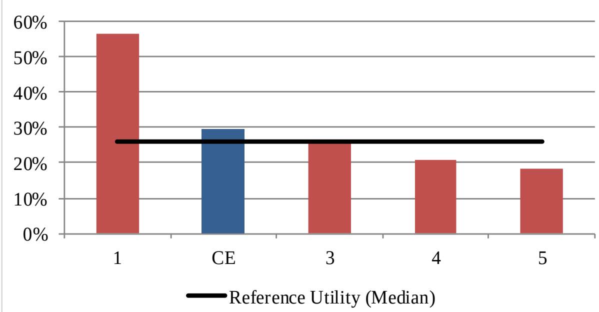


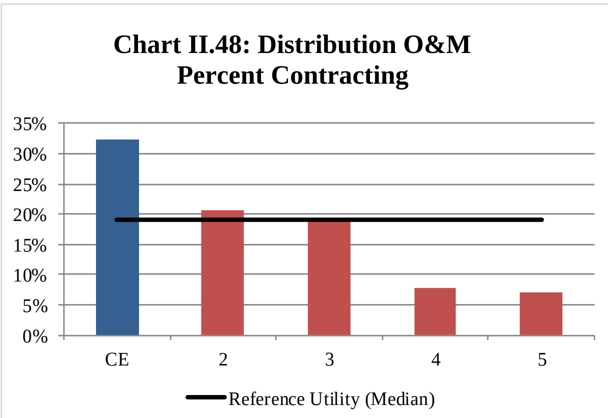
Chart II.47: Distribution Capital Percent Contracting

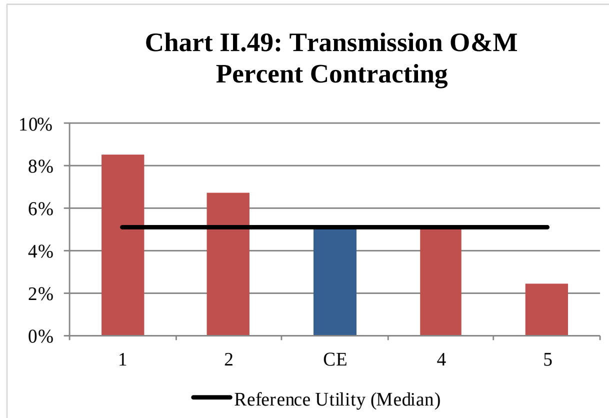


CECONY's transmission/substation capital contracting levels have changed with changes in the workload level. The Company, in other words, used higher levels of contractors as workload increases. Thus, a principal driver of CECONY's 2013 very low transmission/substation contracting level was a comparatively small project workload versus 2009. The completion of major project work prior to this time was not fully replaced by emerging capital needs.

Apart from workload considerations, however, it is also the case that CECONY performed in-house capital transmission/substation work more generally contracted out by its peers. Management contracted out work like civil infrastructure, but performed all associated transmission wiring work in-house. Other utilities often contract some such work (*e.g.*, for new substations). The nature of its infrastructure makes CECONY's wiring work generally much more complex than what the other operations we studied require. Installation and splicing work on underground systems can require special skills more efficiently provided through in house labor.

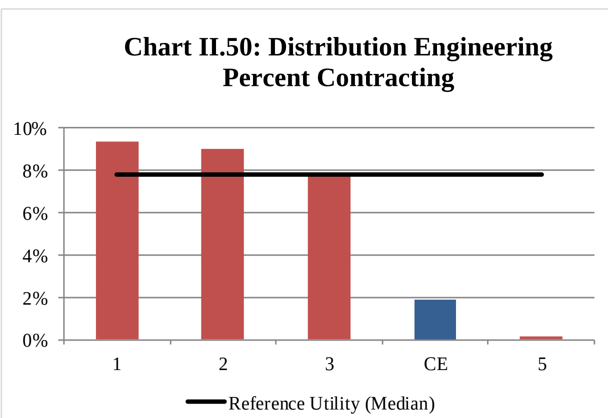
The next charts show 2013 distribution and transmission/substation O&M contracting levels. Distribution O&M contracting was comparatively high, and distribution engineering low. Transmission/distribution contracting was typical.

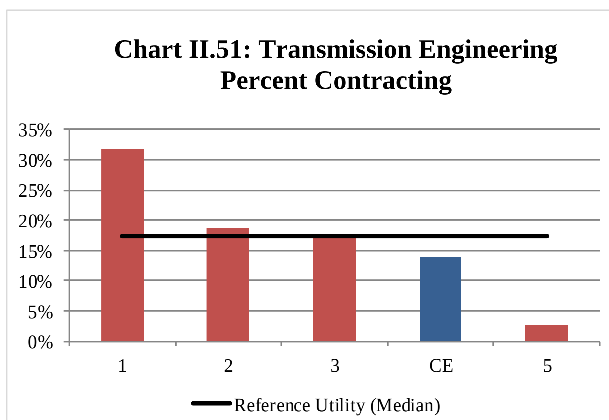




The prevalence of underground systems has led CECONY to a difference in distribution O&M contracting as well, when compared with the other electric operations we studied. Management contracted a great deal of "lower-value" work generated by the characteristics of those systems. The low value work includes items such as flagging traffic, flushing out underground systems, paving, trenching and concrete duct structures. Transmission/substation O&M contracting was in line with the Reference Utility.

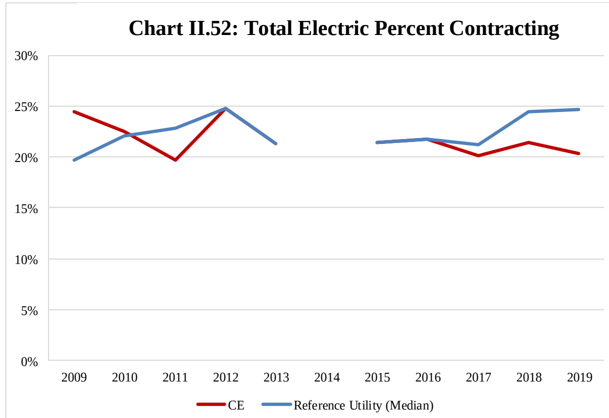
The next charts show 2013 engineering contracting.





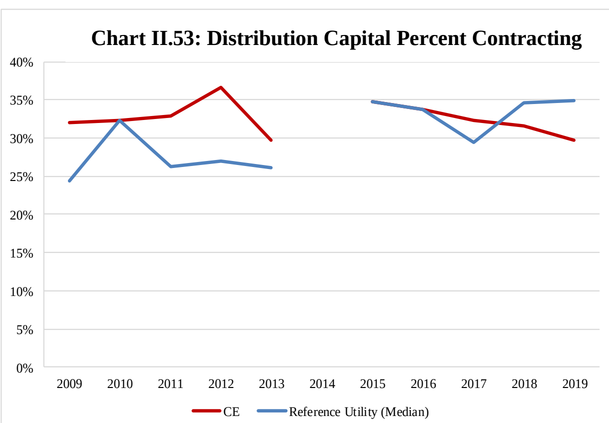
CECONY's 2013 distribution engineering contracting levels fell far below those of the Reference Utility, reaching a magnitude that can be considered nominal. CECONY generally managed distribution engineering as do the state's other utilities. For example, it employed a central group to ensure standardization and to address issues common to its regions (*e.g.*, material specifications, engineering standards). CECONY also employed field engineering resources in each region to address localized distribution issues. CECONY differed from the other operations we studied in that it uses fewer contract engineers. Internal personnel better address the complexity of engineering new connections to its urban networks. In fact, while CECONY used comparatively fewer contract engineers in general, none addressed its Manhattan infrastructure. In contrast, transmission/substation engineering contracting levels were in line with the Reference Utility. As is true for capital work on transmission and substations, the variation in their work from year to year corresponded largely to changes in capital work requirements.

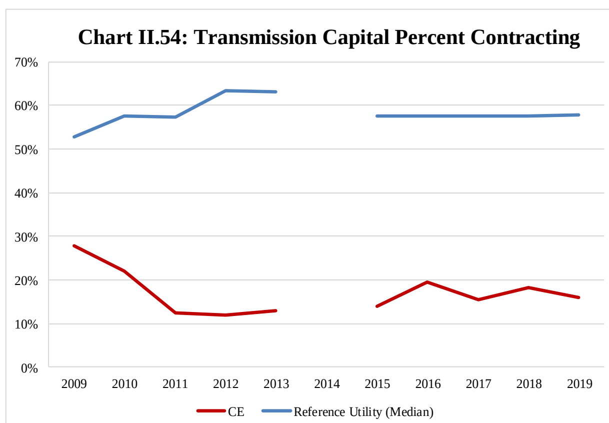
2. Contracting Trends



CECONY's 2009 – 2013 overall electric contracting level dropped early in the period, but a 2013 increase brought it back to 2009's percentage. By comparison, RU contracting levels increased slightly until a large 2013 drop moderated the total increase across the period. We found the CECONY changes consistent with similar reductions in overall capital and in transmission/substation O&M workload levels. Interestingly, CECONY projected continuation of its 2013 contractor use percentage across the forecast portion of our study period (with small annual variations), producing a reduction of a few percentage points by 2019.

When looking at electric operations combined, one needs to keep in mind that CECONY distribution work dominates over transmission and substations. The distribution capital workforce outnumbers the transmission/substation capital workforce by a factor of about four. The next two charts break contracting down between distribution and transmission/substations.





Distribution capital contracting levels remained essentially flat from 2009 to 2013, with a short-term increase attributed to storm hardening, which caused a temporary uptick in distribution capital workload. A forecasted slight but steady decline from somewhat escalated 2015 levels would bring contracting distribution capital contracting back to the 2013 percentage. Transmission/substation capital contracting levels declined precipitously from 2009's already low percentage (compared to the Reference Utility) through 2013. The completion of major substation projects drove this historical decline. Forecasts showed a contractor usage percentage that continued below 20 percent, indicating continuation of the overall strategy that produces the application of higher internal resources at CECONY for transmission and substations.

The next charts show O&M contracting levels. The distribution O&M contracting percentage was declining early in the historical years of our study period, but rose substantially in 2012. Storm hardening efforts performed as part of storm response efforts drove a short-term increase in O&M expenditures that management expects to drop. Forecasts showed the contractor percentage extending into the future at a level fairly consistent with pre-2012 history. Generally, the Reference Utility showed the 2012 effect, but differed somewhat in the future. The Reference Utility forecast projected contractor use on distribution O&M work at a somewhat higher than historical level (excepting 2012). Nevertheless, the Reference Utility's contractor use percentage was forecasted to remain below that of CECONY.

It is difficult to form observations about historical transmission O&M contracting, given the "scatter" of the CECONY and Reference Utility data. CECONY's 2012-2013 variations do appear correlated with workload, however. Forecasts showed stability for the Reference Utility at levels approaching the increased percentages of 2012 and 2013. CECONY, by contrast, continued to show a significantly lower level of contracted transmission O&M.

Chart II.55: Distribution O&M Percent Contracting

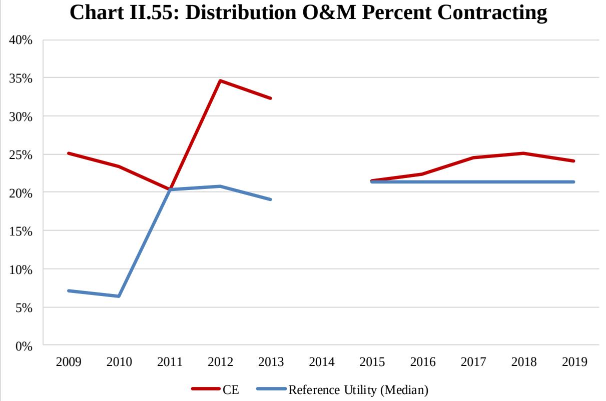
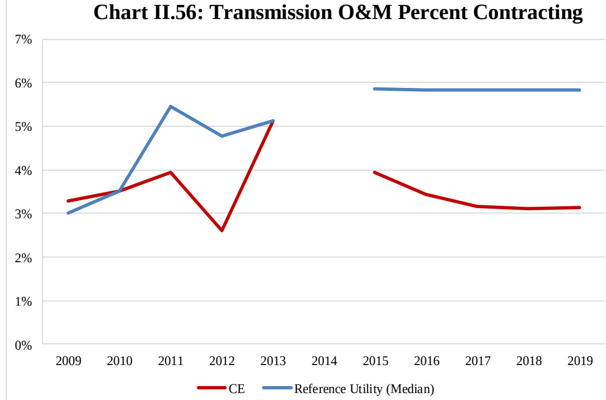
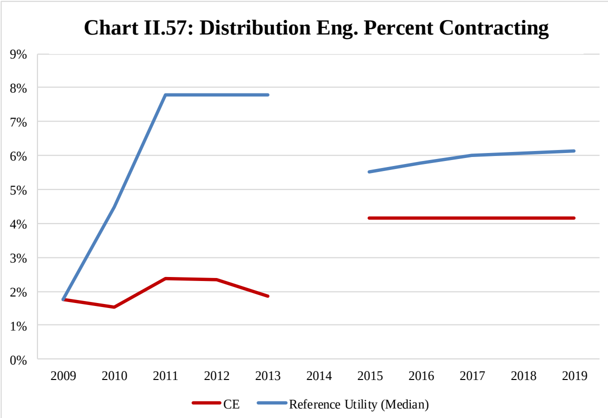
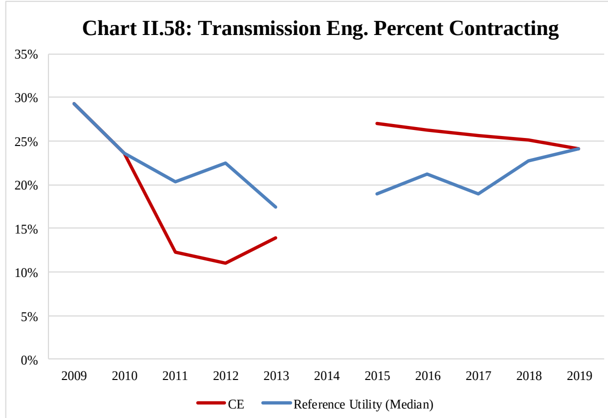


Chart II.56: Transmission O&M Percent Contracting



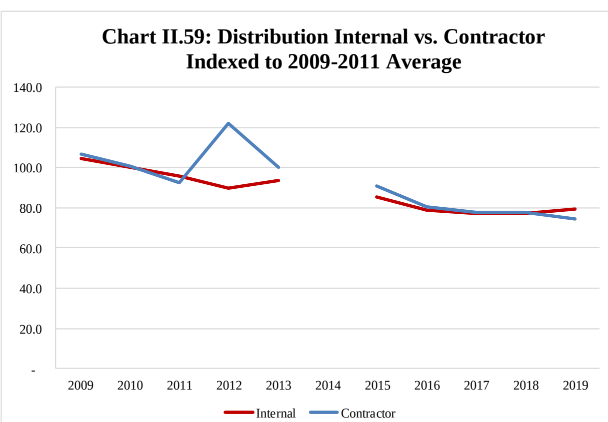
The next two charts show percentages of contracted engineering in distribution and transmission/substation work. Distribution engineering contracting levels remained flat throughout from 2009 - 2013 period. While they reflect roughly a doubling in the forecasted years of our study period, they remained at a fairly nominal level, reflecting continuation of the historical CECONY approach. The transmission/substation engineering contracting levels were more substantial, but continue to correspond, as they did historically, reasonably closely to workload changes, which management forecasted to be at increased levels through 2019.

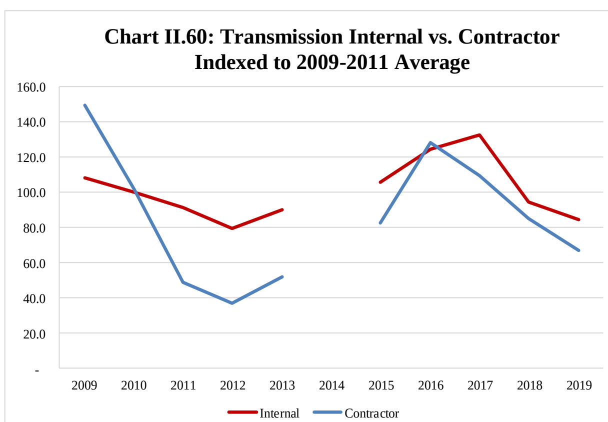




The next two charts plot distribution and transmission/substation contractor use on an index basis, in order to show how they moved relative to each other over the historical portion of our ten-year study period, and how they were expected to move through the forecasted portion. We assigned an index value of 100 to the 2009 to 2011 average for each. The distribution line for 2009 - 2013 shows reductions in internal and contract resources moving closely together, with the exception of storm-response related work in 2012. They were forecasted to continue to move in tandem through 2019. Note that the pattern in transmission was quite different. Rather than the changes in internal and contractor staffing levels tracking with one another, as in distribution, transmission contractor levels varied widely, especially in the early years. We tend to view such wide variations as a function of workload; *i.e.*, management using contractors to address fluctuations in workload. Where such fluctuations are lacking (as in distribution), the suggestion is that contracting is instead being determined by fixed budgets. Simply stated, in one case (distribution), contractor staffing is generally fixed and hence determines the production, or work load. In the other case (transmission), contractor staffing is allowed to vary to meet changing production needs.

Distribution:	production $= f$(workload)	workload is the independent variable
Transmission:	workload $= f$(staffing)	staffing is the independent variable





E. Contractors – Gas

CECONY was a large outlier in its level of gas contracting. The Company relied on outside resources for more than 60 percent of the work, which is more than double the next closest gas operation we studied. This high level of contracting, which was nearly all in capital work, was expected to continue in the years ahead.

1. Level of Contracting - 2013

The next four graphs summarize CECONY's gas contracting ratios for 2013.

Chart II.61: Gas Total Percent Contracting

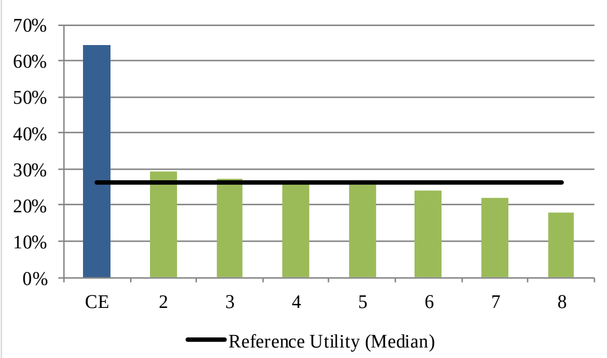


Chart II.62: Gas Capital Percent Contracting

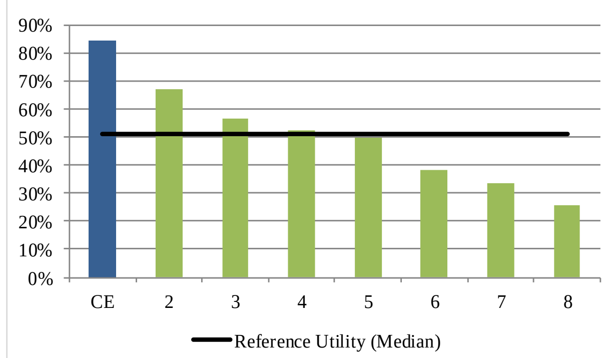


Chart II.63: Gas O&M Percent Contracting

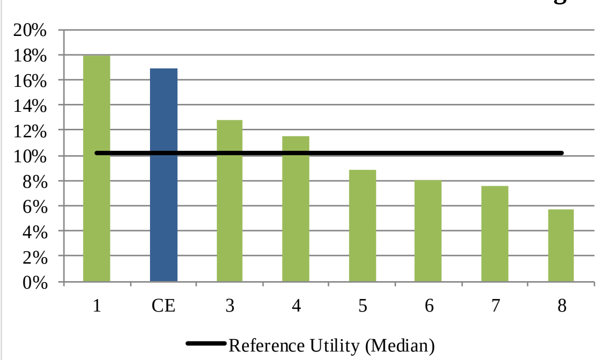
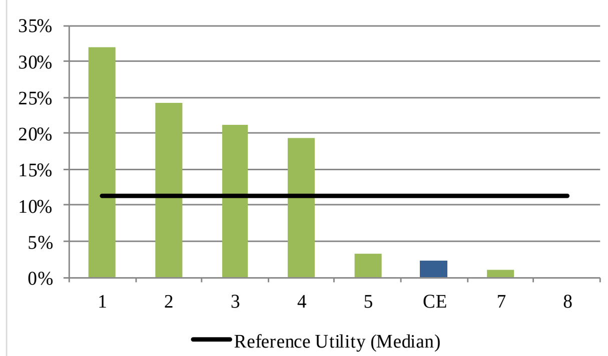
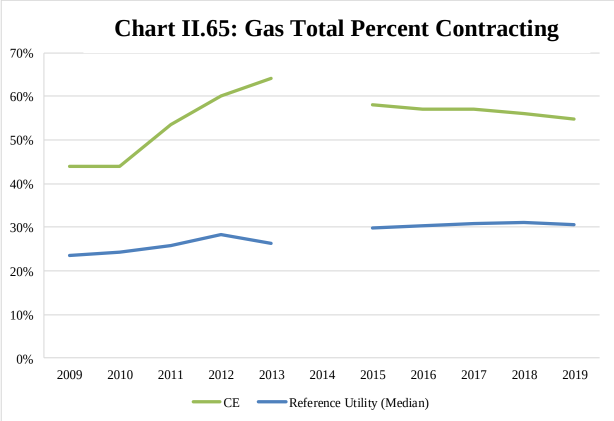


Chart II.64: Gas Engineering Percent Contracting

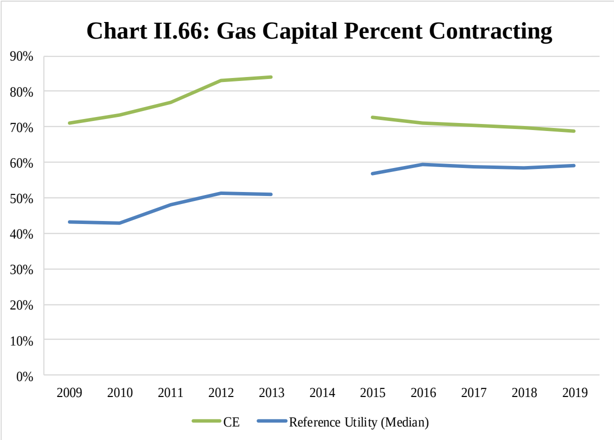


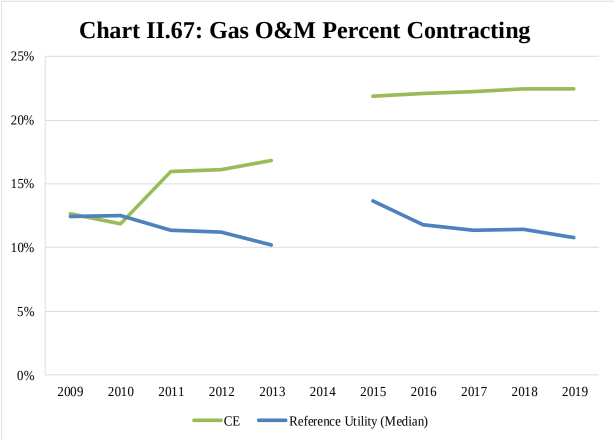
On an overall basis, Gas contracting, as a percent of total FTEs in the study, generally fell in the range from just under 20 to about 30 percent. CECONY was the exception, with its contracting at 63 percent, driven by its capital contracting program. CECONY's capital contracting percentage was the highest in the state, driven by the size and complexity of its main replacement program. It has one of the largest programs in terms of miles of pipe replaced per year. Its system represents one of the most congested underground locations in the world. CECONY's gas O&M contracting was not the highest in the state, but still well above that of the Reference Utility. The Company performed virtually all Gas Engineering with in-house resources.

2. *Contracting Trends*



The next charts summarize trends in CECONY gas contracting. On a total basis, the share of work contracted grew very significantly historically, while the Reference Utility value remained relatively stable. On a forecasted basis, the Reference Utility showed contracting growth, but at a level well below CECONY's forecasted share. CECONY by contrast showed some moderation in contractor use, but still expected it to remain much higher than its state counterparts. The next charts show that the difference between CECONY and the other state utilities we studied is much more pronounced in capital work. The data reflect a comparatively early ramp-up in CECONY's pipe replacement program.

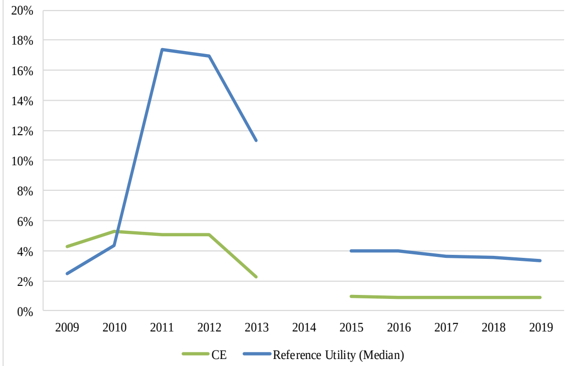




CECONY's gas O&M contracting was at lower levels than the Reference Utility value in 2009, but grew significantly through 2013, as the Reference Utility level stayed essentially flat. Like the other state gas companies, CECONY forecasts showed increased future level of gas O&M contracting. CECONY projected that contractor's would, perform a higher share of work. Beginning in 2009, CECONY has moved significantly apart from statewide experience in substantially increasing its reliance on contractors to perform gas O&M work. The increase in O&M contracting was due, at least in part, to the public awareness campaign that encouraged New Yorkers to call in suspected gas leaks, coupled with a new surveying technique, both of which drove up the emergency response activities and leak repairs.

The accompanying chart shows that contracted gas engineering at CECONY was extremely low historically, both in absolute terms and relative to the Reference Utility. It was projected to fall even lower (again, absolutely and comparatively) through 2019.

Chart II.68: Gas Engineering Percent Contracting



As we did for electric operations, we also plotted (see the next two charts) gas contractor and internal resource use on an index basis, to show their movement relative to each other. We assigned an index value of 100 to the 2009 to 2011 average for each.

Chart II.69: Gas Contractor FTEs

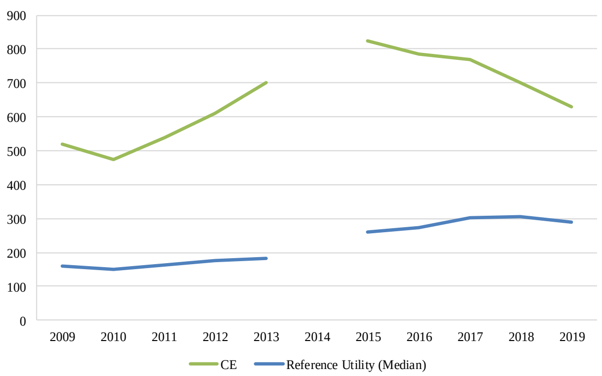
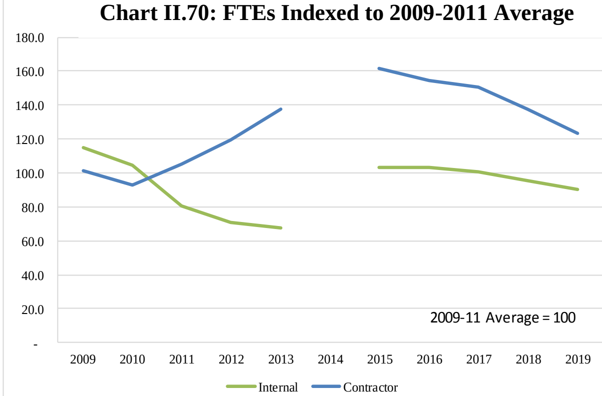


Chart II.70: FTEs Indexed to 2009-2011 Average



CECONY's contracting remained relatively consistent with respect to the Reference Utility for the historical period and future periods. With respect to the balance between internal and contractor staffing indexed to the 2009 - 2011 baseline, CECONY had a rough 50/50 balance during the baseline period, following which the proportion of contractors increased, driven largely by the pipe replacement program.

F. Conclusions

In addressing staffing adequacy, we begin from the premise that there is no one indicator and certainly no simple algorithm that can provide a definitive answer. We approached the question of adequacy by weighing the contributions of multiple perspectives, which we found on many occasions support inferences in opposite directions. We formed judgments about staffing adequacy considering the balance of the weight of the "evidence."

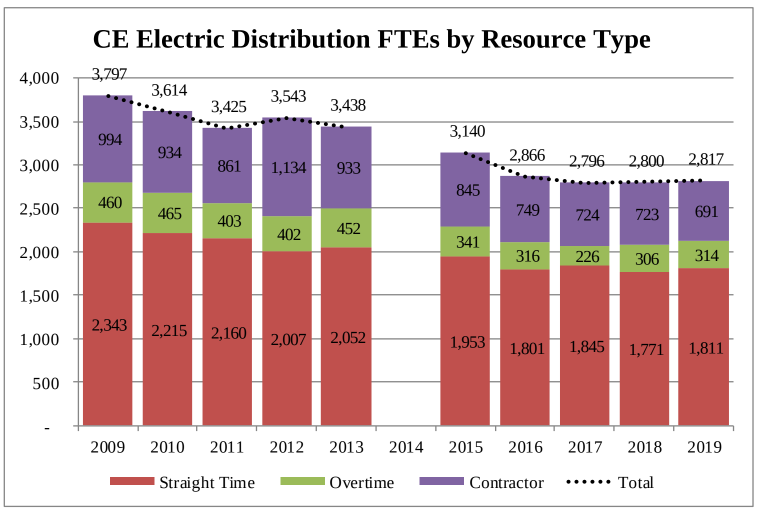
Some of our bases for making such judgments had mathematical underpinnings, but our conclusions on adequacy do not approach (nor could they have) anything like mathematical certainty. They represent our best judgments based on the data we had and our analysis of that data. They are informed as well by the results of our process reviews.

We offer these judgments about adequacy as our best contribution to a process that the companies and their stakeholders should (and do, from what we have seen) agree is critical - - continually seeking out all means possible to ensure that staffing decisions result from the broadest possible range of insights, challenges, and perspectives.

These conclusions reflect our contribution to what will certainly remain an ongoing, dynamic, and fluid staff optimization process, as infrastructure needs, customer expectations, workforce demographics, technological advancements, and policy change continue to bring opportunity and risk to the electric and gas utility businesses.

1. A continuously declining level of applied electric distribution FTEs, coupled with: (a) an increasing trend in outage restoration response times, and (b) recent increases in overtime, suggests insufficient staff, but none of our other indicators confirmed this result.

Electric distribution showed a large decrease in FTE activity between 2009 and 2019. The magnitude of that decrease alone raises significant questions. Industry staffing was on the decline for a long time, reaching its peak in the 1990s. There have been some major downsizings in recent years, including in New York State, but they have been the exception, not the rule. One generally would not expect to see any widespread major staff reductions when most utilities are already assumed to be working from a reduced staffing base.



The start of the CECONY trend coincided with Commission-initiated "belt-tightening", but less clear is what caused reductions to persist. Liberty therefore began with a concern that staffing in distribution might be too low. We sought to determine whether any other indicators would support that concern. Insufficient distribution staffing might first become apparent in outage recovery times, as measured by CAIDI. An examination of CAIDI over the last five years shows CECONY performance declining, to the extent that standards were not met in 2014. This observation provides an indicator that staff declines may have had consequence for service quality.

We also observed indications that declining staff leads to higher overtime. That pattern held in electric distribution for CECONY. We therefore concluded that substantial indicators exist to question whether this staff-reduction path raises service quality implications.

Continuing with our other indicators, however, we did not find further evidence. Production measures appeared generally good, with the exception of the 9ers analysis. The contractor mix appeared normal, suggesting that low staff did not drive up contractor use. Our process analysis (described later in this report) found strong resource planning capabilities.

We cannot state with certainty that resources in electric distribution have fallen too low. We nevertheless consider it proper to caution that management needs to examine carefully its forecasted staffing levels in relation to what has happened with respect to reliability following 2014. That examination needs to address the root causes of recurring service reliability issues, and how its plans for the application of staffing address them.

2. Productivity measures[4] were in line for electric distribution but unit rates (hours per unit of production) were high in substation work, likely due to the unique nature of many of the Company's substations.

Given the many unique features of the CECONY system, one should not be surprised to find productivity more of a challenge than at other utilities. Such is indeed the case in our 9ers analysis of distribution, where CECONY rates were almost 40 percent above Reference Utility values. With respect to the other productivity indicators, including our model and the comparisons of FTEs per utility attributes, the results were different. We therefore see no reason to draw any negative conclusions.

For transmission/substations work, we could not apply a 9ers analysis. However, both of the other productivity measures suggest issues in substations. CECONY's unique substation design aspects and its comparatively small number of substations might tend to mitigate concerns, but the deviations are sufficiently large to warrant management attention.

3. While all electric distribution resources were declining, there was been a slight shift away from reliance on contractors in the resource mix.

The CECONY resource profile showed a near uniform decline in staffing, considering both internal personnel and contractors. Examining the resource mix in the long-term shows the extent of contracting remaining about constant (in the 20-25 percent range). That level indicates a slight reduction from present values. There is nothing unusual in this pattern.

4. Electric transmission/substations work showed an increased use of contractors but at the expense of overtime, not internal straight-time effort.

The percentage utilization of contractors in transmission/substations was planned to increase in the future, but without any corresponding decrease in internal staffing. Rather, the shift to more contracting resulted from planned reductions in overtime.

5. Plans to contain electric distribution overtime in the future are positive, but (a) may not be practical in light of declining staff, and (b) nevertheless remain in the 20 percent range.

Distribution overtime spiked upwards more recently, but CECONY intended to return overtime back to more moderate levels. It is not clear that this plan is feasible, however. Significant reductions in overtime in the face of declining numbers of personnel may not be practical. In addition, the new long-term targets are in the range of 20 percent, which remains a significant level of overtime. These factors indicate value in a management re-evaluation of current plans.

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[4] We considered three of our analyses to be in the productivity category: our study of the ratio of FTEs to various Company attributes, the model, and 9ers.

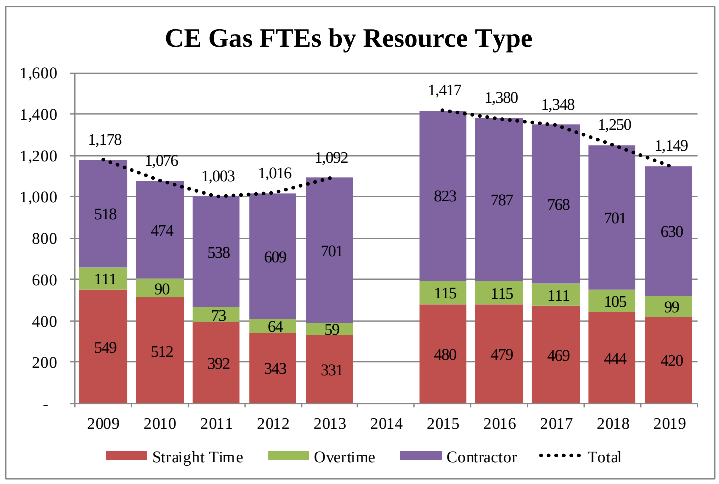
6. Given already-high levels of overtime in electric transmission/substations, forecasts of further increases are problematic.

The dependence on overtime to supply about one-fifth of the resource requirement should be reconsidered. Overtime is generally considered a necessary but often inferior part of the resource mix. When such a high percentage of FTEs are being supplied via overtime, it is more likely a problem. Further, long-term plans to work internal personnel at 25 percent lie well above plans for the other utilities, and appear excessive for application on a continuing basis.

7. Past gas staffing changes as well as forecasted future plans were unusual and did not demonstrate a logical pattern.

As we examined most staffing patterns of the state utilities, they seem to follow a logical pattern, despite the reality that workload varies. Whether companies see the need for fewer, more, or the same numbers of people, there are logical buildups or falloffs generally followed by some level of stability, even for just a few years. In this context, the patterns at CECONY were unusual and difficult to interpret.

We begin with a remarkably precipitous 40 percent drop in internal staffing FTEs between 2009 and 2013. In the latter two years of the decline, contracting rapidly picked up to offset some of the decline. At the time of our field work management's forecasts showed a significant rise from actual 2013 levels (30 percent on a total FTE basis). Those same forecasts, however, then showed a forecasted decline of about 20 percent through 2019.



While pieces of this plan appear to have a foundation, we could not understand the full picture of such staffing variations or the strategy driving them. Certainly one can see main replacement as a major, high-priority driver in the years ahead. However, what changes to cause the large buildup to reverse is less clear. Looking retrospectively, it is equally difficult to determine what drove a 40 percent decrease in internal FTE efforts.

8. Gas productivity measures compared unfavorably with the other state utilities, to an extreme in some cases.

Although the model showed staffing to be in line with the model's expectations, our FTEs per attribute indicator as well as our 9ers analyses both indicated outlying circumstances for CECONY. While not unexpected directionally, the magnitude and breadth of the deviations did raise concern.

The indicators of unit rates were about 40 percent beyond the Reference Utility value, while the physical productivity 9ers were more than double the Reference Utility value.

The key question that arises is whether CECONY's unique characteristics and challenges are sufficient to explain these wide deviations. They may indeed be, but the comparisons are striking enough to compel management attention.

9. CECONY's use of gas contractors, as a percent of the resource mix, was well above that of the other state gas utilities and, although forecasted to decline somewhat, was still about twice that of the others.

All of the utilities we studied face the challenge of optimizing their resource mix for their own circumstances. Although we provide data for each company, and the Reference Utility, we do not suggest that any of those data points are correct for everyone. Accordingly, even CECONY's outlier position in gas contracting is not necessarily a problem. Nevertheless, this data point is so far above all of the others that it deserves management attention and explanation.

10. The main replacement challenges faced by CECONY, which has the highest percentage of leak-prone pipe, and which operates in an extremely population-dense environment, do not seem consistent with 2014-vintage forecasts of decreased staffing between 2015 and 2019, notwithstanding the increase before 2015.

We have commented elsewhere on the main replacement challenges facing the state's gas operations, and how they are responding. Addressing paramount public safety concerns on the one hand creates tension via the many billions of dollars required to mitigate safety risks, on the other hand. The speed at which each utility should eliminate its leak-prone pipe raises strategic and policy issues that management and stakeholders must resolve. We simply note that nowhere is the magnitude of the job to be done (more than 2,000 miles) greater. Whether staffing declines forecasted by management in the years ahead are consistent with the challenge will remain an important matter for attention.

11. Given already-high levels of overtime in Gas, the forecasted increases were problematic.

Prior overtime in gas operations was somewhat high versus the Reference Utility but not especially excessive (about 20 percent). CECONY, however, projected that level to rise to 25-30 percent, or much higher than the other state utilities anticipated, and, in our opinion, too high to be deemed a reasonable resource mix.

We noted previously that high overtime can be an indicator of insufficient staffing. Looking forward, it is fair to ask that question. High overtime is also a potential consequence of an unstable resource plan, as suggested above. The combination of all of these factors should lead management to reconsider each of them carefully.

G. Recommendations

1. CECONY should establish the relationship between (a) declining staff, (b) CAIDI performance data, and (c) increasing overtime, and, if appropriate, balance and optimize them.

The data we examined give reason to question whether extreme staffing declines in electric distribution effort has triggered unintended consequences. Liberty cannot determine conclusively that staffing declines have gone or are going too far, but we do find substantial reason for concern.

It would be well to determine cause and effect here so that action can be taken if indeed staffing changes are causing other problems.

2. **CECONY should determine the reasons why its productivity in distribution and substation work compares unfavorably to the other utilities, and, if appropriate, develop a plan to improve productivity.**

We suspect that CECONY's comparatively weaker productivity in distribution and substations can be explained at least in major part by its unique circumstances. Nevertheless, the subject should be studied with an eye towards performance improvement if that is appropriate.

3. **CECONY should reevaluate plans to reduce electric distribution overtime with a specific focus on the conflicting role of decreasing staffing and the possibility of targets more aggressive than the planned 20 percent.**

We are concerned that the target is not especially aggressive but may not be met anyhow because of the staffing declines that we believe lead to higher, not lower, dependence on overtime. The relationship between staffing and overtime should be reconsidered, and a plan revised as appropriate should follow.

4. **CECONY should reevaluate its future plans for transmission/substations overtime of 25 percent, with the intent of identifying opportunities for substantial reductions.**

Planned overtime levels in these work areas should be reconsidered. At nearly double the rate of the Reference Utility, CECONY's forecasted overtime calls for justification.

5. **In its Gas business, CECONY should provide a logical year-over-year sequence of staffing, assure adequate focus on main replacements, and provide a stable staffing strategy that permits effective workforce planning, including optimization of productivity, overtime, and other key staffing-related factors.**

We have difficulty in understanding the underlying logic of CECONY's stated staffing plan, and question how it may affect the ability to effectively plan for and manage resources. The ability to create and implement a plan that meets the immense challenges of such a large effort has been underestimated by others. The consequences can be very large in terms of both the time and cost involved in putting an unfortunate legacy of the industry's past to rest. Time in this context is measured in decades and dollars in multiple billions. Both can grow rapidly and to shocking levels without stable and credible plans that are comprehensively developed and that retain the ability for adjustment as experience under them unfolds. While the issues involved go well beyond staffing, such plans do form a foundation for effective staffing and staffing-related tactics and decisions.

The most concerning element of the current plan is the declining staffing levels in the 2015 - 2019 window. This decline does not seem consistent with providing sufficient support for main replacements, allowing optimized levels of overtime, and supporting a productive workforce.

6. **CECONY should determine the reasons why its productivity in gas work compares unfavorably, to the extreme in some cases, and, if appropriate, develop a plan to improve productivity.**

We have emphasized that there may be appropriate explanations for CECONY's productivity results and, although the deviations are extreme in some cases, they do not necessarily represent poor performance. Those results do, however, create a burden for management to analyze and explain why CECONY should be looked at differently and why the large differences are explainable. Regardless of the outcome, added attention may help reduce the deviations, whether justified or not.

7. CECONY should examine its use of contractors in gas operations to assure that such high use, compared to others, is optimum.

CECONY's mix of contractors in Gas (at 60 percent), is more than twice that of the Reference Utility value. We know that CECONY's choice of work to be contracted differs from others, and the CECONY approach may be best for the Company. The large difference between the Company and others, however, merits a re-examination.

8. CECONY should reevaluate its future plans for Gas overtime of 25 to 30 percent.

CECONY's forecasted growth in overtime will put it well above all of the other gas utilities. Liberty believes the planned levels are excessive and should be reconsidered by management.

Chapter III: Process Analysis

A. Resource Planning

1. Summary

Among the New York electric and gas utility operations we studied, CECONY has the most robust Resource Planning process, organizational support, and resource planning tools. In particular, it employs the most advanced tools and information in supporting its data-driven, annual resource planning cycle. CECONY also has the state's strongest staff available to support the use of this information.

Despite these strengths, however, CECONY, like the other utilities we studied, still does not develop quantitative FTE or person-hour estimates for forecasted workloads, as it performs the bottoms-up development of work plans. Developing these estimates would enhance CECONY's resource planning process. Options include the use of historical person-hour amounts from past contracts (if the data is kept) to project unit rates, or the use of engineering estimates to quantify projected workloads at the program level.

CECONY also can improve its processes for evaluating the trade-offs between straight time, overtime, and contractors at the functional/work group level in resource plans. Management should develop resource plans that state all forecasted work for straight time, overtime, and contractors in person-hours or FTEs. CECONY could then develop its ability, using data-driven methods that compare the equivalent cost of each of these resources for accomplishing different types of work.

2. Findings

a. Overview

CECONY has a very mature and robust Resource Planning process. We found its organization support, information used, and resource planning tools much more advanced than those generally in use at the other State utilities we studied. Electric and gas capital and O&M forecasts both identify and prioritize work under rigorous analytical frameworks and with the support of structured risk analyses. Forecasts take into account appropriate considerations, which include overall guidance, past spending levels, identified future capital projects, risk-prioritization of those projects, and incremental O&M spending requests. Dedicated business finance and work planner staff support the process. They engage in the construction of resource plans by building bottom-up workload plans. These workload plans tie to capital and O&M forecasts. The electric organization and processes are more mature; the gas organization was advancing in its use of similar kinds of processes and in developing supporting tools.

b. Assessment of Key Resource Planning Elements

i. Organization

A Business Finance group provides resource planning organizational support. Business Finance personnel reside organizationally in the Finance organization. This staff group coordinates the annual process, including the implementation of top-down guidance provided to steer work during the annual budget cycle. Operations staff throughout the electric and gas operating units support work plan and budget development. Personnel have sufficient experience in the process and use of tools to meet budget and resource planning information requirements. Very experienced financial analysts and work planners provide an effective source for using and manipulating historical data and forecasts for budgets. CECONY was engaged during our study in its third annual electric planning cycle under this resource planning approach. As noted, gas operations has less experience with this approach. Its first cycle was underway during our field work. Management had begun using work planners to develop work plans and workload estimates.

ii. Information

CECONY uses sophisticated information tools and processes to analyze data relating to workloads and future budget requirements. Key resource planning information comes from a series of automated tools that include:

- Oracle financials, using the Oracle Business Intelligence reporting tool, provide extensive access and analysis capabilities for historical cost information.
    - Management analyzes the information on both functional and operational organizational bases.
- Hyperion budgeting tools, allowing planning staff to develop in depth information on costs and hours for each major function within each organization unit.
    - These tools support integrated views of costs and workloads throughout the budget development cycle.
- An application provided by VEMO (a leader in the field), supporting headcount and attrition tracking by region and organizational unit.
- The Paybud system, supporting cost workload projections for integration into budget forecasts.

Notably, management develops a wide array of information, and integrates it in developing work plans and accompanying budget requests. The information management uses in this regard includes:

- Tracking and forecasting of all work on the basis of dollars.
- Units of work available for many types of internally assigned work (*e.g.*, contractor work units available for some types of capital and most types of O&M work).
- Detailed breakdowns of hours and costs for internal resources (straight time and OT)
- Information on available time from the Work Management System.
- Projections of staffing workload levels for internal resources based on workload estimates.
- Use of attrition forecasts in determining needed staffing levels.

CECONY follows the prevailing practice among the utilities we studied of using planning information for work to be performed by contractors that is largely limited to cost data. Management does have access in some cases to unit-based information for work assigned to contractors. CECONY does not, however, track historical workloads in either person-hours or FTEs. Management does not develop projections of contractor workloads from unit rates and forecasted in person-hours, which distinguishes contractor forecasting from the methods used to develop internal workload forecasts. In providing data for our study, CECONY was able to use the expertise of engineering estimators to provide estimates of historical electric and gas contractor hours. The historical estimates provided to us used average labor hours per dollar contracted for different types of work, and applied these average unit rates to contractor expenditure levels.

CECONY's comparably strong performance in data collection and use did not leave it completely free of problems, however. We encountered difficulty in several areas. The 2013 payroll loadings provided by management for gas operations were very low by comparison to the other operations we studied. CECONY also could not separate overtime from straight time hours and dollars at the functional level in electric or gas operations from 2009 through 2012, and had the same difficulty in gas for 2013. Those difficulties appear to have resulted from transitional issues that no longer exist, but point to the need for management to ensure that it can track for future use information at a more disaggregated level.

iii. Processes and Tools

CECONY operates a mature annual resource planning budgeting cycle whose uses, processes, and information sources all those involved understand well. The cycle begins in late spring under top-level guidance addressing financial constraints and key issues or initiatives. Initial development of work plans and budgets occurs through June/July of each year. Then come a series of presentations, reviews, and challenges, during which budgets at the lowest organizational levels undergo increasing levels of roll-up to higher organizational levels. The iterative processes used during this part of the cycle give line management the opportunity to make a case for funding changes and increases. These cases become especially important when exceeding the guidance under which initial development occurred, and when amounts exceed past spending levels. The process culminates in November/December, with presentation for board of directors' review of consolidated, vetted, and management-approved resource plans and budgets

CECONY's very robust resource planning process employs the most advanced tools and capabilities we observed, including those of the other, larger state utilities we studied. Characteristics of this advanced approach include a number of notable features, among them:

- Capital forecasts (both electric and gas) identify and prioritize work under rigorous analytical frameworks.
- Capital spending frameworks and risk analyses (addressing multiple categories; *e.g.*, mandatory work, customer work) showed consistency across businesses and functions.
- Gas operations uses it MRP (main replacement program) and Stoner model to set capital priorities; electric operations uses risk-based analysis to do so.
- O&M spending forecasts result from a less rigorous analytical process, tending to be more incremental, and based upon historical spending levels.
- Forecasts take into account top-down overall guidance, past spending levels, identified future capital projects (on a risk-prioritized basis) and incremental O&M spending requests.
- Gas and electric operations look at priorities at the project (capital) and program (O&M) level for each division of the company.
- Throughout the year, senior management uses a "Gatekeeper" monthly review process to track whether current year budgets are on track, and to adjust forecasts.
- Tracking provides input for adjusting future-year forecasts.

- Forecasts are developed from the bottom-up, using the tools cited in the resource planning information section to develop work plans (stated in person-hours), and then converted to cost estimates using work-specific historical unit rates.
- An exception exists for forecasts of contractor resources, which rely on projecting dollar-based expenditures, instead of developing person-hour/unit rate-based forecasts like those developed for internal staffing forecasts.
- Forecasts also allow for productivity gains and take into account anticipated cost increases and/or inflation.

iv. Resource Planning for Overtime and Contractors

CECONY resource planning for overtime relies heavily upon historical use for certain functions and plans reflect past usage levels. Planning considers qualitative guidelines, with 10-12 percent considered acceptable and used in planning estimates. Where past levels have been excessive, plans are put in place to reduce overtime use. Despite the existence of a planning basis for overtime and the development of plans to limit it where high, our study nevertheless raised concerns about resulting overtime levels, addressed in the sections of this report that deal specifically with overtime. In addition, we did not observe the existence of any studies that examined the cost-effectiveness of overtime versus other staffing resources (straight time or contractors) as part of resource planning.

Management cited a number of general standards or practices regarding the use of contractors and they vary by work function. Examples include:

- Contractors perform mandated electric work (interferences, system restoration, and commission-mandated inspection programs).
- Capital work only goes to contractors after fully loading in-house crews.
- Contractors perform all substation civil/steel work.
- Gas operations management seeks to maintain contractor workload at constant levels throughout the year, to ensure continuing access to contractors.

Resource plans and annual budgets identify future contractor workloads on a total dollar basis only. This cost information includes all labor, materials, vehicles, and administrative costs. CECONY keeps historical information on contractor-performed work only based on expenditures; it keeps no information about hours consumed to accomplish capital and O&M work. In contrast to its budgeting for internal resources (straight time and overtime), management does not build contractor budgets from person-hours or FTEs required for functional work requirements.

Management has performed studies of specific functions and capital projects to determine types of work to assign to contractors in plans and budgets. We did not, however, observe any structured or ongoing analyses seeking to determine optimal contractor use.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Resource Planning criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The organization for coordinating and supporting manpower Resource Planning should be treated as a specialized activity, with dedicated resources.
2. Complete and accurate information about units of work performed and costs by work function, by region, and by staff resource type should be available.
3. Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.
4. Overtime should form a clear part of the process of identifying required resources, and should rely on an analytically supportable method for determining optimum levels for each work function.
5. Contractor use should form a clear part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

1. CECONY leads the state in its approach to and its processes for resource planning.

Among the New York electric and gas utility operations we studied, CECONY has the most robust Resource Planning process, organizational support, and resource planning tools. In particular, it employs the most advanced tools and information in supporting a data-driven, annual resource planning cycle. CECONY also has the state's strongest staff available to support the use of this information.

2. Gas operations lags electric operations in the maturity of its approach to resource planning, but is making appropriate progress in closing the gaps.

The electric organization has more experience, and now uses the full range of information and tools available to it to develop its work plans and budgets. However, we found the gas organization resource planning in the early stages of implementation at the time of the study. At that time, electric operations was in its third cycle of using the resource planning approaches and tools described in our analysis. Management had fully implemented and staffed the work planner organization. Gas operations had just begun to staff and develop the work planner function, and was just in the first cycle of resource planning using the approaches developed by electric operations. The gas organization was also early in the process of training personnel and implementing tools and the organization, processes. The gas organization tools were not as fully developed as those of the electric operations we studied.

3. Like the state's other utilities, CECONY's reliance on cost data as a measure of contractor work load does not optimize the process of balancing resources.

Identification of contractor workloads (historical and forecast) on a total dollar basis provides insufficient information for effective resource planning. Historical information for work done by contractors, based only upon expenditures, does not provide sufficient information for understanding past capital and O&M workloads. If forecasted contractor workloads cannot be understood in terms of person-hours or FTEs, it is not possible to compare the amounts of work forecasted for contractors to work forecasted for internal resources (straight time or overtime) and effectively make decisions for balancing these resources.

Liberty also considers the collection and use of such information important in managing contractor work.

4. CECONY was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use at the functional level.

Effective use of overtime and contractors at the functional/work group level in resource plans cannot be accomplished without ongoing, data-driven analysis of how the results of using overtime and contractors compare to the use of internal staff, and to each other as well. Use of one-time, limited scope studies for accomplishing these types of analyses and reviews during the resource planning process is not sufficient for determining the most effective balance of internal staff, overtime and contractor resources for each type of work. Resourcing decisions, based on formal, consistent development of staffing resource plans linked to budget requests would improve management's understanding of overall workload requirements and allocation of staffing resources.

Budgets developed for each organizational unit based upon resource plans that quantitatively define all forecasted work for straight time, overtime, and contractors, stated in person-hours and FTEs of underlying workload, would provide a better understanding of the entire scope and amount of work to be accomplished. Management could then develop ongoing data-driven analysis methods for comparing the equivalent cost of each of these resources for accomplishing different types of work within this resource plan.

5. CECONY could not separate historical information between overtime and straight time.

In the data provided for the study, management also could not separate overtime from straight time hours and dollars at the functional level in electric or gas operations for portions of our historical period (2009-2012). Management needs to verify that those data capture difficulties no longer exist.

4. Recommendations

1. CECONY should expand measures of contractor work load to include FTE- or person-hour based values.

As a first priority, CECONY should develop quantitative FTE or person-hour estimates for forecasted workloads within each of the major functional programs and organizational units in electric and gas operations. These workload person-hour/FTE forecasts of the amount of work to be performed by contractors are central to understanding total work proposed during the bottom-up development of work plans that feed budget requests for each organization. The resource planning process can be enhanced by developing these estimates, either by using historical person-hour amounts from past contracts and applying the project/program unit rates for the work or by using engineering estimates to quantify these workloads at the program level.

2. CECONY resource plans should include data driven analyses that help management evaluate the trade-offs for overtime, contractors, and internal staff at the functional/work group level.

As part of the annual resource planning process, resource plans developed should quantify all forecasted work for straight time, overtime, and contractors in person-hours and FTEs. The annual process should be formalized to require each organizational unit to develop these "total workload" bottom-up workload forecasts, linked to the budget expenditure requests. Resource plan analysis should evaluate the trade-offs for overtime, contractors, and internal staff at the functional/work group level.

Management should develop methods for comparing the equivalent cost of each of these three resource types in accomplishing the different types of work for its functional work groups. Meaningful comparisons of the equivalent cost of each of the three types (on a work type by work type basis) will enable a more informed resource plan for optimizing straight time, overtime, contractor mixes for each organization. Such comparisons can also be used to evaluate requests for changes to internal staffing levels.

3. CECONY should continue to aggressively enhance gas operations' resource planning tools and methods, establishing clear schedules and completing them expeditiously.

Much progress has been made, with more planned. Ensuring steady progress along the lines that gas operations has identified promises to bring resource planning to a level commensurate with that of electric operations. Needed progress includes fully staffing the work planning functions and Business Finance staffs, and developing the same types of tools and analysis capabilities for gas functions already widely used in the electric organization.

4. CECONY should confirm that the historical inability to separate overtime and straight time has been eliminated.

The difficulties Liberty observed appear to have resulted from transitional issues. Management should verify that it can track overtime use information for work functions at a more disaggregated level within the organization.

B. Work Force Management and Performance Measurement

1. Summary

a. Work Force Management

CECONY's Work Management systems, processes, tools, and structure for electric distribution operations and for electric transmission/substation operations occupied a "best-in-state" position, and meet the criteria that Liberty applied in examining their sufficiency to support staffing planning and execution. Management was working toward bringing Work Management for gas operations to a similar state. Efforts include organizational and process changes planned to occur over the next few years. Management should subject plans for gas operations upgrades to detailed plans and schedules. Such plans should address organization changes, inclusion of capital work, centralized scheduling, selection of support systems with appropriate levels of automation, structured and comprehensive collection of performance data, integration with other CECONY and affiliate information systems, and ultimately appropriate formal training for users upon new system and tool initiation.

b. Performance Measurement

Liberty identified no material improvement opportunities in performance measurement. Management had a strong system of work unit measurement; it led the New York energy utility industry. We found management using work measurements to inform workload projections and performance and to inform staffing decisions. The measurements taken extend to a broad range of functional areas and work types.

2. Findings

a. Work Management Systems

CECONY, the largest and most organizationally complex utility in New York State, used separate Work Management Systems for its electric distribution and for its transmission and substation operations. While separate, both integrated with other systems and tools that support workforce management. Both had been closely linked with other corporate systems (*e.g.*, a variety of accounting and HR-related ones) now considered to be part of an integrated Work Force Management approach.

The electric operations Transmission and Substation ("T&S") group used a tool known as Maximo Asset Management. T&S used this industry-standard system since the 1990s. CECONY belongs to a nearly 150-member utility user group that routinely shares information, ideas, problem solutions, and provides other support to members. Other large New York utility operations use it as well. National Grid, KEDLI, KEDNY, and the New York Power Authority are listed among the utility user group members. The T&S group kept current with the latest upgrades by the vendor, and was active in both the state and industry support groups. Electric T&S Operations had fully integrated Maximo into its operations and with supporting systems. It created a separate group to support Work Management and the Maximo tool.

A product of IBM, Maximo operates as an asset management life cycle and workflow process management system. Maximo allows for management of all asset types on a single, software-based platform. Its information capabilities offer for each asset type comprehensive data information about configuration, relationships to other resources, condition, locations, and work processes needed to optimize their performance. Its capabilities allow the use of this information to provide for planning, scheduling, control, audit, and compliance capability. Maximo enables development of key performance indicators to monitor asset conditions, and trigger action based on changes. Key processes can be created assigned, monitored, and reported on. These processes include work orders, service tickets, purchase orders, allowing status tracking from process inception to completion.

Electric distribution operations did not have an integrated Work Management System until recently, when it adopted the ARM (Asset and Resource Management) system offered by LogicaCMG. The adoption of distribution operations Work Management System followed a recommendation by Liberty in its 2009 management audit. That audit found that, while processes were in place, no single integrated system tied them together. Logica, a U.K.-based, multinational IT and management consulting company, was acquired by Canadian-based CGI Group in 2012. CGI provides asset, resource and workforce management systems for 60 major North American electric utilities.

The Distribution operations group was completing the integration of ARM into its Work Management system during our field work in 2015. Completion work sought to integrate the LogicaCMG ARM suite fully into the group's Work Management process, and into CECONY's corporate enterprise system. Distribution operations supported system use and maintenance through creation of a dedicated Work Management organization.

The ARM suite provides CECONY with an enterprise-wide, integrated solution that includes the systems and processes designed to manage physical assets and human resources optimally. ARM's resource management capability provides a structured means for streamlining processes, managing all of the elements of work streams, resource scheduling, and controlling operations costs. ARM's Asset Management component supports comprehensive management of manage maintenance and regulatory compliance activities, optimizes asset useful lives and system reliability, and provides performance and analysis reporting capabilities.

Despite their use of two different support tools, both distribution and T&S had nearly identical Work Management organizations. Both employed comparable underlying Work Management processes. The gas operations Work Management system had yet to reach an integrated state. The processes and tools used during our study dated back to the 1980s, designed principally to support maintenance work. For example, maintenance crews had mobile data terminals in their vehicles, while crews working on capital work did not.

Gas operations historically addressed work force management differently from electric operations. Maintenance activities continued to consume the bulk of gas operations' budget, until the past few years. Improved natural gas availability, prices, and conversion incentives had produced capital work associated with system growth, as had accelerated main replacement work. Growing capital work requirements led management to recognize the need for enhancing its gas Work Management organization, system and tools.

Most gas operations Work Management activity depended on manual processes and activities. In mid-2015, the group began to make organizational changes to support Work Management. Capital projects had been scheduled and managed in the field, not by a central group. The tools used by gas operations comprised a mix of data base applications, manual processes and Microsoft Office products. They did not operate on an integrated, enterprise basis. Management had established a project to develop a new "Gas Work and Asset Management System."

The goal was to standardize gas work processes, improve work scheduling and prioritization, provide a single location for work and asset data, provide an integrated view of financial and operational data, generate more effective trending and analysis, improve operational efficiency, provide more accurate, timely information about work flow and status, and better support integrity management regulations. The schedule for the new system contemplated a total expenditure of about $110 million, under a multi-year process, ending with implementation in 2020:

- 2016 –Data conversion and cleansing
- 2017 through 2018 – System development
- 2019 through 2020 – System implementation.

b. WMS Documentation and Training

Liberty also examined the nature and quality of documentation of Work Management processes. For electric distribution and T&S operations and for gas operations, Liberty found that training materials diagramed the Work Management processes common to all three areas. With respect to tools, electric distribution and T&S operations provided training for their respective systems. This training occurred mostly through on-line “e-Learning” modules. CECONY developed a detailed matrix of the training modules required for all employees involved at any level with their respective Work Management systems. Employees’ training records were automatically updated when these modules were completed. Gas operations was not using a consolidated document or provide a single training course for the few tools used to support the Work Management system in Gas operations. Training was on-the-job, without formal records.

c. Program and Project Scheduling

One of the key attributes of Work Force Management as it concerns staffing is the use of processes for long- and short-term scheduling of resources. Electric distribution operations employed sufficient processes for long- and short-term schedules, applying them to both capital and maintenance work. Distribution operations used ARM to develop long-term schedules for maintenance programs and for all but the largest capital projects. MS Project provides the system for scheduling the largest capital projects. ARM provides the tool for scheduling short-term projects.

Electric T&S operations used Maximo to schedule maintenance work. MS Project was used for capital projects. EPLAN Electric P8 supports short term scheduling and work orders. This electrical engineering design software program supports project planning, documentation, and management. Gas operations performed capital and maintenance work scheduling under a Gas Work Tracker application that used an intranet-based approach, supported by a suite of Oracle applications.

d. Program and Project Monitoring

We also examined the nature of project and program monitoring and feedback. Electric distribution operations held regular, bi-weekly meetings with the Electric Governance Committee (corporate management) to review project progress, and discuss deviations from planned budgets and schedules. The ARM system tied to CECONY accounting and financial reporting systems, enabling regular and tailored spending reports as needed.

Project Managers met bi-weekly with the Corporate Governance Committee (separate from Distribution). Maximo tied as well to accounting and financial reporting programs to support report generation. Gas Operations conducted monthly meetings to review the entire capital project budget with corporate officers and appropriate General Managers. Discussions included both in-progress and planned projects, using a detailed line-by-line review. An Oracle-provided database supported the generation of budget reports.

e. Program and Project Management

Liberty also inquired into the existence and use of a defined Project Management function for key projects and programs. Both Electric distribution and T&S operations had formal Project Management organizations. A General Manager headed each organization. Both groups used employees assigned full-time as Project Managers, and required these managers to obtain (within 12 months of coming into their group) designation as a Certified Project Manager through the Project Management Institute. The “PMI” has operated for nearly 50 years, and is the world’s leading not-for-profit professional membership association for the project, program and portfolio management profession. The PMI has globally recognized standards and certifications, offers resources and tools, and provides professional development courses. The two electric operations groups drew project managers from a variety of backgrounds, which included engineering, construction, and finance. Guidelines for project managers set clear, documented delegations of authority regarding supervision, expenses and schedule decisions.

Projects or programs requiring formal Project Management included those exceeding $5 million and others that management determined to be of public significance or impact.

Five separate descriptions existed for electric project managers. All used the same title, most had the same duties and responsibilities, and all appeared to be at the same salary grade.

Gas operations did not adopt a formal Project Management organization until May 2015. Gas project managers existed, but operated from within the line organization. In May, 2015, Gas operations named a General Manager, and the new group was staffed. No date was given for when the group was expected to be fully functional. Visibility and risk were the criteria for assigning Project Managers to gas projects. Main replacement projects, new regulator stations, and gas transmission line projects provide examples of such projects.

f. WMS Treatment of Overtime and Contractors

Liberty also examined how Work Management systems and tools considered overtime and contractor policies use. For Electric distribution and T&S operations, both Work Management systems and the processes they support fed into other systems used to determine scheduled and actual overtime by employees. Similarly, contractor policies governed the scheduling of capital and maintenance work for both distribution and T&S budgets and schedules.

For Gas operations, prior to the establishment of the Project Management group in May of 2015, decisions regarding contractor policies were based on the type of work to be done. Overtime was not an issue. Once fully staffed, the new Project Management group will be responsible for providing additional guidance to management on these issues.

Liberty sought to determine the degree to which the Work Management System captured performance data not just for internal, but also contractor forces, and whether management used such performance data for resource planning. For distribution and T&S operations, both the LogicaCMG and Maximo systems captured performance data, which management used for internal and contractor evaluations. For Gas operations, some data was collected, but not at the granularity that existed for by the Electric Work Management systems. For example, contractor data was not broken down by individual contractor. Gas Operations captured production data manually for those without MDTs and for contractors, and clerks entered it into corporate data systems manually.

g. Quality Assurance and Control

Liberty also examined how management structured and operated Quality Assurance and Quality Control processes within its Work Management processes. Distribution operations and T&S operations made QA and QC processes part of the Work Management process, but located them within the Construction Department. In mid-2015, a CECONY organization change produced an overarching QA Team under the leadership of a Director–Compliance Management. This team will support electric, gas and steam organizations, and will provide that support in the areas of compliance with regulatory, environmental and health issues, safety and engineering practices. Its responsibilities will include documentation as required. The QA functions currently performed by the Electric Construction groups will fall under this newly formed team. A General Manager – Quality and Compliance reports (separately from engineering and construction) to CECONY's Senior Vice President – Gas Operations. A Quality Control group existed to ensure consistency and documentation as required by the regulations concerning natural gas. Other duties included incident reviews, field inspections, and records review.

h. Performance Measurement

Management conducted a well-developed, mature program of work measurement in electric operations. Forecasted units of work formed the basis for staffing planning. Measured units of work existed for most functional areas, including distribution capital, distribution O&M, transmission and substation capital, and transmission and substation O&M. There were O&M work units for most work. While distribution engineering did not have measures in place during Liberty's field work, it was developing them.

Gas Operations also employed a mature system of work measurement. The Cost Management Group collected and compiled individual measures for various capital and O&M activities on division-wide and on total company bases. The Work Management System derived the relevant units and hours and costs came from the Financial System. All the data fed into an Oracle-based system, which generated reports.

At a higher level, management used a Key Performance Indicator (KPI) system that applied 25 capital and 12 O&M KPIs. Drilling further down into the organization, at the officer and department-head level, CECONY employed a cost management index KPI, which included several different measures, including a productivity measure.

The Company has a history of using work measurement to calculate and track productivity through an integrated work management system. It was using "Compatible Units," standardized work units, and work components, applying standard hours for each one. Management compared standard with actual hours to measure and trend productivity indices.

The use of established productivity data with forecasted units of work to estimate the required staff size operated as the principal method for establishing staffing needs. The process of relating units of work performed to hours required began in the planning stages, and carried through with measurements made up through work completion. This method differed from practice among the other utilities we studied, and constituted a particular CECONY strength.

Management compared expected volumes of work to existing capability available to do that work, applying reasonable time expectancies per unit of work. At a high level, established KPIs addressed both O&M and capital work. The newer LogicaCMG ARM system offered could not generate KPIs related to productivity during Liberty's field work, but that capability was being addressed at the time.

Liberty observed monthly reports containing detailed information on the number of units, cost per unit, actual hours per unit and productivity. Productivity reports issued at the work- center, manager, supervisor, and the crew-lead levels.

3. Conclusions

Liberty based these conclusions on our evaluation of practices and processes against specific Work Management and Performance Measurement criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These seven criteria are:

1. The systems and tools used to support Work Force Management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.
2. Comprehensive, adequate documentation of the Work Management processes, systems and tools should exist and be supported by appropriate training.
3. Management should have and regularly employ well defined processes for the short- and long-term planning and scheduling of capital and O&M.
4. Management should apply an appropriate approach, resources, and methods to program and project management.
5. Systems and tools should capture and enable the analysis of data respecting use of all types of staffing resources.
6. There should exist an appropriate approach to and organization for Quality Assurance and Control.
7. Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness resource use and balancing.

1. CECONY employed an effective electric operations work management approach, systems, processes, and tools; its plans for bringing gas operations to a comparable state should, if implemented timely and effectively, prove similarly successful.

Those approaches applied by electric distribution and by T&S operations met the criteria that Liberty applied in evaluating them. We found only one minor concern, which was the existence of five separate job descriptions for the role of Project Manager, which have only minor differences among them. A single job description for a project manager should suffice for not only distribution, but also serve the T&S and gas groups. Management advised that it expected that the differences concern variations in responsibilities for project managers serving differing types of projects, but would confirm this to be the case.[5] On the gas side, management recognized the need for material improvement, committed to providing it, and was operating under a schedule that called for full implementation of an enterprise-level work and asset management system by 2020, using electric distribution operations' LogicaCMG ARM suite as a model, tailored to the unique requirements of the gas business.

Since completion of our field work, management committed to the development of a comprehensive Gas Operations Work Management system, which will bring needed improvement

[5] Management provided that confirmation in its August 2016 comments on a draft of this report.

to the gas business. Management needs to follow through on plans and schedules to develop its new approach, system, and tools, as described in its recent rate filing.

2. **Electric operations performed scheduling effectively, but gas operations failure to do so for capital work scheduling was not optimum.**

Liberty also believes that gas operations Work Management needs to centralize short-and long-term capital work scheduling. Scheduling capital work in the field rather than centrally, can lead to inefficient use of staffing.

3. **Electric operations monitored program and project performance effectively; gas operations was poised to do so, but awaited augmentation of its capabilities as part of its development of its new WMS.**

The gas operations monthly review process needed to be supplemented through capabilities to be developed as part of the new gas Work Management System. Line-by-line monthly review has value, but substantial growth in capital work calls for more. Liberty reviewed the annual reports generated by the process. They contained significant cost detail, but did not address the staffing and productivity assumptions and actual performance in a manner that isolated their contribution to cost variances.

We found sound on-line training modules developed by the electric distribution and T&S operations groups for their respective systems, and effective matrices developed to identify which employees require training on which modules. They should serve as models for the Gas Operations group to adopt.

4. **Electric operations employed an effective approach, structure, and resources for project management, but gas operations needed to complete plans to enhance project management.**

At the time of our field work, gas operations did not have a clear schedule for completing its project management program changes.

5. **Documentation and training were appropriate in the case of electric operations, but gas operations had not taken a similarly comprehensive approach.**

Gas operations historically took a much less formal approach to documentation and training.

6. **Both electric and gas operations appropriately located and addressed the roles of quality assurance and control.**

Management has taken several steps to enhance its QA/QC in areas material to work management.

7. **CECONY occupied the leading position among the State utilities we studied with respect to performance measurement.**

Management had been systematically performing and applying work unit measurement for about five years. Work measures existed for both O&M and capital work. Existing measures addressed electric distribution, transmission and substation and gas distribution. Management calculated productivity from these measures. These measures informed workload projections and performance. Work measurement provided the basis for productivity measurements. Productivity data and the forecasted number of units provided a basis for projecting staffing needs from project planning to completion. Work measurement was a primary basis for electric distribution staffing plans. Forecasted volumes of work units and their associated productivity offered the starting point for staffing planning.

Management collected and maintained work measurements for most functional areas, employing a broad range of work units for O&M and capital work. Electric distribution, electric transmission and substation, and gas distribution employed work units covering most work. The only exceptions were areas of new technology where work units are not yet developed and established. Electric distribution engineering did not have any measures in place, but they were being developed.

Management collected data at all work unit levels, and issued monthly reports based on that data. The reports included detailed information on the number of work units, costs per unit, hours per unit and productivity. The information was distributed to all pertinent levels.

4. Recommendations

1. CECONY should establish comprehensive detailed plans, and set firm, detailed schedules to complete the upgrade of its Work Management System for Gas Operations.

Management should do so as generally described in its recent rate filing. The plans need to include organizational changes, adoption of full Work Management processes for capital work, selection of a Work Management support system, automation of these processes wherever possible for the collection and use of performance data, and training modules for all users of the new system.

The new Gas Operations Work Management System must integrate with other databases in order to yield usable information on the progress of capital projects and maintenance plans.

2. Gas operations should also centralize as many scheduling functions as possible, including all capital work.

A single scheduling source should contribute to providing appropriate staffing resource identification and assignment to work.

3. Gas operations should identify documentation and training needs that match its plans for its new WMS.

After selection and specification of the Work Management System, gas operations should begin developing training modules. The training modules developed for the electric operations systems are comprehensive and self-paced. They use e-Learning rather than classroom environments. Liberty considers them good models for gas operations to use in guiding development of its training approaches and materials. Electric operations also developed a matrix of which employees and positions require training, and to what “depth.” A similar training structure should be developed for the gas Work Management training.

C. Internal Staffing

1. Summary

Management performed effectively in of planning for internal staff needs based on long standing and well understood practices and procedures. The Company, not surprisingly, as the State’s largest, and one of the country's largest integrated utilities, also employed sophisticated tools for monitoring and managing attrition and retirement impacts.

2. *Findings*

a. General

CECONY operates by far the largest gas and electric utility in State of New York and one of the country's largest as well. Its internal staffing included about 10,900 of the over 13,000 employed by the total enterprise, Consolidated Edison, Inc. (CEI) of which it formed part. Electric and gas operations, excluding shared resources, totaled almost half of the entire CECONY work force (over 5,200). Other CECONY operational groups included Central Operations, Customer Operations, and Environmental Health and Safety. These other groups housed the balance of CECONY's work force. Management divided operations into multiple, geographically oriented regions. The size of the work force and its importance to the safe and reliable operation of the city's electric and gas networks and to the State's (and country's) economy makes the need for effective internal staff planning, training, development, and acquisition a high priority.

Internal staffing planning at CECONY resulted from a multi-phase process conducted as part of the annual budget cycle. Several other ongoing activities, studies, and analyses supported the planning process. Planning began with an analysis of prior year forecasts, rate agreement delimiters, and existing and proposed long-range forecasts. Additionally, "staffing guidance" went to each organization, driven from factors such as current staff levels, forecasted attrition (*e.g.*, retirements, transfers, terminations). Liberty requested and reviewed an example of this "guidance." It included a five-year forecast of voluntary and involuntary turnover and transfers, projected retirements, hires and transfers in, and end-of-year budget requests. It encompassed the entire company, not just Operations, and provided detailed data in the noted categories down to major organization units in each region or by function (*e.g.*, engineering and planning). Examples showing the detail provided include Brooklyn and Queens Subsurface Construction and or Manhattan's District 2 Underground. The data did not provide status or forecasts at the job classification level, of which there were well over 100 in electric operations alone.

b. Process

Internal resource planning occurred as part of the overall, annual resource planning process. As a first step in the preparation of long-term internal staff projections, management developed a work plan displaying mandated work, operational requirements, and strategic initiatives. This work plan derived from the development of work volumes. CECONY determined these volumes by forecasting the requirements of programs and projects. Management also indicated that it identifies productivity savings, and process or technological changes that might allow it to perform work more efficiently.

After completing work plan development, management prepared annual and five-year resource plans. They identified internal staff, support departments (e.g., Construction), and contract labor. Each line organization determines the resources needed to execute the work plan. A Work Force Planning Department (operating within Human Resources) worked with the line organizations over the course of the year in several areas. Relevant here is support in developing and refining staffing budgets to achieve long-range resource plans. This Work Force Planning Department worked with numerous individuals within the line organizations including Section heads, workforce managers, and cost management staff.

Management began to use five-year staffing plans in 2011. Their initiation coincided with the implementation of Oracle, the Company's new financial system. Prior to 2011, long-term resource planning employed a shorter future time horizon. Two other systems (in addition to Oracle) supported internal staffing planning – – Paybud and the VEMO application. Paybud, the Company's payroll application, supported budgeting the staffing needs and labor costs of the five-year plans.

CECONY used an application provided by VEMO, a third party as a planning tool. CECONY's use of the application included historical data. Management used it to support and report on projected attrition, retirements, and terminations. It also provided information on regular and overtime hours and costs. VEMO has filtering capabilities that can provide information on work group, position type, age, and tenure bracket. Management used VEMO only for internal resources. Corresponding contractor resource information came from sources at the local level.

VEMO supports the talent management and acquisition functions of large employers with applications and consulting that address: (a) forecasting and prioritizing demand, (b) analyzing retention, attrition, and retirement, and other factors, and (c) prioritizing workforce gaps by impacts on business strategy. VEMO works with customers it describes as ranging from global to medium-sized companies to configure customized workforce planning models to meet requirements and forecast workforce future.

The Workforce Planning Department used Paybud and VEMO, in conjunction with information on existing staff levels to examine line organizations' long-range plans to develop an initial hiring plan to meet long-range needs.

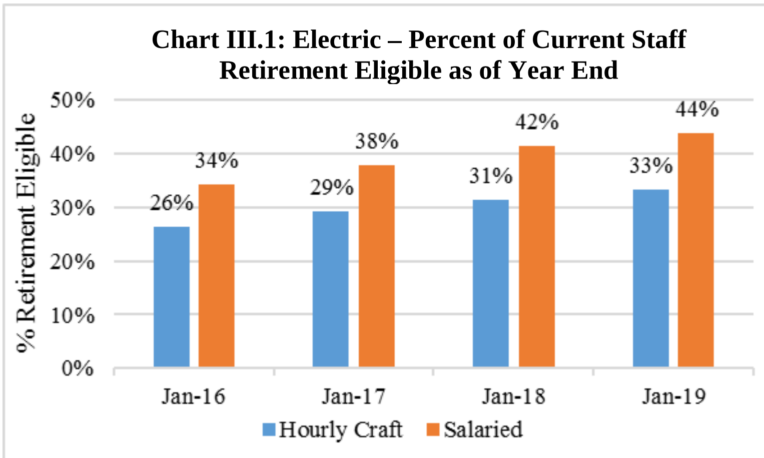
The Work Force Planning Department historically consisted of a single individual, although others reportedly supported that individual as needed. Management more recently placed the function under its Learning Center, subsumed within an analytics group. The line organizations, with Human Resources continuing in its supporting role, provided the driving force behind development of long-range internal staffing plans. The CFO reviewed the final forecast prior to circulating it to other corporate officers and executives. That circulation essentially kicked off the annual and five-year planning processes. Liberty reviewed the 2014 communication from the CFO to other officers. The content reflected a fairly comprehensive, standard set of financial planning guidelines and assumptions.

Both electric and gas operations used the same processes and tools to develop long-term internal staff forecasts. CECONY did not plan or see a need for changing organizational responsibilities, processes, or procedures underlying the planning or execution of internal staffing strategies.

c. <u>Demographics</u>

Concern about the rate at which the utility workforces is "graying," or getting, on average, uniformly older, has been an industry-wide issue for many years now. The phenomenon threatens the loss of skill sets earned over many years, if not decades, that become increasingly difficult to replace as retirements pick up steam. Utilities not only face the loss of resources with traditional core competencies, but also must address the dual challenge of replacing core competencies and attracting additional, younger staff with new skill sets in areas such as data analytics, advanced digital technologies, cyber security, and business development. A simultaneous, slow drain of critical skills and the need to attract new skills cannot be easily or fully addressed by the use of contractors.

CECONY is not immune to this issue. The next figure shows that increasing numbers of electric operations employees will become retirement eligible through 2019.



The next table shows that these percentages reflect large numbers of employees.

Table III.2: Electric – Number of Current Staff Retirement Eligible as of Year End

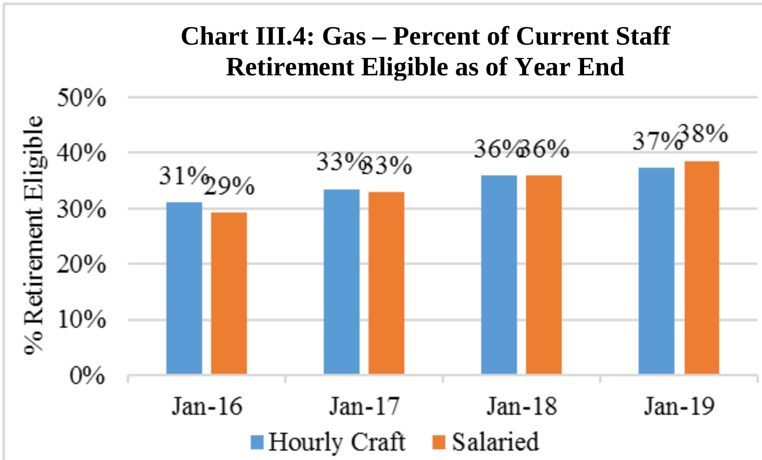
Type	Retirement Eligible			
	1/1/2016	1/1/2017	1/1/2018	1/1/2019
Craft	981	1,086	1,171	1,237
Salaried	673	742	815	860
Total	1,654	1,828	1,986	2,097

Typically, the number of employees retiring in a given year reflects a very low percentage of those eligible. It therefore becomes necessary to combine eligibility and actual retirements to get a quantitative measure of future resource losses. The next table shows that rates of actual retirement by CECONY employees remained relatively flat through 2014. Nevertheless, even a flat rate translates into increasing employee loss as eligibility rates increase.

Table III.3: Electric – Rates of Actual Retirement

Type	2009	2010	2011	2012	2013	2014
Craft	8%	11%	8%	15%	8%	9%
Salaried	6%	8%	10%	14%	10%	8%
Total	**7%**	**9%**	**9%**	**15%**	**9%**	**9%**

The next figure and table show similar trends for gas operations employees. Note that the 2012 retirement percentages stand out substantially from the other years. Often such an anomaly results from a planned force reduction. None was reported, but management did experience what it termed an "unexpected" high rate in 2012, which included a significant labor dispute. In any event, subsequent year rates returned to and remained at the recent historical levels. The spike, however, underscores the importance of ensuring that critical skill sets can survive in sufficient numbers even when stressed by non-recurring events.



The next table shows the numbers of employees underlying these percentages.

Table III.5: Gas – Number of Current Staff Retirement Eligible as of Year End

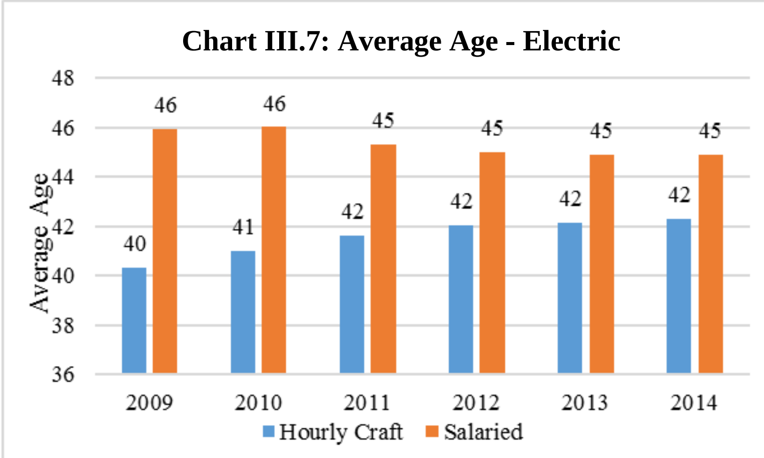
Type	Retirement Eligible			
	1/1/2016	1/1/2017	1/1/2018	1/1/2019
Craft	338	364	390	405
Salaried	189	213	232	249
Total	**527**	**577**	**622**	**654**

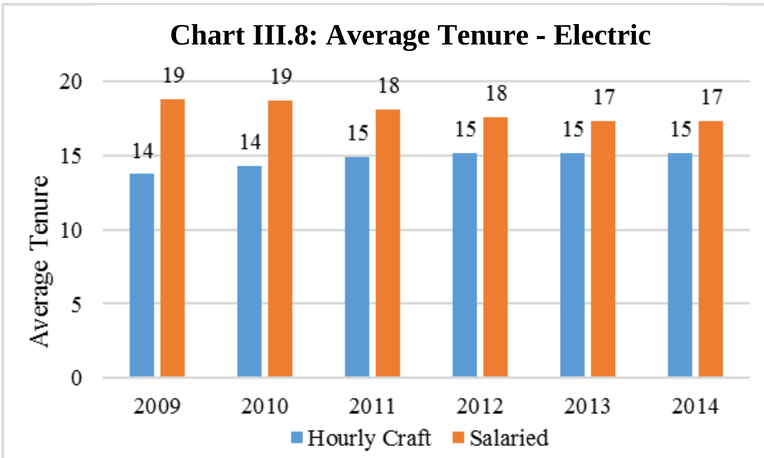
The next table shows CECONY gas retirements expressed as a percentage of retirement eligible employees.

Table III.6: Gas – Rates of Actual Retirement

Type	2009	2010	2011	2012	2013	2014
Craft	6%	13%	11%	21%	8%	10%
Salaried	7%	12%	11%	14%	13%	11%
Total	**6%**	**12%**	**11%**	**18%**	**9%**	**10%**

As with the electric side of the business, 2012 retirement percentages stood out, but substantially returned to the historical levels of the other years. As noted above, management did experience a significant labor dispute in 2012. As retirement eligibility increased, average age and tenure remained fairly stable or dropped marginally. The next two charts show that between 2009 and 2014 the average age of salaried employees in electric operations decreased by one year and the average the tenure by two years. Craft resources increased, but only slightly, in average age and tenure.





Gas operations employees (see the next two tables) decreased in average age and tenure between 2009 and 2014. Salaried gas staff experienced a marked decrease.

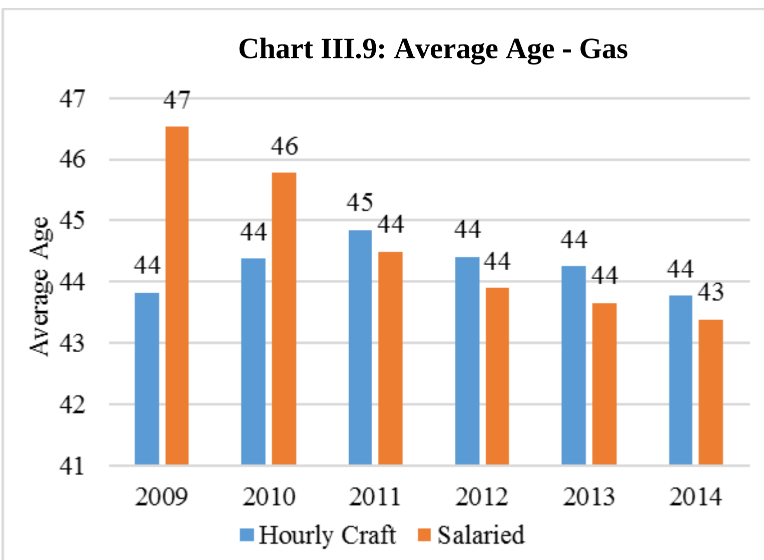
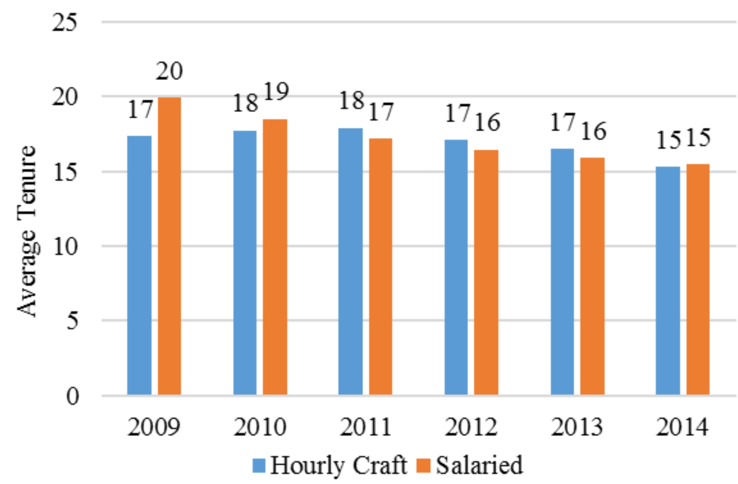


Chart III.10: Average Tenure - Gas



d. Monitoring, Training and Development of Critical Skills

Management's analyses have led it to conclude that it does not face acute skill gaps in its work force. It considered access to training programs sufficient to address any skill deficiencies that could develop. Management practice was to examine whether systemic issues had a potentially great enough impact on maintaining particular skill sets in-house warrant outsourcing as a solution. Examples of efforts to identify and address areas where particular shortfalls loom were illustrated by efforts regarding senior substation operators and gas construction workers. Management had identified the need for specific plans to address projected shortfalls in these two positions, using the VEMO application to support these analyses.) Management at the time of our field work had plans to hire 45 general utility workers (GUWs) by 2016 to address projected shortfall in substation operators and to increase substantially its gas FTEs (from 2013 base levels). Forecasts at the time of our field work showed a large increase in internal FTEs applied to gas construction, resulting in major part from increased in main replacement work. As discussed elsewhere in this report, meeting that target has posed a significant challenge, as other gas utilities increase their main replacement programs.

Management conducted training at its Learning Center in Queens, where it focused on technical and leadership training. The Company divided technical training into four categories; *i.e.*, career path training, compliance training, environmental, and regulatory. Management organized training by discipline – electric or gas – and the Center worked jointly with the line organizations to build and maintain skill sets. The Learning Center had approximately 70 experienced instructors and 7 managers. The Company had also developed eLearning courses on numerous subjects.

In terms of outside training and development resources, management also partnered with vendors. It performed training benchmarking and it participated in industry associations that address learning. The groups included the Edison Electric Institute (EEI), the Northeast Gas Association (NGA), the Midwest Energy Association (MEA) and others to identify best practices in employee training and development. Management had also established relationships with academies and schools having curriculums or a focus aligned with its entry-level positions. Descriptions of joint efforts with the bargaining units for recruitment, training and development of craft personnel included the establishment of a Military Steering Committee, with the purpose of increasing veteran representation in the workforce, as well as a partnership with the Oneonta Job Corps Academy to enhance the flow of candidates into entry-level positions.

The Company joined the Center for Energy Workforce Development (CEWD) in 2014 as a financial, contributing member. CECONY also engaged in several CEWD efforts, including membership in CEWD's Troops to Energy Jobs Initiative.

CEWD is a non-profit consortium of electric and natural gas utilities and their associations. Its members formed it about 10 years ago to promote joint efforts to address looming workforce shortages in the utility industry. CEWD is a leader in seeking solutions to industry workforce issues. It has teamed with educational institutions to create ways to sustain a qualified, diverse workforce. Its partners include the International Brotherhood of Electrical Workers. Its roughly 100 members include utilities diverse in size, region, ownership, and service types. CECONY was joined by other New York members Avangrid, Central Hudson, National Grid, and the New York Power Authority. In collaboration with the CEWD, CECONY was working with other companies to create a natural gas "boot camp" for the northeast region. The Company also noted that it had participated in many other CEWD sponsored events.

CECONY's active participation in CEWD programs and its development and implementation of VEMO as a workforce planning tool, comprised particularly notable strengths in addressing future resource needs.

We inquired about the existence of key performance indicators (KPIs) measuring performance in attaining resource targets. The CECONY Learning Center used KPIs to measure success in areas such as reducing operating errors and e-learning participation and pass-fail rates on promotional tests. Management, however, did not offer any KPIs measuring performance in meeting resource targets, or in ensuring achievement of projected staff complements in number or on schedule.

3. *Conclusions*

Liberty based these conclusions on our evaluation of Company practices and processes against specific Internal Staffing criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These six criteria are:

1. There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.
2. Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.
3. There should exist sufficient sources of complete, accurate staffing information by region and by function
4. Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.

5. Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.
6. Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

1. CECONY had detailed forecasts of medium- and longer-term capital and O&M work requirements; they were comprehensive enough to identify likely resource requirements over those time frames.

Management used a highly structured, well-understood work plan development process based on the identification of work to be performed translated into hours and costs. Projections extended over a five-year time horizon, and involved appropriate line and management personnel.

2. CECONY's capital and O&M work forecasts had an adequate factual and analytical foundation to support staffing projections.

The identification of work requirements resulted from a multi-step process driven by significant line organization input and subject to multiple layers of review and examination. Conversion of those work requirements into resource needs resulted from a structured, straightforward process that proceeded directly from the work forecasts.

3. CECONY had adequate sources to provide complete and accurate information about staffing by region and by function.

Use of Paybud and VEMO, systems focused on budgeting and attrition-related information, respectively, provided sufficient data at an appropriate level of detail to allow wide and deep coverage of staffing related information. VEMO's capabilities represent what constitutes a best-in-class system for tracking attrition-related information.

4. Appropriate CECONY forecasts existed of likely losses through attrition and retirement of internal resources by function, region, and work type, but the drop in tenure among gas salaried staff merits attention.

VEMO, the third party hosted program used by the Company for tracking, monitoring, and reporting on attrition, retirement and other similar demographic characteristics, can produce forecasts of those characteristics down to region and function. Attrition and retirement forecasts were consistent with historical trends, recent experience, and expected regional conditions.

Management had a reasonably sound understanding of areas most significantly affected by personnel losses and those likely to have a material impact on work performance. Management did not believe that losses in key personnel had affected work performance. Management also sufficiently addressed potential future losses. CECONY had identified two job classifications, Substation Operators and Gas Construction workers, whose projected deficiencies in resource totals over the next few years could have an adverse impact on work performance. Management had instituted programs to address both of those situations, and was actively executing them.

There was a notable loss in tenure among gas salaried staff during the historical portion of our study period. While not problematic to date, the potential for continuing tenure loss here needs to be examined in connection with forecasts of substantially increased resources across the remainder of our study period. In meeting the already significant challenge of building a large new staff, CECONY needs to find ways to ensure that its more senior personnel remain available in some form and at a sufficient level to serve in model, mentor, and real-time, exemplary capacities.

5. CECONY's training and development programs were sufficiently robust to provide adequate support for long-term staff requirements, but lacked key performance indicators in one area.

The internal training programs were comprehensive, well developed, and oriented toward effective support of the line organizations. CECONY also maintained relationships with schools, associations, and the Center for Energy Workforce Development, each of which contributed to an effective training and development environment. Notwithstanding the effectiveness of the training and development program, there was no key performance indicator measuring whether resource goals or staffing targets were achieved. Given the major efforts in gas operations to bring on hundreds of new staff over the next few years, and the uncertain but changing needs in electric operations, there needed to be greater accountability for meeting internal resource targets.

4. Recommendations

1. CECONY should address the availability of sufficient numbers of seasoned gas salaried employees to serve in mentoring and similar roles for an internal staffing complement forecasted to expand greatly.

Should loss in long-tenured gas salaried staff continue over the next several years, CECONY's challenges in integrating large numbers of new resources will become greater. Management needs to address that possibility carefully. Should analysis show it to be of significant risk, management needs to find ways to ensure that it mitigates that risk through programs that will accelerate knowledge and experience transfer now by those who possess it to those who will follow them in the ranks of the more seasoned contributors and managers.

2. CECONY should develop key performance indicators that measure the effectiveness of efforts to achieve staffing targets and accountability should be assigned to the appropriate individual(s).

Given the need to address large increases in total numbers and in critical skill sets, management should develop metrics that permit management continually to track success in meeting resource recruitment, acquisition, development, and training targets. CECONY has underway a reasonable set of activities to perform these activities. The addition of clear, measurable metrics will increase visibility on the importance and on the success meeting the targets toward which those activities are directed.

D. Overtime

1. Summary

CECONY had strong analytical capabilities for addressing overtime, and committed substantial attention to balancing overtime against the need to add required resources. Nevertheless, forecasted overtime trends pointed to higher targets, which merit management's reconsideration.

2. *Findings*

Liberty has often found in other work that overtime among utilities does not generally receive a degree of organizational attention commensurate with its importance in cost and staffing analysis and planning. The magnitude of work done on overtime, the negative impacts on personnel from high overtime, the reduced productivity associated with overtime, and issues of control, especially with emergency requirements, argue that overtime planning and management should get more attention in most organizations.

Our examination of CECONY's processes found them to be sound in managing overtime. We found no process gaps, either on an absolute basis or relative to the other state utilities. Nevertheless, Liberty did find defined opportunities for process improvement.

The Company was attentive to overtime, and employed a strategy to limit it to 20 percent for gas and 20 to 25 percent for electric operations. The annual plan projected electric operations overtime, based on historical usage and established guidelines for the use of overtime. Each business area reviewed overtime usage on an ongoing basis. Overtime was typically used for trouble work or reliability issues requiring immediate response. For gas operations, overtime was budgeted based on historical usage and measured against key performance indicators. Overtime use was mostly for emergency work, such as storms, emergency response to gas leaks, and emergency gas leak repairs.

Electric operations employed more advanced tools, systems, reporting, and analyses, such as the VEMO Virtual Employee Model resource planning tool, the training requirements, the crew reports, key performance indicators, monthly cost analysis, five-year work plan, and productivity reports, for example. Gas operations planned to follow suit, implementing the same approach and practices.

Management used performance indicators to monitor productivity and the capability to assess productivity drops in high overtime periods. Cost analysts working from the various operating locations routinely studied and analyzed cost performance. Management at those locations relied on the work of these analysts to identify issues or concerns about overtime costs. More broadly, on a monthly basis, the work of the cost management group also supported identification of cost impacts resulting from high overtime levels.

Monthly overtime reports and metrics segregated data into three categories of overtime: over 30 percent, between 20 and 30 percent, and between 10 and 20 percent. Metrics reports contained a "Corrective Action" section. The Human Resource system generated another overtime report. Use of the three preceding categories moves in the direction of the control zone process we consider optimum for managing overtime.

Management typically formulated resource plans on a case-by-case basis down to the local line level. Its method involved many different and sometimes competing factors. Decisions considered technical expertise, changing workloads, resource availability, flexibility, fixed costs, emergent work, scheduled work, overtime, and overheads. Additional considerations included standards that define safety, quality, and schedule expectations. Depending on the work, managers also examined past contractor productivity.

3. *Conclusions*

Liberty based these conclusions on our evaluation of Company practices and processes against specific Overtime Use criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. There should exist an analytically supportable method for determining optimum levels of overtime.
2. Overtime planning and use should consider the relationship between amounts of overtime use and productivity and costs.
3. Overtime determinations should be uniquely applied to differing work functions and types.
4. Overtime use considerations should occur as a formal part of the process of identifying required resources.
5. Overtime use should conform to assumptions used for determining resource requirements.
6. Overtime use should comprise part of an integrated process for balancing internal, overtime, and contractor resources across all functions we are examining.

1. CECONY provided a significant level of planning, monitoring, and oversight to the management of overtime, and had sound analytical capabilities.

The degree of attention to overtime as a management parameter varies among the operations we studied. CECONY performed appropriately in this area. Budget targets and caps existed, although their effectiveness may have been limited. Tradeoffs in staffing decisions received an appropriate level of analysis and management consideration. The skills and capabilities applied to analysis and decision-making were appropriate.

2. CECONY did not employ an analytically supportable method for determining optimum levels of overtime.

An in-depth process existed for seeking to determine the desirable overtime level, but the process was neither analytical nor documented. Management was in a position to determine the optimum resource level, given its effective tools, knowledgeable managers, analytical capability, and the strong desire to improve. The process might have to be fine-tuned to accommodate changing circumstances.

Management sought to manage overtime actively. Management stated that a 20 percent level was optimal, but did not act in accord with that belief, stating the desire to bring OT to 15 percent, and eventually to a target level of 10 percent. These circumstances demonstrate the importance of deriving such targets analytically and with a documented rationale.

3. CECONY routinely considered the interrelationship among overtime, productivity, and costs, in its decision-making related to overtime, but not quantitatively.

Management relied on its extensive productivity measurement metrics to monitor performance. It had the capability to conduct production studies when needed to assess whether productivity declined in high overtime period. Management had not performed structured analyses to address how overtime affects productivity and cost quantitatively, apart from recognition of the nominal difference that wages and benefits produce in hourly employee costs. Management relied on monthly cost analysis performed by the cost management group to address any cost issues resulting from high overtime levels. Monthly overtime reports and cost analysis came from the cost management group.

4. CECONY applied overtime planning and analysis at the functional level.

Managers had productivity measurement tools at the detailed levels to detect performance problems early. Management also recognized that different work groups or work types should have different levels of planned overtime. Analyses were performed from time to time to gauge the balance among straight time, overtime, and contractor mix.

5. CECONY adequately considered overtime in its resource planning and budgeting functions.

CECONY managers provided multiple examples of how their analyses led to bringing additional crews to the workforce. Our examination of the underlying data (from our staffing templates) confirmed additional hires of substation mechanics, linemen, and gas mechanics.

In the event of identifying major resource problems, management could rely on the Program Project Planners (PPP) from the Work and Resource Management (WRM) team to perform capability analysis to assess the gap and recommend solutions.

6. Recent overtime levels, which were perhaps borderline, were nonetheless trending upward and were projected to grow substantially more in the future.

Liberty could not evaluate whether the targets of 20 to 25 percent for electric and 20 percent for gas work have actually been achieved thus far. Management could not provide accurate overtime information from 2009 to 2013, due to the transition of the data management system from the legacy financial system (Cost Analysis Reporting Environment, or CARE) to the Oracle Business Intelligence (BI) system. We estimated the overtime figures in our overtime analysis, based on overtime data for all crafts. This approach tended to lower the overtime level somewhat, due to a larger workforce that included crews that work little overtime. Based on the estimated figures, however, CECONY appeared to have conformed to the budget level of 20 percent in gas and electric.

However, recent levels in electric distribution and transmission rose considerably above targets. Moreover, CECONY forecasts at the time of our field work showed rates for electric transmission and for gas at above 25 percent (well above projected levels for the Reference Utility).

7. CECONY appropriately considered overtime as an element of the resource stack, and appropriately planned its use on an integrated basis with the other resource elements.

Overtime use normally becomes part of the integrated resource balancing process only during the annual budgeting process. With the establishment of the Work and Resource Management (WRM) concept, CECONY developed the capability to assess the resource needs on macro and longer-term levels. Management identified the work, assessed the available productive hours, reviewed work plans, and projected the capability gap for actionable solutions. Sufficient process, the personnel, and tools existed to carry out this robust, integrated process.

Managers described in interviews how excessive overtime drove them to increase resources in substation technicians, overhead distribution linemen, and gas mechanics. Most of the discussion and the material supplied on data responses focused on the choice between using internal or contractor resources. Overtime was considered only during the annual budgeting process. CECONY had already hired more workers. It might take some time for the new crews to reach fully qualified level.

8. CECONY's future plans for electric distribution, which called for lower staffing while at the same time reducing the percentage of overtime, were counter-intuitive.

Such a strategy is not credible in the absence of specific plans that either significantly reduce workload or significantly increase productivity.

4. Recommendations

1. CECONY should develop analytically supported methods for determining optimum overtime levels.

Each utility's circumstances will dictate its needs for an analytically optimized solution for overtime. Such sophisticated approaches will be more appropriate in cases where: (a) overtime expenditures are large, both absolutely and relative to other staffing related costs, (b) planned levels of overtime are relatively high, (c) productivity issues are present, (d) non-economic issues are present, or (e) control issues are present.

CECONY certainly shares a number of these characteristics. The Company thus becomes a logical candidate for a more robust analytical determination of an optimized level and strategy for overtime. Liberty therefore recommends that the Company consider alternate schemes and, if appropriate, modify its approach.

The Company is in position to determine the optimum overtime level, because it has all the building blocks in place. These assets include a comprehensive work management system, knowledgeable personnel, willingness to pursue, the key performance measures, and a long-term resource planning tool. Armed with the knowledge of optimum overtime level, in conjunction with an effective integrated process of balancing internal and external resources, management will be able effectively to predict quantitatively the magnitude of the types of resources required.

2. CECONY should include all relevant factors in its decision-making vis-à-vis overtime.

Each utility's circumstances will dictate the level of effort appropriate for managing various elements of its work. CECONY is a large utility in both the electric and gas businesses. It has the analytical capabilities and the tools. CECONY needs to ensure that it has a strong understanding of the negative impacts of overtime and considers those impacts as practical in its decision-making processes.

3. CECONY should define an optimum level of overtime, presumably well below that projected at the current time, and implement control schemes to manage within that value or range.

Liberty has identified the continuous high level of overtime that management provided in its forecasts through 2019. Despite the good intention of desiring to lower overtime and set the target at 15 percent, continued operation outside a reasonable control zone questions the effectiveness of the control process and the adequacy of overtime control measures. It will be appropriate to re-establish a credible target or range and implement suitable control measures. Monitoring of overtime in problem functions, analysis of deviations, and implementation of corrective measures should be considered minimum requirements.

4. CECONY should review its electric distribution plans, whose assumption of substantial decreases in both staffing and overtime do not seem reasonable.

The stated goals are positive, but do not seem to recognize the inevitable balancing of staffing and overtime that makes significant simultaneous reductions in both unlikely.

E. Contractor Use

1. Summary

CECONY employed a consistent and generally appropriate strategy for and approach to electric and gas operations contracting. Management was using effective contract pricing methods and a suitable organization and tools for managing contract work. An adequate pool of contractors existed to support ongoing needs and to promote availability of contractor resources for emergency response work. We found its application of weightings for past performance when considering future bids a particular strength.

In electric operations, CECONY should evaluate bringing electric overhead line contractor oversight under the central contractor management organization. A change may promote consistent management methods and reduce staffing requirements. In gas operations, CECONY has appropriately embarked on a plan to increase the internal work force, recognizing growing needs and a tightening marketplace. However, better planning is in order to ensure the ability to support its very large acceleration in pipe replacement

2. Findings

a. Electric Operations

CECONY used reasonably clear guidelines for determining where it finds contractors generally preferable to in-house resources. CECONY employed three main overall electric contracting strategies:

- Project specific -a large job where the capabilities or schedule make sense
- Workforce specific - work load requires staff augmentation
- Skill set - low cost or specialized skills are needed.

In general, there existed a good overall balance of contracting levels. Work division rules existed. They directed low-value and civil work (*e.g.*, trenching and underground structures) to contractors. CECONY sent other project work to contractors on an as-needed basis. Work other than civil and low-value work underwent a team review process. CECONY had recently decided to contract out overhead line inspection work, which conforms to a common industry practice.

CECONY used an appropriate rationale and definitive work division rules for contractor use. Management decided quite some time ago to use contractors for trenching and UG structures work. CECONY implemented its PPP (Program and Project Planner) process to provide a sound basis for contractor resource planning. CECONY used overhead contractors for project specific work and work level augmentation. Transmission work used the street work contractors in place for excavation work and oil spill clean-up. Management used contractors for substation capital, but not operations work.

Management sought to maintain a base number of electrical distribution contractors, in order to promote mutual aid relationships. For overhead line work, CECONY tried to have three three-person crews in each area, with possibly more in the Westchester region. A different line contractor was usually operating in each area. This approach allowed three different contractor companies to be called for storm response. Storm hardening required extra contractors recently. Employees predominated on CECONY's underground secondary inspection program and on its five-year inspection programs for their first three years. Management then moved such work toward contractors. About sixty percent of the system will have been inspected by contractors by the end of 2016.

Management did not approach contracting based on having to meet any minimum internal staffing numbers. CECONY did have a commitment to hire seventy-five percent of the prior year workforces the following year.

Distribution contracts generally used unit prices, with occasional fixed sum bidding. Key performance indicators included a metric addressing the amount of time and equipment work given to unit price contractors.

Except for a recent contractor cost study, the distribution unit price line work had not been subjected to periodic comparative cost reviews. However, for per diem, unit price, and lump sum contracts bids, an independent group conducted a formal bid check process. Management generally used lump sum bids only for large projects. Under this bid check process, the Cost Management Group prepares independent "shadow bids" to compare simultaneously with contractor bid submissions, enabling comparisons with internal expectations and helping to identify issues raised by contractor bids.

We inquired into the process of managing contractors. CECONY had a strong central organization in place for underground line contract work management. This organization resided in the Construction Management department. A Central Construction Management organization provided oversight to the underground contractors under their management (trenching, conduit, manholes). Union inspectors provided the first level of oversight, using mobile-office software. The next level came from Chief Construction Inspectors, who oversaw first-level inspectors. A body of project specialists provided technical contract management. All oversight came from internal employees.

For overhead line work, the local regions employed a contractor oversight organization under the local General Manager. We found the use of two independent oversight organizations unique. Management supported it as reducing risk in overhead contract work in the regions. An overhead manager conducted regular monthly meetings with other regional managers for consistency. Each area had Operations Supervisors, typically assigned to monitor contractors on the large projects.

Each oversight organization used a different method of processing invoices. The COMPASS billing system (Construction Management Pay and Support System) addressed underground contractor invoicing. Distribution overhead line work in the regions operated under a weekly "pay-as-you-go" billing process. This process counts the completed units for the active layouts and inputs the information into Oracle for payment. The use of two independent pay processing systems was also unique. Processing unit price contract invoices within thirty days served management as a KPI.

CECONY had a multi-level contactor oversight system:

- Module 1, the Contractor Field Observation Report, included a checklist of items the Company expects to see at the site, and provided for immediate feedback with respect to problems.
- Module 2, an Infraction Report, required a contractor to submit a corrective action plan.
- Module 3, referred to as an Action Line, went to the Company's Supply Chain group for resolution, which required a corrective action plan.
- Ultimately, the issue could have gone before the Compliance Committee (a board of Company employees external to the project) that evaluated the situation, and either terminated the contractor, or developed a corrective action plan.

Contractor monitoring also included contractor OSHA incident rates, which formed the basis for a key performance indicator.

3. Gas Operations

In gas operations, the decision contract was based on factors that included seasonality of work load, timeliness, specialized skill sets, nature of the work, and cost. Management used a mix of lump sum bid contracts for defined scope, major projects (typically for one-quarter - to one-half million dollars and higher) and unit pricing contracts for smaller, routine jobs. For unit-price contracts, management used a unit price manual ("Trenching Manual") which identified all activities and associated prices.

The mix of resources and augmentation of in-house staff resulted from long-standing policies and procedures, rather than from periodic analysis. It varied month-to-month and by division. Management considered cost trends in determining where to use contracts, and performed some specific cost studies. Decisions to use in-house versus contract labor considered all the factors described above, with cost described as playing a relatively minor role.

CECONY maintained a base of approximately twenty pre-screened and pre-qualified firms for construction. That process allowed for rapid deployment of contractor crews, following contractor selection. Management, observing the increasing costs of contractors, had embarked on an internal five-year hiring plan, to double the internal construction and distribution work forces during that time.

Management typically used three-year contracts, but had begun to include options to extend them to a fourth and fifth year.

In managing contractor performance, gas operations used the same multi-level system applicable to electric operations. Management met quarterly with each contractor to provide a performance review. In addition, the General Managers prepared a report of contractor performance semi-annually.

The contract review, invoicing and payment processes proceeded through the normal Supply Chain process (outside of the operating organizations), providing the normal system of checks and balances.

4. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Contractor Use criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The level of contractor use and the types of contractors retained should be supported by a contractor strategy that considers work volume, quality, timeliness, costs, and other relevant considerations.
2. There should exist a data-driven understanding of the comparative costs of using contractor versus internal resources, and apply a good qualitative rationale for choosing between contractor and internal resources.
3. Management should retain a sufficiently broad base of firms should remain under contract, pre-screened or pre-qualified for activities and tasks for which contractors are regularly used or anticipated to be used.
4. (Gas only) Where contractor resources are limited in terms of numbers of crews available or skill sets to meet anticipated future needs, the utility should be working to promote development of a skilled pool of resources.
5. Contractor strategy should be supported by appropriate contractor management processes.

1. In electric operations, CECONY supported its level of contractor use and the types of contractors through consistent strategy and execution.

The contracting levels were average and consistent across the functions. Cost effective unit price contracts applied to distribution line work. Lump sum bidding was occasionally used for large overhead project work. A system existed for employing three different overhead line contractors in the regions to keep a pool available for storm response work.

A sound qualitative rationale supported the use of contractors in lieu of internal resources. CECONY had firm work division rules in place for the underground distribution line work. It contracted appropriately for the performance of low-value work. For large project work, the PPP process (Program and Project Planner) provided a decision framework for the use of contractor resources.

Distribution line work costs had not been subject to periodic comparative cost reviews, but the bid check processes did provide a baseline for comparing contractor bids to internal expectations and for identifying issues raised by contractor bids.

2. CECONY employed a reasonable number of electric contractors.

Management appropriately considered availability for emergency work in doing so.

3. In electric operations, CECONY employed a strong contractor work performance organization, and used sound performance evaluation procedures.

A formal Contractor Oversight System existed for monitoring and evaluating all contractors. A central organization in the Construction Management department managed this system. A group of internal field inspectors provided field support. Management used a dedicated invoice processing system (COMPASS) for the underground contractors.

Management appropriately centralized oversight of underground contractors. However, the overhead line contractor oversight was de-centralized. For overhead line work in the outlying regions with overhead lines, three independent contractor oversight organizations operated, reporting under the region General Managers. The invoices in the regions were also processed in the standard Oracle system rather than through the COMPASS system.

Liberty's concern with these separate de-centralized organizations lies in consistency of processes, training, procedures and outcomes. Also, it is unique to find two separate contractor management organizations in place.

4. CECONY's use of contracted services in gas operations was generally consistent with industry practice.

Management contracted out most of its capital construction, approximately twenty percent of its O&M, and about ten percent of its engineering. The activities contracted out (construction, locating and mark-outs, surveys, and others) generally followed industry norms. CECONY contracted a fairly high percentage of emergency response which was somewhat unusual relative to the New York companies.

CECONY's bid check estimating process provided a solid basis against which to benchmark contractor bids. The Cost Management Group prepared independent "shadow bids" (prepared in real time in response to requests for bids, and submitted along with contractor bids). This approach validated contractor bids, and identified issues where contractor bids might have fallen be out of line with management expectations.

5. CECONY used a broad base of contractors for gas construction.

The Company maintained a robust field of contractors under active contract as well as additional pre-screened and pre-qualified firms. For pipe replacement, that field included approximately twenty contractors.

6. CECONY had taken some steps to increase the number of resources that will be required to support its construction program.

In recognition of the tightening of the contractor market and associated increasing costs, CECONY had embarked on a five-year plan to increase its internal work force, which will move the mix from a 60/40 contractor to in-house ratio to a 50/50 ratio.

7. Gas operations used an effective support structure for its contract operations.

CECONY's oversight system comprised a multi-level process for reviewing and assessing contractor performance and provides initial, immediate feedback to contractors, as well as a path for escalation as needed. In addition to on-site review and feedback, management met regularly with contractors.

CECONY's incentive/penalty mechanism for future bids was a strength. CECONY created a direct link between performance (over and above the basic requirement of meeting minimally acceptable performance criteria) and selection for future contracts.

Based on contractor ratings, management developed a "bid multiplier" for application to all contractors' bids involving labor for purposes of bid evaluation. For bid evaluation purposes only, the contractors' bids were subject to a multiplier of plus or minus five percent of the bid price, depending on ratings of recent past performance.

5. Recommendations

1. CECONY should conduct a structured evaluation of the costs and benefits of bringing electric overhead line contractor oversight under the central contractor management organization.

While no physical changes in personnel locations or numbers might occur, bringing the management of the three independent organizations under the central organization would allow for more consistent processes and outcomes. Staffing reductions might ultimately be possible.

2. CECONY should refine and expand plans for increasing internal staffing, the contractor base, or both to meet the needs of the future pipe replacement program.

CECONY has recognized the tightening of the contractor market and increasing costs brought on by the industry-wide acceleration of pipe replacement projects and New York State's emphasis on expanding the use of gas vis-à-vis other fuels. However, management's actions were likely not sufficient in light of its plans to further increase its rate of pipe replacement by about forty percent over the current level in future years, and in light of the accelerating programs among all most other companies in New York and the Northeast.

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

Final Report: Orange and Rockland
Case 13-M-0449

Presented to:

Public Service Commission
State of New York

Presented by:

The
Liberty Consulting Group

February 21, 2017

279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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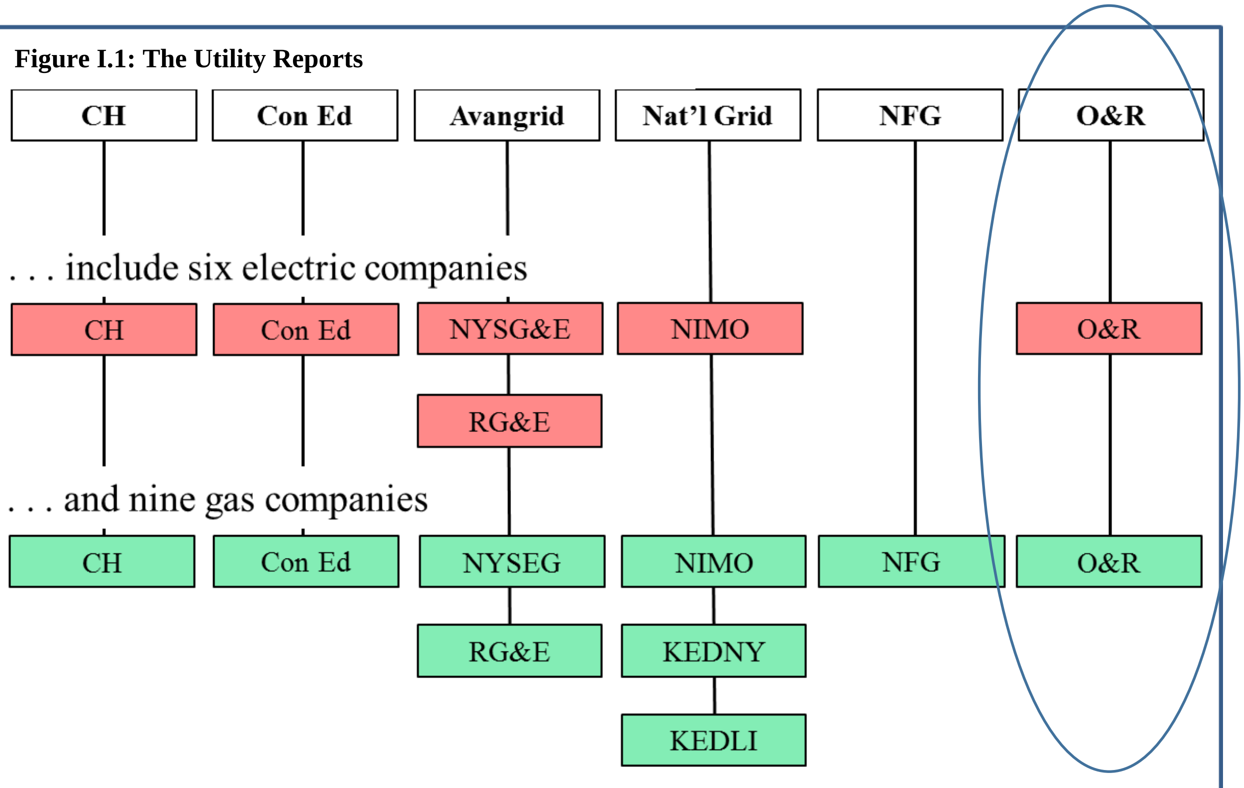
Chapter I: Background

The Liberty Consulting Group completed an extensive study of a prescribed set of staffing patterns and practices (the scope of which the Statewide section of this report addresses) at fifteen utility operations operating within six enterprises in New York State. The first part of this report addresses the results of our study from a statewide perspective. This part describes our study and presents its results as they relate directly to Orange and Rockland's operations (electric and gas) examined.

Figure I.1: The Utility Reports



ORU operates as a wholly owned subsidiary of Consolidated Edison, Inc. ("CEI"). ORU has electric operations in New York, New Jersey, and Pennsylvania, and gas operations in New York and Pennsylvania. ORU serves approximately 450,000 electric and gas customers in seven counties in the three states in which it operates, with over 80 percent of total customers in New York. Approximately 75 percent of ORU's electric customers are New York based while over 99 percent of its gas customers reside in the state.

ORU is the smallest of the New York electric utilities that Liberty evaluated and the second smallest gas utility. Central Hudson is the smallest gas utility in terms of operating revenues and customer base. In terms of relative size, ORU electric operating revenues in 2014 represented approximately 6 percent of CECONY's, while its gas operating revenues were approximately 12 percent of CECONY's. Staffing at ORU is similarly proportional.

Our study examined staffing in quantitative and qualitative manners. This part of the report describes the results of our analyses regarding ORU quantitative staffing data and a qualitative review of the processes associated with staffing in the electric and the gas utility. Understanding that data and the comparisons we have made with other New York utilities requires a framework that explains the relevant characteristics in context with the other state utilities.

Our study examined a ten-year period - - five of them historical and five projected. We conducted field work in 2014, which presented a challenge in treating that year's data. We collected year-to-date actual data and budgeted or forecasted data for the remainder of the year. Differences in systems, fiscal years, reporting and approaches to forecasting to-go data provide examples of the difficulties in identifying a way to split 2014 into actual and forecasted portions or to reflect it on an amalgamated basis. Those difficulties eventually led us to determine that we could not find a way to report 2014 data meaningfully for use in our study.

In 2015, progress on this project halted for a period of many months, during which we sought to resolve major difficulties regarding gaps and errors in data reporting. We observed that the hiatus in work and the need for data correction provided an opportunity to alter project scope to permit collection of actual data for all of 2014 and to update projections for future years. It was decided not to do so. Therefore, we continued to work with the split nature of 2014 data and with earlier forecasts for future years, which included 2015.

When making utility-to-utility comparisons one must remain mindful of the need to avoid comparing "apples to oranges." The complex analyses involved here and the unique circumstances of utilities even across the fairly narrow geographic range of a single state certainly do make it impracticable to reduce comparative evaluations of performance and results simply to algorithms. Nevertheless, it is possible, with care, to provide data comparable enough to assist in the formation of useful judgments. They can have value even in complex circumstances, particularly where they are performed on a multi-dimensional basis and only when accompanied by the application of industry expertise in the underlying applications and activities.

We thus undertook our quantitative analyses recognizing the need to understand and reflect the differences that drive staffing among the state's group of utilities. Among the challenges present in doing so, our work provided a significant advantage as well. Despite the differences among its members, this advantage arose from the ability to derive commonly defined, contemporaneous data sets from a utility population that: (a) number enough to allow the use of statistically derived measures, (b) operate under the authority of a single regulatory authority[1], and (c) encompass what is a remarkably, if not uniquely narrow, geographic range (when contrasted with other comparative studies we have seen in the industry).

We operated nevertheless with the recognition that superficial application of data would not serve. We sought to understand and define the characteristics of the utility operations within the scope of our study and how they vary in the utility population. This starting point set the stage for effective structuring of the data to be collected and then analysis of that data.

In comparing the utilities, we begin with attributes of common interest that might have some impact on staffing levels. These initial attributes might be termed as potential "hard" drivers of staffing. These drivers generally correspond to system attributes that utilities generally cannot

[1] Note, however, that the Pennsylvania Public Utility Commission and the New Jersey Board of Public Utilities also regulate ORU operations in those two states.

control. For example, the number of customers a utility surely affects required staffing, yet that parameter is a function of the environment in which the utility operates. The number of customers represents neither a performance statistic nor a value that management can influence. The relevance here of such factors lies in their ability to help clarify the "givens" that define a utility's relative size in the industry. That knowledge is critical to an understanding of relative staffing requirements.

We also examined "soft" drivers" of staffing. While these are not "givens,", they do concern things that management decisions and actions influence, and those decisions and actions that do, or at least may, affect both staffing and performance. For example, a utility chooses the number of gas mains it will replace each year; that decision affects staffing requirements.

A. The Reference Utility

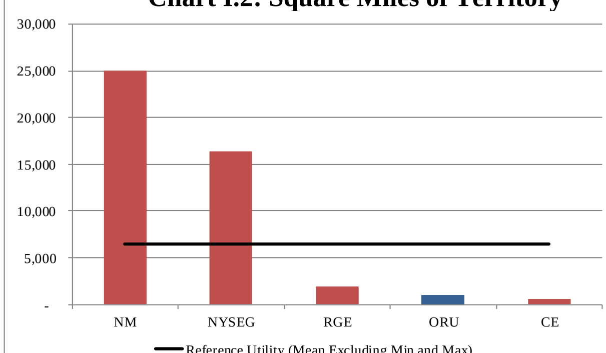
Our many comparisons of staffing frequently refer to "the Reference Utility." We combined data from all the operations we studied to produce a composite for comparative purposes. This part of the report sets forth many charts and accompanying discussions of attributes or sets of attributes related to staffing in comparison to the Reference Utility. These uses of a Reference Utility provide a common indicator for how the various utilities differ from the composite. For example, if a utility has the same number of customers as the Reference Utility, we can state that utility's number of customers as 1.0. If another utility has 50 percent more customers, we can state its customer count as 1.50. These measurements provide a way of illustrating the relative position of any utility in comparisons with others. This approach provides a dimensionless variable for selective use in other calculations. Comparison to the Reference Utility never provided a basis for conclusions, but rather a way to put each of the companies we studied in a statewide context and to assist in identifying areas useful for inquiry into staffing numbers, distribution, and adequacy.

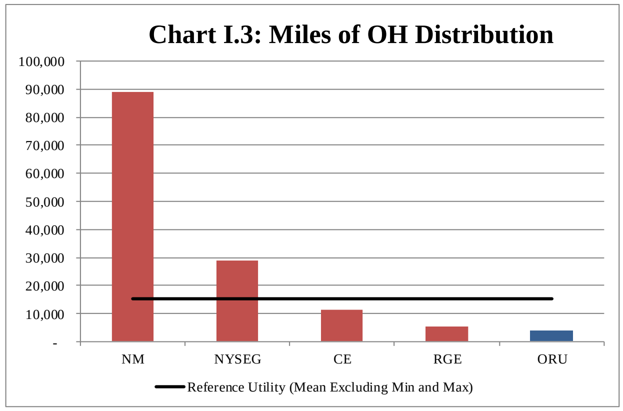
In defining the value for the Reference Utility, one option would have been simply to use the average of the state utilities. Some circumstances, however, make this approach impractical. For example, one or two very large utilities can dominate the data, calling for mitigation of the impact of the outlier(s). This phenomenon encourages the use of a median rather than an average. A similar approach might use the average of the utilities, but calculated after removing the minimum and maximum values. For electric attributes, we used the median or average excluding the minimum and the maximum. After examining the gas attributes, we reached the same conclusion.

B. Specific Electric Attributes – Hard Drivers

This section describes what we determined to be system attributes comprising hard drivers of staffing. The size of a utility's service territory and quantities derived from it (such as customer density) should have some impact on staffing. Sparse service territories likely experience higher costs as employees require greater travel times, with resources spread over a greater area. A larger service territory can also require more distribution facilities, producing higher maintenance demands.

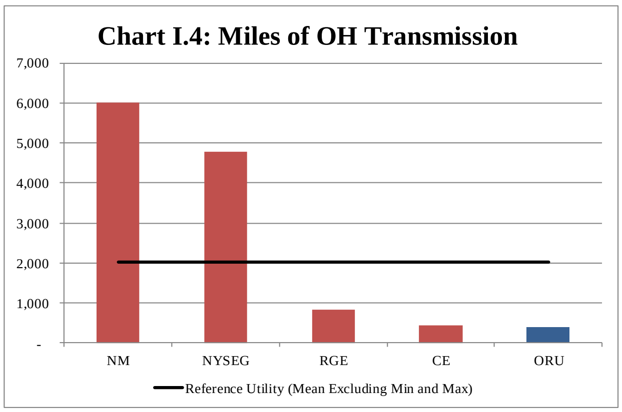
Chart I.2: Square Miles of Territory

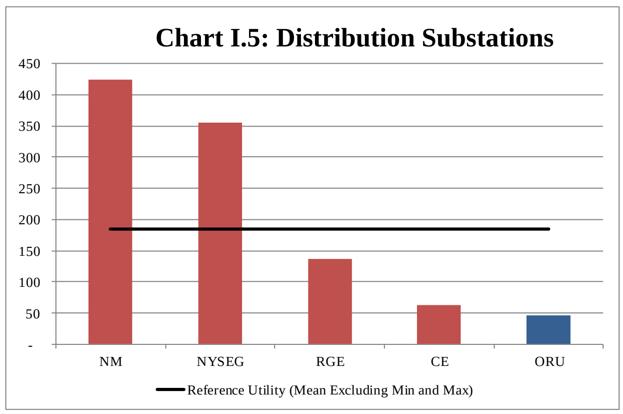




ORU has a relatively small service territory, compared to New York, and more generally to companies elsewhere. The fact that the Company is not spread out to the same degree as others can provide some strategic advantages in distribution staffing.

Consistent with its relatively compact service area, ORU has the smallest quantity of overhead distribution lines. Miles of distribution lines should be a driver of distribution man-hours and, as such, one would expect relatively lower levels of staffing at ORU. On the other hand, economies of scale will not be present to the same extent as at the larger firms.





ORU has the smallest amounts of transmission and distribution assets of the state utilities. Nationally, ORU is in the smallest decile in terms of overhead transmission miles. In terms of related staffing and costs, this is likely to impose a strategic disadvantage. Given the other size-related characteristics, one would correctly expect the number of substations to be the lowest among the state companies.

These first four parameters define the geographically related attributes, and create a clear picture of ORU's place in the utility population. In today's consolidating industry, smaller firms face a special challenge. This does not necessarily mean ORU is less efficient than others, but it is true that smaller firms are starting from a less advantageous position in some staffing areas than their larger neighbors.

Shifting from these geographically related parameters, ORU remains a relatively small operation. Its several hundred thousand customer count is quite small in comparison to the many utilities with millions of customers. Other than CECONY, none of the state utilities are especially large on a customer basis, and ORU is the smallest. An off-shoot of the customer count, customer density measures the number of customers per square mile of service territory. Intuitively, one would expect density to comprise an important attribute affecting staffing and other performance parameters. All else being equal, higher density promotes staffing efficiencies, although extremely high densities can make work logistically more difficult and expensive. Factors such as comparative size illustrate the value in examining multiple drivers when analyzing staffing drivers, rather than searching for a single “silver bullet.”

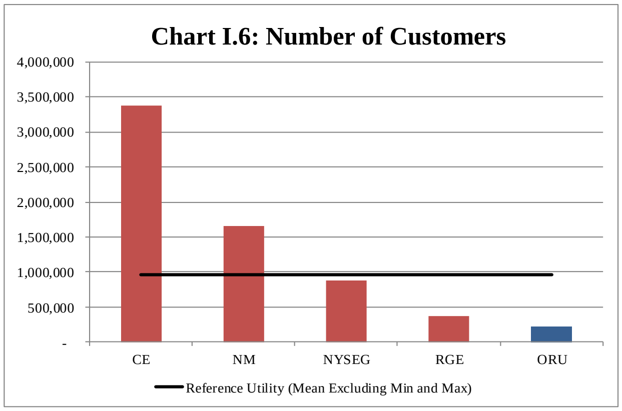


Chart I.6: Number of Customers

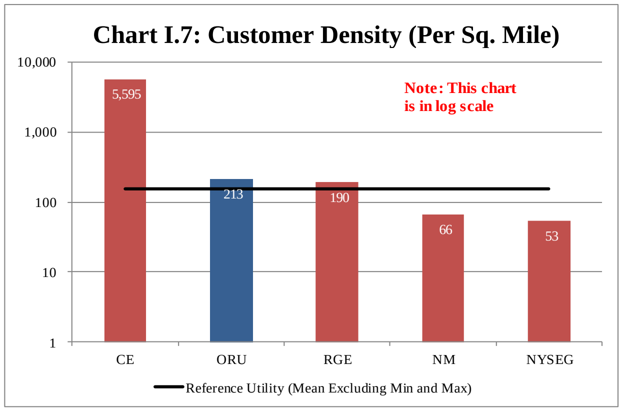


Chart I.7: Customer Density (Per Sq. Mile)

ORU occupies more of a mid-range position, with a comparatively high density among the operations we studied, but less than CECONY’s extremes.

Sales and peak system demand offer typical indicators of utility size, but factors that likely have at best an indirect influence on T&D staffing. These factors also show the dominance of CECONY among the state’s utilities. The closeness of the pattern among the companies when measured by demand or sales is as one would expect, if the operations share similar load factors.

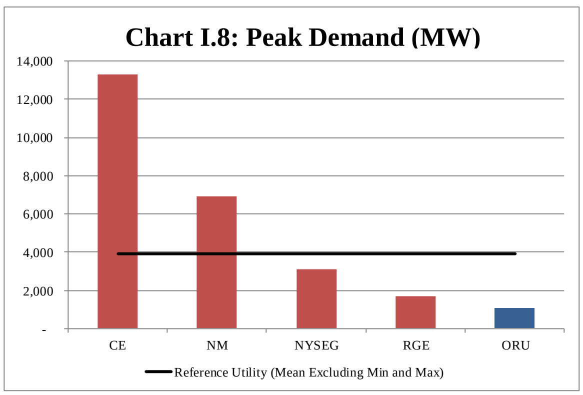


Chart I.8: Peak Demand (MW)

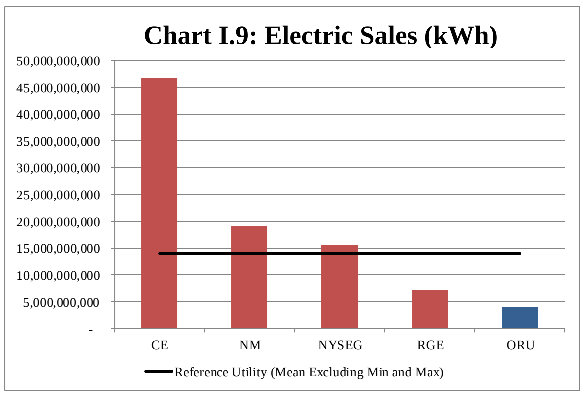


Chart I.9: Electric Sales (kWh)

The Retail Electric Volume chart shows where the New York utilities rank among those across the country. From an electricity sales perspective, the state utilities are not particularly large on a national scale, with the obvious exception of CECONY. Five of the six state utilities fall at the national median or lower, and three, including ORU, are in the bottom quartile.

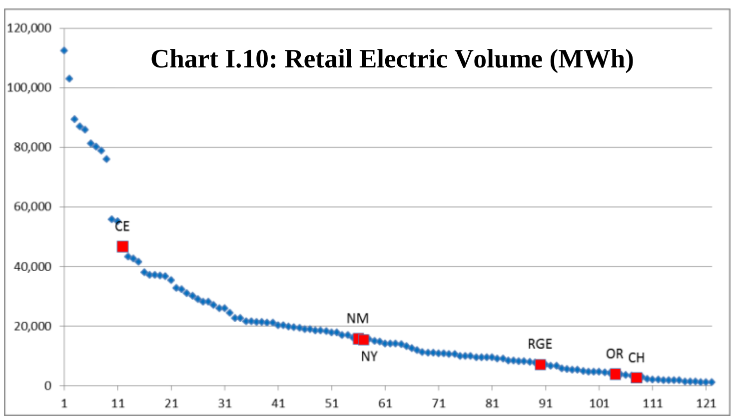
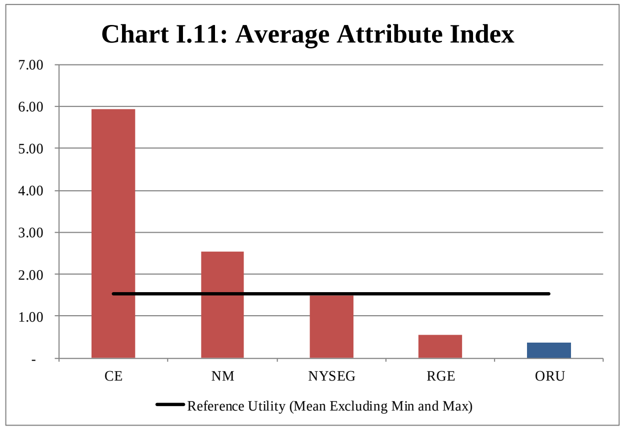


Chart I.10: Retail Electric Volume (MWh)

The chart below (Attributes Indexed to the Reference Utility) depicts the attributes discussed above combined into an average. It then indexes that average, in order to provide an integrated, overall perspective on the relationship among the state's electric operations, when considering all the hard drivers we have identified. This approach shows ORU as the smallest of the operations we studied.



While not offering much in directly analyzing New York electric utility staffing, this amalgamated measure of hard drivers does illustrate ORU's relative position vis-à-vis the other state utilities. It is reasonable to expect that this position has some influence on the company's staffing levels.

C. Full-Time Electric Resources

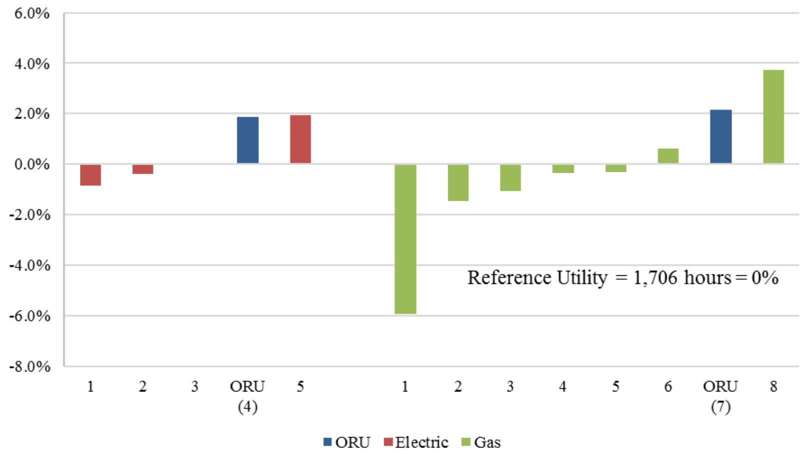
In order to provide a common parameter for the analysis of staffing levels, Liberty selected "full time equivalents," or FTEs. We defined this FTE parameter as follows for purposes of this study:

- For utility employees: reported hours divided by available hours
  - Using available hours provided by each Company
  - Available hours exclude holidays, vacation, training, and other off-the-job hours
- For contractors: reported hours divided by 2,080 (52 weeks per year multiplied by a 40-hour work week).

We chose to use this FTE approach to approximate the number of workers employed. It makes it easier to understand staffing data than other bases (*e.g.*, hours) would. While this approach provided a way to model numbers of applied FTEs, it remains important to consider differences among the operations we studied. The number of available hours per FTE varied among those companies. For example, one utility had available hours per employee of 1,800 per year, while another had 1,650. Theoretically, the first utility can provide the same number of available hours with 9 percent fewer employees. The following chart shows the variance of each operation we studied from the 1,706 hours we calculated for the Reference Utility (by averaging the available hours for all the electric and gas operations we studied).

Most of the operations centered reasonably closely around the Reference Utility level, which the chart shows to be the case for ORU. Thus, an ORU FTE corresponds closely to a Reference Utility FTE in terms of the number of available hours each represents. The gap between the high and low gas operations for the state's other companies showed a total value of 10 percent.

Chart I.12: Added Staffing Required due to "Available Hours"



One cannot calculate contractor FTEs on the same basis as one would for internal resources. Contractor employees certainly have off-the-job time as well. However, when contractor employees are off (for vacations or training, for example), contractors rotate and shift resources to keep crew (or another applicable group) complements full. If they do not, they are not paid. Thus, 2,080 is a valid number to use for a contractor FTE. On the surface, that number appears to make a contractor FTE more effective. However, the advantage in hours gets substantially mitigated by higher contractor costs. The rates a company pays for contractors builds in the costs of contractor-employee off-time. With all else equal, a contractor FTE, as we use the term in this study, is equivalent to about 1.22 utility FTEs in terms of hours worked. The FTE measure that we use provides a meaningful and intuitive understanding of staffing levels, but care in applying that understanding remains important.

Using this FTE approach, the following charts show ORU's comparative position in staffing as measured by full-time equivalent personnel (FTEs).

Chart I.13: FTEs - Total

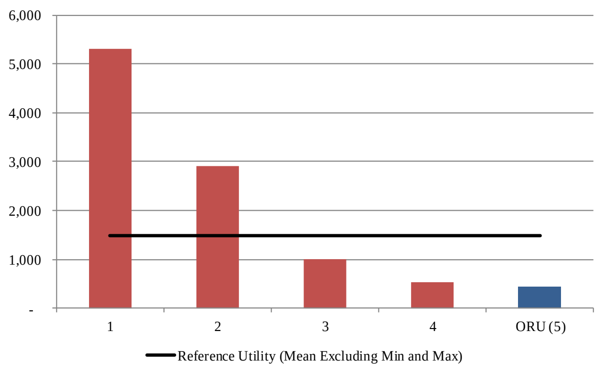


Chart I.14: FTEs – Capital

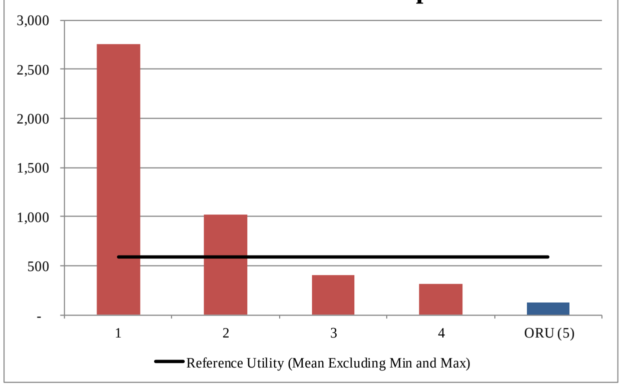


Chart I.15: FTEs – O&M

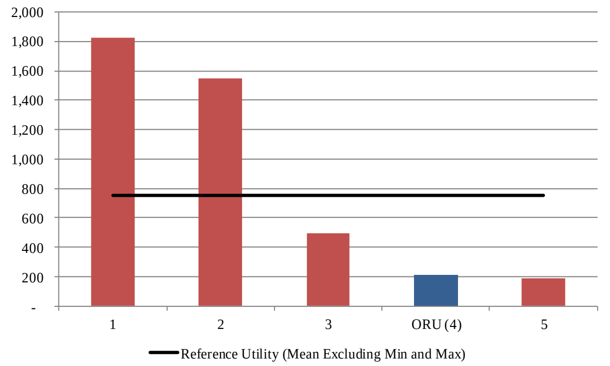
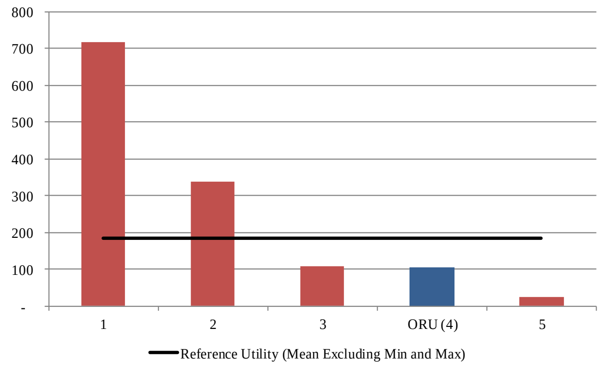


Chart I.16: FTEs – Engineering

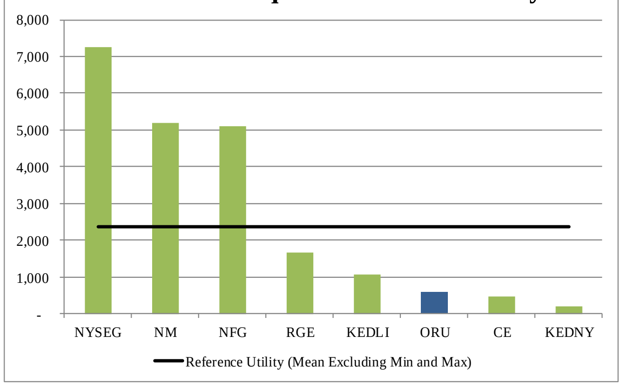


The resulting combination of internal straight time, internal overtime, and contractor data to produce a total FTE number provides an approximation of the overall or total number of people required to support programs or activities. It also provides a staffing-based expression of workload, and lays the foundation for a comparison of contractor and internal resource levels.

In terms of total staffing in the functions covered by this study, ORU falls where expected at the lowest level among the utilities. ORU was very close to the lowest in in the O&M category and comparatively low in the engineering category as well.

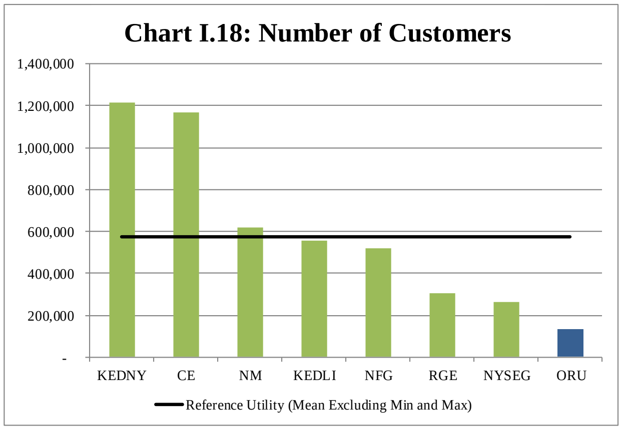
D. Specific Gas Attributes – Hard Drivers

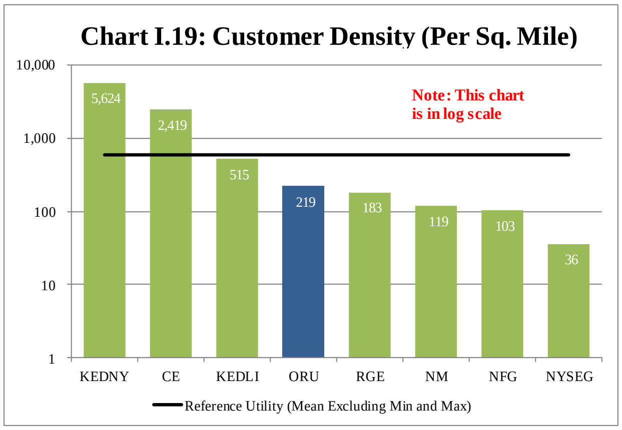
Chart I.17: Square Miles of Territory

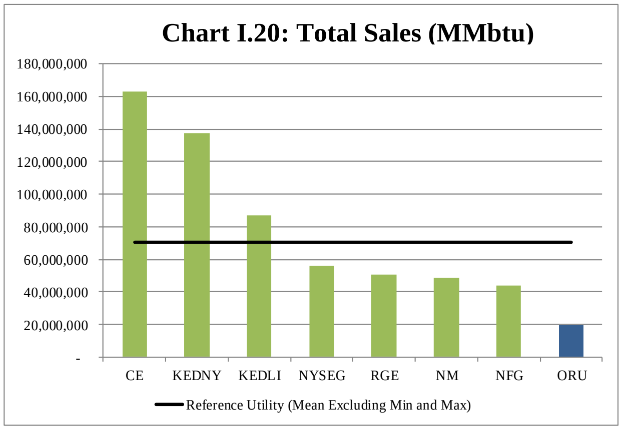


The size of a gas utility's service territory and its customer density can also be expected to influence its staffing. Travel times, the level of distribution facilities, and the number of service centers and crew support locations present examples of such impact. Additionally, the gas delivery business exhibits other variables (not present in the electric business) that affect staffing directly and indirectly. Virtually every occupied structure in an electric utility's service territory has electric service. This is not the case for gas distribution utilities. Competition from oil, propane, electricity, and other fuels affects penetration rates for gas utilities. Moreover, many customers in the state do not have access to gas service, residing too far from transmission and distribution pipes to be served economically. Many electric customers do not have gas, because it is unavailable, or because they choose not to take it. However, virtually every gas customer is an electric customer. For those reasons, there are many more electric than gas customers in the state.

The next two charts show customer numbers and density.

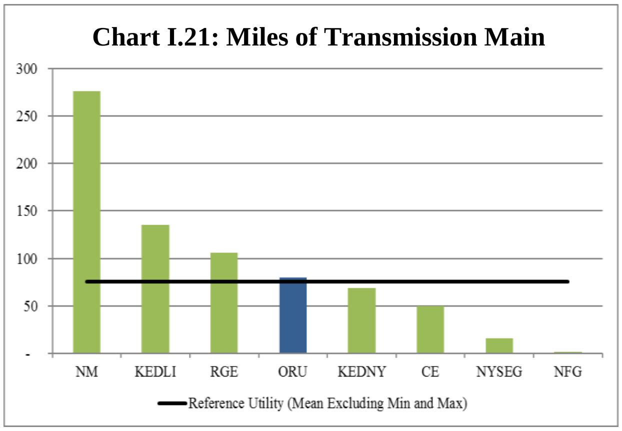






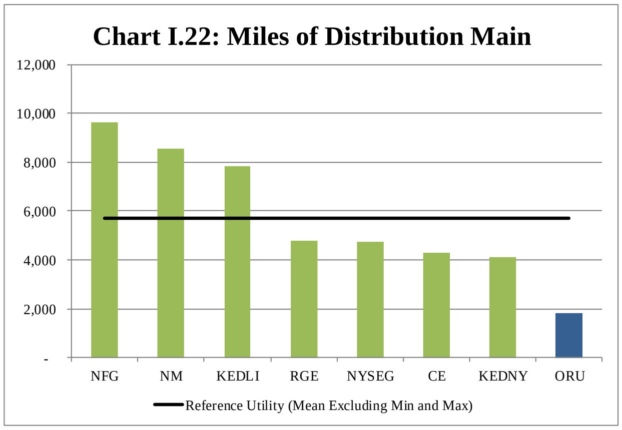
The state's gas operations include two very large companies, each with over one million customers. Three other mid-size companies cluster around the Reference Utility value of just under 600,000 customers. The three remaining, relatively small companies have two hundred thousand or fewer customers. ORU lies at the low end in customer numbers. Its compact territory places it comparatively higher in density (fourth of eight New York utility operations). As expected, the two metropolitan New York companies have comparatively very high customer densities. Upstate densities are correspondingly very low, particularly for those serving primarily rural areas.

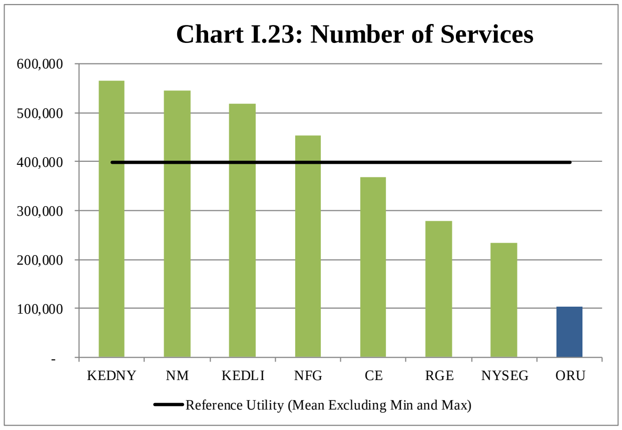
Customer mix explains why the companies with the largest and smallest numbers of customers frame the chart, but for the others, the ranking by number of customers does not match the ranking by level of sales. Companies with large commercial and industrial loads tend to have the highest levels of usage per customer. These large customers tend to concentrate in the major metropolitan areas today, but that has not always been the case. In decades past, Upstate regions housed many major industrial customers who are now long gone. Having lost such large loads, the Upstate gas companies have greater ability to add new customers today without significant capacity additions. Lessening the need for new facilities to add customers can bring substantially lessening in resource needs for capital work.



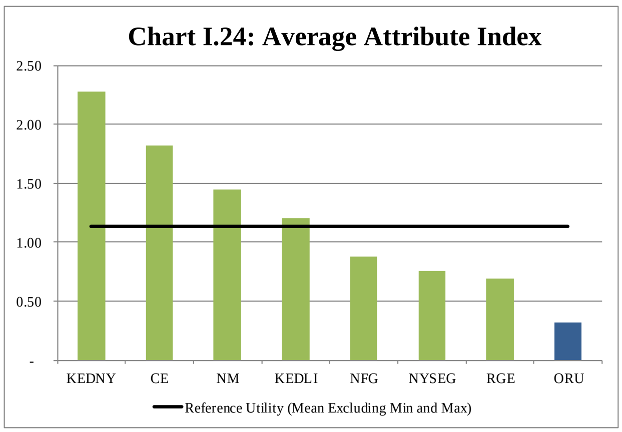
Transmission in the gas business more generally falls to pipeline rather than distribution companies. Most gas utilities, however, have some facilities classified as transmission under certain technical and operating characteristics of the facility (typically around 200 psi when measured by operating pressure). Transmission facilities in a distribution utility move large volumes of gas over relatively longer distances within service territory locations where pipeline companies do not have facilities. ORU's level of transmission facilities place the Company at the Reference Utility level.

The next two graphs display ORU's number of distribution main miles and number of customer services. The Company's figures, like its other size metrics fall at the low end of the range of the operations we studied. One would expect these key infrastructure measures to be important drivers of staffing needs.





The chart to the right (Attributes Indexed to Reference Utility) depicts the attributes discussed above into an average, similar to what we showed for the state's electric operations. CECONY lies at the high end as expected, just behind KEDNY.



E. Gas FTEs

This section compares 2013 gas FTEs among the New York gas operations. The next four charts show that ORU has the fewest number of customers, the least miles of main, and the least amount of retail sales of any state gas utility. It did not, however, have the fewest total FTEs. In addition, its FTEs devoted to capital and O&M work were higher than two other state gas utilities.

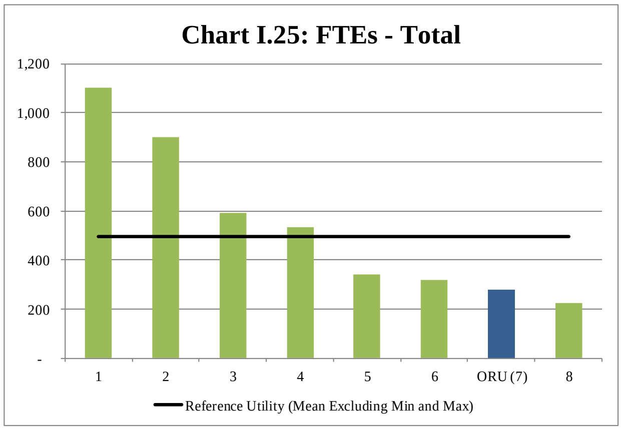


Chart I.25: FTEs - Total
1,200
1,000
800
600
400
200
-
1
2
3
4
5
6
ORU (7)
8
Reference Utility (Mean Excluding Min and Max)

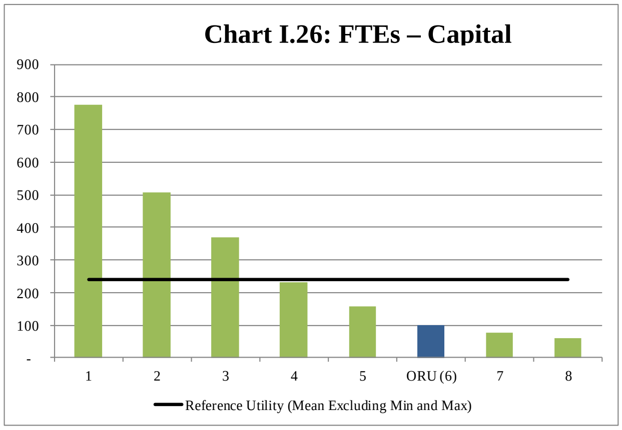


Chart I.26: FTEs – Capital
900
800
700
600
500
400
300
200
100
-
1
2
3
4
5
ORU (6)
7
8
Reference Utility (Mean Excluding Min and Max)

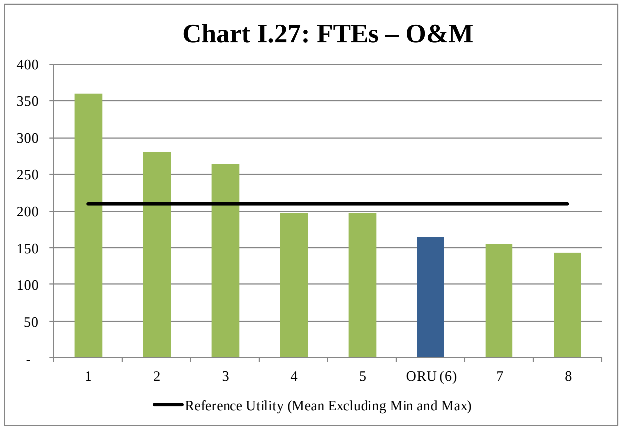


Chart I.27: FTEs – O&M
400
350
300
250
200
150
100
50
-
1
2
3
4
5
ORU (6)
7
8
Reference Utility (Mean Excluding Min and Max)

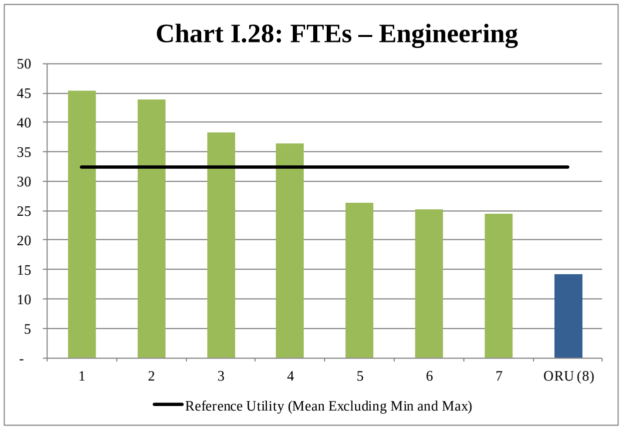


Chart I.28: FTEs – Engineering
50
45
40
35
30
25
20
15
10
5
-
1
2
3
4
5
6
7
ORU (8)
Reference Utility (Mean Excluding Min and Max)

Chapter II: Data and Analysis

A. Resource Planning/Total Staff Assessment

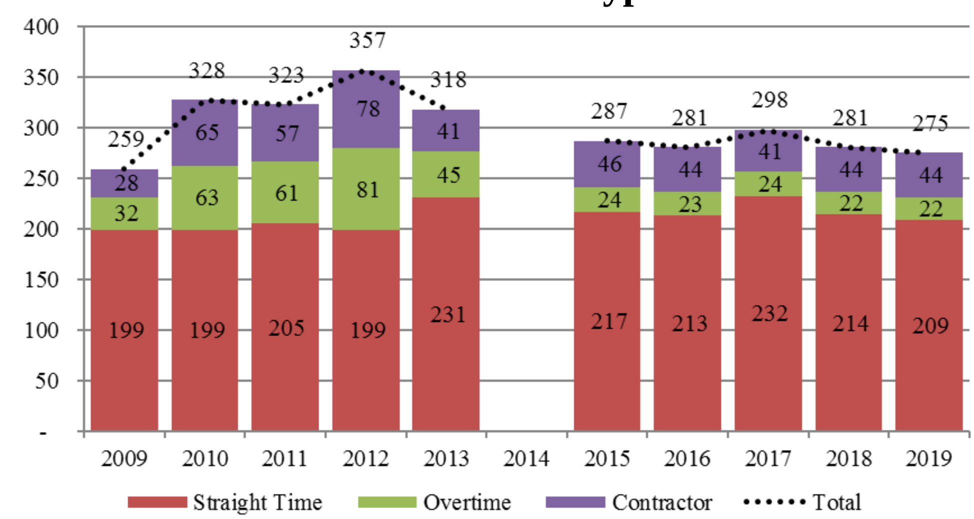
1. Total Staff Assessment – Electric

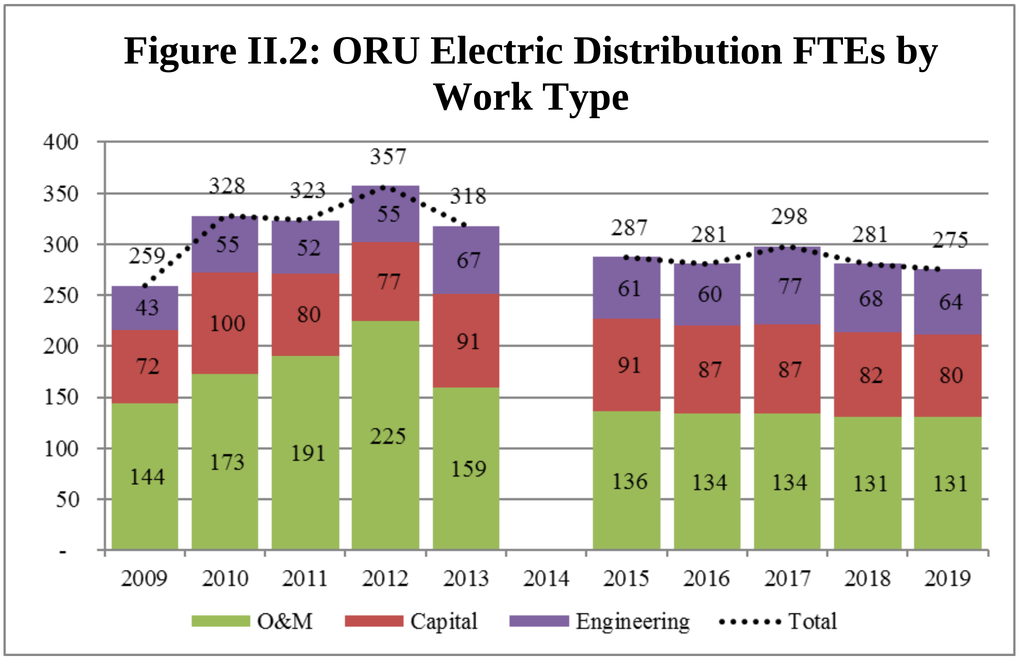
This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for electric distribution and transmission and substation functions at ORU.

a. <u>Electric Distribution Staffing Trends</u>

The following chart shows historical and forecasted staffing resources for electric distribution functions for the period 2009-2019, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors. The second following chart breaks down the same data by type of workload - - O&M, capital, and engineering work. Staffing resources and workload are depicted in terms of Full Time Equivalents (FTEs). An FTE equates to the amount of work provided by one employee for a year, a common way of depicting staffing/workload levels for different types of staffing resources.

Figure II.1: ORU Electric Distribution FTEs by Resource Type





For the 2009-2013 period, internal straight time staffing remained very stable. Internal straight time FTE levels held between 199 and 205 FTEs (with the single exception of 2013). We did not include data for 2014, during which we performed study field work. The companies reported data on incompatible bases for 2014, which at the time required a combination of actual year-to-date and forecasted data. Each of the other study years for the 2009-2019 period were either fully actual or fully forecasted data.

Variations in overall workload were picked up by increased use of overtime and increased use of contractors. Capital work varied by 35 percent during the period (between 72 and 100 FTEs of work) and O&M resources applied varied by more than 50 percent (between 144 and 225 FTEs of work). The biggest jumps in O&M arose from the major storms of 2011 and 2012. Management resourced that work significantly with short-term increases in overtime and contractor FTEs. This approach to meeting peak demands in workload with overtime and contractors reflects a typical management approach used by many. In this case, however, the approach drove overtime to very high levels - - particularly during 2010 to 2012.

For the 2015-2019 forecast period, we had concern about two related issues: (a) the level of work projected for O&M is unrealistic in projecting much lower FTEs than any historical year (about 134 FTEs), and (b) despite straight time levels projected to increase over historical year levels, the forecasted levels of overtime do not appear credible, given experience. We address issues related to overtime in subsequent sections.

The period 2009 to 2013 also witnessed a dramatic increase in FTEs devoted to distribution engineering. Beginning with 43 FTEs in 2009, engineering work increased to 67 FTEs by 2013 (a nearly 80 percent increase). Forecasts for 2015-2019 projected these workload levels to be sustained at between 60 to 77 FTEs. This placed ORU’s ratio of distribution engineering staff FTES to field staff FTEs (combination of capital and O&M work) at 1 to 4.8. This is an extraordinarily low ratio of engineering staff to field staff. For the 2009-2013 period this ratio ranged from 1 to 6.8 to 1 to 7.5 for the other state electric utilities. Both the increase in FTEs and the higher levels of FTEs, compared to the amount of fieldwork, were of concern, and will be further examined in the next part of the analysis.

Table II.3: Electric Distribution Resource Mix

Actual Resource Mix - 2013		
Source	**ORU**	**RU**
Straight Time	73%	67%
Overtime	14%	13%
Contractor	13%	20%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**ORU**	**RU**
Straight Time	76%	65%
Overtime	8%	10%
Contractor	16%	25%
Total	100%	100%

The accompanying table compares ORU's historical and forecasted resource mix to that of the Reference Utility (RU). It shows in both cases a relatively stronger reliance on internal resources. Contractors show some growth, but not at the expense of internal, straight-time resources. Reductions in overtime to levels marginally lower than the Reference Utility forecasted value were driven by small increases in both the other two resource categories. ORU's 2013 percentage of contractor resources was a third lower than the Reference Utility value and straight-time FTEs were higher. The 2019 straight-time FTES grow even higher relative to the Reference Utility, causing the gap between the Reference Utility and ORU's comparatively lower contractor and overtime percentages to grow larger. This confirms ORU's apparent approach to drive down its use of overtime by increasing the use of employee straight time. The result was an even higher reliance on straight time employees and lower use of contractors compared to the state's other electric operations we studied.

b. <u>Reliability Performance</u>

We examined changes in reliability through 2014 (the year covered by the most recent reliability reports available from the Commission). We did so to identify any apparent correlations between reliability metrics and staffing. In addressing the reliability of electric service, we looked at two measures for which the Commission has adopted standards and for which it requires reports. The electric industry commonly uses both as measures of service reliability. The first of those measures, SAIFI (System Average Interruption Frequency Index), consists of the average number (frequency) of interruptions that a customer could expect to experience. We chose not to use this measure, even though it does have, in our view, some connection to staffing. Applying resources to inspect, maintain, and operate electricity delivery infrastructure clearly has a bearing on the frequency with which outages occur. The difficulty in using SAIFI for our purposes lies in the time lag involved; *i.e.*, the fact that systems decline over time when a company underperforms such activities.

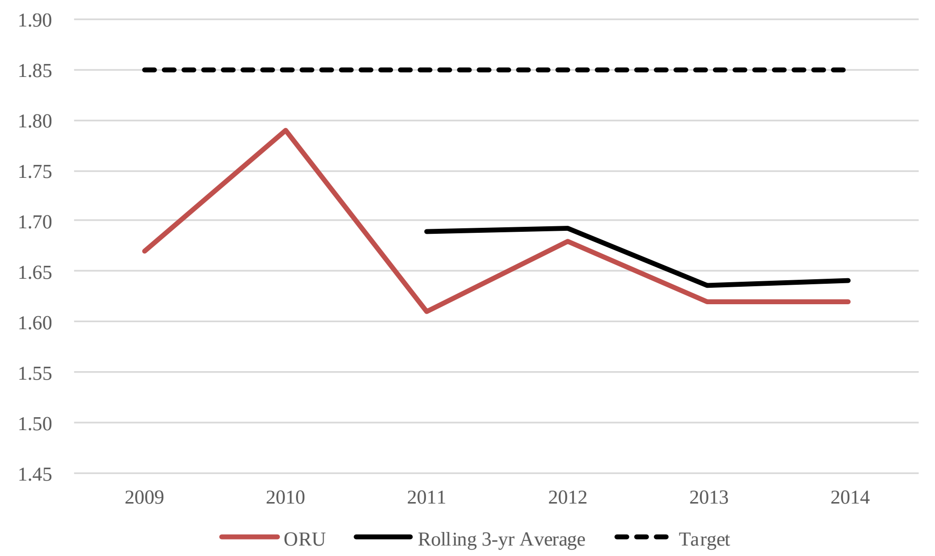
With consequences of staffing curtailment in these areas delayed by some and perhaps many years, it becomes impossible to connect staffing changes over fairly short durations with outages. For example, following a period of short staffing, a utility may engage in a "catch-up" program designed to restore infrastructure to desired conditions. As that work proceeds, outages owing to work not performed years ago and still not "caught up" in a cycle of heightened activity may occur. While tempting, it could well be wrong to assign causation to current staffing levels. In addition, the scope of our study excluded vegetation management (*e.g.*, tree trimming) by design. The failure to provide proactive, comprehensive, and diligently executed vegetation management can also affect customer outages, particularly their frequency. An inability to consider this factor further diminishes the already tenuous value of using SAIFI to gauge staffing in the areas our study was charged with examining.

We found the second measure, CAIDI (Customer Average Interruption Duration Index), more pertinent to our purposes. The industry uses CAIDI commonly as a measure of reliability. It sums all the durations of all customer outages (usually across a period of a year), and divides that sum by the number of customer interruptions experienced. Restoration work is performed largely internally (often supplemented substantially in cases of widespread, severe outages by crews from outside those normally available to the utility) when it is of manageable scope. Measures of CAIDI generally exclude extreme events. Thus, longer outage durations do give reason to question the numbers of internal staff.

Vegetation management (outside the scope of our study) also can affect CAIDI (*e.g.*, spotty vegetation management can produce overgrown trees that take more time to clear in order to provide crews with the access needed to repair and replace the equipment needed to restore service). However, the exclusion of extreme events mitigates this effect. Moreover, the effect of vegetation management on CAIDI is less substantial than its effects on SAIFI, after exclusion of such events.

We therefore focused our review of reliability on CAIDI. The following chart shows ORU's CAIDI performance for 2010-2014, excluding major storms.

Figure II.4: ORU CAIDI – Excluding Major Storms

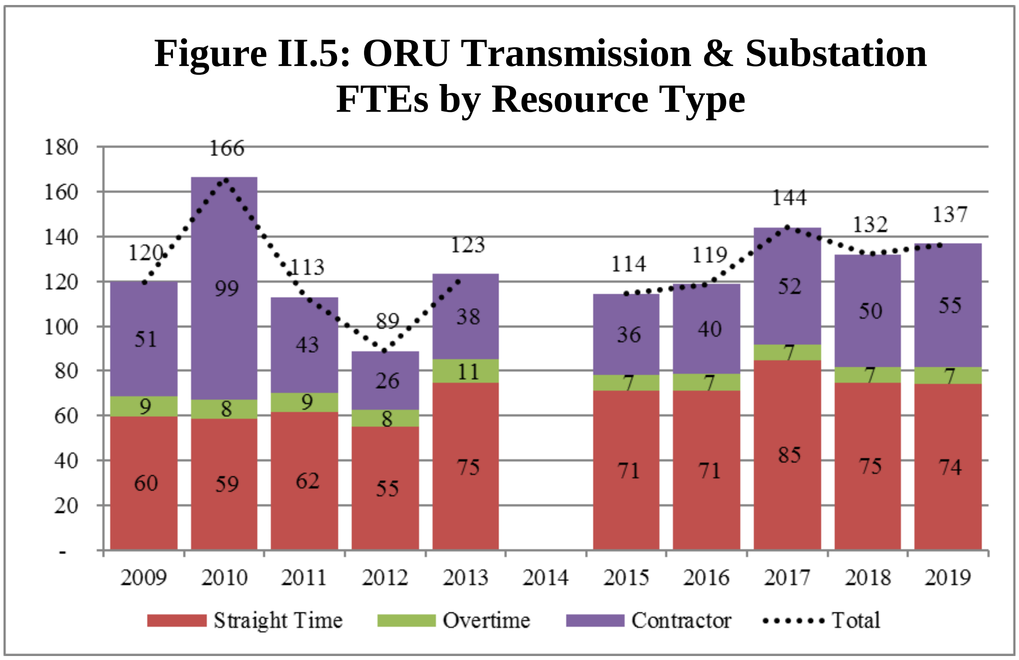


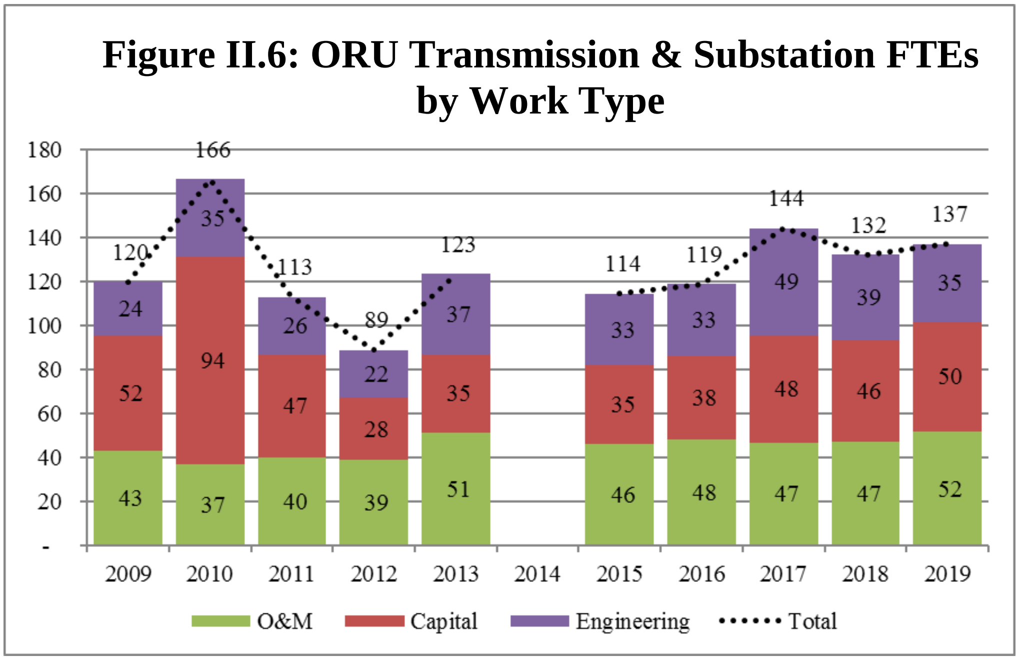
We considered the exclusion of major storms a more appropriate basis for comparing performance, as the number, magnitude, and frequency of such events can skew data very substantially.

Returning to our examination of ORU's CAIDI without major storms, ORU performance from 2009-2013 reveals a very favorable trend. Apart from its higher 2010 figure (*i.e.*, longer average interruption durations, or worse reliability performance), ORU has consistently had the state's lowest durations (*i.e.*, best reliability performance as measured by CAIDI). Moreover, its levels have remained very consistent in recent years. We, therefore, conclude that ORU staffing levels have been adequate for maintaining this key service level measure at very favorable levels.

c. Electric Transmission and Substation Staffing Trends

The next chart shows historical and forecasted staffing resources for electric transmission and substation functions for the period 2009-2019, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors. The following chart breaks down the same data by type of workload - - O&M work, capital work, and engineering work.





Much like distribution work, transmission and substation internal staffing levels remained very stable throughout the 2009-2013 historical period (with the single exception of 2013). Unlike distribution, overtime levels remained consistently less than 10 percent, with projections of a decrease in the future. A one-year jump in capital work during 2010 was largely met by a similar one-year increase in contractors.

In the 2015-2019 forecast period, internal resources were projected to remain at the higher FTE levels reported for 2013 (approximately 71-75 FTEs throughout the forecast period), further reducing the reliance on overtime. Contractors were again expected to be used to adjust for year-to-year changes in workload. Levels of T&S engineering workload were also projected to sustain at 2013 FTEs for the forecast period, and were not out of line with similar modest increases for T&S engineering at other state utilities.

The accompanying table compares ORU's overall resource mix (percentages of straight-time, overtime, and contractor FTEs) to those of the Reference Utility. Historically, the Company made greater relative use of internal, straight-time resources, relative to contactors, and its use of overtime was very similar to the Reference Utility value. Across the forecasted portion of our study period, ORU expected to increase its percentage of contractors to a level in line with similar increases for the Reference Utility.

Table II.7: Electric T&S Resource Mix

Actual Resource Mix - 2013		
Source	**ORU**	**RU**
Straight Time	60%	56%
Overtime	9%	8%
Contractor	31%	36%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**ORU**	**RU**
Straight Time	54%	53%
Overtime	5%	7%
Contractor	40%	40%
Total	100%	100%

d. Electric Staffing Levels

This section examines how ORU's FTE staffing levels compare to other state utilities in the study. Our comparisons used two approaches: ratios of staff versus key system attributes and five-year average FTE levels compared to estimates from Liberty's staffing model.

The next table compares ORU's 2013 FTE levels with those of the other electric operations we studied. The comparisons shown in the chart use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility value, divided by the "all attributes" index described in the "Hard Drivers" subsections of this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. If the number of FTEs for each utility were proportional to its size, and no other factors were considered, this index's value would be 1.0 for every utility. A higher index value suggests that FTEs are higher than might have been expected based on size alone. First, we compare how ORU's 2013 FTE levels compare to other state utilities in the study on a simple ratio basis for certain key system attributes.

Table II.8: Total Electric Staffing Ratios

		All NY Utilities		
Parameter	ORU	Low	RU (Median)	High
Distribution FTEs				
Per Customer	1.40	0.66	1.00	1.40
Per OH Line Mile	1.69	0.46	1.00	6.46
Per Unit Sales	1.08	0.47	1.00	1.43
T&S FTEs				
Per OH Line Mile	1.00	0.24	1.00	13.49
Per Substation	1.00	0.28	1.00	4.22
Total				
Per Customer	1.27	0.72	1.00	1.27
Per Unit Sales	1.00	0.59	1.00	1.43
Per Average of All Attributes	1.16	0.67	0.97	1.16

For distribution work, FTEs per customer and FTEs per mile of overhead line are both higher than the Reference Utility ratio, consistent with the nature of their distribution system and relatively low percentage of underground facilities. However, the ORU value of 1.08 FTE per unit of sales falls reasonably close to the Reference Utility value of 1.0, indicating a comparable level of distribution staffing on a unit of sales basis, compared to other state utilities. For transmission work, ORU's FTEs per unit values of 1.0 equals the Reference Utility value.

Overall electric FTEs per customer are 1.27 – the highest value for the state. We found this measure unsurprising, because distribution comprises three-fourths of the total electric work force. This result also conforms generally with the nature of the service area. The value of 1.00 overall electric FTEs per unit of sales indicates a comparable level of electric staffing under this metric.

Next we examine how ORU's average staffing levels for the historical portion of our study period compared to staffing level estimates from the model developed by Liberty. We developed that model using the data provided by all the utilities we studied. The model correlates actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produces staffing level estimates, broken down by capital, O&M and engineering, for each utility. The estimates consider how the utility's unique combination of attributes vary with staffing levels compared to how the other state utilities' staffing levels vary for the same combination of attributes. The model provides a more sophisticated way to consider each utility's staffing levels normalized for each utility's unique mix of infrastructure. The model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Those variances provide one of the bases used to question issues and perform analyses of staffing.

The next tables show five-year average actual FTEs versus model results for distribution and for transmission and substation activities. The tables break the results down by capital, O&M, and engineering functions. Note the two instances (Substation Capital and Transmission Capital) where we show "No Model." In these cases, we report only ORU's actual values. Observing a very high level of volatility in all companies' year-to-year expenditures for transmission and substation capital functions, we determined that we could not construct a statistically valid model for such work, given that we had only five years of data to use.

Table II.9: ORU Electric Distribution Five-Year Average FTES (2009-2013)

Distribution			Transmission & Substation				
Type	Actual	Estimate	Type	Function	Actual	Estimate	Note
Capital	84	87	Capital	Transmission	44	44	No model
				Substation	7	7	No model
O&M	178	153	O&M	Transmission	10	10	-
				Substation	32	39	-
Engineering	54	21	Engineering	T&S	29	29	-
Total FTEs	317	262	Total FTEs	T&S	122	130	-

The results of modeling show no statistically significant differences between ORU's actual numbers and the model's results for capital work (1 percent difference) and O&M work (11 percent difference). For distribution engineering the model confirmed the earlier analysis about the high levels of staffing. Model estimates for distribution engineering were less than half the average actual FTE levels (21 FTEs for the model versus actual FTEs of 54). This observation confirms our concern that staffing levels in this area are very high, compared to other state utilities. Five-year average FTE levels for most transmission and substation functions were at or near model estimates. The exception was Substation O&M, where average actual FTEs were 22 percent lower than model estimates (32 actual versus 39 model FTEs). ORU may have recognized this gap, because management's forecasts for 2015-2019 show an ongoing increase of six to eight FTEs in this area.

2. *Productivity – Electric*

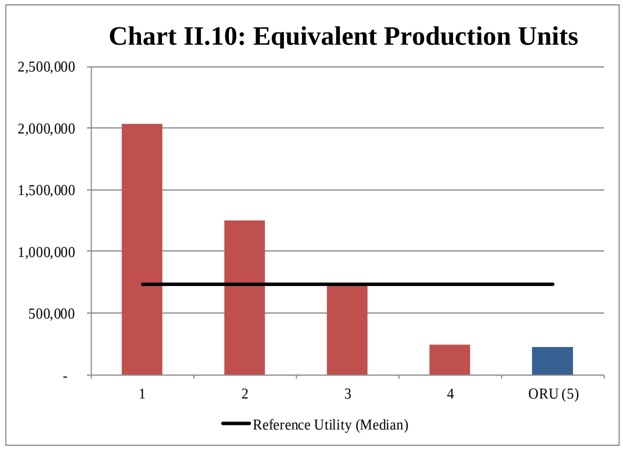
Liberty has addressed productivity from several perspectives. We undertook comparisons of the operations we studied as a function of staffing per unit of a variety of commodities or attributes. We also developed a concept we termed state normalized unit rates (NYNURs or 9ers). The

Productivity chapter in the Statewide report describe this concept. Our 9ers present a common measure of production (equivalent production units, or EPUs) that facilitates comparisons across commodities and organizations. The number of hours, or FTEs, or dollars expended per EPU therefore becomes one indicator of productivity.

In developing the 9ers concept we learned that the utility data available was not sufficiently comprehensive to allow us to apply it to all the hours spent on the work activities within the scope of our study. We did, however, find sufficient data to develop usable measures for about half of the hours each utility actually expended. The partial nature of the results dictates caution in carrying any performance conclusions too far. Nevertheless, we believe the concept has value as another indicator which, when supported by others, can be informative.

a. Equivalent Production Units

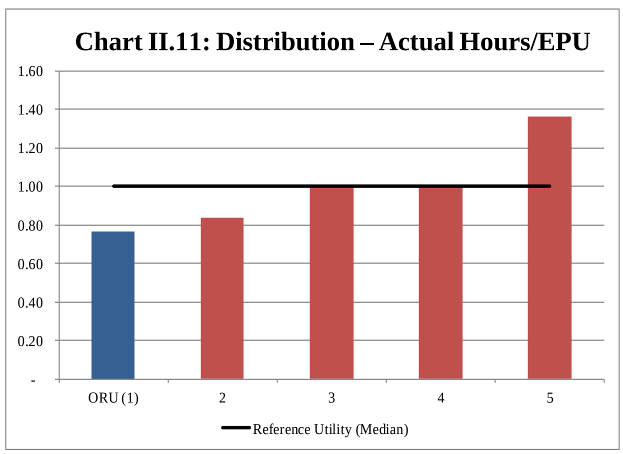
An EPU equals the number of hours the Reference Utility expended to produce one unit of a given commodity. Stated in another way, the EPU quantifies the Reference Utility actual unit rate value for that commodity. For example, if the Reference Utility unit rate for "widgets" equals 10 hours per widget, then installation of one widget earns a utility 10 hours. This process creates a common denominator for production, allowing us to add EPUs together at any level of detail or for any organizational breakdown.



For the limited scope covered by our analysis, ORU produced, or earned, the smallest production value of the electric utilities. The absolute number of EPUs measures unit output, but means little on its own. It derives usefulness when constructed to represent a comparable production level among companies. The ability to measure the number of employees per EPU at a total company level may be the ultimate, but not perfect, measure of productivity.

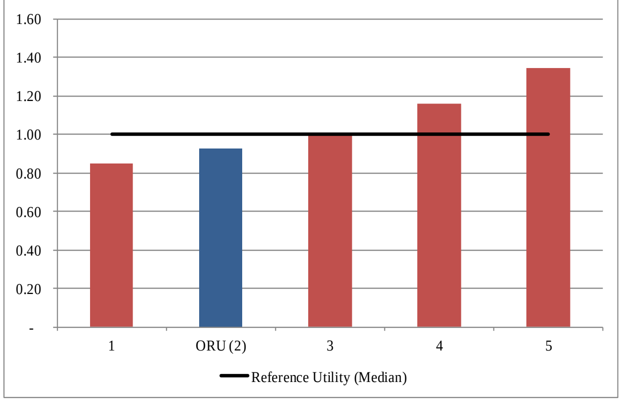
b. Productivity

We use the term physical productivity here to mean the actual hours per EPU. The next chart illustrates the hours each utility spent in the limited scope areas per EPU. Note that the Reference Utility is 1.0 here by definition, because we defined an EPU as the Reference Utility's actual unit rate. The next chart illustrates the hours each utility spent in the limited scope areas per EPU, which we term physical productivity. ORU exhibited the best physical productivity for these functions. This result varies from the ratio analysis above, which uses a different measurement basis.



Given the wide disparity among the utilities, the distribution around the Reference Utility is surprisingly limited.

Chart II.12: Distribution – Actual Dollars/EPU



We define cost productivity as the dollars of labor cost expended to achieve an EPU. We normalized this data to the Reference Utility value, whose cost productivity is $81.13 per EPU. Here ORU's relatively high composite hourly labor rate[2] reduces its relative competitive position, but the Company nonetheless remains more cost efficient than most of the others.

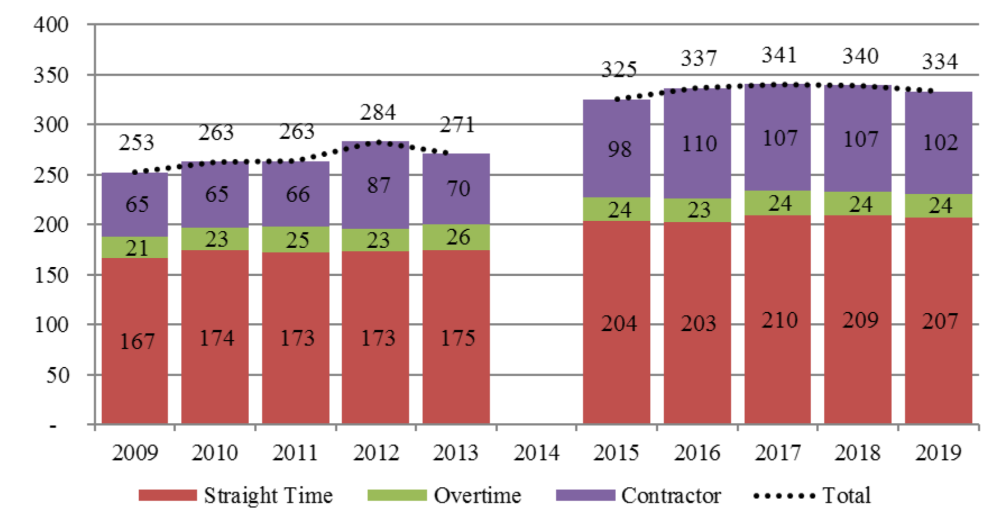
3. *Total Staff Assessment - Gas*

This section addresses historical (2009-2013) and forecast (2015-2019) staffing resources for gas operations at ORU.

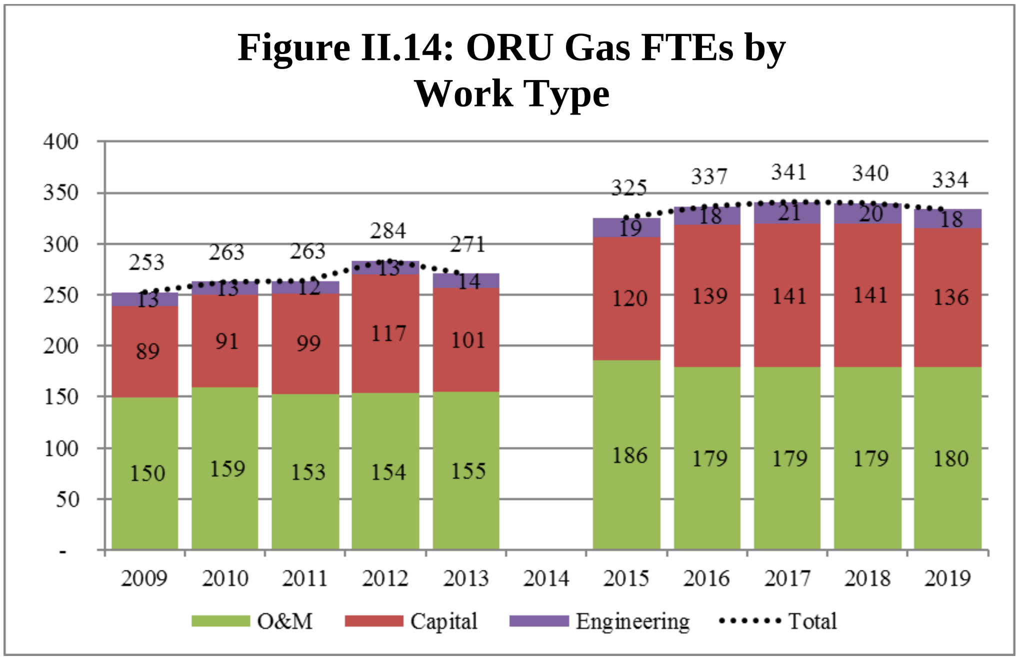
a. Gas Staffing Trends

The next chart shows the 2009 through 2019 historical and forecasted gas staffing resources in the areas encompassed by our study, broken down by resource type (internal staff straight time, internal staff overtime, and contractors). As was true for all the state's utilities, we were not able to secure consistently derived data for 2014, which was in progress during our field work. The second chart below breaks down the same data by type of workload - - O&M, capital, and engineering work.

Figure II.13: ORU Gas FTEs by Resource Type



[2] The composite labor rate includes all internal straight and overtime and all contractor hourly rates, weighted by hours.



Throughout the 2009-2013 historical period internal staffing resources were very stable, with the modest increases in capital work primarily met by contractor resources. Stable internal resources, including the modest use of overtime, lead us to conclude that management followed a rational approach to staffing gas functions.

The 2015-2019 forecast data that ORU provided showed increases in both O&M and capital work. Resource forecasts showed maintenance activities (including emergency response to leaks, leak surveillance and follow-up, and distribution system maintenance) as the biggest driver of increased straight-time FTEs going forward. Similarly, forecasts showed pipeline renewal and replacement (*e.g.*, main replacement) as the biggest driver of contractor FTE increases. These increases in future workload accompanied by commensurate increases in internal staff and contractors continued the same rational pattern to resourcing the work during the historical period.

The historical period also witnessed a consistently low level of FTEs devoted to gas engineering. FTE activity in engineering work ran between 12 and 14 FTEs throughout the period. ORU management appears to have recognized this issue; 2015-2019 forecasts projected engineering FTE levels to increase substantially - - rising to total levels of between 19 and 21 FTEs. Gas engineering staffing levels at other state utilities varied between 27 FTEs and 52 FTEs throughout the 2009-2013 period. Except for the very large New York City area utilities, ratios of field staff to engineering staff for other gas utilities ranged between 6 to 1 and 11 to 1 for the 2009-2013 period. ORU's ratio of field staff to gas engineering staff was 19 to 1. This represented an extraordinarily high ratio of field staff to engineering staff. Both the comparatively low levels of FTEs, compared to others, and the higher FTE ratios of fieldwork versus engineering raised questions.

The accompanying table shows ORU's overall resource mix (percentage of straight time, overtime, and contractors) compared to those of the Reference Utility. Historically, ORU's mix lay close to the Reference Utility value, distinguished by slightly lower use of contractors. ORU's projections showed little change in the share of work performed with internal straight-time FTEs, and an increase in contractor use. A reduction in forecasted overtime accounted for a portion of the rebalancing. ORU data showed a moderate rebalancing. The forecasts provided showed the Company still using more internal resources (by a small margin) when compared with the other state utilities we studied. Both ORU and the Reference utility showed increased contractor use, reflecting the industry pattern of ramping up contractor resources to meet accelerating main replacement programs.

Table II.15: Gas Resource Mix

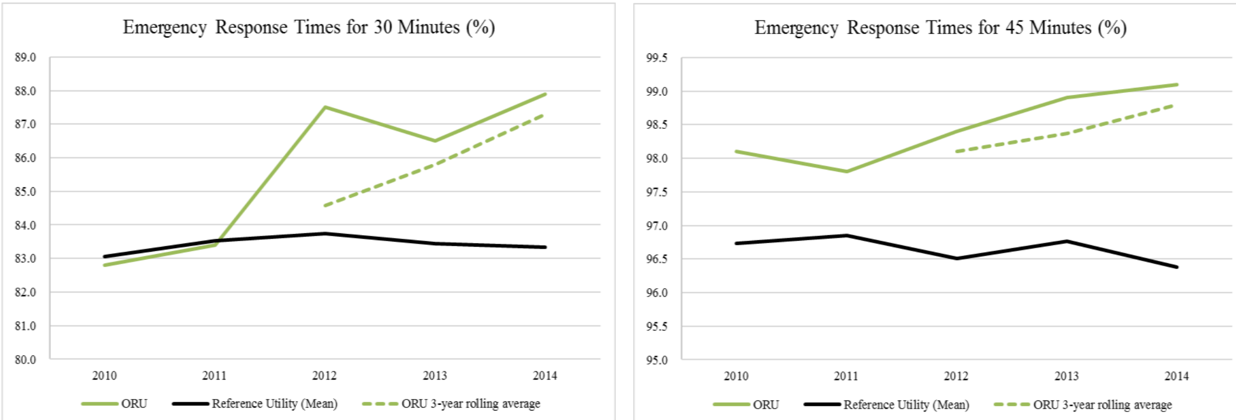
Actual Resource Mix - 2013		
Source	**ORU**	**RU**
Straight Time	64%	62%
Overtime	10%	8%
Contractor	26%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**ORU**	**RU**
Straight Time	62%	59%
Overtime	7%	8%
Contractor	31%	33%
Total	100%	100%

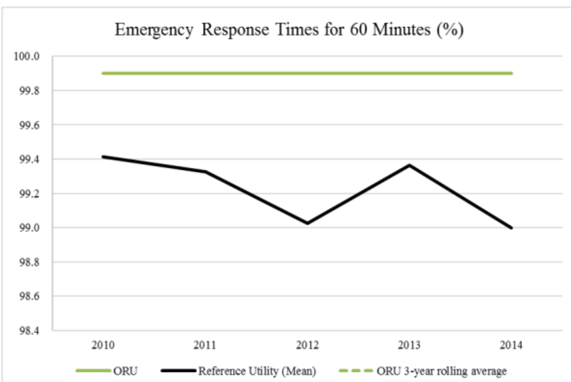
Growing reliance on contractors reflects what we believe is a significant statewide cause for caution. All gas utilities throughout the Northeast are ramping up their use of contractors for accelerating their pipe replacement programs. However, we are also mindful of the challenges in ramping up internal resources at a higher rate than anticipated in the forecast that ORU provided during our field work for this study. ORU, like its peers, needs to remain very much focused on assessing markets for skilled resources and in participating in efforts to expand those resources.

b. Performance Metrics

We charted historical changes in gas performance metrics as reported to the Commission. Stable FTEs throughout the period resulted in improving performance, as measured by leak response times and backlogs of potentially hazardous leaks. Backlogs of potentially hazardous leaks present a more complex picture. We considered leak-response times and backlogs of leaks as defined in 16 NYCRR Part 255; *i.e.*, Types 1, 2A, and 2. The next charts show that the percentage of leaks responded to within the 30- and 45-minute windows improved, and remained well above Reference Utility levels.

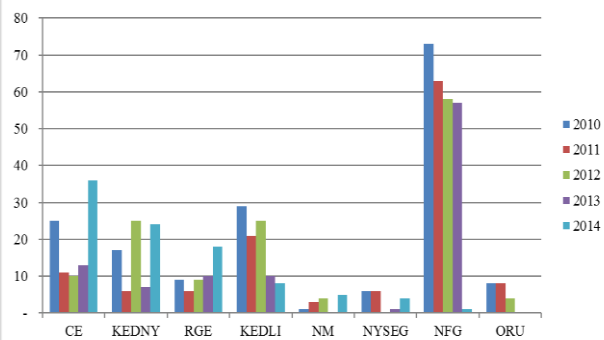
Chart II.16: ORU Emergency Response Times





Against steady or declining response times on average across the state, ORU improved from levels close to those of the Reference Utility during 2010 and 2011. Its backlog of potentially hazardous leaks, already comparatively low, fell to zero in 2014. We therefore conclude that ORU staffing levels have been adequate for improving these service level measures to very favorable levels.

Chart II.17: Backlog of Potentially Hazardous Leaks: 2014



c. <u>Gas Staffing Levels</u>

The table below compares ORU's 2013 FTE levels with those of the other state utilities we studied, normalized by key system attributes.

Table II.18: Gas Staffing Ratios

Parameter	ORU	All NY Utilitites Low	RU (Median)	High
Gas FTEs				
Per Customer	2.32	0.70	1.00	2.32
Per Mile of Main	2.11	0.49	1.00	3.60
Per Unit Sales	1.82	0.60	1.00	1.82
Per Average of All Attributes	1.49	0.80	0.96	1.49

As was the case for ORU's electric distribution ratios, its gas FTEs per customer and gas FTEs per mile of main exceeded the Reference Utility values. Higher ratios under these measures are consistent with the nature of ORU's distribution system and lower than average customer densities per square mile. However, FTEs per unit of sales are also near the statewide high, indicating an unfavorable level of gas staffing on a unit of sales basis, compared to other state utilities.

Next we examine how ORU's five-year average staffing levels for the period 2009-2013 compare to estimates from the model developed by Liberty (as we did for electric operations). The next table shows five-year average actual FTEs versus model results for gas capital, O&M, and engineering functions.

Table II.19: ORU Gas Five-Year Average FTEs (2009-2013)

Type	Actual	Estimate
Capital	99	112
O&M	154	171
Engineering	13	27
Total FTEs	266	310

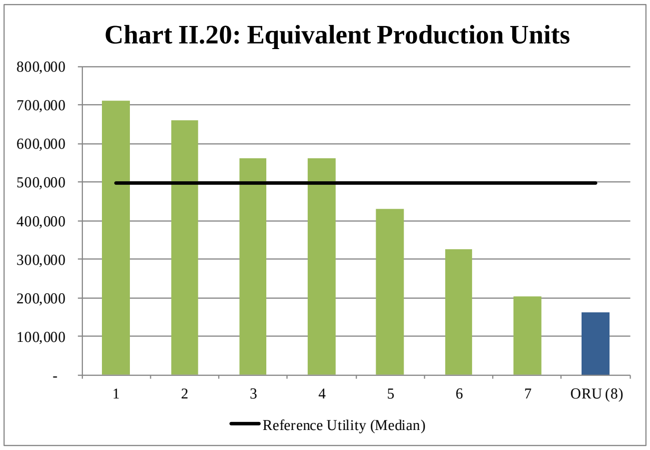
Based upon the model analysis, all ORU's five-year average staffing levels were less than model estimates. O&M actuals were 10 percent lower than model estimates. Actuals for capital were 12 percent lower and engineering about 52 percent lower. This result differs from what we observed from the ratio analysis addressed above. It may suggest staffing levels better matched to system infrastructure and program requirements than the previously discussed, simple ratios indicate.

For gas engineering, the model confirmed the earlier observations about low levels of staffing. Model estimates for gas engineering indicated twice the average actual FTE levels (27 FTEs for the model versus actual FTEs of 13). ORU forecasts project engineering FTE levels will increase to between 20-22 FTEs in the 2015-2019 period.

4. Productivity - Gas

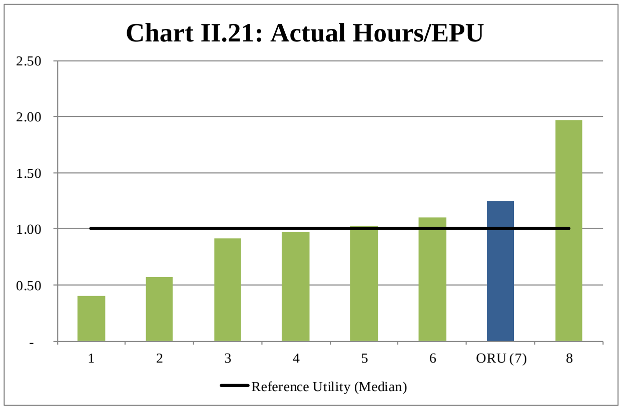
a. Equivalent Production Units

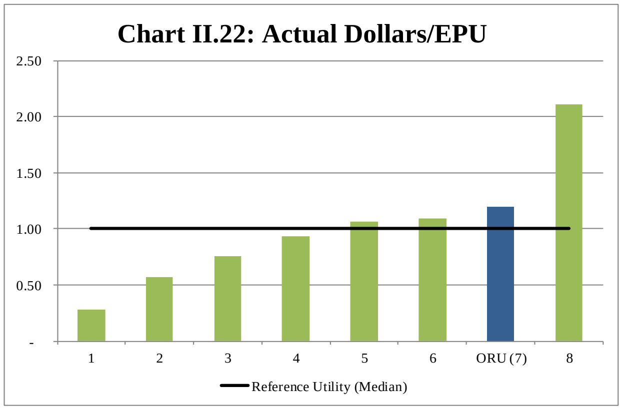
We have seen earlier that ORU is the smallest gas company in our sample by virtually every measure. It is therefore not surprising that ORU had the lowest production level as expressed in EPUs. The magnitude of the difference is substantial, as ORU operated at only about 30 percent of the production level of the Reference Utility.



b. Productivity

Physical productivity for ORU was about 25 percent worse than the Reference Utility. On the surface, this is not necessarily a surprise nor is it obviously out of line. One would expect the smallest firm to lack the economies of scale others might enjoy. However, this 9ers data produces results similar to the FTE per attribute data discussed above. Both suggest that ORU is higher than its peers in gas staffing when viewed on a comparable basis. We note that the model results would not support such a conclusion.





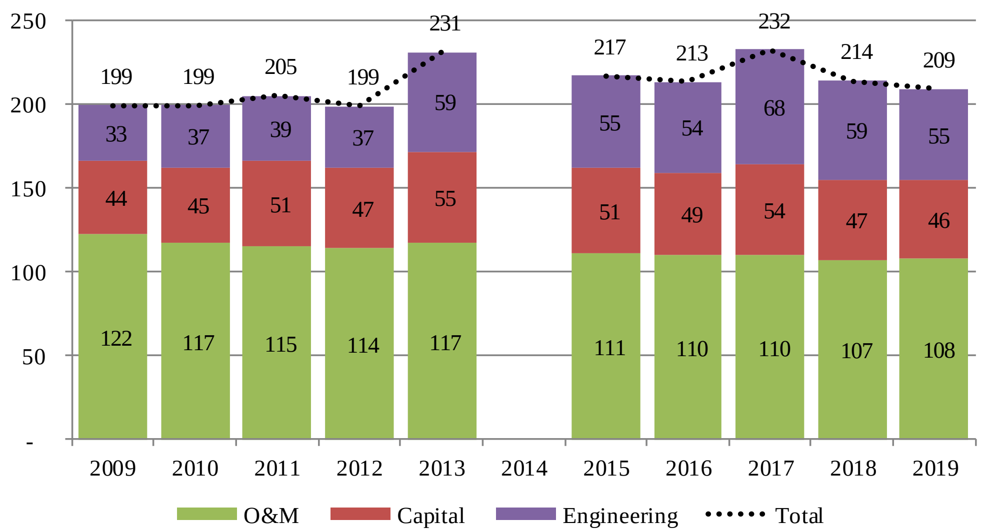
ORU's deviation from the Reference Utility value became smaller when considering cost productivity ($ per EPU). Although ranking poorly, the distribution of utilities is somewhat narrower and ORU was not far from the Reference Utility value. Unlike electric distribution, where ORU had a relatively high composite hourly labor cost, the gas composite cost was less than the Reference Utility value. The median cost productivity for the gas utilities was $94.69 per EPU.

B. Internal Staffing

1. Electric Distribution

The following chart shows overall straight time (*i.e.*, internal staff) levels for electric distribution, divided into O&M, capital and engineering resources. Total internal resources did not change materially from 2009 through 2012. Not surprisingly, the year following Hurricane Sandy (2013) showed a significant increase, driven by engineering and capital work. Information provided by ORU showed combined FTEs for capital and O&M work returning to pre-Sandy levels by 2015 (albeit with a slightly higher ratio of capital to O&M). Engineering forecasts, however, remained high through 2019. With combined 2019 capital and O&M FTEs seven percent below 2009 levels, forecasted 2019 engineering FTEs were higher than 2009 levels by two-thirds.

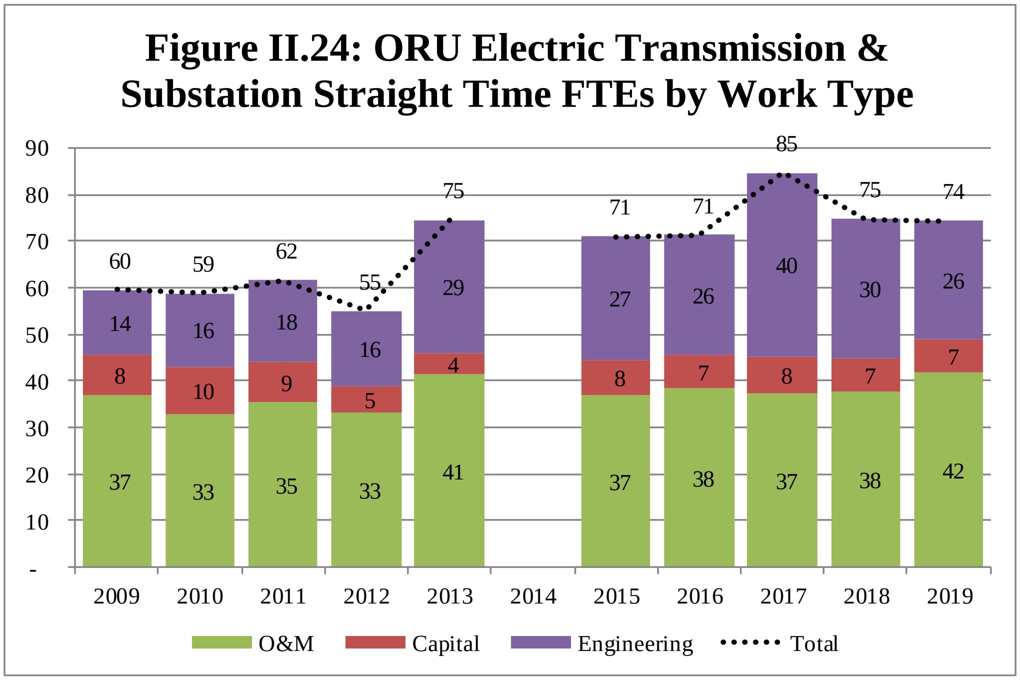
Figure II.23: ORU Electric Distribution Straight Time FTEs by Work Type



In total, internal FTEs forecasted in 2019 exceeded 2009 levels by a modest five percent. Over the same period O&M FTEs were, based on forecasts at the time of our field work, expected to decline by about 10 percent, based upon the forecasts provided, while capital FTEs changed only 44 to 46, with year-to-year variations consistent with the generally uneven nature of capital work.

Projections showed distribution engineering FTEs declining modestly from 2013's 59 FTEs to a projected total of 54 FTEs in 2016. Forecasts showed a large (for engineering) increase to 68 for a single year (2017), followed by a decline back to 55 FTEs by 2019. The "lumpy" nature of the forecasts and the "heavier" application of engineers relative to capital and O&M work (represented by forecasted FTEs in those two areas) make it appropriate to question the basis for ORU's forecasts of engineers.

Transmission and substation FTEs showed the same 2013 jump, but significantly more pronounced on a percentage basis. Engineering FTEs ranged from an actual low of 14 FTEs in 2009 to a forecasted high of 40 FTEs in 2017. This latter year thus showed the same anomalous increase as ORU forecasted for distribution internal straight-time FTEs. Transmission and substation FTEs also showed the same "leap" in proportion to capital and O&M FTEs in 2013, and a continuation of that heavier engineering load through 2019.



Some variation in transmission and substation internal staff levels, over the long term, can reflect expansion and contraction of a "lumpy" (exhibiting substantial year-to-year variation) capital program. Engineering resources were reported as low as 14 FTEs in 2009 and projected as high as 40 FTEs in 2017. There appear, though, to be three points of departure: (a) relatively flat total and component FTE levels in the 2009 to 2012 period, (b) a jump in O&M and engineering staff in 2013, and (c)subsequent, relatively stable transmission and substation total and component staff levels. Similar to distribution engineering, transmission and substation internal staff levels showed notable and significant increases and decreases in resource levels in 2017.

The next table shows ORU's internal staff levels for both the distribution and transmission and substation areas, relative to other state electric utilities. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index described in the "Hard Drivers" subsections of this report. This is a rough indicator of the overall total FTEs as a function of the size of a utility.

Table II.25: Electric Straight Time Staffing Ratios

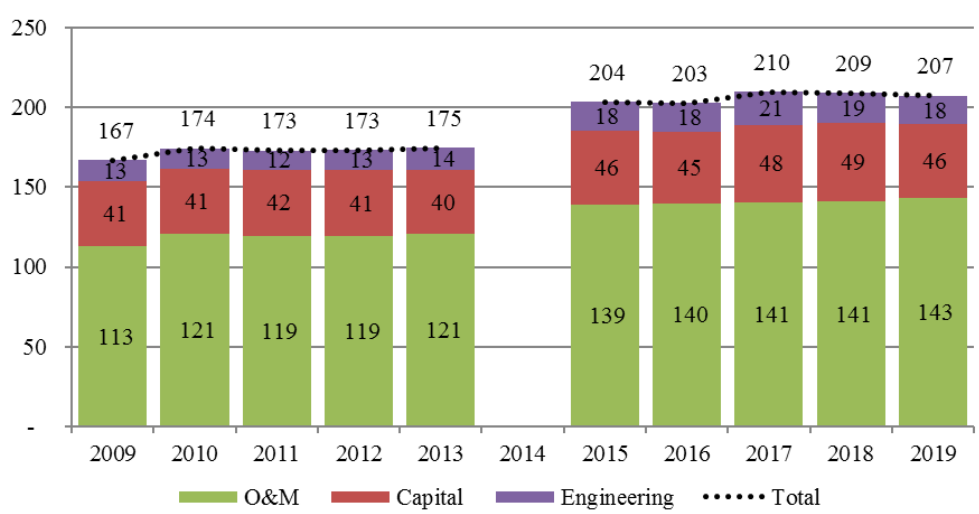
Parameter	ORU	All NY Utilities Low	All NY Utilities RU (Median)	All NY Utilities High
Distribution FTEs				
Per Customer	1.71	0.63	1.00	1.71
Per OH Line Mile	2.13	0.50	1.00	6.70
Per Unit Sales	1.31	0.45	1.00	1.49
T&S FTEs				
Per OH Line Mile	1.79	0.42	1.00	29.16
Per Substation	1.64	0.42	1.00	8.35
Total				
Per Customer	1.36	0.62	1.00	1.36
Per Unit Sales	1.05	0.44	1.00	1.30
Average of Total	1.21	0.53	1.00	1.33
Per Average of All Attributes	1.09	0.57	0.77	1.09

ORU's levels related to distribution fell consistently and far enough above the Reference Utility in all comparative areas to suggest a need for attention to whether its internal resources are too high. In the transmission and substation area, ratios were higher than the Reference Utility value, but merely suggest a higher reliance on internal staff, given that the overall FTE per substation ratio is at 1.0.

2. *Gas Internal Staffing*

The next table shows gas operations internal straight-time FTEs for the years 2009-2013.

Figure II.26: ORU Gas Straight Time FTEs by Work Type



The total number of such FTEs remained very stable through 2013, with a small increase in those dedicated to O&M work. Forecasted data provided by ORU showed very different and sustained, higher staff levels from 2015 through 2019. The total increase from 2013 to 2015 was 16 percent. Continuing forecasted increases through 2019 brought total internal FTEs to a level 24 percent above 2009 levels. Increased capital work contributed slightly to internal staff increases (about 10 percent), but contractors picked up most of the increase in capital work. Not surprisingly, engineering FTEs increased by about 20-25 percent to support the increased overall levels of capital work.

The next table shows how internal staffing ratios compare to the Reference Utility value.

Table II.27: Straight Time Staffing Ratios

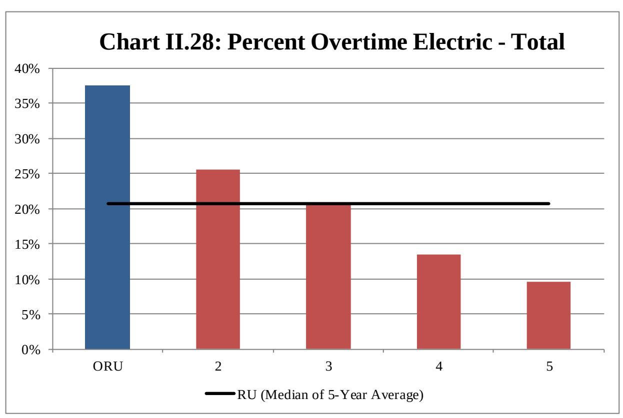
Parameter	ORU	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	2.46	0.52	1.00	2.46
Per Mile of Main	2.11	0.54	1.00	2.94
Per Unit Sales	1.90	0.44	1.00	1.90
Per Average of All Attributes	2.16	0.50	1.00	2.43

As was the case for ORU's overall gas system ratios, its gas FTEs per customer and gas FTEs per mile of main exceeded those of the Reference Utility. Higher ratios under these measures are consistent with the nature of ORU's gas system and lower than average customer densities per square mile. Similar to electric, gas FTEs per unit of sales were also near the statewide high, indicating an unfavorable level of gas staffing on that basis, compared to other state utilities.

C. Overtime

1. Overtime – Electric

ORU reported overtime on a different basis than the other utilities. ORU included all unavailable hours (training, vacation, sick time, holidays) at the functional level, effectively increasing the straight time hour base, in comparison with others we studied. Management calculated overtime percentages against this inflated base, thus producing a lower percentage than would exist if measured as others did. Liberty adjusted ORU reported overtime upwards to assure consistency of comparisons.



The accompanying chart illustrates ORU's electric overtime average over the five-year period 2009-13.[3] The remaining bars represent the four other state electric utilities in this portion of the study. ORU's reported electric overtime, adjusted as above, was the highest of

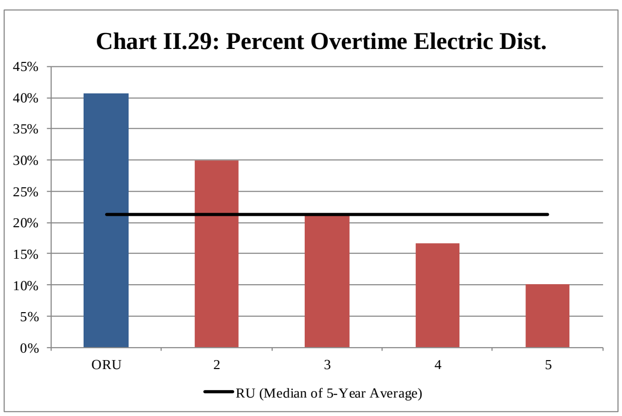
[3] All overtime reported in this chapter excludes any engineering functions.

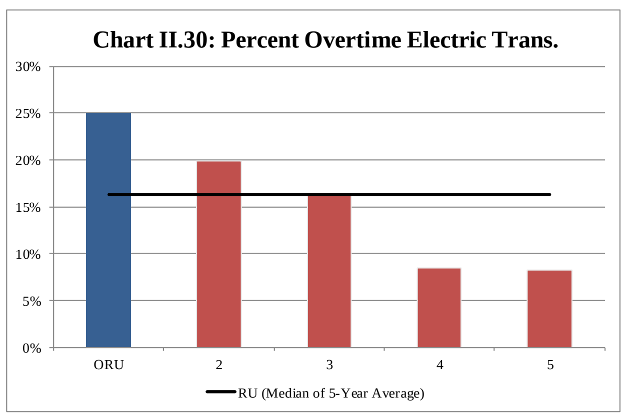
the state electric firms, and well above the Reference Utility. It faced significant storms in 2011 and 2012.

ORU's most compelling extenuating factor here was its lack of 24-hour coverage, which necessitated handling essentially all off-hour emergencies with overtime hours. ORU's regular work week comprised eight hours by five days (Monday through Friday). The other companies had around the clock staff coverages for emergencies. Management has analyzed this balance between expanded off hours staffing and reliance on overtime. Management continued to believe that added overtime provided the least cost solution. We discuss ORU's analyses in this area later in this report, when reviewing management's processes for the planning and management of overtime. For now, we can state that the acceptance of an overtime penalty to avoid new hires, when analyzed properly, can indeed offer an optimal solution. We do not believe that this explanation accounts for all the hours by which ORU exceeded its peers. In other words, ORU overtime was likely well above the Reference Utility value with or without this extenuating circumstance.

Another explanation for high overtime is ORU's agreement to tie added use of overtime to the use of contractors. We explain this agreement more fully in our discussion of contracting. When management uses contractors under certain circumstances, it triggers a requirement for weekend work for employees. This obligation has a significant impact on the Company's ability to implement an optimal resource mix.

The charts below depict ORU's comparative performance, broken down between electric distribution and transmission/substations resources. The same pattern existed. The distribution function was especially high, with a result about double the Reference Utility value. Not important in isolation, that figure takes on more significance when observing that it represents the average for the total force for 52 weeks per year. Accordingly, exceeding the Reference Utility value does raise questions.

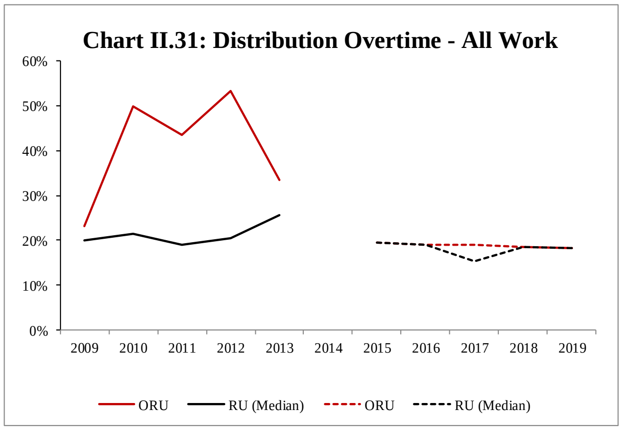




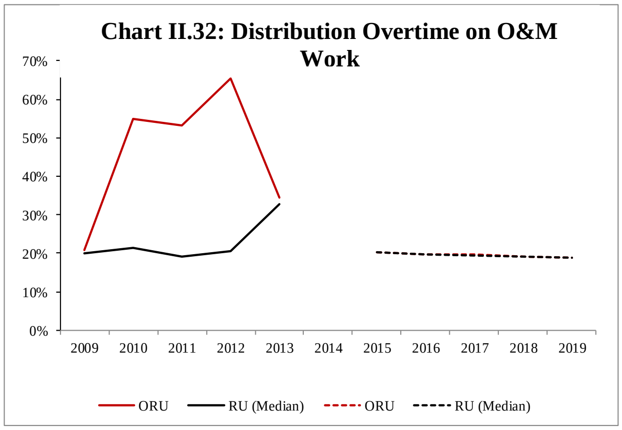
ORU's target for overtime has been 25 percent[4], which is above the Reference Utility value. The Company therefore did not simply exceed its peers, but also greatly exceeded its own definition of what is appropriate.

[4] The Company's internal target is actually 20 percent, but recall that it is calculated differently from the other companies. On a comparable basis, the ORU internal target is about 25 percent.

The accompanying chart plots ORU's actual and forecasted overtime. The data suggest that distribution overtime was especially problematic in the 2010-12 window and that the Company expects overtime to come back within its 20 percent goal in the future. Whether this will happen remains to be seen, but the Company's recognition of the need to reduce its overtime coupled with its commitment to a plan to indeed do that is a positive sign.

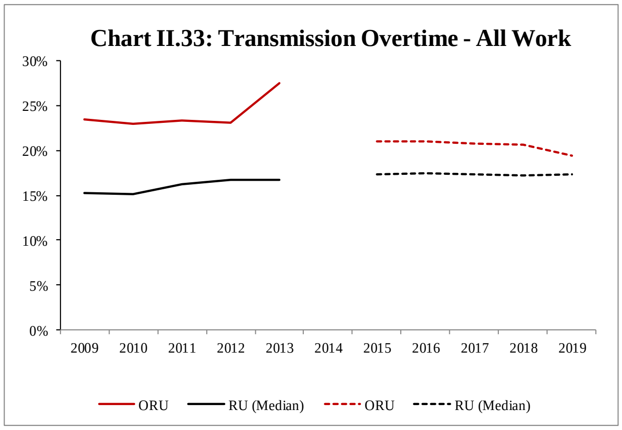


The accompanying chart plots distribution overtime on O&M work. The data make clear that distribution work was the primary driver of ORU's high overtime levels. This lends credence to management's belief that the lack of 24-hour coverage for emergencies was a key factor. Liberty agrees, but we do not find that this attribute explains the full magnitude of the problem, or anywhere near it. We suspect the Company agrees, or a plan to return to 20 percent would be questionable.



The magnitude of the improvement required to get to 20 percent is shown as ORU moves from a position as a large outlier to equal the Reference Utility for this category.

The accompanying chart shows that ORU's position in electric transmission/substations was also well above the Reference Utility value. Sharp recent increases from an already-high level, without any real assurances that the upward trend will be contained, raises a significant concern.



The tables below indicate the degree to which ORU relied on overtime as a percentage of its resource needs. Note the percentage here represents the fraction of *total* hours (straight time plus overtime plus contractors) that is overtime. This differs from the other percentages used in this chapter, which we calculated as the fraction of *internal* hours (straight time plus overtime) represented by overtime.

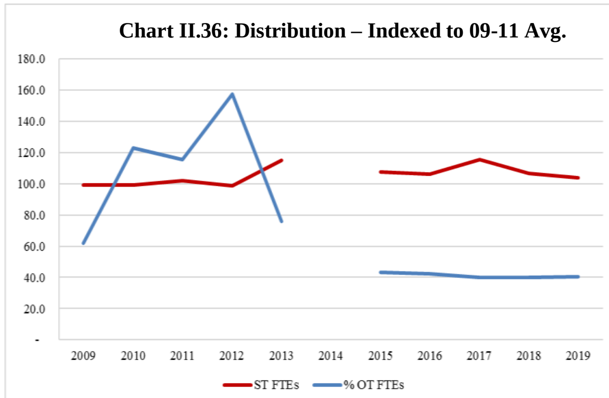
In both the distribution and transmission/substations areas, ORU had a far higher dependence on overtime than the Reference Utility value indicates. The most important observation concerns the 22 percent reliance in distribution. This means that ORU depended on overtime to provide more than one of every five total labor hours. By any measure this is an extreme result that did not appear to offer an optimum resource mix.

Chart II.34: Distribution Overtime Mix in the Resource Stack

Description	ORU	RU (Median)
OT as a % of Total FTE	22%	14%

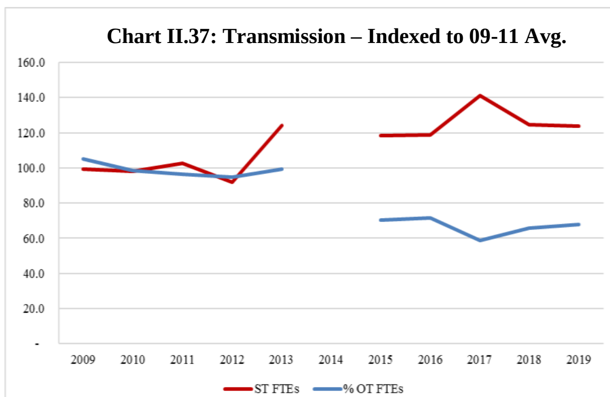
Chart II.35: Distribution Overtime Mix in the Resource Stack

Description	ORU	RU (Median)
OT as a % of Total FTE	14%	9%



The accompanying chart examines the relative trends in staffing and overtime for ORU distribution. We made this comparison to determine whether there may be a relationship between adequacy of staffing and levels of overtime. On a statewide level, we saw some limited correlation between staff reductions and increases in overtime, and vice versa.

The analysis is not straightforward, especially for ORU, because the annual values fluctuated widely. We chose the 2009-2011 averages as a baseline for our index approach, assigning that average a value of 100. We then plotted the other data of interest on the same basis. A long-term view of ORU indicated stable internal staffing, coupled with a very substantial drop in overtime. The challenge of cutting overtime in half (to a net of 20 percent) will create a major challenge, if not accompanied by a corresponding increase in applied straight time resources.

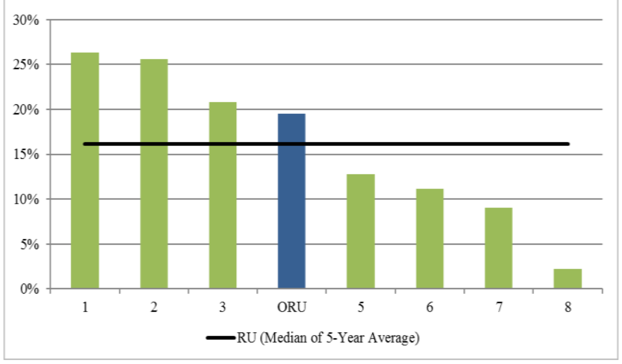


The transmission/substations data shown in the accompanying chart indicate projected staffing increases that accompany a similarly precipitous drop in planned overtime. This relationship is more transparently credible than the distribution view, but the ability to achieve so large a reduction in overtime remains a major challenge.

2. Overtime - Gas

A more moderate view emerges from the review of gas overtime. ORU fell only slightly above the Reference Utility value. The gas Reference Utility value itself was lower for gas than for electric operations. There were two clear outliers, but most of the gas operations we studied had rates of 20 percent or less.

Chart II.38: Percent Overtime: Gas - Total



ORU exceeded the Reference Utility overtime value of 16 perccent. Further, the three utilities at about 10 percent or less show that a low bound was possible, at least before considering unique circumstances at each of them.

ORU overtime in gas, like elecric, operations reflected the lack of 24-hour on-shift personnel. The lack of those shifts likely explains much of the amount by which ORU overtime exceeded the Reference Utility value, particularly given that the ORU overtime rates were not far above the Reference Utility value. That observation derives further suppot from examiningexpense and capital work separately, in which case ORU performance raised no issues.

Chart II.39: Percent Overtime: Gas - Capital

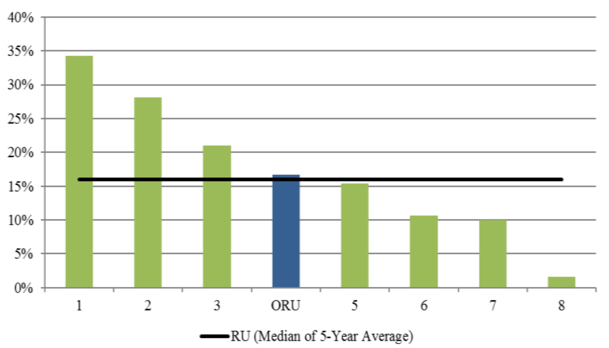
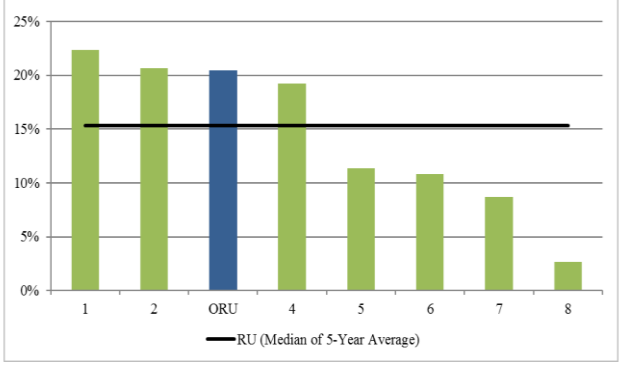
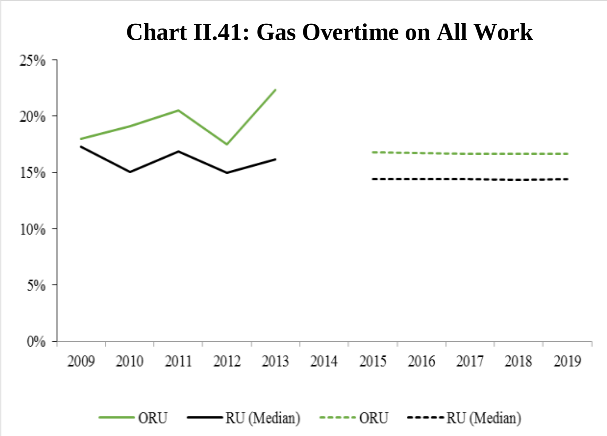


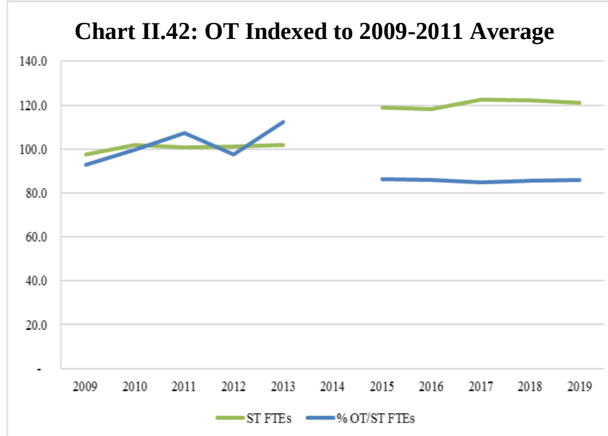
Chart II.40: Percent Overtime: Gas – O&M



Similarly, we observed nothing remarkable in the longer term picture for gas operations. ORU generally tracked the Reference Utility value into the future. Management planned to maintain levels at about 17 percent. Prior performance suggests that such goals were neither too aggressive nor unreasonable.

The inverse relationship examined between staffing and overtime appeared in the ORU projections, if not the actual results to date. Management projected increased staffing and decreased overtime, both to meaningful levels. Given that such changes produce a reasonable result, as demonstrated in the accompanying chart, management's strategy made sense. The degree of improvement expected is good, but may prove challenging to achieve.

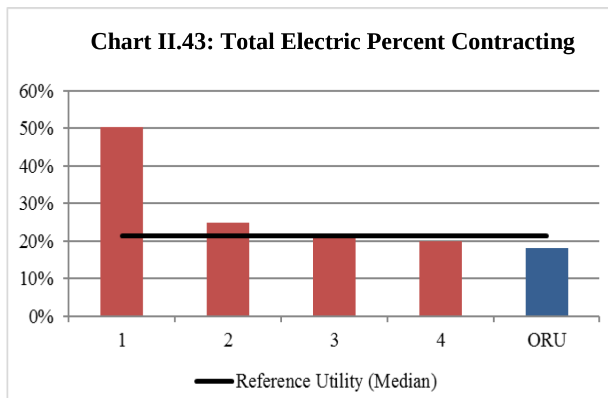




D. Contractors – Electric

On balance, electric contracting levels at ORU were typical for the state utilities (about 20 percent). The dominant driver for ORU was transmission capital, in which the contracting level was the highest among state utilities. Future forecasts were stable and near levels at the time of our field work.

1. Level of Contracting - 2013

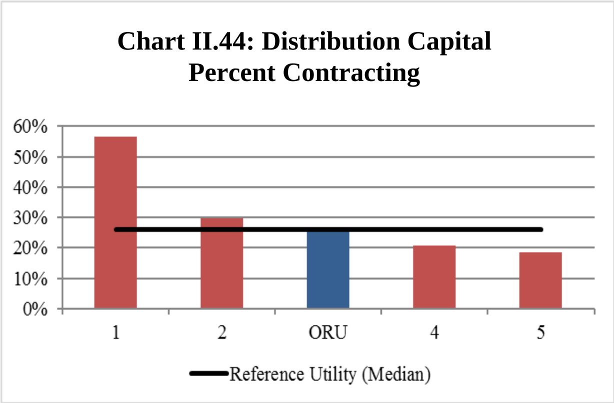


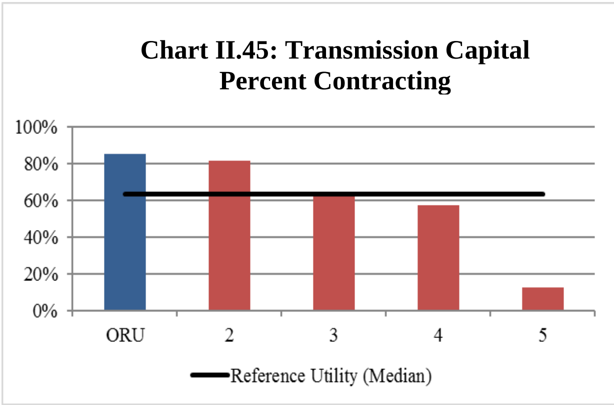
Several characteristics differentiate ORU's electrical system from that of CECONY. They include:

- A small company operating in a service territory that produces higher customer density
- A lack (despite comparatively high customer density) of the physical characteristics that form much of CECONY's network,
- About a third of distribution lines consisting of URD/UCD (Underground Residential Development/Underground Commercial Development).

ORU made the lowest percentage use of electric contracting in the study group, albeit by a slight margin. One outlier in New York made significantly greater use of contracting than did its peers. Otherwise, contracting by the state's remaining electric operations fell into a notably narrow range.

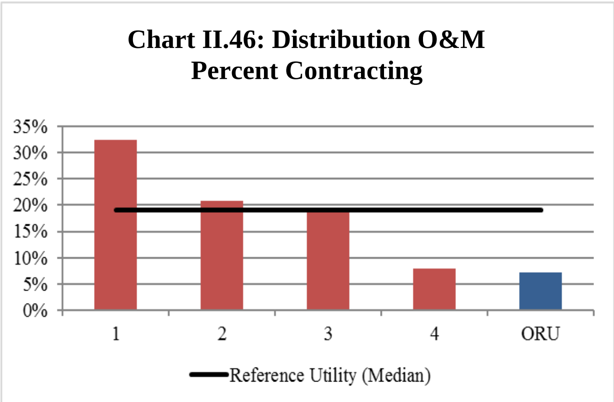
The next graphs break down 2013 comparative levels of electric contracting by distribution and transmission/substations. ORU used the highest percentage of contracting for transmission/substation capital work. Its distribution capital contracting was mid-range. On a combined basis, distribution dominated the total contracting percentage, because ORU's distribution capital FTEs exceeded those of transmission/substation by about four times.

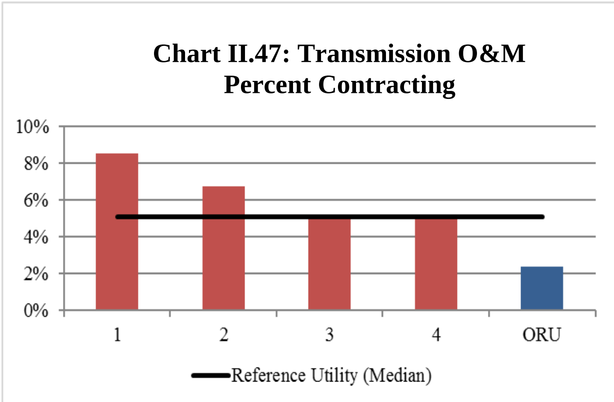




The next charts show that ORU made the lowest (by a sizeable margin) use of O&M contracting. ORU sought to employ only specialty or cost-effective contractors (*e.g.*, for drilling and boring, flow mole, pole excavation, and pole inspection), which contributed to its well-below-average use of contractors. Labor agreements also influenced ORU's contracting levels. Management was required to make minimum overtime levels available for employee line workers in cases where distribution overhead line contractors were working. ORU had to make eight hours of overtime available over two weeks (four hours per week) in such cases. The rule applied on a division basis to ORU's three divisions. ORU sought to limit contractor work to one division per week.

The graphs below show ORU's 2013 levels of electric O&M contracting. Its overtime levels for both distribution and transmission/substation O&M work were the state's lowest.





The next charts show that no state utility contracts a large amount of engineering work (save for one that employs well greater than average contracting for transmission engineering). ORU fell at the higher end in both Distribution and Transmission, but the percentages contracted in both cases were small.

Chart II.48: Distribution Engineering Percent Contracting

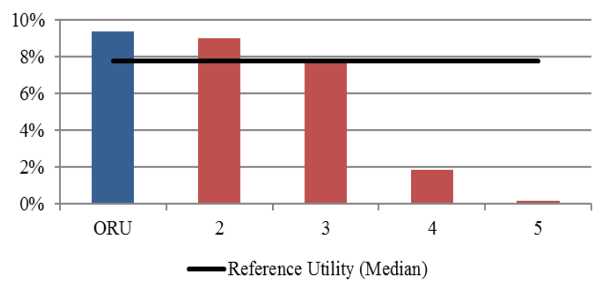
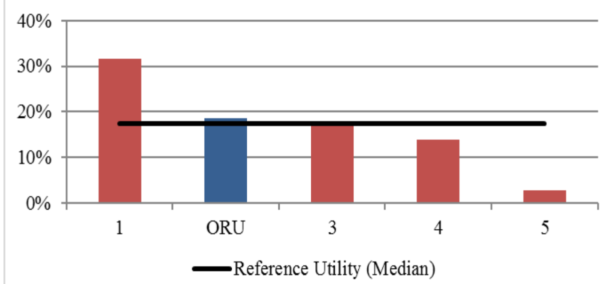


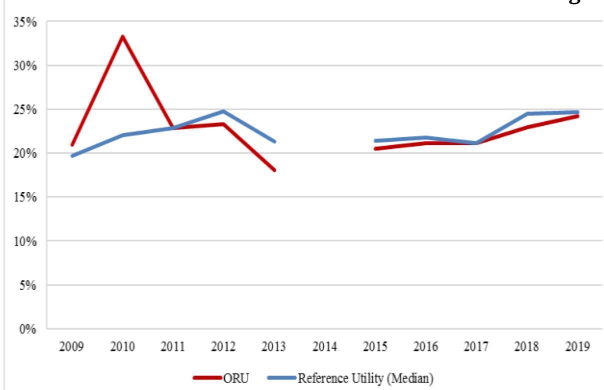
Chart II.49: Transmission Engineering Percent Contracting



2. *Contracting Trends*

ORU's total electric contracting levels through 2013 trended slightly downward, except for an upward 2010 spike. Large work demands caused that spike. The charts below showing capital contracting reflect this spike. The forecasts that ORU provided showed moderately increasing contractor use percentages through 2019.

Chart II.50: Total Electric Percent Contracting



The next charts divide contracting trends between distribution and transmission/substation capital work. The charts show the impact of the 2010 work spike on distribution versus transmission/substation work. As shown, contracting levels ran below the Reference Utility levels in historical years, other than 2010. The forecasts that ORU provided showed its use of contractors for distribution capital tracking the Reference Utility value. Forecasted use was higher than historical use, but, not projected to grow materially across the forecast period.

Chart II.51: Distribution Capital % Contracting

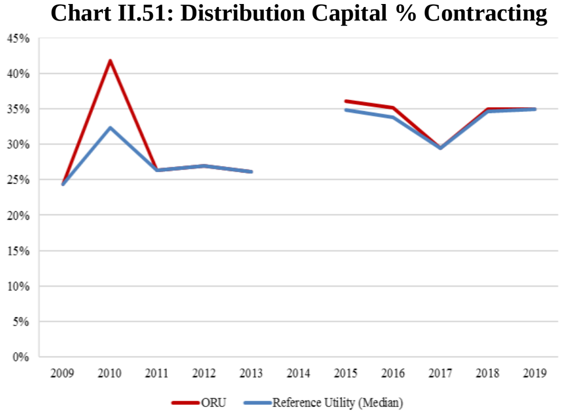
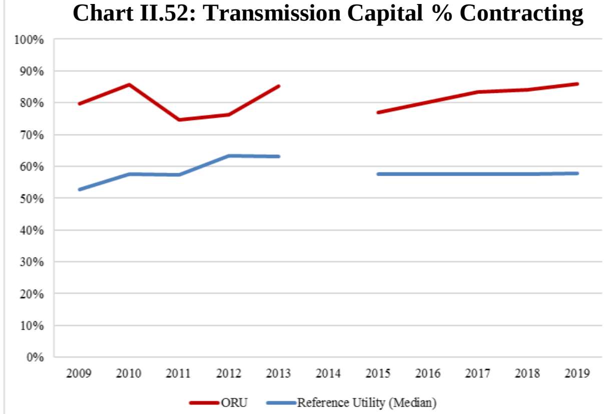


Chart II.52: Transmission Capital % Contracting



ORU's transmission/substation capital contracting levels were high historically, and were anticipated to remain so through 2019. Overall, its relationship to the Reference Utility was very consistent from 2009 through 2019. ORU contracted out its large transmission line project work. This workload was comparatively high through the period. ORU also contracted out a significant amount of substation work. Contractors performed substation civil work and some steel erection, while internal resources performing wiring.

The graphs below show electric O&M contracting levels. Emergency storm work drove the large increases that occurred in the 2011 to 2013 period. Other drivers included smart grid and storm hardening work, which was diminishing. The forecasts that ORU provided showed distribution O&M contracting below the 2013 level. Past transmission/substation O&M contracting levels were negligible. Forecasts showed future levels rising to the Reference Utility value.

Chart II.53: Distribution O&M % Contracting

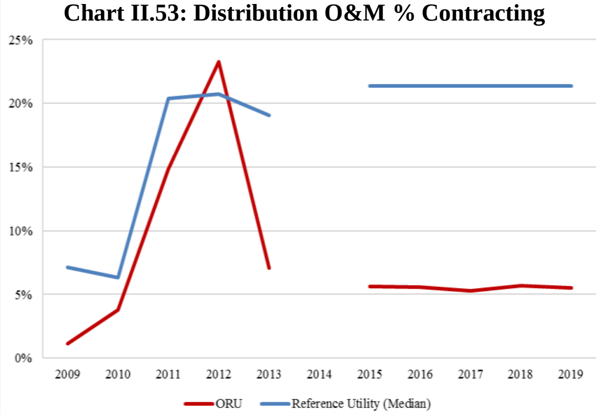
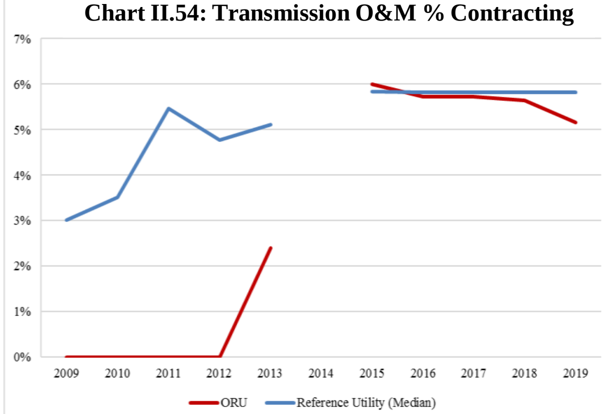


Chart II.54: Transmission O&M % Contracting



The next graphs show ORU electric engineering contracting levels. ORU used one combined engineering group, rather than separating distribution and transmission/substation groups. Thus, the Company's contracting curves for distribution and transmission/substation appear similar. Distribution contracting levels trended downward through 2013, by which time they came close to Reference Utility levels. The 2010 spike resulted from increases in engineering needs associated with the major capital project work discussed above. ORU expected engineering contracting to increase through 2019, producing levels significantly above the Reference Utility value. The transmission/substation contracting levels also trended downward in the historical period, a result driven by a decreased use of contractors and internal personnel increases. Forecasts showed them increasing moderately through 2019, remaining at levels close to the Reference Utility value.

Chart II.55: Distribution Eng. % Contracting

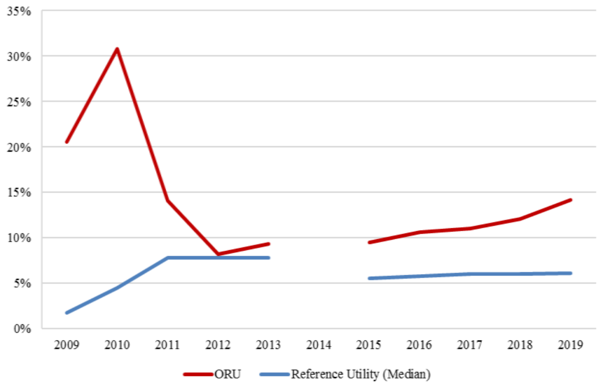
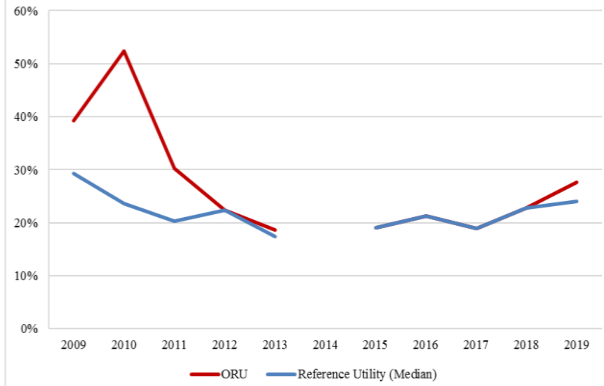
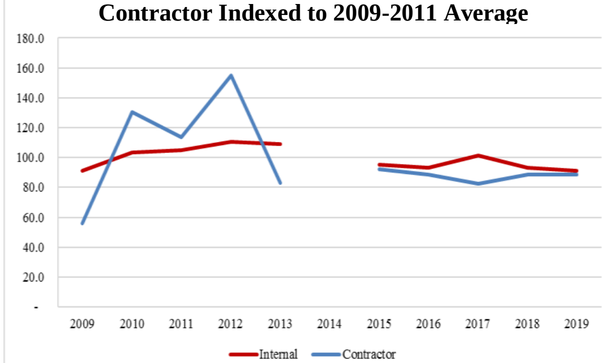


Chart II.56: Transmission Eng. % Contracting



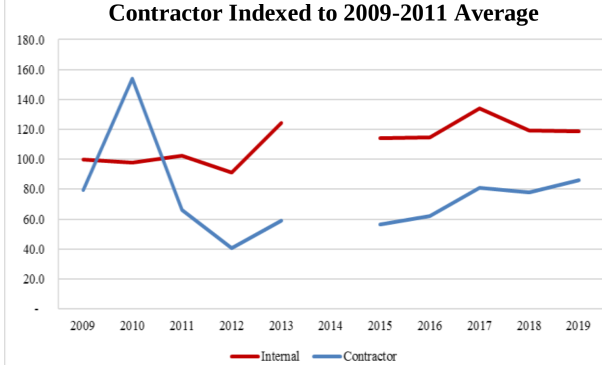
The next two charts plot distribution and transmission/substation contractor use on an index basis, in order to show how they moved relative to each other over history and how they were expected to so move through the forecasted portion of our study period. We assigned an index value of 100 to the 2009 to 2011 average for each. The distribution graph shows little variation in future years, compared to the 2013 levels. The FTE levels, based on the projected budget levels, were projected to hold steady or decline slightly. When the FTE index increased upward in the 2010 to 2012 period, the contracting index also tracked upward with it. The workload variations in that period arose from a short-term increase in project and storm response work. We observed that: that (a) internal staffing and contracting in distribution tracked each other, and (b) management planned a slight decline in both resource groups for the future. Neither observation caused concern.

Chart II.57: Distribution Internal vs. Contractor Indexed to 2009-2011 Average



The transmission/substation graph shows a larger FTE index variation in the 2009 to 2013 period. The capital construction work employed a large contractor contingent in 2010, which drove the contracting index value upward. The future internal work load trend from 2013 was projected to increase steadily, but the mix of contractor resources, despite interim increases, was forecasted to decline in the long-term.

Chart II.58: Transmission Internal vs. Contractor Indexed to 2009-2011 Average

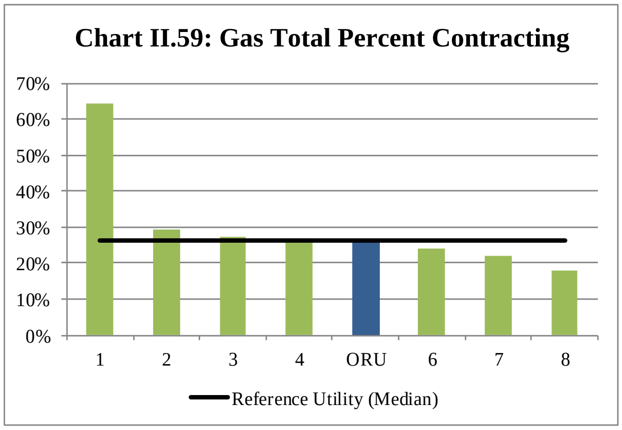


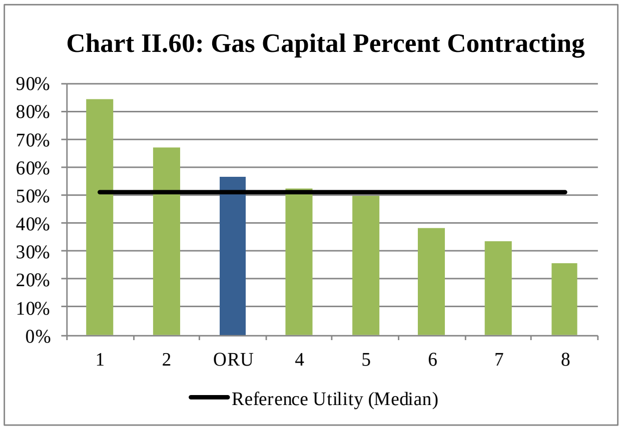
E. Contractors – Gas

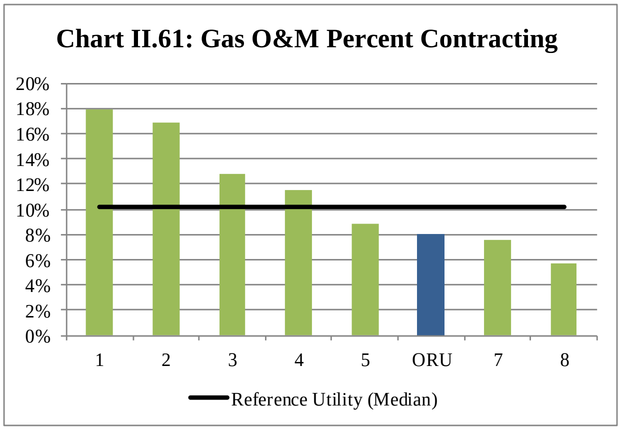
ORU's degree of reliance on contractors in gas was typical of the industry. Forecasts showed contractor use increasing slightly.

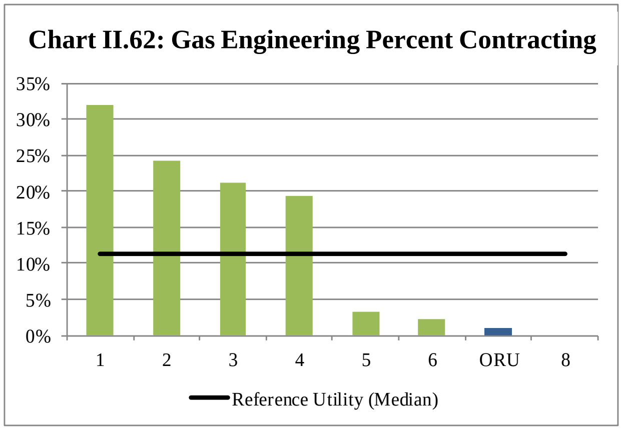
1. *Level of Contracting - 2013*

The next four graphs summarize ORU's gas contracting ratios for 2013.









A single outlier contracted at around 60 percent, but total contracting by the other gas operations (as a percent of total FTEs) fell in the narrow range of about 20 to 30 percent. ORU fell mid-range. Its capital contracting percentage was more than half higher than, but not far out of line with, the Reference Utility value. The chart displaying gas O&M contracting shows that the vast majority of that work was done in-house, with 18 percent the highest contracting share for any single company in 2013. ORU gas O&M contracting fell at the lower end of the state range.

ORU performed virtually all gas engineering with in-house resources, which made it like three Upstate gas utilities. Gas engineering showed a significant split between the four operations at the low end and the four at the high end of the range.

2. *Contracting Trends*

The next charts summarize trends in ORU gas contracting over the 10 years of our study period.

Chart II.63: Gas Total Percent Contracting

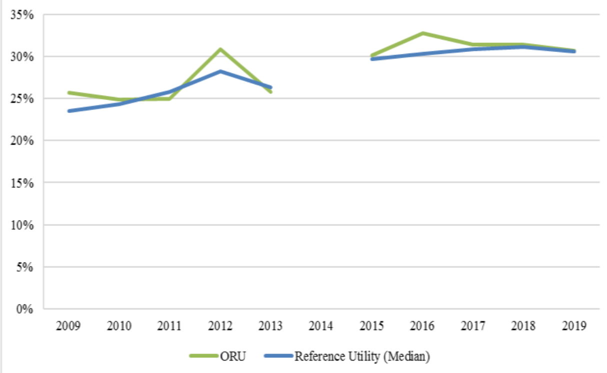


Chart II.64: Gas Capital Percent Contracting

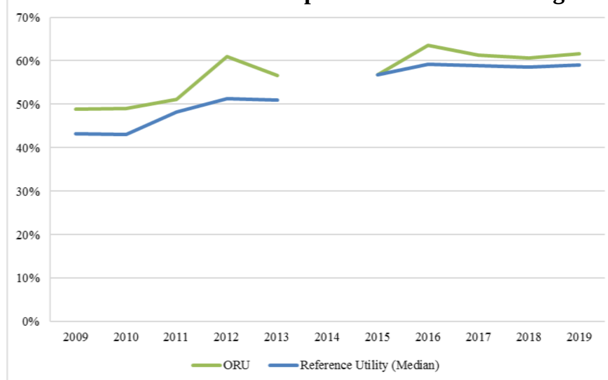


Chart II.65: Gas O&M Percent Contracting

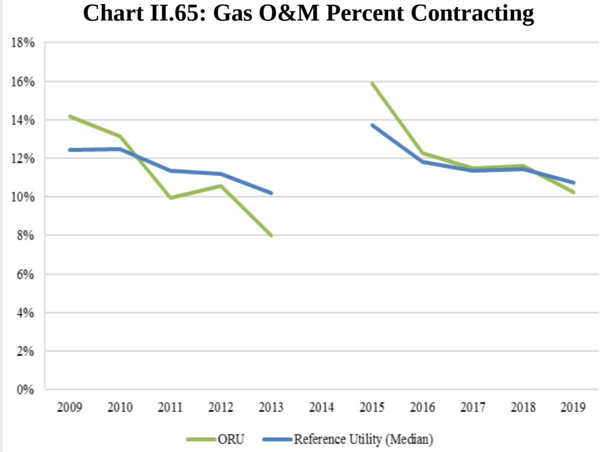
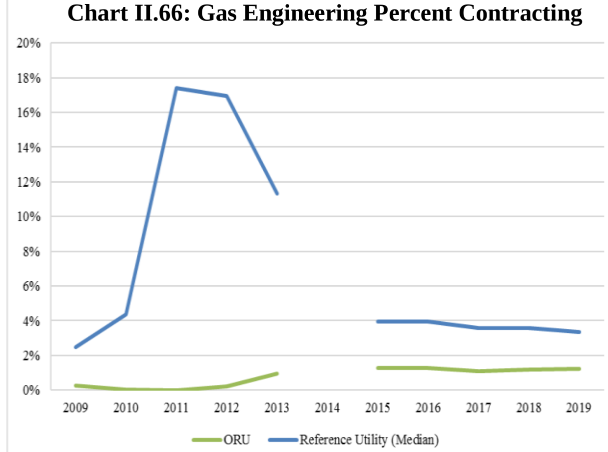
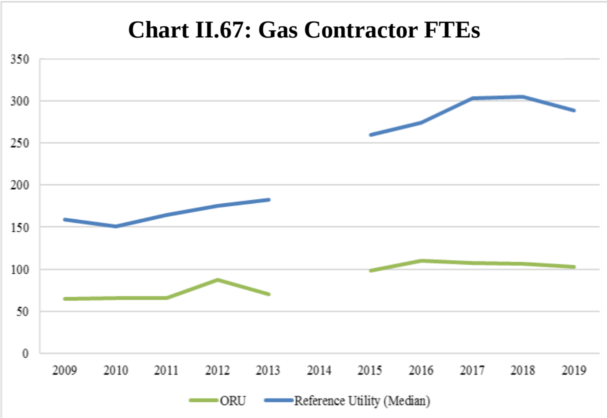


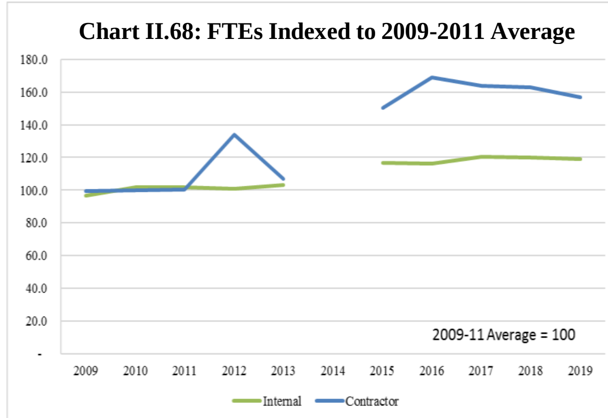
Chart II.66: Gas Engineering Percent Contracting



The percentage of contractor usage remained fairly steady through 2013. A 2012 exception occurred. Management experienced an almost 25 percent increase in pipe replacement above previous and subsequent years. ORU expected overall workload to remain stable, but anticipated that future pipe replacement will increase modestly from the historic period average to the future period. The heavier use of contractors for replacement thus produced an expected increase in overall contractor use through 2019. The following chart also shows this effect, comparing contractor and internal staffing to their 2009 to 2011 averages.

As we did for electric operations, we also plotted (see the next two charts) gas contractor use on an index basis, in order to show their movement relative to each other. We assigned an index value of 100 to the 2009 to 2011 average for each.





The balance between contractor and internal resources remained stable through 2013, except for 2012, which experienced an unusually high level of pipe replacement work. The forecasted balance shifted toward contractors primarily because of the increased main replacement work.

F. Conclusions

In addressing staffing adequacy, we begin from the premise that there is no one indicator and certainly no simple algorithm that can provide a definitive answer. We approached the question of adequacy by weighing the contributions of multiple perspectives, which we found on many occasions support inferences in opposite directions. We formed judgments about staffing adequacy considering the balance of the weight of the "evidence."

Some of our bases for making such judgments had mathematical underpinnings, but our conclusions on adequacy do not approach (nor could they have) anything like mathematical certainty. They represent our best judgments based on the data we had and our analysis of that data. They are informed as well by the results of our process reviews.

We offer these judgments about adequacy as our best contribution to a process that the companies and their stakeholders should (and do, from all that we saw) agree is critical – – continually seeking out all means possible to ensure that staffing decisions result from the broadest possible range of insights, challenges, and perspectives.

These conclusions reflect our contribution to what will certainly remain an ongoing, dynamic, and fluid staff optimization process, as infrastructure needs, customer expectations, workforce demographics, technological advancements, and policy change continue to bring opportunity and risk to the electric and gas utility businesses

1. Our quantitative analyses provided no reason to question the reasonableness and adequacy of ORU staffing in electric or gas field operations.

Our various quantitative approaches did not disclose any overall concerns about staffing at ORU, except for engineering, which we address below.

2. **Quantitative analyses, however, did indicate engineering concerns about high electric distribution engineering and low gas engineering resource levels.**

Liberty's model revealed a major deviation between actual distribution engineering staffing (54) and the model's estimates (21). Actual gas engineering FTEs were low.

Analysis of distribution engineering to field ratios indicates that ORU's value of 1 to 4.8 did not compare well with the other utilities we studied, who ranged from 1 to 6.8 and 1 to 7.5. ORU's gas engineering to field FTE ratios of 1 to 19 varied greatly from the state ranges of 1 to 6 at the low end and 1 to 11 at the high end. These deviations were substantive enough to merit management consideration.

3. **Our measures of productivity and effectiveness place ORU in the middle for electric operations, but lagging somewhat in gas operations.**

We used three quantitative indicators to address productivity and efficiency: our FTE per attribute analysis, the model, and 9ers. Results in distribution proved flat, suggesting average performance. Transmission/substations indicators ran slightly above average. Gas indicators were somewhat below average. The relatively weak performance in the FTE per attribute and 9ers analyses for gas suggest a need for further attention.

4. **ORU was an outlier in terms of high dependence on overtime in electric operations, while gas overtime was high but not to the same extreme.**

ORU had the highest levels of historical overtime, although those levels did decrease in the final historical year of our study period. If this recent trend continued past 2013, the issue may be moot. If not, the gap was large enough to raise concern. There are two reasons: (a) the high overtime percentages, and (b) the high component of internal overtime in the total resource mix (22 percent in distribution). Depending on overtime for more than a fifth of one's resource needs raises substantial questions.

5. **Management forecasted reduced overtime, which bring it to more normal levels, but reductions in distribution overtime were hard to reconcile with the corresponding lack of planned increases in internal FTEs applied.**

Liberty's staffing study has established some correlation between staffing trends and overtime trends. While the strength of such correlations can be debated, ORU plans to achieve much lower levels of overtime with only minimal increases in internal staffing. It may be possible, but the magnitude warrants clear, analytically supported plans.

6. **ORU made the least use of contractors among the state electric utilities, although not to the extreme, while ORU gas contracting was in line with industry patterns.**

ORU's past and projected reliance on contractors does not suggest any issues. On the electric side, ORU uses contractors to a lesser extent than the other utilities, but we found no indications questioning the effectiveness of such low use.

G. Recommendations

1. **ORU should analyze its distribution staffing (including engineering), identifying the sources appropriateness of its the relatively high levels versus the other state utilities.**

2. **With gas productivity levels moderately weaker versus the other utilities, ORU should determine the reasons for such deviations, and identify resulting opportunities for improvement.**

3. **To the extent high overtime issues in distribution have not yet been resolved, ORU should: (a) determine optimal levels, (b) develop plans to achieve those optimal levels, and (c) take steps to manage to those levels.**

4. **ORU should conduct a structured re-evaluation and report on the role of internal staffing in its long-term plans, particularly as internal staffing will help attain optimal overtime targets.**

Chapter III: Process Analysis

A. Resource Planning

1. Summary of Improvement Opportunities

Much like sister-company CECONY, ORU used many of the same sophisticated approaches and tools for resource planning in its electric and gas operations. The tools and information available to support data-driven annual the resource planning cycle were more advanced than the other smaller state utilities in this study.

Management implemented these tools, approaches, and supporting organizational staff for resource planning a year later in the gas organization than it did in the electric organization. The gas organization's use of this approach was therefore not as mature or extensive at the time of our field work. The gas organization thus needed to implement more completely the full range of resource planning tools and information in development of their resource plans.

Like other utilities in the study, ORU did not develop quantitative FTE or person-hour estimates for forecasted workloads during the bottom-up development of work plans. The resource planning process can be enhanced by developing these estimates, either by using historical person-hour amounts from past contracts to project unit rates, or by using engineering estimates to quantify these workloads at the program level.

Finally, there is an opportunity to improve processes for evaluating the trade-offs between straight time, overtime, and contractors at the functional and work group levels in resource plans. Management should develop resource plans that state all forecasted work for straight time, overtime, and contractors in person-hours or FTEs. ORU would then have the ability, using data-driven methods that compare the equivalent cost of each of these resources for accomplishing different types of work.

2. Findings

a. <u>Overview</u>

ORU applied mature and robust Resource Planning processes. Patterned after the approach developed at CECONY, the organizational support, information used, and resource planning tools were much more advanced than the approaches typically used by smaller utilities. Capital and O&M forecasts, both electric and gas, identified and prioritized work using rigorous analytical frameworks and risk analyses. Forecasts considered overall guidance, past spending levels, identified future capital projects (on a risk-prioritized basis), and incremental O&M spending requests. Dedicated business finance and work planner staff supported the development of resource plans by building bottom-up workload plans, tied to capital and O&M forecasts. The electric organization and processes were mature; the gas organization was still early in the process and was still developing some support tools.

b. Assessment of Key Resource Planning Elements

i. Organization

ORU's Business Finance group provided resource planning organizational support. Business Finance functions fell under the operating organizations. This staff group coordinated the annual process, implementing top-down guidance during the annual budget cycle. Operations staff throughout the operating units in electric and gas supported work plan/budget development. Personnel were experienced in the process and use of tools to support budget/resource planning information requirements. Financial analysts and work planners were experienced in using and manipulating historical data and forecasts for budgets. During the study, electric operations was in the second annual cycle using this resource planning approach; gas operations was just beginning its first cycle and had just starting using work planners to develop work plans and workload estimates.

ii. Information

Sophisticated information tools and processes were used for analyzing data relating to workloads and future budget requirements. Key resource planning information was provided by a series of automated tools, including:

- Oracle financials, using the Oracle Business Intelligence reporting tool, provided extensive access and analysis capabilities for historical cost information. Information could be analyzed on both a functional and operational organizational basis.
- Hyperion budgeting tools allowed planning staff to develop in depth information on costs and hours for each major function within each organization unit. These tools allowed integrated views of costs and workloads throughout the budget development cycle.
- An application provided by VEMO (a leader in the field) was used to track headcounts and attrition by region and organizational unit.
- The Paybud system was used to cost workload projections for integration into budget forecasts.

Notably, a wide array of information was developed and integrated into the work plans and accompanying budget requests, including:

- All work was forecast and tracked using dollars.
- Units of work were available for many types of internally assigned work.
- Contractor work units were available for some types of capital work and most types of O&M work.
- Planning information included detailed breakdowns for hours and costs for internal resources (straight time and OT). The WMS system provided information on available time.
- Staffing levels for internal resources were projected based on workload estimates. Determination of needed staffing levels accounted for attrition forecasts.

Like other utilities throughout the state, planning information for work to be performed by contractors was largely limited to costs. In some cases, units for work assigned to contractor in the past was available, but the historical workloads were not tracked (nor were future workloads forecasted) in person-hours. In providing data for our study, ORU could use the expertise of engineering estimators to provide estimates of historical electric and gas contractor hours. The historical estimates provided to us used average labor hours per dollar contracted for different types of work, and applied these average unit rates to contractor expenditure levels.

iii. Processes and Tools

As is true for most utilities, the annual resource planning budgeting cycle was well understood and mature. It began in late spring with the development of guidance from Finance and senior management about financial constraints and key issues or initiatives. After development of work plans and budgets in June/July, submissions went through a series of presentations, reviews, and challenges (with increasing roll-ups and organizational levels). At various points throughout this process, line management had opportunity to make its case for funding changes and increases, especially when requests exceeded guidance or past spending levels. The process culminated in November/December with presentation for board of directors' review of consolidated, vetted, and management-approved resource plans and budgets.

ORU employed a robust resource planning process. The process and tools used by ORU were developed by sister utility, CECONY. These advanced tools and capabilities thus paralleled those in use at the larger state utilities. Characteristics of this advanced approach included features such as:

- Capital and O&M forecasts, both electric and gas, identified and prioritized work using rigorous analytical frameworks and risk analyses.
- Forecasts considered top-down overall guidance, past spending levels, identified future capital projects (on a risk-prioritized basis) and incremental O&M spending requests.
- Capital spending frameworks and risk analyses (addressing multiple categories; *e.g.*, mandatory work, customer work) showed consistency across businesses and functions.
- Gas operations used MRP (main replacement program) to set capital priorities; electric operations used risk-based analysis to set priorities.
- O&M spending forecasts resulted from a less rigorous analytical process, tending to be more incremental, and based upon historical spending levels.
- Gas and electric operations examined priorities at the project (capital) and program (O&M) level for each group within the Company.
- Throughout the year, senior management used a monthly review process to track whether current year budgets were on track or required forecast adjustments.
- Tracking provided input for adjusting future-year forecasts.
- Forecasts were developed bottom-up using the tools cited in the resource planning information section to develop work plans (stated in person-hours), and then were converted to cost estimates using work-specific historical unit rates.
- Forecasts also allowed for productivity gains, and considered anticipated cost increases or inflation.

Management followed the prevailing practice among the utilities we studied, in limiting planning information used for work to be performed by contractors largely to cost data. Management did have access, in some cases, to unit-based based information for work assigned to contractor. ORU did not, however, track historical workloads in either person-hours or FTEs, and it did not develop projections of contractor workloads from unit rates and forecasted person-hours, which distinguished contractor forecasting from the methods used to develop internal workload forecasts.

iv. Resource Planning for Overtime and Contractors

Resource planning for overtime relied heavily upon historical use for certain functions, and plans reflected past usage levels. Management considered a level of 10 to 12 percent (per management's calculation) acceptable, using this range as a guide for planning estimates. Where past levels were excessive (more than 12-15 percent per management's calculation), plans were put in place to reduce OT use. We did not find any management studies examining the cost-effectiveness of overtime versus other staffing resources (straight time and contractors) as a resource planning method.

Use of contractors varied by work function, and recognized constraints in maintaining qualified contractor workforce for a smaller company in an ex-urban environment:

- For Electric overhead work, management always kept two contractors on property, in order to maintain enhanced emergency capabilities for storm events.
- Gas operations sought to keep enough contractor personnel qualified under PHMSA Operator Qualification requirements to supplement the capabilities of the internal workforce.

Resource plans and annual budgets identified future contractor workloads on a total dollar basis only (including all labor, materials, vehicles, and administrative costs). Historical information for work done by contractors encompassed only expenditures, and did not include any information about capital and O&M work hours. Unlike budgets for internal resources (straight time and overtime), contractor budgets were not built from person-hours or FTEs required for functional work requirements.

Management performed studies of specific functions and capital projects to determine types of work to assign in plans and budgets, but we saw no optimization analyses. Management was capturing data that will permit the tracking of actual hours and dollars versus budget. Placing an Oracle-based work unit report on-line would enable use of that data for resource planning and efficient utilization of resources.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Resource Planning criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The organization for coordinating and supporting manpower Resource Planning should be treated as a specialized activity, with dedicated resources.
2. Complete and accurate Information about units of work performed and costs by work function, by region, and by staff resource type should be available.
3. Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.

4. Overtime should form a clear part of the process of identifying required resources, and should rely on an analytically supportable method for determining optimum levels for each work function.
5. Contractor use should form a clear part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

1. ORU used state-of-the art approaches in its processes for resource planning.

ORU benefitted from CECONY's investment in and development of robust Resource Planning processes, organizational support, and resource planning tools. Management employed advanced tools and information in supporting its data-driven, annual resource planning cycle. ORU also had strong, dedicated staff available to support the use of these tools and information.

2. Gas operations lags electric operations in the maturity of its approach to resource planning, but was making appropriate progress in closing the gap.

The electric organization had more experience with, and was using the full range of information and tools available to it to develop work plans and budgets. However, gas organization resource planning was in the early stages of implementation at the time of our field work in this study. At that time, electric operations was in its second cycle of using the resource planning approaches and tools we have described. Management had implemented and staffed the work planner organization. Gas operations was in the first cycle of a resource planning process that used the approaches implemented by electric operations a year earlier. The gas organization was also early in the process of training personnel and implementing tools.

While the organization, processes, and tools used by the gas organization were similar to those in electric operations, they were thus not as fully developed.

3. Like the state's other utilities, ORU's reliance on cost data as a measure of contractor work load did not optimize the process of balancing resources.

Identification of contractor workloads (historical and forecast) on a total dollar basis provided insufficient information for effective resource planning. Historical information for work done by contractors, based only upon expenditures, does not provide sufficient information for understanding past capital and O&M workloads. If forecasted contractor workloads cannot be understood in terms of person-hours or FTEs, it is not possible to fully understand and to make fully informed decisions for balancing these resources.

4. ORU was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use at the functional level.

Effective use of overtime and contractors at the functional and work group levels in resource plans cannot be accomplished without ongoing, data-driven analysis of how the results of using overtime and contractors compare to the use of internal staff, and to each other as well. Use of one-time, limited scope studies for accomplishing these types of analyses and reviews during the resource planning process is not sufficient for determining the most effective balance of internal staff, overtime, and contractor resources for each type of work. Resourcing decisions, based on formal, consistent development of staffing resource plans linked to budget requests would improve management's understanding of overall workload requirements and allocation of staffing resources.

Budgets developed for each organizational unit based upon resource plans that quantitatively define all forecasted work for straight time, overtime, and contractors, stated in person-hours and FTEs of underlying workload, would provide a better understanding of the entire scope and amount of work to be accomplished. ORU could then develop ongoing data-driven analysis methods for comparing the equivalent cost of each of these resources for accomplishing different types of work within this resource plan.

4. Recommendations

1. ORU should expand measures of contractor work load to include FTE- or person-hour based values.

ORU should develop quantitative FTE or person-hour estimates for forecasted workloads within each of their major functional programs and organizational units in the electric and gas organizations. These workload person-hour/FTE forecasts of the amount of work to be performed by contractors are crucial to understanding total work proposed during the bottom-up development of work plans that feed budget requests for each organization. The resource planning process can be enhanced by developing these estimates, either by using historical person-hour amounts from past contracts and applying them project/program unit rates for the work or by using engineering estimates to quantify these workloads at the program level.

2. ORU resource planning should include data driven analyses that help management evaluate the trade-offs for overtime, contractors, and internal staff at the functional and work group levels.

As part of the annual resource planning process, resource plans developed should quantify all forecasted work for straight time, overtime, and contractors in person-hours and FTEs. The annual process should be formalized to require each organizational unit to develop these "total workload" bottom-up workload forecasts, linked to the budget expenditure requests. Resource plan analysis should evaluate the trade-offs for overtime, contractors, and internal staff at the functional and work group levels.

Management should develop methods for comparing the equivalent cost of each of these resources for accomplishing different types of work for these functional work groups. The methods for comparing the equivalent cost of each of these resources for accomplishing different types of work in the resource plan can be used to determine the optimal levels the straight time, overtime, contractor mix for each organization, and can also be used to inform requests that justify changes to internal staffing levels.

3. ORU should set a firm completion date for execution of plans to enhance gas operations' resource planning methods and tools, and aggressively implement them according to that schedule.

Much progress has been made, with more planned. Ensuring steady progress along the lines that gas operations has identified, promises to bring resource planning to a level commensurate with that of electric operations. Needed progress includes fully staffing the work planning functions and Business Finance staffs, and developing the same types of tools and analysis capabilities for gas functions already widely used in the electric organization.

B. Work Force Management and Performance Measurement

1. *Summary*

a. Work Force Management

A subsidiary of CEI, ORU operates separately from its affiliate, CECONY, although it has looked to its much larger affiliate for opportunities that may meet its needs cost effectively. ORU used less comprehensive and structured Work Force Work Management approaches, processes, and tools, which reflected the scale and scope of a comparatively small utility. The electric and gas operations groups used similar Work Management systems and tools, developed in-house, prior to ORU's acquisition by CEI. There were no plans for major improvements, but the systems and tools generally performed capably to support planning and management of staffing in the areas within our study's scope. Nevertheless, some modest improvement opportunities exist.

b. Performance Measurement

At the time of Liberty's field work, we observed at ORU the capability to monitor and measure levels of work performed in relation to resource inputs in a manner that supports a data-driven, analytically-based process for planning staffing resources or balancing them among internal staff, overtime, and contractors. Management, however, was not comprehensively using that capability to define measures, regularly collect data to enable their use, or apply results in planning and evaluating staffing resources. Management needed to advance efforts, as CECONY has in many respects done, to develop and use the capability to apply a comprehensive set of performance measures to drive staffing plans, to measure their effectiveness, and to optimize them for the long term. Doing so with respect to replacement and installation of natural gas pipe should be the first priority, given expansion in the Company's efforts and growing demand for skilled resources across the area, region, and country.

2. *Findings*

a. Work Force Management Systems

A comparatively small utility, ORU relied upon a flat organization to keep its management closely informed about work performance. Both its electric and its gas operations groups used similar Work Force Management approaches, systems, and tools, with a few exceptions. ORU purchased a Work Management System ("WMS") more than 15 years ago (prior to the CEI acquisition of ORU), and continued to use it. The system did not operate on an integrated, enterprise-level basis, but ORU has continued over the years of its use to link a number of tools together.

The resulting interfaces gave management access to both ORU and CECONY corporate data bases, which permitted operation in many key respects in the manner of a single system. These interfaces linked the WMS with automated applications (driven in significant part by Peoplesoft/Oracle platforms) that managed human resources, payroll, material requisitions, purchase orders (based on compatible units), the CIS ("Customer Information System"), and mapping (to update property records on construction job completion). Management described the extent of the modifications and enhancements it has made over the years as sufficient to make its approach, systems, and tools, essentially "home grown."

ORU has placed a Work Management Group within Electric operations. This group provided system administration support to the gas and substation groups. While full documentation of systems existed, it was outdated, leaving the various department users to create and use their own, informal process guides.

b. Work Management Documentation and Training

Liberty found extensive written documentation of work management processes. Most of the manuals available focused on processes, but not the tools that support them. A module called "DCIA" operated as the core of ORU's WMS. DCIA's graphical front end was a web-based client. There had been issues with using the system. Management acknowledged the need for documenting the tools available in its "Web-WMS." Several work management processes remained manual, operating under extensive checklists and templates for project management.

c. Program and Project Scheduling

Management used an industry-standard automated system to plan, schedule and control major, long-term (five-year horizon) electric and gas capital projects; *i.e.*, version six of an application called Primavera (known as "P6"). P6 supports the broad range of activities needed to manage large projects successfully, including resource capacity balancing, optimum resource allocation, progress tracking, monitoring and visualizing versus plan, assessing the impacts of adverse trends or events, and analyzing different plans for completion. Electric and gas operations used Microsoft Excel to plan and manage smaller long-term and all short-term projects Management used Microsoft Project software to plan and manage maintenance activities, but planned to migrate that function to P6.

d. Program and Project Monitoring

Regular project monitoring at the high level occurred principally through a monthly Projects Review Meeting. The Vice President of Operations (or Director of Financial Services) reviewed schedule and budget progress with other managers. Oracle provided the data used to provide budget information and to prepare forecasts of cash flows. The tools used to support work management have existed for a number of years. Liberty observed no basis for concern about their general suitability. WMS and supporting tools training was not formal or structured, but provided by Subject Matter Experts (SME's) in each business group to new users on a one-on-one basis.

e. Program and Project Management

ORU began to use a dedicated Project Management Organization in 2010. It operated under the direction of the Vice President of Operations, who had responsibility for the electric and gas divisions that perform operation, construction, and maintenance. This 11-person full time organization was supported by another nine FTEs (with three of the 11 positions, including the Director, open) and operated under a classically defined mission that includes:

- Providing for controls, approvals, and planning needed to ensure safe, efficient, and timely delivery of capital projects

- Streamlining project execution using new planning tools and procedures
- Delivering capital projects on time, budget, and scope.

Five full-time Project Manager positions existed to handle high value and strategic capital projects and programs. The group managed some $40 million in capital projects in 2015. Management sought to have the organization's employees become certified by the Project Management Institute. The Project Managers came from a broad background in both engineering and financial groups. A formal job description existed for the Project Manager position.

A $5 million threshold existed for assignment of a capital project to a Project Manager. Lower-value projects with high visibility or strategic value could also have a Project Manager assigned. ORU cited transmission projects of around $1 million as exemplifying those warranting Project Manager assignment.

f. Treatment of Overtime and Contractor Use

Work Force Management at ORU did not include a formal feedback mechanism regarding overtime or contractor use. Regular communication among managers during the scheduling and budgeting process encompassed these topics.

The Work Management System captured performance data used to evaluate internal crews and contractor crews. For contractors, these data were used to develop performance indices that undergo consideration in assessing future bids.

g. Quality Assurance and Control

Internal auditing and other groups had responsibility for QA and QC functions, which operated under different approaches in Electric and Gas. Auditing performs Electric Quality checks, guided by a safety and operational risk assessment. Division Engineers and responsible supervisors performed quality inspections regularly on construction projects exceeding $25,000. Weekly inspections occurred for larger projects. For gas projects (typically contracted), an ORU inspector existed for each contractor. The inspector had responsibility for continuously monitoring work quality. Unannounced field inspections addressed damage prevention.

The Quality Assurance group (Internal Auditing) performed separate quality audits of documentation, and environmental health and safety.

h. Electric Performance Measurement

ORU measured work productivity in work order categories on a per-job or per-work order basis. The work measures used during our field work did not have sufficient granularity to determine actual units of work. Management measured earned hours and scheduled hours, and tracked job-site productivity. It monitored some O&M unit costs, in order to track hours and dollars spent for budget monitoring, but not for work unit measurement and analysis. ORU planned to begin using its new Oracle system to compare work units based on cost, hours and number of units performed. The work units measured will be the same as those already used for developing staffing budgets. These measures lend themselves to use as Key Performance Indicators.

In making plans for core staffing, ORU considered work levels at a general level, using historical factors such as storm response and the conduct of maintenance based on typical asset management parameters, such as established inspection and maintenance cycles and failure rates. Plans also considered anticipated system expansions arising from new business. Management sought to use contractors for projects exceeding what internal forces could handle on an essentially full-utilization basis. Management considered it problematic to base staff levels and balancing decisions "only" on performance measures, but considered them useful in optimizing use of existing resources.

Management had begun the capture of data permitting the tracking of actual hours and dollars versus budget. Plans to place an Oracle-based work unit report on line would enable use of that data for resource planning and efficient utilization of resources.

i. Gas Performance Measurement

Management used a variety of data collection and tracking tools for gas operations. They included a capital project tracking, which rolled up individual projects into a company status report comparing actual to budgeted spending, miles of pipe replaced, new business tracking, and O&M activity tracking by category. The new Oracle system had the potential for developing and tracking performance measures and developing productivity measurements, but that capability had not yet been exploited, except for a few specific cases.

3. Conclusions

Liberty based these conclusions on our evaluation of practices and processes against established Work Management and Performance Measurement criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These seven criteria are:

1. The systems and tools used to support Work Force Management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.
2. Comprehensive, adequate documentation of the Work Management processes, systems and tools should exist and be supported by appropriate training.
3. Management should have and regularly employ well defined processes for the short- and long-term planning and scheduling of capital and O&M.
4. Management should apply an appropriate approach, resources, and methods to program and project management.
5. Systems and tools should capture and enable the analysis of data respecting use of all types of staffing resources.
6. There should exist an appropriate approach to and organization for Quality Assurance and Control.
7. Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness resource use and balancing.

a. Work Force Management

1. ORU employed a work management approach, systems, processes, and tools that appropriately supported staffing optimization.

ORU's Work Management System, processes and tools generally proved appropriate. ORU managed both capital and maintenance work with the same Work Management System. Work management tools communicated among various databases throughout ORU, allowing performance data to be collected and studied. Management used contractor performance data to evaluate future bids. Communication among managers and closeness to the details of work performed did much to replace the capabilities that justify significant resource commitments to fully automated and integrated WMS at larger utilities. Liberty found ORU's overall approach to and its systems and tools supporting Work Force Management appropriate, particularly given enhancements being planned at the time of our field work.

2. WMS documentation and training were appropriate.

The documentation of the Work Management processes was reasonably complete; the only gap identified was the need for documenting the tools available in its "Web-WMS." However, management relied too heavily on SME and other users for the training of new employees in the various Work Management systems and tools. There was no formal training material other than user manuals. A loss of institutional knowledge, could substantially diminish the effectiveness of Work Management processes.

3. ORU performed electric and gas operations scheduling effectively.

Management used a sophisticated system to plan, schedule and control major electric and gas capital projects. An appropriate approach and tools existed for scheduling other capital work as well. Management planned to move O&M plan and management to an industry-standard automated system as well. ORU had the ability to schedule its capital and maintenance work with sufficient granularity.

4. ORU used methods that support effective monitoring of electric and gas operations program and project performance.

As often proves true for smaller utilities with a flat management structure, ORU personnel demonstrated wide knowledge of the status of major projects and programs. Regular review meetings among Project Managers, corporate managers and others in the Work Management processes promoted exchange of information and feedback on the validity of resource assumptions underpinning plans and schedules. Management did not employ formal feedback mechanisms regarding overtime or contractor use. Regular communication among managers during the scheduling and budgeting process encompassed these topics.

5. ORU electric and gas operations employed an effective approach, structure, and resources for project management.

ORU had not experienced a heavy load of large capital projects. Its use of a dedicated Project Management Organization was effective in addressing them. That organization has been in place since 2010, had adequate resources, and operated under a formal and well-structured set of guidelines and methods.

6. ORU electric and gas operations appropriately located and addressed the roles of quality assurance and control.

ORU had a comprehensive QA/QC process, using both internal crews, inspectors and internal auditing resources.

7. For the most part, ORU did not monitor and measure levels of work performed in relation to resource inputs at a work unit level.

Management did not have a work-based monitoring system in place for either the electric or gas businesses. It did not capture unit costs and unit hours, and therefore was unable to develop productivity reports. There were some exceptions. ORU tracked hours for certain gas jobs, such as leak repairs and valve inspections, which it then used to develop the staffing plans in those areas. Because of the lack of a comprehensive system for defining and using performance measures for use in planning and evaluating staffing, ORU did not apply performance measures to work load projections and performance, incorporate such measures into staffing decision-making, or determine production and productivity levels for staffing use.

ORU's comparatively small size mitigated the impacts of failure to take a more structured and comprehensive approach to using performance measurement for the staffing purposes addressed in this study. We found managers and senior managers very close to the work and possessing a sound sense of production and productivity at the broad levels. We observed that they factored that knowledge into decisions and decision-making process qualitatively.

Moreover, for the data and metrics that ORU does maintain, it collected information timely and at appropriate levels, and communicated it to the appropriate individuals in the organization.

4. Recommendations

1. ORU should develop training materials for both its processes and tools, for use by persons new to relevant positions.

Reliance on SMEs is not an optimum way to pass knowledge down to new employees. Despite extensive documentation on the processes and tools, it was not presented or available in a 'training' mode. Moreover, management needs to act to address its acknowledged need for documenting the tools available in its "Web-WMS."

2. As a first priority, ORU should develop performance measures for replacement and installation of pipe.

Pipe replacement and installation is the far and away the biggest contributor to capital cost, and will be increasing, on an installed unit basis, significantly over the period through 2018. ORU will spend hundreds of millions over about 10 years on gas pipe replacement. Its program illustrates an area, regional, and national phenomenon, as utilities have begun to accelerate substantially programs that deal with leak-prone pipe. Fundamental changes in relative natural gas cost have also created the potential for systemic increases in this fuel's share of the energy market. These changes also contribute substantially to both basic and incremental (individual customer hook-ups) infrastructure expansion.

The market for skilled engineering, management and labor to perform those activities is already being stressed and we believe it will further tighten considerably. These prospects make it critical for management to focus on performance monitoring and measurement in this area, in order to ensure that it can continue to optimize resources among the three alternatives of internal staff, overtime, and contractors. We are strong believers that strengthening the internal core of resources can contribute significantly in mitigating the risks that resource shortages would create.

3. ORU should capture work unit measurements using the data capabilities of its existing data systems.

Management has significant existing capability to do so, which puts ORU in the enviable position of avoiding much of the foundational costs of such systems. Those costs can prove considerable in relation to the scope and scale of a smaller utility. ORU needs first to develop a plan for work unit measurements. This plan should comprehensively address the activities for which it will track and analyze numbers of units, cost per unit and hours per unit. A comprehensive work unit measurement system will track and inform productivity levels, inform current staffing level needs and allow for better forecasts of future staffing needs. We understand that Company size may call for a paced introduction of such capability over a considerable number of years.

The following list typifies the types of measures that should be subject to regular reporting and that should be used not only to assess the effectiveness and efficiency of staffing resources, but also to help in driving forecasts of resources required to meet forecasted requirements in a manner that optimizes the balance among straight internal time, overtime and contractor use.

Monthly Overall Staffing Monitoring – Actual versus Planned (FTE):
(a) Straight Time
(b) Overtime
(c) Contractors
(d) Total Company – ST, OT, Contractors displayed as stacked bars

Internal / Contractor Mix – Actual versus Planned (Functions with major contractors), as appropriate:
(a) Gas:
- Construction – Main Renewals, Replacements and Upgrades
- Construction – Services Renewals, Replacements and Upgrades
- Construction – New Customer Additions – Services
- Construction - System Additions - Mains

(b) Transmission
- Transmission Construction – Overhead or Underground
- Substation Construction

(c) Distribution
- Overhead or Underground Construction - Renewals and Replacements
- Overhead or Underground Construction – New Customer Additions
- Overhead or Underground Construction – Major Projects
- Overhead or Underground – Emergency Responses

Internal Resource Replenishment (Headcounts) – Actual versus Planned:
(a) Total Workforce
(b) Attritions (based on historical data, adjusted for anticipated future conditions)
(c) Retirement (based on potential retirees, adjusted for anticipated future conditions)
(d) New Hires (based on qualifications and training duration required to become fully qualified)

High-level Performance Indicators on Productivity:

(a) Gas

- Hours per Mile of Main Replaced
- Hours per Service Replaced
- Hours per Meter Replaced
- Hour per Mile of Main Installed
- Hours per Leak Repaired
- Hours per Trouble Job Ticket Responded

(b) Electric

- Hours per Mile of Overhead Line Renewed or Replaced
- Hours per Mile of Overhead Line Installed
- Hours per Overhead Trouble Job Ticket
- Hours per Mile of Overhead or Underground Line Renewed or Replaced
- Hours per Mile of Overhead or Underground Line Installed
- Hours per Underground Trouble Job Ticket

C. Internal Staffing

1. *Summary*

ORU effectively planned internal staff needs based on long-standing and well understood practices and procedures. Management employed sophisticated tools for monitoring and managing attrition and retirement impacts using capabilities managed and deployed at CECONY. Electric operations, however, were slow to develop analyses or studies that support its (and CECONY's) stated belief that the industry is more than likely to experience significant structural change in the future. In addition, while internal staffing planning efforts were largely effective, some unexpected variations in engineering staff levels appeared in the forecasted portion of our study (2015 to 2019). We found them unusual, given the likely need for stability (in numbers) required of more technical and specialized engineering resources to deal with a more complex grid and network. We did not, however, identify changes in planning processes to deal with this potential issue, except for the need for management to be attuned to the alignment of its long-term planning efforts with its vision for the industry.

2. *Findings*

a. General

ORU employed a relatively small operating profile and staffing footprint in New York; despite its size, the current and previous CEOs of CECONY both served previously as ORU president. ORU's connections with CECONY have produced staffing practices and procedures, tools and systems, and a general approach to internal staffing planning that largely reflect those of its larger utility affiliate. The companies conduct significant sharing of systems, terminology, support resources, budget calendars, training facilities, and key planning processes.

Internal staffing planning at ORU, similar to CECONY, operated under a multi-phase process that formed part of the annual budget cycle, and continued throughout the year, with certain activities, studies, and analyses taking place on an ad hoc basis dependent on requests and needs. Planning began with an analysis of prior year forecasts, rate agreement delimiters, and existing and proposed long-range forecasts. Additionally, "staffing guidance" came to each organization based on current staff levels, hires, and forecasted attrition (*e.g.*, retirements, transfers, terminations). We reviewed samples of this information (as part of examining CECONY, which operates under similar guidance). It included a five-year forecast of voluntary and involuntary turnover and transfers, projected retirements, hires and transfers in, and end-of-year budget requests. It encompassed the entire company, not just operations, and provided detailed data in the noted categories. It did not, however, provide status or forecasts at the job classification level.

b. Process

Management performed a multi-step process in the preparation of long-term internal staff projections. As a first step, management developed an annual work plan, comprised of mandated work, operational requirements, and strategic initiatives. Second, and critically, came development of work volumes, created by forecasting the requirements of programs and projects. Work volumes form a foundational component of any work plan (although not universally developed in the utility industry). ORU forecasted them by analyzing the requirements of known or planned capital and maintenance programs to arrive at a projected workload for the various tasks and activities to be undertaken. Third, management indicated that it customarily has identified productivity savings, and process or technological changes that might allow it to perform work more efficiently.

Subsequent to process and productivity analyses, management then performed capability analyses, which essentially examine the ability, given current staffing levels, available employee time, and anticipated attrition, to: (a) match or meet the work volumes previously projected, and (b) assess the need for additional resources. Should current staff levels be deemed insufficient, management then addressed the use of overtime or contractors, along with potential hires. Attention was paid to optimizing the resource plan to allow for an appropriate mix of cost effective resources as well as a balancing of necessary skills and expertise.

The annual work plan formed the basis for the long-term, or in the case of ORU, a five-year, internal staffing plan. Mid-year staff count formed the basis for the long-term plan, incorporating bargaining unit and management personnel. The line organizations, not human resources, had accountability for development of the long-term projections. ORU relied on CECONY's Work Force Planning Department, part of Human Resources, which provided routine reporting and information, including headcount, historical attrition, retirement and hiring trends. The line organizations used the information, among other activities, to develop and refine staffing budgets to achieve long range resource plans. The Work Force Planning group worked with individuals within the line organizations including Section heads, workforce managers, and cost management staff. Ultimately, the ORU Board of Directors reviewed the full five-year business plan and forecast and, upon approval, prepared a memorandum to the CEI Board recommending approval of the first year of the five-year plan.

The development of five-year staffing plans began in 2011 and coincided with the implementation of the new Oracle financial system. Prior to 2011, long term resource planning was more limited in duration. In addition to Oracle, internal staffing planning within ORU drew support from VEMO, a third party supported application and planning tool that contains historical data used to support and report on projected attrition, retirements, and terminations. It also provided management information on regular and overtime hours and costs. VEMO's filtering capabilities provide information on work group, position type, as well as age and tenure bracket. VEMO could not be used to estimate contractor resources; that function took place at the local level. Management also used HR/PeopleSoft, an Oracle product, to maintain headcount information by organizational hierarchy. ORU did not track numbers and types of contractor resources in one central location; each functional work group maintains that information for its respective area.

ORU did not use Paybud, (a payroll application used by CECONY) to budget the staffing needs and labor costs of its five-year plans. The small size of ORU enabled the performance of that task manually.

The line organizations developed initial staffing plans, using data from their internal work management and corporate financial systems and from CECONY's Work Force Planning Department (which falls under Human Resources). The CECONY-supplied information included headcount, historical attrition, retirement and hiring trends, which the line organizations used to develop staffing plans. After completion of an initial staffing plan, loading it into VEMO permitted final analysis and refinements. The CECONY Work Force Planning Department until recently consisted of a single individual, although others supported that individual as needed. Workforce Planning moved to the Learning Center, also a CECONY managed group, becoming subsumed within an analytics group. ORU's Financial Services group will also assist the line organizations in the development of the cost elements of five, -year staffing plans as needed. However, the line organizations, with Human Resources in a supporting role, have been and were expected to remain the driving force in the development of long-range internal staffing plans.

The processes and tools used to develop long-term internal staff forecasts were the same for electric and gas operations. Management observed that it did not foresee a near-term immediate need to modify or change the organizational responsibilities, processes, or procedures underlying the planning or execution of internal staffing strategies.

c. Staffing Trends

Liberty asked management to identify other drivers of change that might affect the maintenance, augmentation, or reduction in anticipated staff levels in either electric or gas operations in the next five years. Management identified possible changes in new employee capabilities or resource levels in several areas, including:

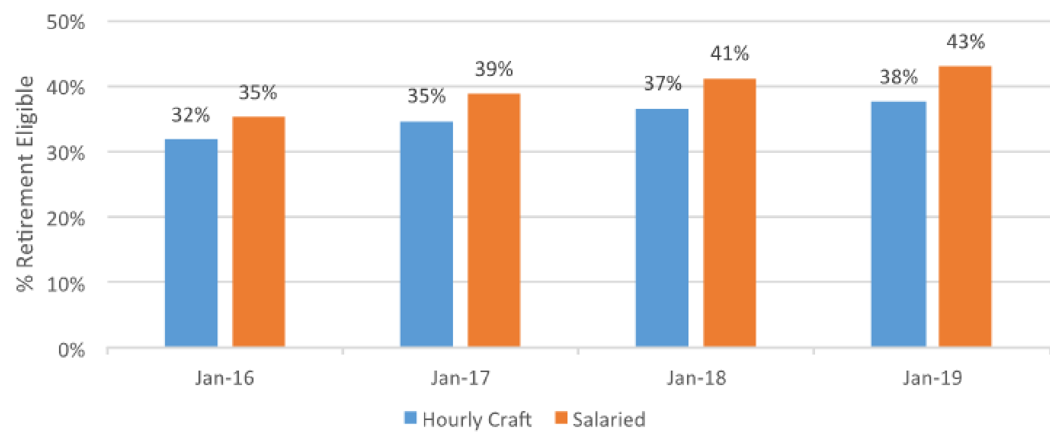
- Data Analytics – management and analysis of increasing amounts of customer data
- Business Development – implementation of new business models and management of relationships with new third party vendors and developers.
- Technology – Automated Metering Infrastructure (AMI), data exchange, cyber security, controls and communications, for example.

d. Demographics

Concern about the rate at which the utility workforces is "graying," or getting, on average, uniformly older, has been an industry-wide issue for many years now. The phenomenon threatens the loss of skill sets earned over many years, if not decades, that become increasingly difficult to replace as retirements pick up steam. Utilities not only face the loss of resources with traditional core competencies, but also must address the dual challenge of replacing core competencies and attracting additional, younger staff with new skill sets in areas such as data analytics, advanced digital technologies, cyber security, and business development. A simultaneous, slow drain of critical skills and the need to attract new skills cannot be easily or fully addressed using contractors.

ORU is not immune to this issue. The chart below shows increasing retirement eligibility (over the next four years) for electric operations staff employed as of January 1, 2015. For example, retirement eligible salaried employees show a projected increase from 35 to 43 percent from 2016 thru 2019, respectively.

Chart III.1: Electric – Percent of Current Staff Retirement Eligible as of Year End



The next table shows the numbers of employees underlying these percentages.

Table III.2: Electric – Number of Current Staff Retirement Eligible as of Year End

Type	Retirement Eligible			
	1/1/2016	1/1/2017	1/1/2018	1/1/2019
Craft	66	72	76	78
Salaried	59	65	69	72
Total	125	137	145	150

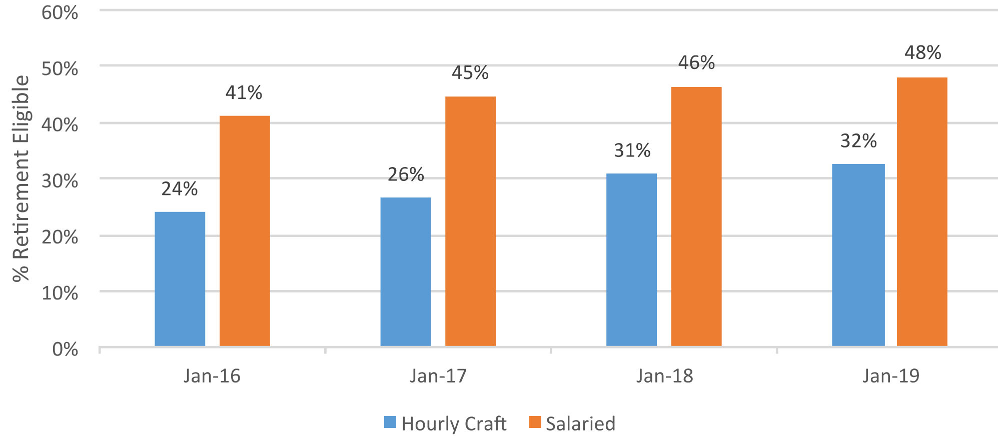
Those eligible to retire that actually did retire remained relatively flat from 2009 to 2012 (see the table below), but an order of magnitude increase occurred in retirements for craft in 2014 versus 2013. The same year saw a tripling of retirements for salaried employees. These jumps potentially presage significant staff replacement needs for both salaried and craft resources.

Table III.3: Electric – Rates of Actual Retirement

Type	2009	2010	2011	2012	2013	2014
Craft	8%	2%	11%	5%	3%	29%
Salaried	8%	16%	8%	15%	6%	19%
Total	8%	6%	10%	10%	3%	23%

The retirement eligibility profile of gas operations staff, shown in the next chart, showed a trend similar to electric operations. Both craft and salaried employee's retirement eligibility increased between 7 and 8 percent over the 2016 – 2019 period. However, salaried employees showed a marked difference in absolute percentages with retirement eligibility for salaried employees increasing from 41 to 48 percent while craft employees increased from 24 to 32 percent. This trend, coupled with a relatively high level of retirements from individuals actually eligible to retire (see the Rates of Actual Retirements table below) could produce near term difficulties for ORU, as experienced employees retire at a rate that may tax the ability to train and develop replacements. Management observed, however, that it combines ORU and CECONY data for purposes of analyzing retirement trends, because as the ORU data alone comprises too small of a data set to be considered statistically significant.

Chart III.4: Gas – Percent of Current Staff Retirement Eligible as of Year End



The next table shows the numbers of employees underlying these percentages.

Table III.5: Gas – Number of Current Staff Retirement Eligible as of Year End

Type	Employees 1/1/15	Retirement Eligible			
		1/1/2016	1/1/2017	1/1/2018	1/1/2019
Craft	117	28	31	36	38
Salaried	112	46	50	52	54
Total	229	74	81	88	92

Table III.6: Gas – Rates of Actual Retirement

Type	2009	2010	2011		2012	2013	2014
Craft	17%	4%	25%		10%	10%	10%
Salaried	7%	8%	7%		17%	3%	13%
Total	11%	6%	13%		15%	5%	10%

Notwithstanding the increase in retirement eligible staff, ORU exhibited some interesting trends in average age and tenure of its work force in both electric and gas operations. For example, while the data indicated an increasing retirement eligible pool and actual retirements, the following chart and table show that between 2009 and 2014 the average age of salaried employees in electric operations decreased by one year, and the average tenure by two years. Craft resources showed an essentially flat trend, with average age and tenure the same in 2009 as in 2014, albeit with some interim fluctuations.

Chart III.7: Average Age - Electric

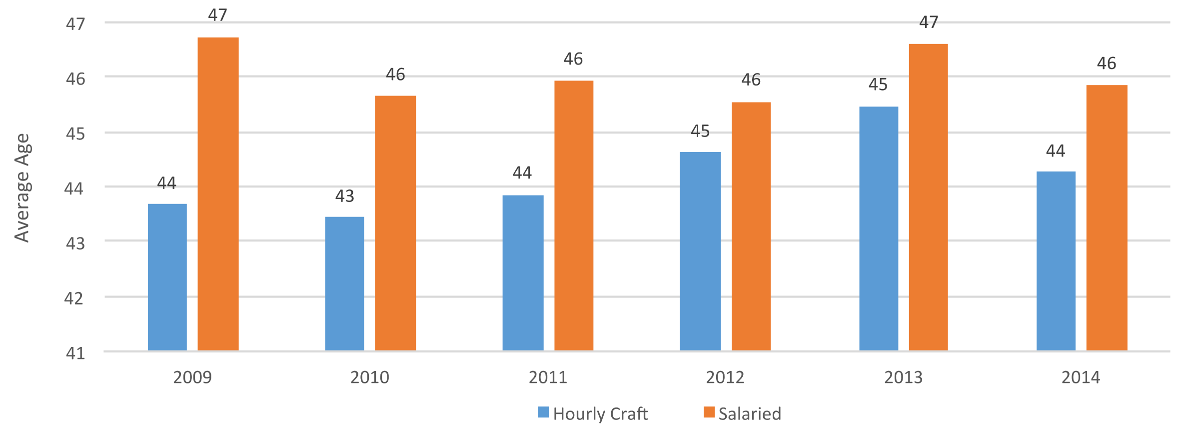
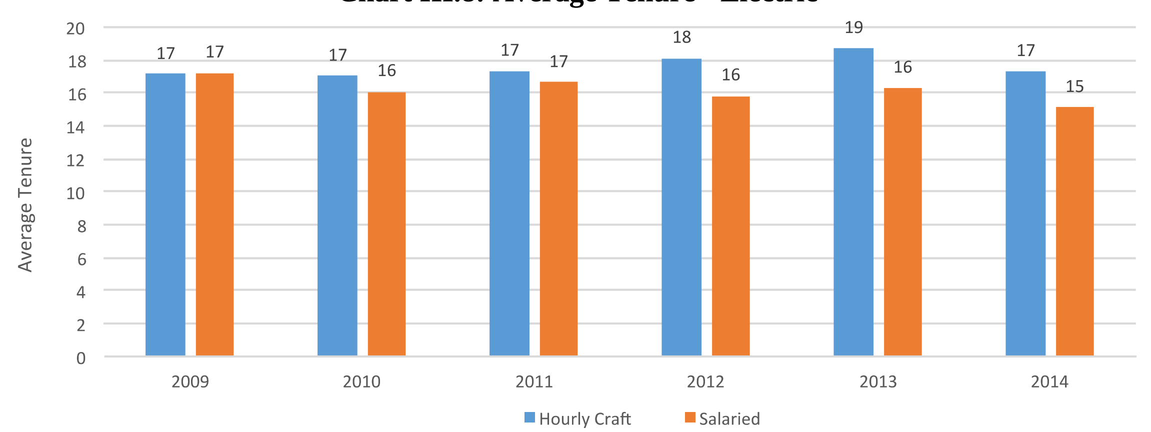


Chart III.8: Average Tenure - Electric



Gas operations showed somewhat different trends with salaried employees' average decreasing by three years from 50 to 47 over the period 2009 to 2014 while the average age for Craft resources increased from 42 to 44 (shown in the first of the following two charts). Average tenure over the period also differed somewhat between gas and electric operations. Salaried staff average tenure decreasing from 21 to 17 years while craft average tenure remained flat at 14 years (shown in the second of the two charts below).

Chart III.9: Average Age - Gas

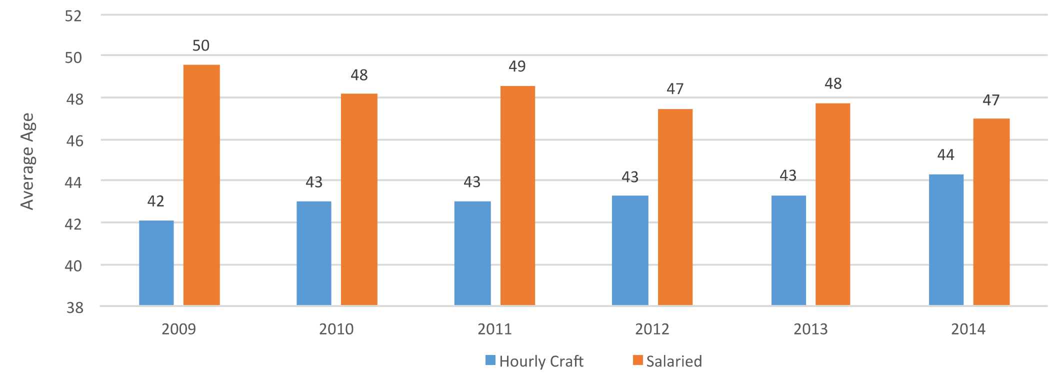
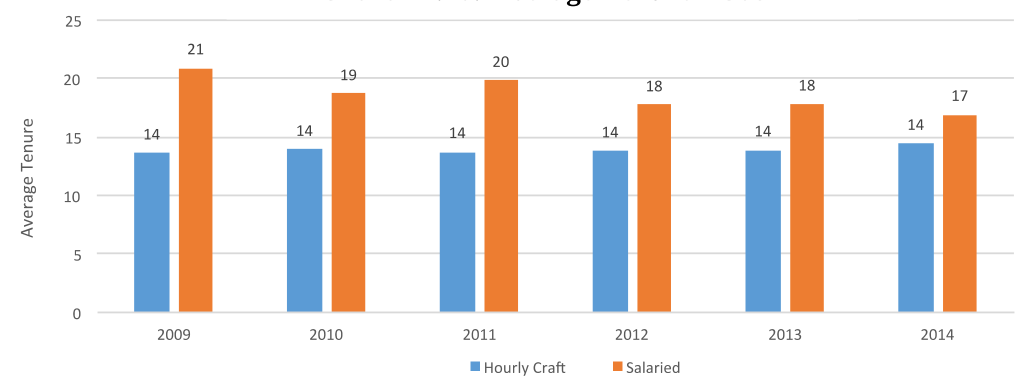


Chart III.10: Average Tenure - Gas



e. <u>Monitoring, Training, and Development of Critical Skills</u>

In electric operations, management identified the need for equipment technicians, line supervisors, engineers, among others, attributing those needs partly to implementation of advanced automation technologies and Smart Grid related initiatives. gas operations identified a need for compliance and emergency response personnel. Management further observed that the gaps between the skill sets of the high percentage (*i.e.*, 35 percent) of line supervisors currently nearing retirement age and those resources of relatively recent vintage posed potential problems. Management cited the development of similar circumstances in the engineering and control center areas. Finally, management realizes that it can be reasonably anticipated that yet unknown gaps and skill sets will manifest themselves due to the changing nature of the utility industry and the increasing technological sophistication required of engineering and control center positions.

Management conducts ORU leadership and management training at the Learning Center in Queens, which CECONY uses as well. Technical or craft training (*e.g.*, electric line and gas technical) occurs at ORU facilities in Spring Valley and Goshen in New York. The common Learning Center staff, however, coordinates and manages such ORU technical training. Management divided technical training into four categories: career path training, compliance training, environmental, and regulatory. Training was organized by discipline (electric or gas). The Learning Center worked jointly with the line organizations to build and maintain skill sets. The Learning Center had approximately 70 experienced instructors and seven managers. Management had also developed eLearning courses on numerous subjects. The Center used key performance indicators (*i.e.*, KPIs) measuring reductions in operating errors, e-learning participation, and pass-fail rates on promotional tests. It did not, however, use KPIs related to the achievement of line-organization resource targets. We found no indication that any organization had a KPI related to ensuring that projected staff complements are achieved in total or on schedule.

In terms of outside training and development resources, management observed that it "…partners with vendors, performs benchmarking and participates in industry associations to support learning objectives." It cited participation in industry groups such as the Edison Electric Institute ("EEI"), the Northeast Gas Association ("NGA"), the Gas Technical Institute ("GTI") and others to identify best practices in employee training and development. Management also identified several institutions and agencies with which it participates in its recruitment efforts. Descriptions of joint efforts with the bargaining units for recruitment, training and development of Craft personnel included the establishment of a Military Steering Committee (seeking to increase veteran representation in the workforce).

The Company (in partnership with CECONY) joined the Center for Energy Workforce Development (CEWD) in 2014 as a financial, contributing member, and has been engaged in a number of CEWD efforts. These efforts included membership in the CEWD Troops to Energy Jobs Initiative. Management also worked with other companies, in collaboration with the CEWD, to create a natural gas "boot camp" for the northeast region, in addition to participation in a number of other CEWD-sponsored events.

We asked about any practices related to long-term internal staffing that management considered a "best practice." Management cited its use of Key Performance Indicators related to management training, and noted success in to filling bargaining unit positions from other parts of CEI, thereby potentially accelerating the ability to address craft position openings.

3. Conclusions

Liberty based conclusions on our evaluation of practices and processes against specific Internal Staffing criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These six criteria are:

1. There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.
2. Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.
3. There should exist sufficient sources of complete, accurate staffing information by region and by function
4. Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.
5. Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.
6. Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

1. ORU had detailed forecasts of medium- and longer-term capital and O&M work requirements; they were comprehensive enough to identify likely resource requirements over those time frames.

Management conducted a highly structured, well-understood work plan development process based on the identification of work to be performed translated into hours and costs and resource targets. The process essentially mirrored that of CECONY. Projections extended over a five-year time horizon, and involved appropriate line and management personnel.

2. ORU's capital and O&M work forecasts had an adequate factual and analytical foundation to support staffing projections.

The identification of work requirements resulted from a multi-step process driven by significant line organization input and subject to multiple layers of review and examination. Conversion of those work requirements into resource needs resulted from a structured, straight-forward process that proceeded directly from the work forecasts.

3. ORU had adequate sources to provide complete and accurate information about staffing by region and by function.

Use of Oracle and VEMO, systems focused on budgeting and attrition-related information, respectively, provided sufficient data at an appropriate level of detail to allow wide and deep coverage of staffing related information. VEMO's capabilities represent what constitutes a best-in-class system for tracking attrition-related information.

4. Appropriate ORU forecasts existed of likely losses through attrition and retirement of internal resources by function, region, and work type.

VEMO, the third party hosted program used by the Company for tracking, monitoring, and reporting on attrition, retirement and other similar demographic characteristics, can produce forecasts of those characteristics down to region and function. Attrition and retirement forecasts were consistent with historical trends and recent experience.

Management demonstrated a sound and comprehensive understanding of areas where losses in key personnel had most significantly affected or could affect work performance. Management has determined that this information supports the conclusion that losses in key personnel, in skills or numbers, had not affected work performance, and we observed no indications to the contrary.
ORU identified two job classifications, Substation Operators and Gas Construction workers, whose projected deficiencies in resource totals over the next few years could have an adverse impact on work performance. Management had instituted programs to address both of those situations and was actively executing them.

5. ORU's training and development programs were sufficiently robust to provide adequate support for long term staff requirements, but lacked key performance indicators in one area.

The internal training programs were comprehensive, well developed, and oriented toward effective support of the line organizations. ORU also maintained relationships with schools, associations, and the Center for Energy Workforce Development, each of which contributed to an effective training and development environment. Notwithstanding the effectiveness of the training and development program, there no key performance indicator measured whether resource goals or staffing targets were being achieved. Given the major efforts in gas operations to bring on scores of new staff over the next few years, and the uncertain but changing needs in electric operations, there needed to be greater and focused accountability for meeting internal resource targets.

4. Recommendations

1. ORU should develop key performance indicators that measure the effectiveness of efforts to achieve staffing targets and accountability should be assigned to the appropriate individual(s).

Documented KPIs will increase accountability within ORU and help ensure that resource goals and staffing targets are being achieved.

D. Overtime

1. Summary

ORU was regularly experiencing overtime higher than its established targets in electric distribution activities, suggesting issues at the planning or execution stages. Overtime trends made existing targets no longer credible, which, in turn, precluded effective overtime control. There was no shortage of analytical capabilities at ORU and management did confront the overtime challenge, with attention to the balancing of overtime against the need to add off-hours resources. It appears however that such balancing centered on a 25 percent[5] overtime level, which had proven to be too low. The use of a more accurate estimate for overtime may alter ORU's thinking in this area. We do not think that ORU's approaches were faulty, but opportunities for improvement existed.

2. Findings

Liberty has often found in other work that overtime among utilities does not generally receive a degree of organizational attention commensurate with its importance in cost and staffing analysis and planning. The magnitude of work done on overtime, the negative impacts on personnel from high overtime, the reduced productivity associated with overtime, and issues of control, especially with emergency requirements, argue that overtime planning and management should get more attention in most organizations.

We earlier raised several concerns about ORU's overtime levels. Nevertheless, the processes underlying its management of overtime appeared sound, notwithstanding the planning and execution issues associated with the inability to achieve targets. Liberty found opportunities for process improvement that are moderate at best. We found no process areas subject to significant weaknesses, either on an absolute basis or relative to the other operations we studied.

Management was attentive to overtime, and employed a strategy to limit it to 20 percent. For electrical operations, overtime was projected in the annual manpower plan based on historical usage and established guidelines for the use of overtime. Key performance indicators were developed to align the use of overtime with business strategies. Each business area reviewed

[5] The target for distribution was 20 percent, which corresponds to about 25 percent on the basis we used in this study.

overtime usage on an ongoing basis. Overtime was typically used for trouble work or reliability issues that required immediate response.

For gas operations, management budgeted overtime based on historical levels, and measured against key performance indicators. Overtime use occurred mostly for emergency work, such as storms, emergency response to gas leaks, and emergency gas leak repairs. Electric operations used more advanced tools, systems, reporting, and analyses. Gas operations planned to follow suit, implementing the same approach and practices.

3. Conclusions

Liberty based these conclusions on our evaluation of practices and processes against specific overtime criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. There should exist an analytically supportable method for determining optimum levels of overtime.
2. Planning should appropriately consider the relationship between amounts of overtime use and productivity and costs developed separately for the different work functions and types.
3. Overtime use should comprise a formal part of the process of identifying required resources.
4. Overtime use should conform as closely as practicable to well-founded assumptions used for determining resource requirements.
5. Overtime use should comprise part of an integrated process for balancing internal, overtime, and contractor resources across all functions at issue.

1. ORU provided a significant level of planning, monitoring, and oversight to the management of overtime, and had sound analytical capabilities.

The degree of attention to overtime as a management parameter varies among the utilities, but received substantial attention at ORU. Budget targets and caps existed, although their effectiveness may have been limited. Tradeoffs in staffing decisions received an appropriate level of analysis and management consideration. The skills and capabilities applied to analysis and decision-making were appropriate.

2. ORU did not employ an analytically supportable method for determining optimum levels of overtime.

ORU determined that the appropriate level of overtime is about 25 percent. There we found an internal, consensus rationale supporting that target. In some utilities, overtime levels are so constrained or the expenditures are so small, that adverse effects from overuse are not an issue. Where overtime use is comparatively low, analysis needs to be sufficient to support staff planning, but differential productivity effects are not likely to be substantial enough to justify extensive study. Each utility needs to answer this question based on its individual circumstances. We found ORU's levels high enough to merit consideration of improved approaches to optimization.

3. ORU did not routinely measure the interrelationships among overtime, cost, and productivity in decision-making related to overtime use.

ORU did not analyze how productivity varied during normal work shifts and overtime periods. Management did believe that it had adequate performance indicators to monitor productivity overall or the capability to assess whether productivity drops in periods of high overtime use. Management indicated that considering overtime effects on productivity on a formal basis would be difficult.

To the extent that a large fraction of overtime in a company results from "no choice" situations, productivity differential is moot. On the other hand, large amounts of overtime present a diminishing-returns issue. Each company needs to understand its exposure here and the extent to which overtime penalties should be better understood and considered in decision-making.

4. ORU did not apply overtime planning and analysis at the functional level.

Management recognized that different work groups or work types should and do have different levels of overtime based on the nature of the work. This type of planning at ORU did not go down to the functional level. Most utilities see the functional level as the ultimate basis for effective planning and control of costs in general, although the abilities to implement such a strategy vary widely. Liberty therefore recommends more, not less, attention at the functional level. The degree to which such functional attention is desirable in overtime needs to be evaluated and determined.

5. ORU adequately considered overtime in its resource planning and budgeting functions.

ORU managers considered historical overtime levels in long-term resource planning strategy and in performance trending. Overtime parameters were adequately considered and integrated into budgets and plans.

6. ORU appropriately considered overtime as an element of the resource stack and appropriately planned its use on an integrated basis with the other resource elements.

ORU described its annual workforce planning process as practiced during the budgeting season. Management took into consideration current productivity, training requirements, amount of unproductive time, and workload demands to establish baseload internal resource levels.

In electric operations, ORU conducted an analysis to compare the benefits of scheduling more workers versus having work crews on standby. The costs had been optimized based on times of high customer demand, paying crews to standby for response from home, paying crew schedule premium and overtime, and the availability of personnel to complete project schedules.

In gas operations, a schedule optimization analysis was performed to determine whether it was cost effective to schedule more workers on off-shifts versus having crews on standby, a direct application to optimize overtime usage.

4. Recommendations

1. ORU should develop a more analytical process to determine the optimum levels of overtime.

Each utility's circumstances will dictate its needs for an analytically optimized solution for overtime. Such sophisticated approaches will be more appropriate in cases where (a) overtime expenditures are large, both absolutely and relative to other staffing related costs; (b) planned levels of overtime and relatively high; (c) productivity issues are present; (d) non-economic issues are present; or (e) control issues are present.

ORU's circumstances exhibit several these characteristics, making it a logical candidate for a more robust analytical determination of an optimized level and strategy for overtime. Therefore, management should consider alternate schemes analytically, and modify its approach accordingly. Management should include in its study an evaluation of its decision not to provide for 24-hour coverage

Liberty believes that a study of overtime within the framework of a "control zone" approach can be beneficial. Nevertheless, ORU's circumstances and needs may be more basic, given that it has regularly exceeded its overtime targets. A target is largely irrelevant, regardless of how it is derived, if it is not achievable, and that indeed appears to have been the case at ORU. Any determination of an optimum level should therefore be accompanied by an ability to control to that target (or range).

More work remains for management to accomplish. Management has focused on the 25 percent level, but the actual levels have been much higher, meaning the costs and stakes are higher as well. Management appears to have concluded that current levels are too high (and hence not optimal). Otherwise, it is not clear why it has changed the target. The basis for concluding that its lower target is achievable is by no means clear. A credible analysis that balances the issues, including the control issues, is in order to produce an optimal result.

Management of ORU faces a complicating factor in overtime use. The absence of 24-hour coverage leads to balancing higher overtime against the option of staffing a new off-hours shift. That balance tends to favor overtime. Management has conducted studies of this tradeoff, but appears to have used an artificially low (for ORU) 25 percent level of overtime. At a minimum, a re-analysis should use actual levels of overtime.

More extensive analysis appears necessary to give management the confidence that either: (a) overtime can and should be made lower, or (b) the high costs and other negative consequences of 30 percent+ overtime, while highly undesirable, are nonetheless the optimum option.

2. ORU should include all relevant factors in its decision-making vis-à-vis overtime.

Each utility's circumstances must dictate the level of effort appropriate for managing various elements of its work. Liberty does not recommend that management undertake expensive analytical exercises that may offer no real return. We do recommend that management act to ensure that it has a strong, data-driven understanding of the negative impacts of overtime, and considers those impacts as practical in its decision-making processes.

3 ORU should expand the use of functional planning, budgeting, and monitoring of overtime.

While utilities generally accept the appropriateness of a functional approach to cost management, not many carry that concept very far. The question of functional cost management is not whether to do it, but rather how far to go in its application. This question has particular relevance in examining overtime.

In this regard, overtime is admittedly a lower level cost element, and ORU is a small utility. We therefore accept the possibility that overanalyzing overtime at the functional level may prove non-productive. However, management has not been able to reach its overall targets, and it is reasonable to expect that much of the variance arises in just a few key functions. If overtime is not planned, budgeted, and monitored in at least those particular functions, then solutions are not likely to be forthcoming in the near term.

Liberty therefore recommends that ORU consider an expanded role for functional management of overtime, if not for all functions, then for at least those functions likely to be the most fruitful.

E. Contractor Use

1. Summary

ORU's processes for the awarding and managing of contractor work largely met Liberty's evaluation criteria. We saw little room for significant improvement in those processes. Bargaining unit rules affected the ability to optimize contractor staffing to some extent. Also, ORU faced challenges in adding to internal staff to manage increased contractor work expected in the future.

2. Findings

a. <u>Contracting Levels & Types of Contracts</u>

Except for transmission/substation capital, we found the level of contractor use consistent with management's approach of minimal contractor usage. The high level of transmission capital contracting resulted from large project work. ORU did not face any minimum staffing rules for distribution. Transmission operations did have to address a minimum nine-linemen rule for EHV (extra high voltage) crew work.

Management used blanket purchase agreements with unit price rates for underground line work, overhead line work and engineering. Management also used lump sum agreements. Projects were split into either rate type depending on individual job factors. Larger projects generally used lump sums. Linear work, such as trenching, were generally best fitted for unit pricing. Management's general work practice served to assign all jobs with over 1000 hours of work to contractors.

Gas contracting was consistent with the general range of contract services used by the other New York gas utilities. Management did not have specific policies on work types or volumes to be contracted, but applied factors such as seasonality, balancing peaks and valleys of work load, need for specialized skills and equipment, and high volume, low skill repetitive work. Generally, management has for some time contracted out the types and volumes of work described below.

Leak repair, locating and markouts were performed primarily in-house, with contractors used as a peak-shaving resource (about 10 percent of the O&M work load). Leak surveys were performed by a mix of in-house employees and outside contractors. Approximately two-thirds of pipe replacement work was performed by outside contractors, while new business capital divided roughly equally between in-house staff and contractors. On the in-house capital projects, some specialized work, such as landscaping and paving, was contracted. Contracts typically had three-year durations.

Larger projects, about 20 percent of the capital work, were typically bid out on a lump sum basis, with the remaining 80 percent of the work done on unit rate ("blanket") contract basis.

b. Data-driven Understanding of Contractor Usage

Project management teams made the decisions on the bid type used. For lump sum bids, ORU started using the CECONY bid check department and some two or more years ago.

Every six months, ORU compared contractor costs for overhead construction projects to the costs of company crews for every project. Management calculated contractor hourly costs from the hours and unit costs of completed projects from the previous six months. These hourly costs were then loaded in the WMS system for comparison to company crew costs.

ORU was one of two state electric companies operating under an internal bargaining unit overtime rule. Both also comprise the only two having distribution O&M $/customer costs above the average. When management is making use of distribution overhead line contractors in a division, eight hours of overtime in a two-week period (four hours per week) must be made available for all linemen. This rule applies at the division level; ORU has three divisions. Management tries to schedule work to keep contractors in only one division for the week, to limit the impacts. Management offers every other Saturday to the linemen to maximize the benefits of the additional overtime work.

For gas operations, ORU conducted an analysis comparing the costs of in-house versus contractor work for certain activities. Liberty reviewed those studies but found the results to be inconclusive.

c. Broad Base of Contractor Firms

An ORU goal seeks to keep at least one or two overhead line contractors employed to create a worker pool for storm response. This amounts to about twenty percent of the typical overhead line work. Management was using three overhead line contractors.

ORU shared its gas contractor databases with CECONY. The combined database includes 20 to 25 contractors, but some only work in the territory of one of the two sister utilities. ORU's most recent capital bid solicitation, sought bids from 14 contractors. Typically, the Company got five to six bids in response to its solicitations.

d. Contractor Oversight and Management

For both electric and gas contracting, ORU used a dedicated contractor management workforce, comprised of two-person teams (one company employee and one contractor). The contractor used for this purpose came from a project management company, not a contractor from the firm doing the work.

Management handled contract review, invoicing, and payment processing through the normal ORU/CECONY Supply Chain process (outside the operating organizations), to provide checks and balances. Their Oracle system processed invoice payments. The CECONY Contactor Oversight System tracked issues and safety infraction reports. ORU inspected 100 percent of distribution work. Contractors did not have the ability to make changes to work orders. Dollar variances trigger project reviews.

Contractors were required to report safety incidents and the number of lost time hours for all accidents. An ORU KPI (the TCIR, or "total case incident rate") applied to contractors. The three contractor companies reported their data individually, and then management totaled it, and evaluated the data on an all-contractor basis. Reporting was done at the work area and at the overall contractor levels. The contractor TCIR rate tied to the ORU KPI performance measurements and incentives.

3. Conclusions

Liberty based these conclusions on our evaluation of practices and processes against specific Contractor Use criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The level of contractor use and the types of contractors retained should be supported by a contractor strategy that considers work volume, quality, timeliness, costs, and other relevant considerations.
2. There should exist a data-driven understanding of the comparative costs of using contractor versus internal resources, and apply a good qualitative rationale for choosing between contractor and internal resources.
3. Management should retain a sufficiently broad base of firms should remain under contract, pre-screened or pre-qualified for activities and tasks for which contractors are regularly used or anticipated to be used.
4. (Gas only) Where contractor resources are limited in terms of numbers of crews available or skill sets to meet anticipated future needs, the utility should be working to promote development of a skilled pool of resources.
5. Contractor strategy should be supported by appropriate contractor management processes.

1. Overall, ORU fully supported its types and levels of contractor use with a consistent strategy and execution.

Electric operations contracting levels were generally minimal, and applied through a consistent process. Management contracted out the appropriate low-value and specialized work. ORU used both unit price and lump sum rate agreements in a best-fit process to keep costs down. About twenty percent of the overhead line work went to contractors, in order to secure access to a pool of storm response resources.

Gas operations contracting was generally consistent with industry practice, with the preponderance of routine work performed in-house, and with logical and consistent rationales applied to a contracting strategy.

2. ORU applied a firm data-driven understanding and a good qualitative rationale to support the use of contractor versus internal resources.

Management's general practice was to use contractors for large jobs (over 1000 hours of work). It performed cost comparisons of company and contract crews every six months.

The split between in-house and contract labor was in line with that of the other Upstate gas companies. Management had good qualitative and experimentally-based rationales for supporting its decisions, although it did not perform rigorous cost studies to support them.

3. ORU used a strong contractor oversight organization and robust contractor evaluation procedures.

For both electric and gas contracting, ORU employed a centralized contract management organization composed of two-person field teams. The CECONY Contractor Oversight System supported efforts to monitor and evaluate contractor performance. Management demonstrated a strong contractor-safety focus. Employment of the contractor TCIR as part of KPIs constituted a strength.

For gas contracting, management used the same multi-level contractor field oversight system that CECONY did. A Contractor Field Observation Report included a check list of items expected at the site, and provided a source of immediate feedback on any problems identified. For problems not addressed, management generates an Infraction Report, which requires a contractor to submit a corrective action plan. Ultimately, if a problem continued to escalate, the Compliance Committee, a board of employees external to the project, could evaluate a contractor, develop a corrective action plan, or terminate the contractor. Management conducted quarterly performance review meetings with each contractor. On a semi-annual basis, General Manager reports addressed contractor performance.

The ORU/CECONY incentive/penalty mechanism for construction projects (unique in the state) provided an additional level of motivation for contractor performance. The ORU/CECONY oversight process incorporated a variety of inputs, including filed oversight reports, environmental health and safety reports, QA reports, and gas safety reports. Twice a year, management performed a comprehensive contractor evaluation.

Management evaluated contactors on a five-point scale for each of specified dimensions of work quality (customer and public satisfaction, quality of workmanship, user department satisfaction, conformance to specifications, drawings and layouts, quality of products and materials, and quality and reconciliation of field reports, as well as timeliness, administration, and conduct of the work).

Based on those evaluations, contractors received scores over a 10 percent spread, from .95 to 1.05, which then converted to a bid multiplier.

4. The bargaining unit overtime rule negatively affected the comparative costs of using contractors.

Management had an obligation to offer company employees eight hours of overtime in a two-week period in cases where a contractor was working in the division. This work rule increased costs by causing additional overtime costs where it applied.

5. The ramp-up in pipe replacement activity among the Downstate companies and the Northeast was likely to affect both ORU's costs and availability of contractors.

As noted earlier in this report (*e.g.*, the Gas Attributes sections), ORU's pipe replacement program was scheduled to ramp up modestly over the next five years (from 18 miles to 21 miles per year in 2016, then to 22 and 23 miles per year, respectively, in 2017 and 2018). The midpoint of the range of FTEs per mile of pipe replaced, 1.4 FTEs, equates to an overall requirement of 4.2 FTEs in 2016, increasing to a cumulative total of 7 FTEs by 2018. In isolation, an increase from 18 to 23 miles, or about some 27 percent over four years for an ongoing, planned program would not be cause for concern.

However, in context, there is cause for concern. ORU had already experienced the beginnings of a shortage of qualified workers, first with welders and then gas mechanics, as other companies accelerated their pipe replacement programs. Management also observed contractor employees "hopscotching" among contractor firms, generating worker churn, but producing no net gain in the available contractor work force. Further, in its then most recent round of solicitations, the fully loaded cost of contractor pipe replacement rose approximately 20 percent, after having seen no escalations since the first such contracts were bid in 2012. As CECONY, KEDLI and KEDNY ramp up their programs, competition for external resources will increase.

While hiring in-house is always an option, under ORU's procedures, it would take 36 months to progress from entry level Gas Mechanic to 1st class, with additional training beyond that to become a certified welder. Specific training and internal requirements vary among utilities, but ORU's progression was not atypical.

4. Recommendations

1. ORU should implement plans for increasing internal staffing, contractor base, or both to ensure resources needed to maintain levels of current pipe replacement program.

ORU should work with CECONY in particular and the other New York utilities in general to address the potential shortage in qualified gas mechanics, welders and any other workers needed to support the pipe replacement programs. These efforts should include activities pertaining to in-house employees and to contractors.

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

Final Report: National Fuel Gas
Case 13-M-0449

Presented to:

Public Service Commission
State of New York

Presented by:

The
Liberty Consulting Group

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279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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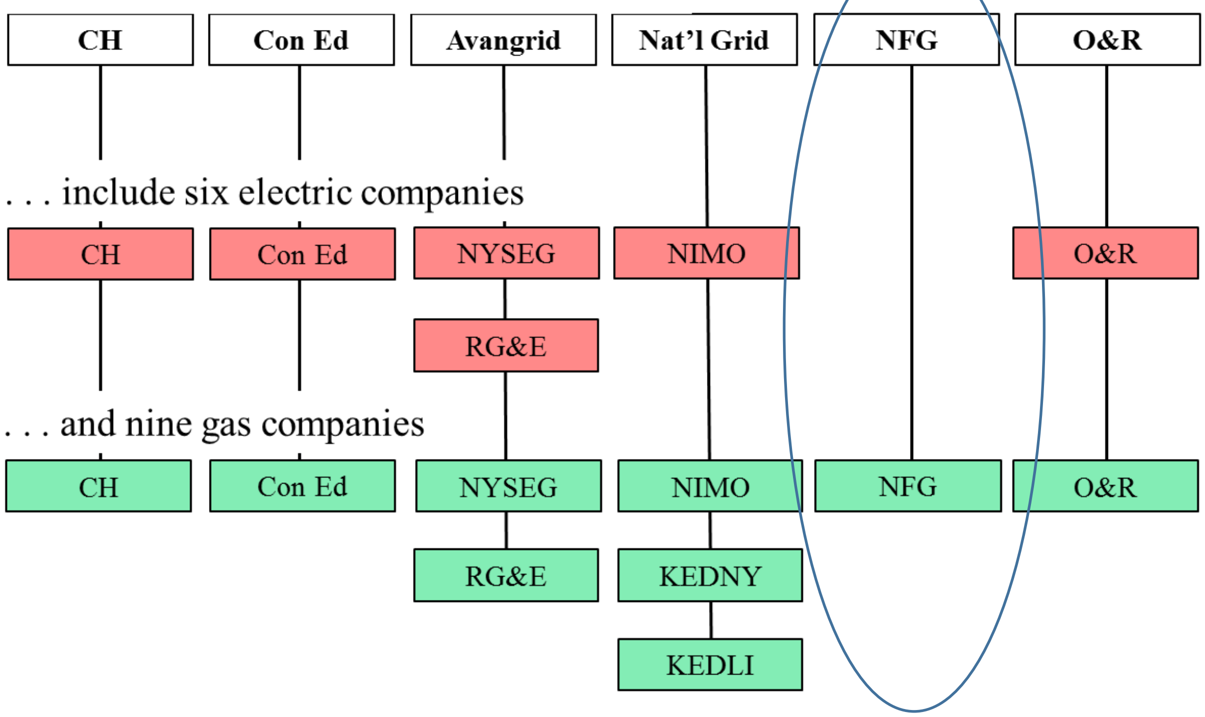
Chapter I: Background

The Liberty Consulting Group completed an extensive study of a prescribed set of staffing patterns and practices (the scope of which the Statewide section of this report addresses) at fifteen utility operations operating within six enterprises in New York State. The first part of this report addresses the results of our study from a statewide perspective. This part describes our study and presents its results as they relate directly to National Fuel Gas Distribution Corporation (NFG).

Figure I.1: The Utility Reports



National Fuel Gas Company, a diversified energy company, has headquarters in Williamsville, New York. It operates an integrated collection of natural gas and oil assets across five business segments: Exploration & Production, Pipeline & Storage, Gathering, Utility, and Energy Marketing. The utility segment, which includes the operations of NFG, sells or transports natural gas to more than 740,000 customers in western New York and northwestern Pennsylvania. New York holds about 525,000 of NFG's retail customers. NFG has the fifth largest retail customer base of the state gas utility operations we studied. RG&E, NYSEG, and O&R have smaller numbers of retail customers. NFG lies even lower in terms of sales (MMBTUs), with only O&R trailing it. While relatively small by these measures, NFG's extended service territory has produced by far the largest total miles of distribution mains among the operations we studied.

Our study examined staffing in quantitative and qualitative manners. This part of the report describes the results of our analyses regarding NFG quantitative staffing data and a qualitative review of the processes associated with staffing at the utility. That data and the comparisons we have made with other New York utilities requires a framework that explains the relevant characteristics in context with the other state utilities.

Our study examined a ten-year period - - five of them historical and five projected. We conducted field work in 2014, which presented a challenge in treating that year's data. We collected year-to-date actual data and budgeted or forecasted data for the remainder of the year. Differences in systems, fiscal years, reporting, and approaches to forecasting to-go data provide examples of the difficulties in identifying a way to split 2014 into actual and forecasted portions or to reflect it on an amalgamated basis. Those difficulties eventually led us to determine that we could not find a way to report 2014 data meaningfully for use in our study.

In 2015, progress on this project halted for a period of many months, during which we sought to resolve major difficulties regarding gaps and errors in data reporting. We observed that the hiatus in work and the need for data correction provided an opportunity to alter project scope to permit collection of actual data for all of 2014 and to update projections for future years. It was decided not to do so. Therefore, we continued to work with the split nature of the 2014 data and with earlier forecasts for future years, which included 2015.

When making utility-to-utility comparisons one must remain mindful of the need to avoid comparing "apples to oranges." The complex analyses involved here and the unique circumstances of utilities even across the fairly narrow geographic range of a single state certainly do make it impracticable to reduce comparative evaluations of performance and results simply to algorithms. Nevertheless, it is possible, with care, to provide data comparable enough to assist in the formation of useful judgments. They can have value even in complex circumstances, particularly when performed on a multi-dimensional basis and only when accompanied by the application of industry expertise in the underlying applications and activities.

We thus undertook our quantitative analyses recognizing the need to understand and reflect the differences that drive staffing among the state's group of utilities. Among the challenges present in doing so, our work provided a significant advantage as well. Despite the differences among its members, this advantage arose from the ability to derive commonly defined, contemporaneous data sets from a utility population that: (a) number enough to allow the use of statistically derived measures, (b) operate under the authority of a single regulatory authority, and (c) encompass what is a remarkably, if not uniquely narrow geographic range (when contrasted with other comparative studies we have seen in the industry).

We operated nevertheless with the recognition that superficial application of data would not serve. We sought to understand and define the characteristics of the utility operations within the scope of our study and how they vary in the utility population. This starting point set the stage for effective structuring of the data to be collected and then analysis of that data.

In comparing the utilities, we begin with attributes of common interest that might have some impact on staffing levels. These initial attributes might be termed as potential "hard" drivers of staffing. These drivers correspond to system attributes that utilities generally cannot control. For example, the number of customers a utility has surely affects required staffing, but that parameter is a function of the environment in which the utility operates. The number of customers represents neither a performance statistic nor a value that management can influence. The relevance here of such factors lies in their ability to help clarify the "givens," that define a utility's relative size in the industry.

We also examined "soft" drivers" of staffing. While these are not "givens," they do concern things that management decisions and actions influence, and those decisions and actions that do, or at least may, affect both staffing and performance. For example, a utility chooses the number of gas mains it will replace each year; that decision affects staffing requirements.

A. The Reference Utility

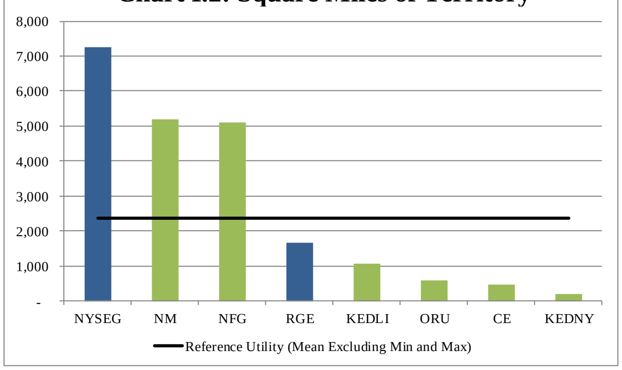
Our many comparisons of staffing frequently refer to "the Reference Utility." We combined data from all the operations we studied to produce a composite for comparative purposes. This part of the report sets forth many charts and accompanying discussions of particular attributes or sets of attributes related to staffing in comparison to the Reference Utility. These uses of a Reference Utility provide a common indicator for how the various utilities differ from the composite. For example, if a utility has the same number of customers as the Reference Utility, we can state that the utility's number of customers as 1.0. If another utility has 50 percent more customers, we can state its customer count as 1.50. These measurements provide a way of illustrating the relative position of any utility in comparisons with others. This approach provides a dimensionless variable for selective use in other calculations. Comparison to the Reference Utility never provided a basis for conclusions, but rather is a way to put each of the companies we studied in a statewide context and to assist in identifying areas useful for inquiry into staffing numbers, distribution, and adequacy.

In defining the value for the Reference Utility, one option would have been simply to use the average of the state utilities. Some circumstances, however, make this approach impractical. For example, one or two very large utilities can dominate the data, calling for mitigation of the impact of the outlier(s). This phenomenon encourages the use of a median rather than an average. A similar approach might use the average of the utilities, but calculated after removing the minimum and maximum values. For gas attributes, we used the median or average excluding the minimum and the maximum.

B. Specific Gas Attributes – Hard Drivers

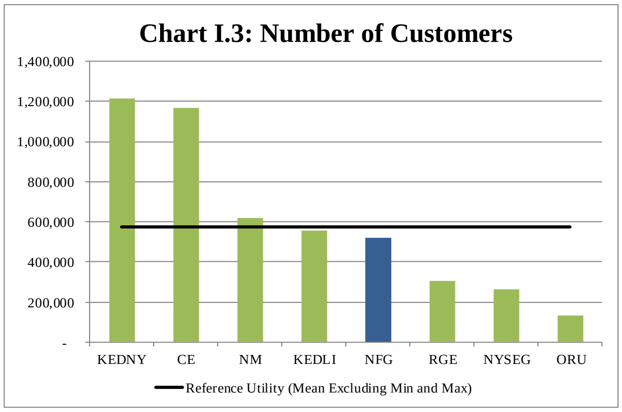
This section describes what we determined to be system attributes comprising hard drivers of staffing. The size of a gas utility's service territory and its customer density can be expected to influence its staffing. Travel times, the level of distribution facilities, and the number of service centers and crew support locations present examples of such impact. Additionally, the gas delivery business exhibits other variables (not present in the electric business) that affect staffing directly and indirectly. Virtually every occupied structure in an electric utility's service territory has electric service. This is not the case for gas distribution.

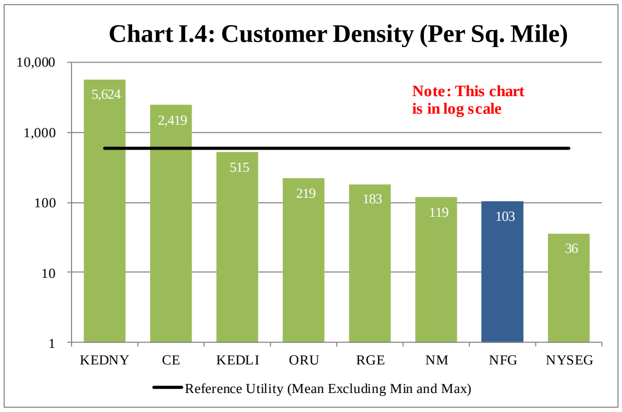
Chart I.2: Square Miles of Territory



Competition from oil, propane, electricity, and other fuels affects penetration rates for gas utilities. Moreover, many customers in the state do not have access to gas service, residing too far from transmission and distribution pipes to be served economically. Many electric customers do not have gas, because it is unavailable or because they choose not to take it. However, virtually every gas customer is an electric customer. For those reasons, there are many more electric than gas customers in the state.

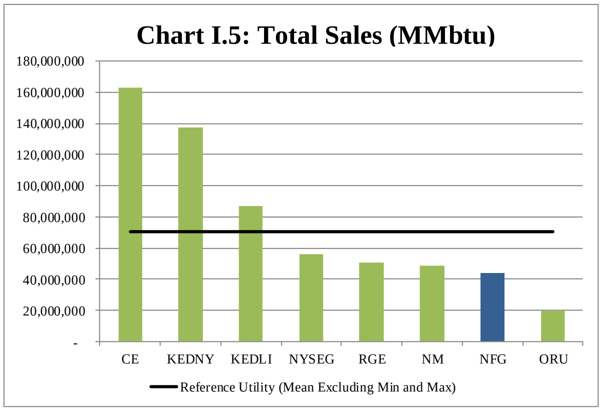
The next two charts compare the attributes of customer numbers and density. Factors such as comparative size illustrate the value in examining multiple drivers when analyzing staffing drivers, rather than searching for a single "silver bullet."





NFG serves a relatively large area in western New York. NFG serves the largest metropolitan area outside New York City, on the one hand, and some of the most rural areas of the state, on the other hand. It joins two other companies at what represents the Reference Utility number of customers. NFG's customer numbers are similar to that of two of the other upstate utilities, NIMO and RG&E, whose territories share some of the same characteristics and diversity as do those of NFG.

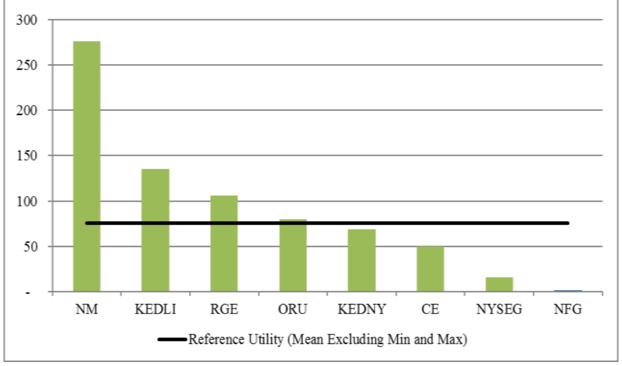
The state's gas operations include two very large companies, each with over one million customers. Three other mid-size companies cluster around the Reference Utility value of just under 600,000 customers. The three remaining, relatively small companies have 300,000 or fewer customers. As expected, the two metropolitan New York companies have comparatively very high customer densities. upstate densities are correspondingly very low, particularly for those serving primarily rural areas.



Customer mix explains why the companies with the largest and smallest numbers of customers frame the chart, but for the others, the ranking by number of customers does not necessarily match the ranking by level of sales. NFG demonstrates this point, ranking second lowest in sales, but two places higher in customer numbers. NFG's customer density is also second lowest. Companies with large commercial and industrial loads tend to have the highest levels of usage per customer. These large customers tend to concentrate in the major metropolitan areas today, but that has not always been the case. In decades past, upstate regions housed many major industrial customers who are now long gone. Losing these large loads often allows upstate gas companies to add new customers now without significant requiring capacity additions, thus, all else equal, reducing resources needed for capital work.

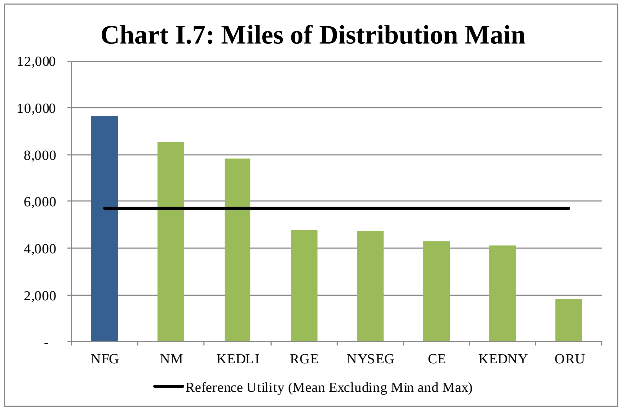
Transmission in the gas business more generally falls to pipeline rather than distribution companies. Most gas utilities, however, have some facilities classified as transmission under certain technical and operating characteristics of the facility (typically around 200 psi when measured by operating pressure). Transmission facilities in a distribution utility move large volumes of gas over relatively longer distances within service territory locations where pipeline companies do not have facilities.

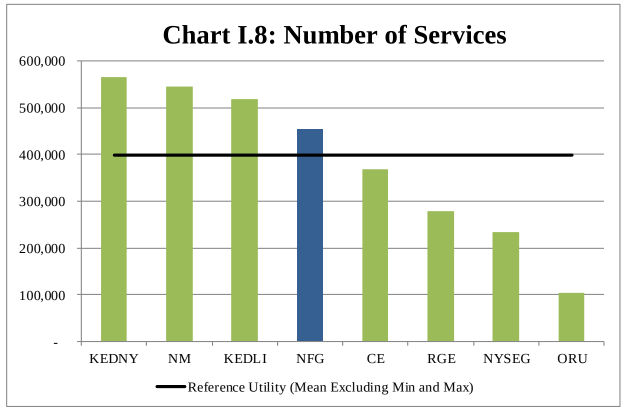
Chart I.6: Miles of Transmission Main



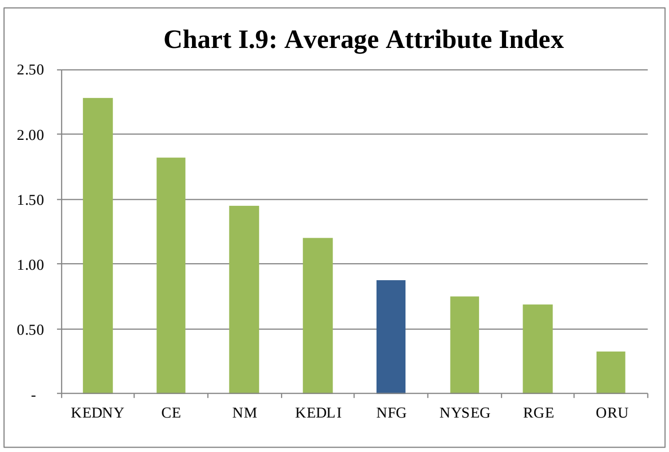
NFG has virtually no transmission mains, which may seem contrary to what one might expect from a company with a comparatively large service area. Earlier in its history, a predecessor to NFG operated integrated transmission and distribution operations. The two operations separated, at which time the resulting transmission company retained the backbone system in the distribution company's service territory. Another factor contributing to NFG's current absence of substantial transmission facilities is that several other pipeline companies traverse NFG's service territory, supplementing the region's transmission capability.

The next two charts show that NFG operates the state's largest number of mains (by the common measure of miles) even though it is the median in number of services. A predecessor to NFG began as one of the oldest gas utilities in the country. Its historically early start in the business and its subsequent continuous presence in the region have contributed to a comparatively high saturation of gas heat. This attribute, combined with NFG's relatively large territorial footprint, places it at the top of the list in terms of miles of mains. Its number of services, by contrast, roughly matches its customer numbers.





The next chart depicts the attributes discussed above rolled into an average. This index offers an estimated statement of comparable size. We presented charts above illustrating the relative size of each utility based on different attributes. In each case, size was quantified as a function of the Reference Utility value. A utility with a measure of 1.5 would be 50 percent higher than the Reference Utility, for that particular attribute. We can measure size on the basis of a single attribute, but we would also like to measure size based on *all* attributes. If we simply take the values for all of the attributes and average them, it provides us a rough indicator of a utility's overall size versus the other utilities. We call this the "average of all attributes index."



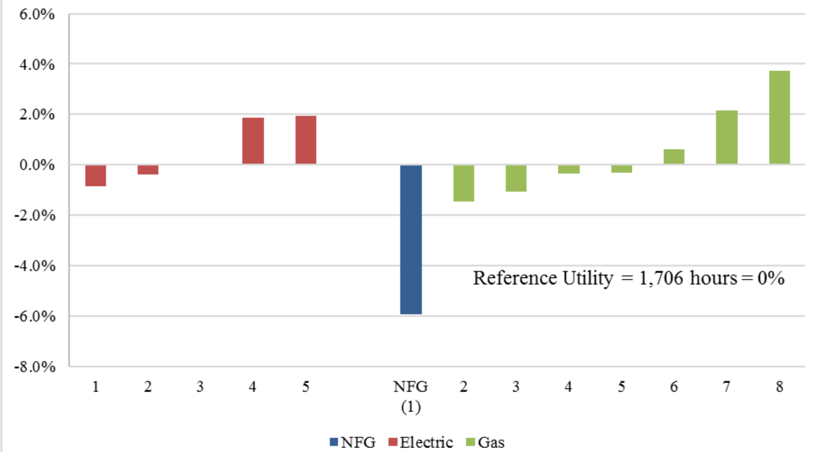
C. Full-Time Equivalent Gas Resources

In order to provide a common parameter for the analysis of staffing levels, we chose as our measure "full time equivalents," or FTEs. We defined FTEs as follows for purposes of this study:

- For utility employees: reported hours divided by available hours
  - Using available hours provided by each company
  - Available hours exclude holidays, vacation, training, and other off-the-job hours
- For contractors: reported hours divided by 2,080 (52 weeks per year multiplied by a 40-hour work week).

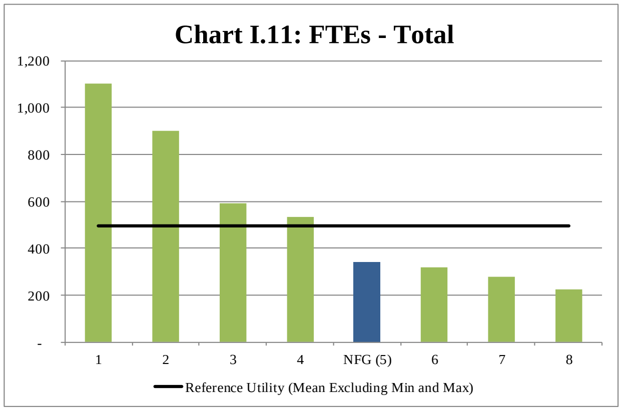
We chose to use this FTE approach to approximate the actual number of workers employed. It makes it easier to understand staffing data than other bases (*e.g.*, hours) would. While this approach provided a way to model numbers of applied FTEs, it remains important to consider differences among the operations we studied. The number of available hours per FTE varied among those companies. For example, one utility had available hours per employee of 1,800 per year, while another had 1,650. Theoretically, the first utility can provide the same number of available hours with 9 percent fewer employees. The accompanying chart shows the variance of each operation we studied from the 1,706 hours we calculated for the Reference Utility (by averaging the available hours for all the electric and gas operations we studied). NFG was clearly an outlier. The data suggests that, all other things being equal, NFG required 6 percent fewer internal people, simply because of the higher number of hours that its people are available to work. The FTE measure that we use provides a meaningful and intuitive understanding of staffing levels, but care in applying that understanding remains important.

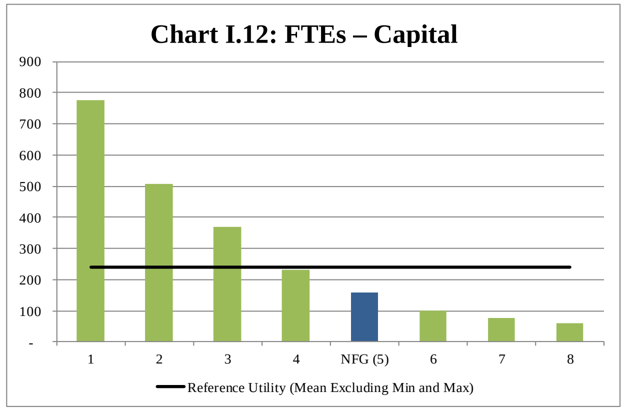
Chart I.10: Added Staffing Required due to "Available Hours"

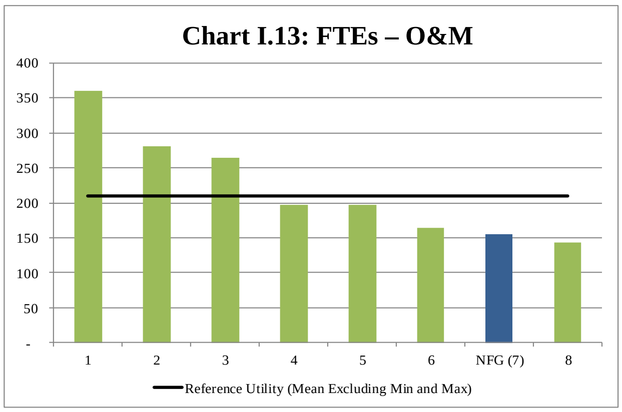


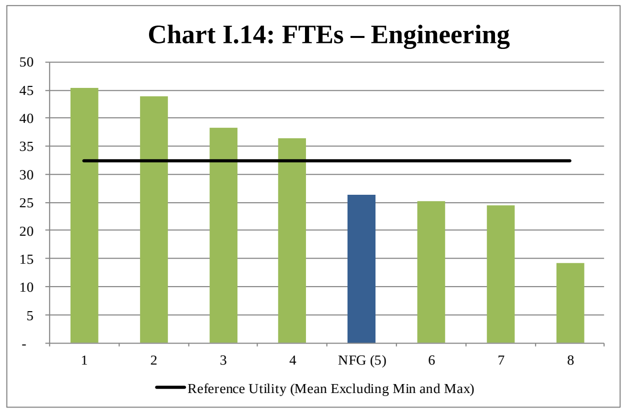
One cannot calculate contractor FTEs on the same basis as that which applies to employees. Contractor employees certainly have off-the-job time as well. However, when contractor employees are off (for vacations or training, for example), contractors rotate and shift resources to keep crew (or other applicable group) complements full. Thus, 2,080 is a valid number to use for a contractor FTE. On the surface, that appears to make a contractor FTE more effective. However, the hours advantage gets substantially mitigated by higher contractor costs. The rates a company pays for contractors builds in the costs of contractor-employee off-time. With all else equal, a contractor FTE, as we use the term in this study, is equivalent to about 1.22 utility FTEs in terms of hours worked. The FTE measure that we use provides a meaningful and intuitive understanding of staffing levels, but care in applying that understanding remains important.

Using this FTE approach, the next four charts show total NFG staffing below the statewide average, consistent with its size relative to other state gas utilities.









All four of the preceding FTE measures placed NFG notably below Reference Utility values. NFG's miles of main and number of services fell, as discussed earlier, above the Reference Utility levels.

Gas FTE ranges (with some exceptions in engineering) generally exhibited a notable upstate/downstate split, with the latter, largely urban operations above Reference Utility values. NFG's FTEs looked generally comparable to the upstate operations. In addition, on the indexed average bases charted earlier, NFG was sized below the Reference Utility. NFG's position on that earlier size chart corresponded reasonably closely to its FTEs shown in the immediately preceding four FTE charts.

Chapter II: Data and Analysis

A. Resource Planning/Total Staff Assessment

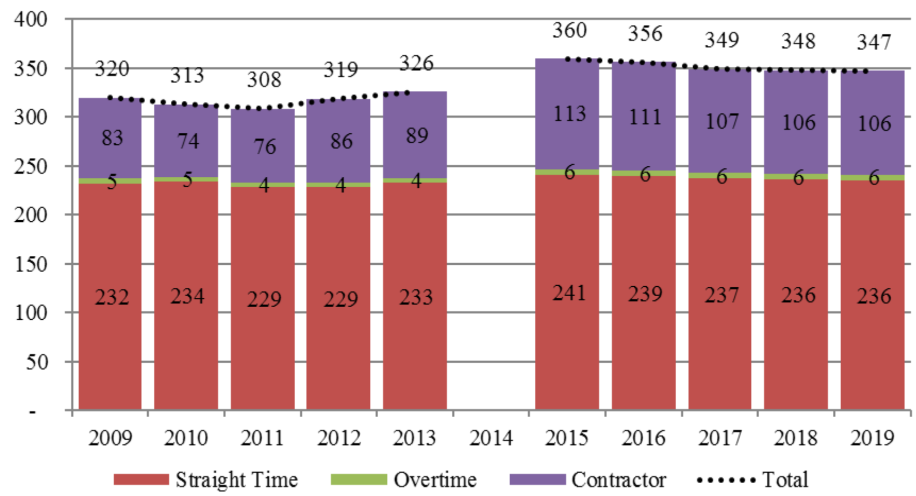
1. Total Staff Assessment

This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for gas operations functions at National Fuel Gas (NFG).

a. Staffing Trends

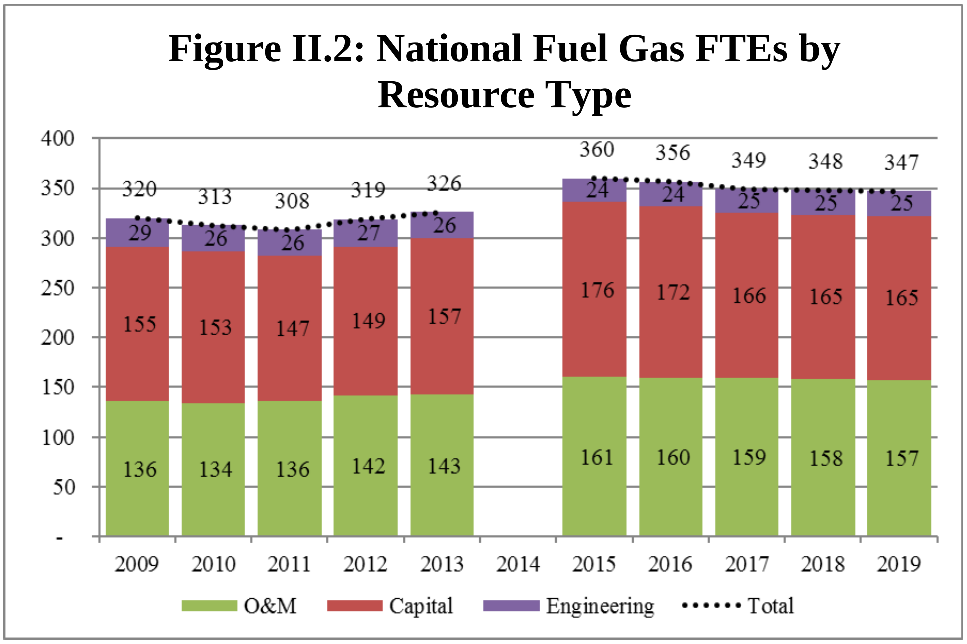
The next chart shows the 2009 through 2019 historical and forecasted gas staffing resources in the areas encompassed by our study, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors. We did not include data for 2014, during which we performed study field work. The companies reported data on incompatible bases for 2014, which at the time required a combination of actual year-to-date and forecasted data. Each of the other study years for the 2009-2019 period used either fully actual of fully forecasted data. The chart depicts staffing resources in terms of Full Time Equivalents (FTEs) as we calculated them as described earlier. An FTE conceptually represents the amount of work provided by one employee for one year, a common way of depicting staffing/workload levels for different types of staffing resources.

Figure II.1: National Fuel Gas FTEs by Resource Type



Total staffing showed little change over the historical portion of our study period, with a small uptick in contractor use between 2012 and 2013. Projections provided by NFG showed contractor use growing by about another 13 percent between 2013 and 2015. NFG's projection showed internal straight-time resources remaining flat and overtime use continuing at remarkably low levels across all 10 years of our study period. The nine percent growth in total resources from 2009 through 2019 came essentially entirely from growth in contractor use (28 percent across the full 10-year period).

The next chart portrays the breakdown (shown in FTEs) of the workload accomplished each year. We broke workload into capital, O&M, and engineering components.



Over the historical period 2009-2013, capital work was relatively stable and O&M work grew very slightly (about three percent). Forecasted workload for 2015-2019 grew by about 10 percent. Capital work grew by more than 10 percent (approximately 20 FTEs) and O&M work grew by a similar amount. While the forecasted increase in capital work was modest, the associated increase in miles of pipe replacement versus increase in FTEs of staff required proved consistent with historical unit rates, which were similar to rates experienced by other upstate gas utilities (see the Productivity section). This consistency lends credibility to the staffing forecasts for capital work.

Forecasted increases in O&M workload from the historical period– approximately 15-18 FTEs – suggested that management was rebalancing resources to address O&M needs. We address this issue more fully in the Service Level section below.

The predominance of contractor use for main replacement work explains the weighting of resource growth toward contractors. The following chart shows NFG's overall resource mix (straight time, overtime, and contractors) compared to the Reference Utility mix. The chart makes the expected increase in contractor use apparent. It also shows that NFG used, and expected to continue to use, comparably greater percentages of internal time, despite remarkably low overtime levels. NFG's expected growth in contractor use did, however, mirror Reference Utility levels.

Figure II.3: Gas Resource Mix

Actual Resource Mix - 2013		
Source	**NFG**	**RU**
Straight Time	71%	62%
Overtime	1%	8%
Contractor	27%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**NFG**	**RU**
Straight Time	68%	59%
Overtime	2%	8%
Contractor	31%	33%
Total	100%	100%

The impact of NFG's very low overtime use becomes more clear when observing that its total internal FTEs (straight and overtime combined) fell close to the Reference Utility levels in 2013 (72 percent at NFG versus 70 percent for the Reference Utility). This commonality occurred despite a 15 percent greater use of straight time at NFG versus the Reference Utility as a share of total FTEs (71 percent of total FTEs at NFG versus 62 percent for the Reference Utility). Thus, the biggest issue raised here is not so much headcount differences, but whether such minimal use of overtime reflects an effective means of optimizing resources.

b. Performance Metrics

We charted historical changes in performance metrics as reported to the Commission. The most current Commission report available during our field work provided performance data for 2014. The next charts show the results. NFG continued to respond to about the same number of leaks within 30 minutes. The portion responded to within 45 minutes jumped in 2013, but fell in 2014. The net effects of these shifts however, was not great. The rolling three-year average line in the chart below showed a consistent level of performance that was better than the Reference Utility value.

NFG historically had by far the highest backlog of leaks (defined by the Commission pursuant to 16 NYCRR Part 255; *i.e.*, Types 1, 2A, and 2. Management achieved a remarkable improvement in backlogs in 2014, with the number dropping to one. The 2014 Gas Safety Performance Measures Report observed that in five of the previous seven years, NFG had been identified as an outlier in this category. The data shows it to be remarkably so. The 2014 improvement took NFG from the worst to one of the best performers in this category. Interestingly, 2014's 60-minute window response rate fell notably, taking NFG for the first time below the Reference Utility value. Management cited extreme weather as contributing to emergency response performance.

Chart II.4: Emergency Response Times

Chart II.5: Backlog of Potentially Hazardous Leaks: 2014

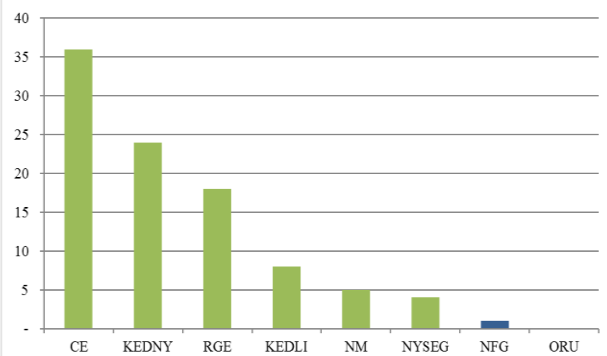
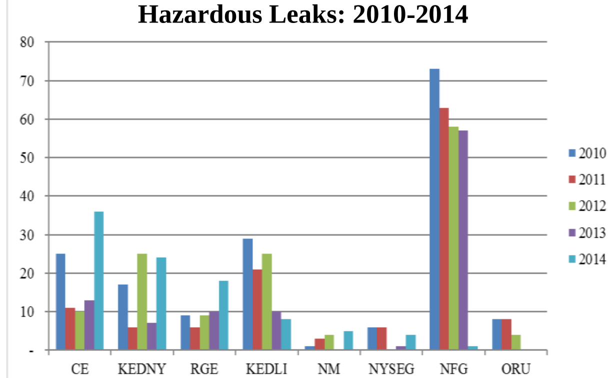


Chart II.6: Backlog of Potentially Hazardous Leaks: 2010-2014



NFG resource forecasts indicated an ability to meet future needs by a combination of rebalancing internal resources to add FTEs to the leak repair and surveillance functions and with moderate growth in contractor use for leak surveillance. Projected 2015 internal resources for O&M work suggested continuation of that realignment, but the questions of sustaining improved levels and what balance of resources is optimum for doing so remains a matter of interest.

c. Gas Staffing Levels

This section examines how NFG's FTE staffing levels compare to other utilities in the study. Our comparisons used two approaches: ratios of staff versus key system attributes and five-year average FTE levels compared to estimates from Liberty's staffing model.

First, we compare how NFG's 2013 FTE levels compare to other utilities in the study on a simple ratio basis for certain key system attributes. The comparisons use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility value, divided by the "all attributes" index described in the "Hard Drivers" subsection of this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. If the number of FTEs for each utility were proportional to its size, and no other factors were considered, this index would be 1.0 for every utility. A higher index suggests higher FTEs than expected based on size alone.

Chart II.7: Gas Staffing Ratios

		All NY Utilitites		
Parameter	NFG	Low	RU (Median)	High
Gas FTEs				
Per Customer	0.70	0.70	1.00	2.32
Per Mile of Main	0.49	0.49	1.00	3.60
Per Unit Sales	1.01	0.60	1.00	1.82
Per Average of All Attributes	0.88	0.80	0.96	1.49

In all cases, total NFG applied FTEs fell at or below the median. These ratios do not by themselves provide a basis for evaluating staffing adequacy. The performance metrics data, however, does make it appropriate to question the sufficiency of O&M FTEs to address leak response and backlogs.

Next we examine how NFG's five-year average staffing levels for the period 2009-2013 compare to FTE estimates from the model developed by Liberty. We developed the model using the data provided by all the state's utilities in the study. It correlates actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produces staffing level estimates, broken down by capital, O&M and engineering for each utility. The estimates consider how the utility's unique combination of attributes varies with staffing levels compared to how the other state utilities staffing levels vary for the same combination of attributes. It provides a more sophisticated way to consider each utility's staffing levels normalized for each utility's unique mix of infrastructure. The model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Those variances provide one of the bases used to perform analyses of staffing.

The next table shows five-year average actual FTEs vs. model results for gas capital, O&M, and engineering functions.

Table II.8: Gas Five-Year Average FTEs (2009-2013)

Type	Actual	Estimate
Capital	152	166
O&M	138	137
Engineering	27	24
Total FTEs	317	327

The results of modeling show a remarkable level of consistency with the previous simple ratio comparison shown above. Actual NFG staffing levels fell at or below model estimates for all key functions:

- For capital work, five-year average staffing levels were less than eight percent below model estimates.
- For O&M work, five-year average staffing levels were the same as model estimates.
- For engineering work, five-year average staffing levels were within a reasonable range (11 percent below) of model estimates.

Average staffing levels fell inside the range of accuracy for model estimates for these functions. Based upon model results, five-year average staffing levels for these functions were within the range of expected staffing levels for NFG's facilities, compared to other state utilities.

2. Productivity

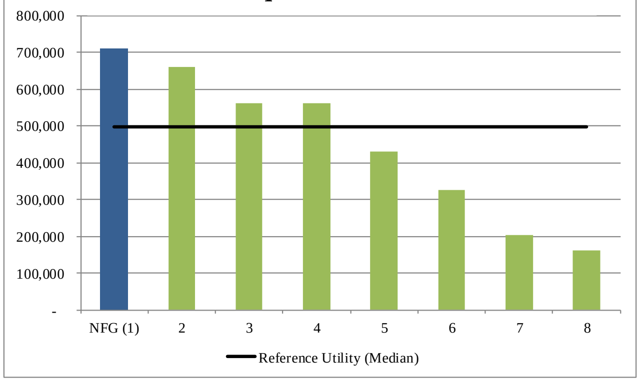
We addressed productivity from several perspectives. We undertook comparisons of the operations we studied as a function of staffing per unit of a variety of commodities or attributes. We also developed a concept we termed New York normalized unit rates (NYNURs or 9ers). The Productivity chapter of the Statewide report describes this concept. Our 9ers present a common measure of production (equivalent production units, or EPUs) that facilitates comparisons across commodities and organizations. The number of hours, or FTEs, or dollars expended per EPU therefore becomes one indicator of productivity.

In developing the 9ers concept we learned that the utility data available was not sufficiently comprehensive to allow us to apply it to all of the hours spent on the work activities within the scope of our study. We did, however, find sufficient data to develop usable measures for about half of the hours each utility actually expended. The partial nature of the results dictates caution in carrying any performance conclusions too far. Nevertheless, we believe the concept has value as another indicator which, when supported by others, can be informative.

a. Equivalent Production Units

An EPU equals the number of hours the Reference Utility expended to produce one unit of a given commodity. Stated in another way, the EPU quantifies the Reference Utility actual unit rate value for that commodity. For example, if the Reference Utility unit rate for "widgets" equals 10 hours per widget, then installation of one widget earns a utility 10 hours. This process creates a common denominator for production, allowing us to add EPUs together at any level of detail or for any organizational breakdown.

Chart II.9: Equivalent Production Units



For the limited scope covered by our analysis, NFG's productivity in terms of "earnings" was remarkably high. NFG is not the largest gas utility in New York, or anywhere near it. Such a high level of EPUs could only result from a comparatively very low unit rate, which is indicative of a highly productive operation. The absolute number of EPUs measures unit output, but means little on its own. It derives usefulness when constructed to represent a comparable production level among companies. The ability to measure the number of employees per EPU at a total company level may be the ultimate, but not perfect, measure of productivity.

b. Productivity

We use the term physical productivity here to mean the actual hours per EPU. The next charts illustrate the hours each utility spent in the limited scope areas per EPU, which we term physical productivity. Note that the Reference Utility is 1.0 here by definition, because we defined an EPU by reference to the Reference Utility's actual unit rate. The charts make clear what the EPU chart implied; NFG's unit rates were less than half those of the Reference Utility, meaning productivity was more than twice that of the Reference Utility.

Chart II.10: Actual Hours/EPU

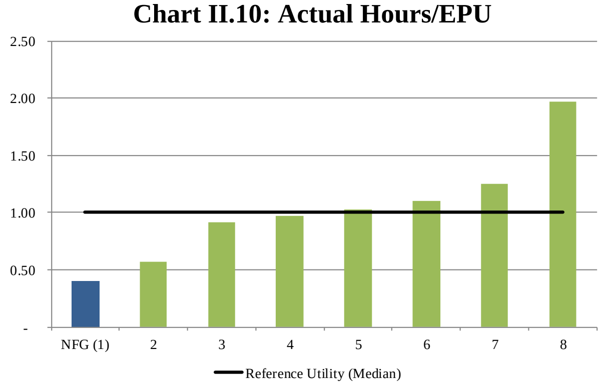
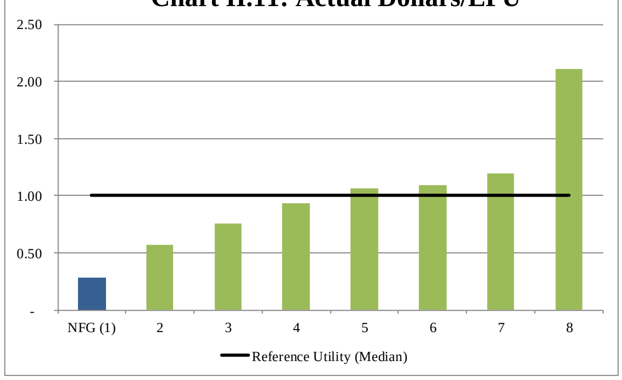


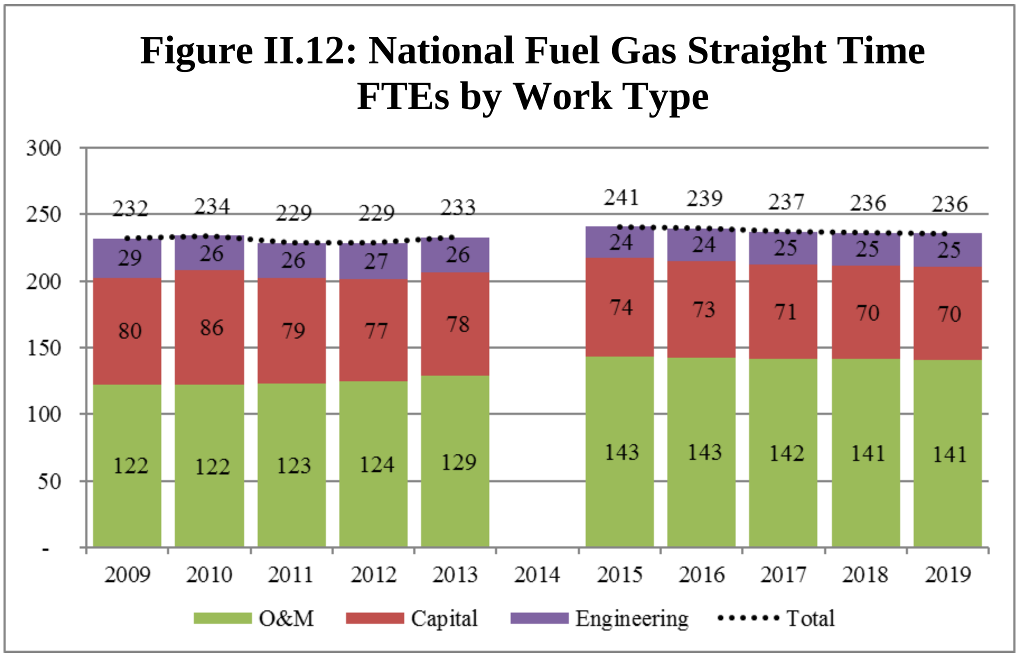
Chart II.11: Actual Dollars/EPU



We define cost productivity as the dollars of labor cost expended to achieve an EPU. We normalized this data to the Reference Utility, whose cost productivity was $94.69 per EPU. NFG ranked best in cost productivity due largely to its best physical productivity, but it also had the lowest composite hourly labor rate among all gas utilities. This two-fold superiority translated into lower unit costs by a factor of four, when compared to the Reference Utility value, a remarkable result. The composite hourly labor rate included all internal straight time, overtime, payroll loadings, and all contractor rates, weighted by hours.

B. Internal Staffing

The next chart confirms the discussion earlier in this report about the remarkable consistency in NFG's internal staff levels over our 10-year study period.



No other utility had or forecasted that it will even approach NFG's essentially flat line in internal straight-time FTEs. Internal straight-time FTEs totaled 232 in 2009. The 236 that NFG provided as its 2019 FTE projection varied by less than two percent over the ten years. Even the intervening historical years showed virtually no change. What increase occurred over the 10-year study period was all forecasted, with a peak projected for 2015. Even that peak represented only a three percent rise. This modest rebalancing of internal resources appeared to have been driven by management's efforts to reduce leak backlogs, as described earlier.

NFG maintained very close control over internal resources. The extremely low use of overtime made the convergence between actual headcount and FTEs (as we measured them) very high comparatively. Each new hire requires Company presidential approval, underscoring such control and indicating that controlling growth, rather than optimizing resource balancing, appeared to drive both historical performance and future staffing plans.

NFG's approach clearly reflected a long-standing internal staffing approach not evident at the other state utilities. We have not commonly seen it elsewhere either. NFG's particular environmental factors (*e.g.*, economic conditions and gas-only focus) lent themselves to an approach not easily replicable. But the uniformity of internal resource use, both in straight time and overtime, as we shall see below, also suggested a particularly static approach to resource balancing.

Earlier, we discussed NFG's performance metrics showing a historical decline in a number of areas. The massive improvement in 2014 backlogs reflected a realignment of resources and corresponding results. Projected 2015 internal resources for O&M work perhaps suggested continuation of that realignment, but the questions of sustaining improved levels and what balance of resources is optimum for doing so remains a matter of interest.

The next table compares National Fuel's 2013 FTE levels with those of the other gas operations we studied. The comparisons shown in the chart use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index described in the "Hard Drivers" subsection of this report. A higher index suggests FTEs higher than expected based on size alone. NFG's values were very low overall when compared with those of the Reference Utility.

Table II.13: Gas Straight Time Staffing Ratios

		All NY Utilitites		
Parameter	NFG	Low	RU (Median)	High
Gas FTEs				
Per Customer	0.83	0.52	1.00	2.46
Per Mile of Main	0.54	0.54	1.00	2.94
Per Unit Sales	1.16	0.44	1.00	1.90
Per Average of All Attributes	0.84	0.50	1.00	2.43

C. Overtime

Chart II.14: Percent Overtime: Gas - Total

The accompanying chart illustrates NFG's overtime average over the five-year period 2009-13.

All of our overtime measurements showed NFG as an extreme outlier on the low side. There were no comparable in-state operations, or any others we have seen in our experience. The extreme nature of the results showed in the fact that the next lowest utility used three times the NFG level. The Reference Utility value was about five times higher. NFG operated under a view that very fundamentally differed from conventional utility practice. NFG had operated under a longstanding and ingrained approach that keeps overtime use at nominal levels.

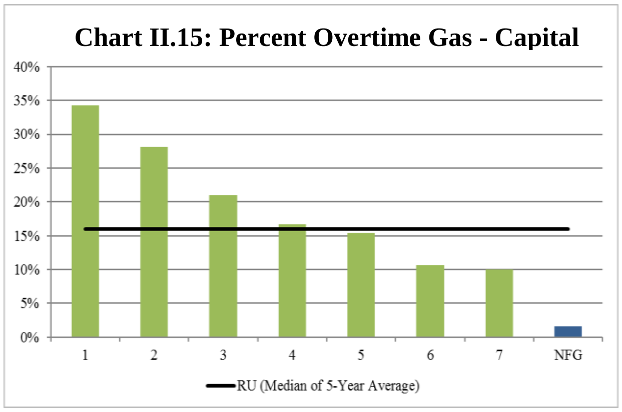


Chart II.15: Percent Overtime Gas - Capital

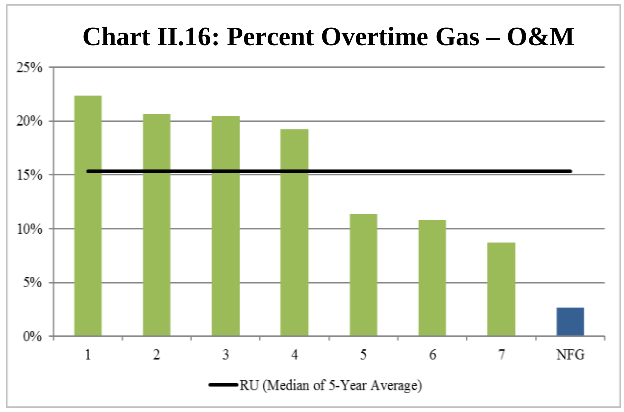


Chart II.16: Percent Overtime Gas – O&M

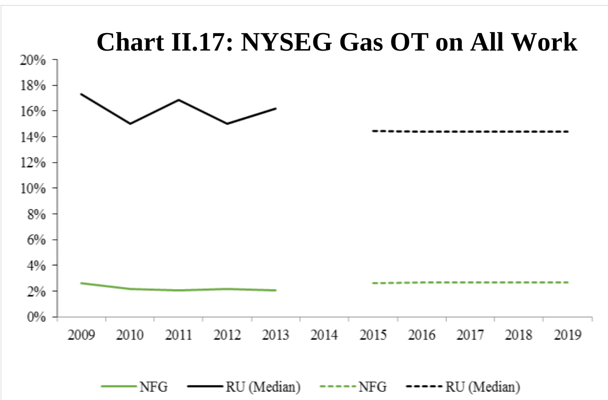


Chart II.17: NYSEG Gas OT on All Work

Our views of staffing optimization treat overtime as an integral element of a resource mix that also includes regular internal staffing and contractors. It should always comprise a comparatively smaller part, but an important one to optimize nevertheless. Overusing it inherently diminishes its effectiveness, making it important to look at high levels as an inherent warning sign. Thus, to some extent there is a tendency to see lower rates as better rates. However, our study here showed what experience generally tells, which is that sound reasons exist to spend overtime. For example, some in New York could have lowered overtime by adding a third shift. The bottom line at NFG is that no reason exists to question whether it is too high. We evaluate whether its level resulted from effective processes in the following process sections of this report. Whether that level was too low (which a simplistic comparison calls into question) is, from a quantitative perspective, something we looked for in examining use of all resource types.

We also examined (see the accompanying chart) how overtime and staffing moved with respect to each other among the companies we studied. The goal was to see whether a substantial correlation existed (*e.g.*, to address whether a rise in overtime accompanied by a drop in staffing might indicate insufficient staffing). It became logical, in this context, to examine whether NFG's extremely low use of overtime was an indicator of overstaffing. But there was no evidence that this was the case, or looked to be a risk in the future.

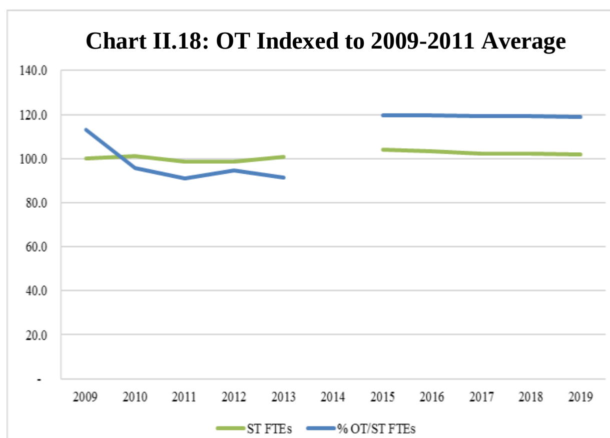


Chart II.18: OT Indexed to 2009-2011 Average

D. Contractor Use

1. Level of Contracting - 2013

The next four graphs summarize NFG's contracting ratios for 2013.

Chart II.19: Gas Total Percent Contracting

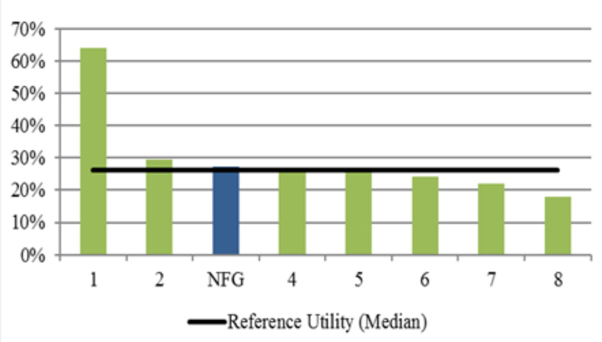


Chart II.20: Gas Capital Percent Contracting

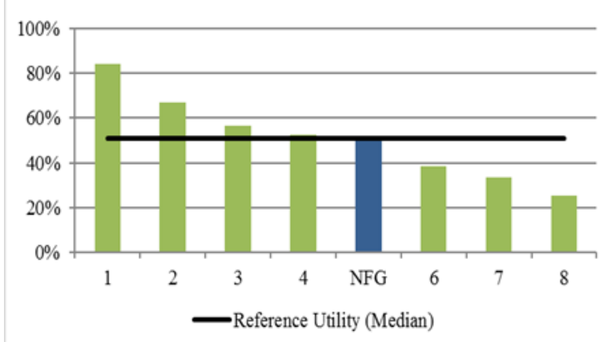


Chart II.21: Gas O&M Percent Contracting

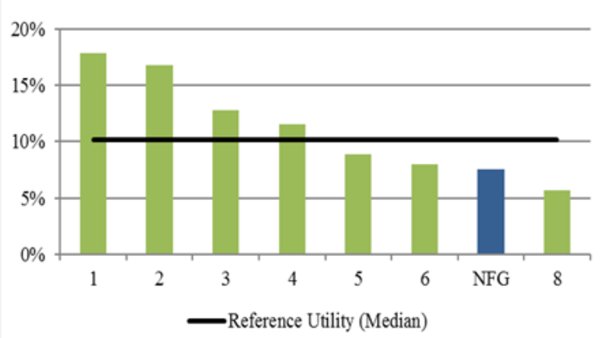
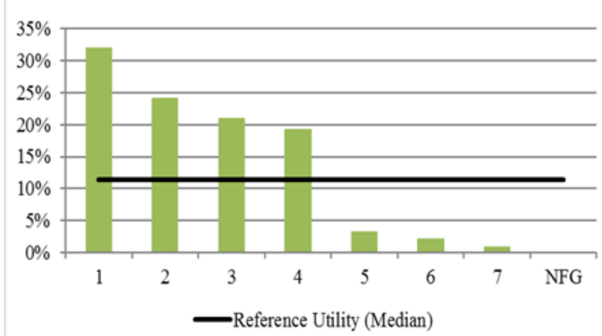


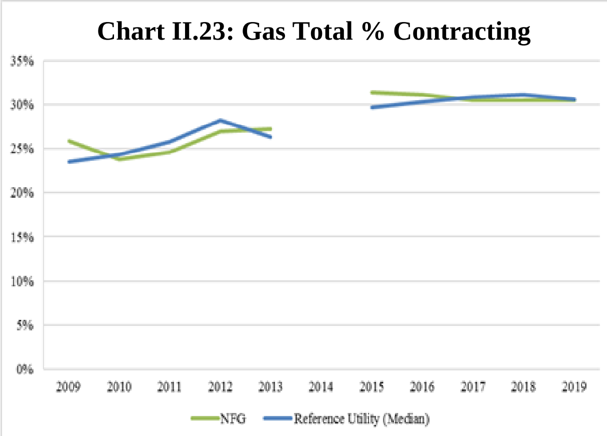
Chart II.22: Gas Eng. Percent Contracting

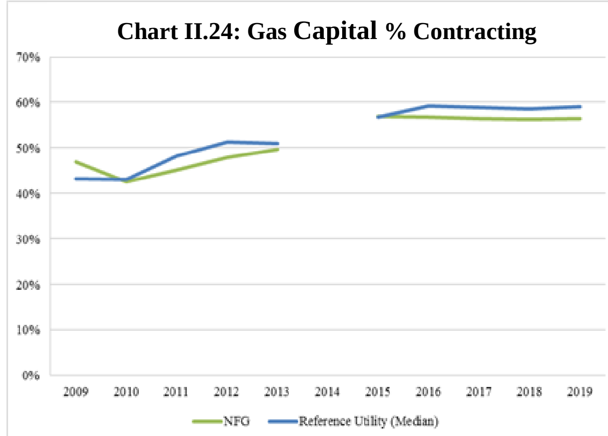


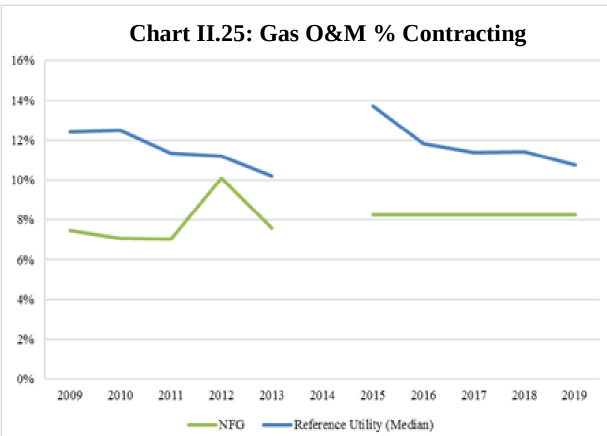
Contracting among the gas operations we studied generally fell (as percent of total FTEs) in a range from about 20 to 30 percent, with one extreme outlier, whose percentage exceeded 60 percent. NFG's contracting percentages fell essentially at the median. NFG's contractor use fell at the low end of the range for O&M and was negligible for engineering. As the preceding charts demonstrate, O&M contracting percentages were low at all the operations we studied. Some made significant use of contracting for engineering. NFG's negligible engineering percentages however, were accompanied by rates at three other upstate operations that used less than five percent.

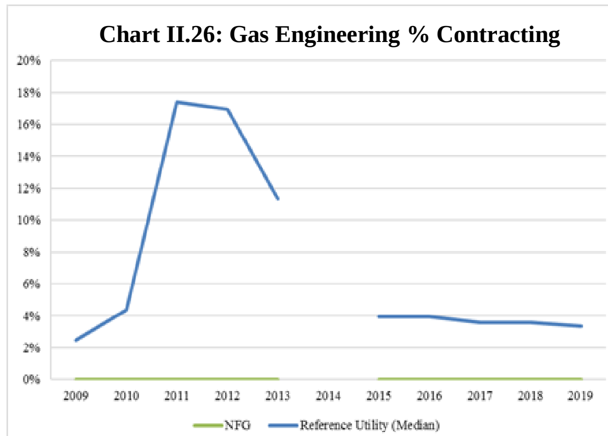
2. Contracting Trends

The next four charts show trends in NFG's overall level of contracting over the historical and forecasted portions of our 10-year study period. NFG's historical rate of growth tracked the experience of the Reference Utility closely. As the charts demonstrate, for NFG and for gas operations in the state as a whole, capital contracting largely drove historical contracting increases, reflecting two factors commonly applicable: (a) the general preponderance of capital work among the activities usually let to contractors, and (b) the statewide increase in rates of pipe replacement.





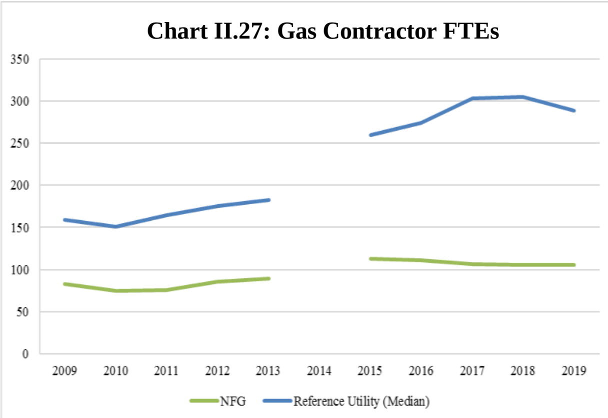


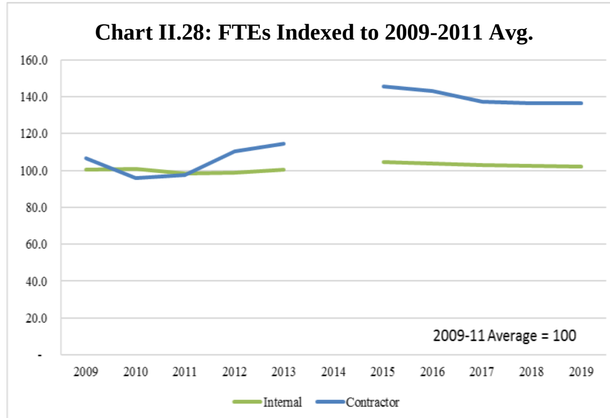


NFG's forecasted contracting percentages showed the increased and generally sustained levels that the Reference Utility demonstrated, again reflecting the large contribution of pipe replacement to capital work across the forecasted portion of our study period.

NFG expected its O&M contracting to remain (as it experienced through 2013) at comparatively low levels relative to the Reference Utility. Management's forecast reflected a continuation of NFG's position through 2019. The NFG forecast showed levels continuing close to those experienced in 2013. This flat line forecast diverged from that of the Reference Utility, which began from a higher base, but also remained flat thereafter. The NFG engineering chart showed no measurable historical or forecasted levels of contracted engineering.

We also plotted (see the next two charts) gas contractor and internal resource use on an index basis, in order to show their movement relative to each other. We assigned an index value of 100 to the 2009 to 2011 average for each. NFG's contractor FTEs increased slightly over the historic period, as it increased its pipe replacement program somewhat. However, management considered the program stable - - continuing at approximately the same rate for the future portion of our study period. The Reference Utility lines were significantly influenced by replacement rate increases among the downstate utilities. The overall stability is reflected in the final graph, which shows a modest increase in the future period over the historic average, while the Reference Utility value increases substantially.





E. Conclusions

In addressing staffing adequacy, we begin from the premise that there is no one indicator and certainly no simple algorithm that can provide a definitive answer. We approached the question of adequacy by weighing the contributions of multiple perspectives, which we found on many occasions support inferences in opposite directions. We formed judgments about staffing adequacy considering the balance of the weight of the "evidence."

Some of our bases for making such judgments had mathematical underpinnings, but our conclusions on adequacy do not approach (nor could they have) anything like mathematical certainty. They represent our best judgments based on the data we had and our analysis of that data. They are informed as well by the results of our process reviews.

We offer these judgments about adequacy as our best contribution to a process that the companies and their stakeholders should (and from all that we have seen do) agree is critical – – continually seeking out all means possible to ensure that staffing decisions result from the broadest possible range of insights, challenges, and perspectives.

These conclusions reflect our contribution to what will certainly remain an ongoing, dynamic, and fluid staff optimization process, as infrastructure needs, customer expectations, workforce demographics, technological advancements, and policy change continue to bring opportunity and risk to the electric and gas utility businesses.

1. NFG's processes, and the results they produce, suggested that management operated in a different paradigm from most utilities and from the other state operations we studied.

An analyst may be tempted to conclude that NFG is a small company for whom formal structures, rigid process, and sophisticated systems are simply not applicable. In some respects, management appeared to operate under such a belief. Our quantitatively based analyses do not give substantial indication that management's less structured and formal approaches, processes, and tools have failed NFG substantially. The lack of quantitative support does not mean that looking for advanced structure, processes and tools is inapt. Here it just means for our study that we did not find quantitative support for concluding that, where NFG is not "at the same place" as others, suboptimal staffing has occurred.

One thing we can conclude with quantitative support is that NFG is not actually a "small" company at all, as defined by commonly used attributes. In terms of footprint and infrastructure, it is larger than the Reference Utility. It does have comparatively small sales amounts. What distinguished NFG was less a function of size and more a function of reliance on what we would describe as a more traditional approach in some key areas associated with staffing. That term is by definition at odds with our criteria for formality, process, and sophistication.

We do not consider those criteria overbearing, but our quantitative analyses of staffing at NFG do prove the adage about exceptions proving the rule. The process reviews that follow the quantitative section of this report still apply the specific criteria to NFG. In a fair number of cases, management met them fully. Where it did not, management generally had adopted a package of systems, processes, and tools that, while not measuring up fully against the criteria, nevertheless functioned effectively from a process view, given the application of values, outlooks, and seasoned contributors and managers who responsible for addressing the staffing issues that our study addressed.

In any event, our goal in this section of the report is not to repeat what we treat at length later. Here we examine what the numbers tell us. The overriding story of those numbers is that, where we gained confidence in process review areas despite gaps vis-à-vis our criteria, quantitative analysis generally did not give us reason to second guess that confidence.

2. Staffing patterns at NFG showed unusual stability year-over-year, indicating an approach of applying fine-tuning rather than re-baselining.

We found the stability and consistency of NFG's staffing levels surprising at the beginning of our study efforts. Our examination of a ten-year period covering 2009 through 2019 found a general pattern of large swings in staffing levels in the state as a whole. NFG's constancy was a notable exception. From one point of view it calls into question whether NFG really did test regularly for optimized staffing, or instead arbitrarily held staffing at steady levels. The lack of material quantitative indicators of concern does not give reason to suggest problems even if the answer were to lie in the latter direction. Certainly, NFG should take a dynamic view of staffing optimization and our process reviews discussed later urge that approach. For the present, however, we could not find any quantitative reason to question staffing stability or the numbers of FTEs behind it.

We did find one indicator of potential concern in our quantitative analyses. We looked for trends in operating performance, using Commission-established metrics. That analysis had special significance for operations with steady low or declining staffing. NFG was in the candidate population for such a concern. We found leak response generally good, except for 2014. We further found that leak backlog was generally not good, again except for 2014. Interestingly, a departure from NFG's pattern of overall stability in staffing showed in forecasts of increased staffing in areas relevant to the underlying work.

This response showed a willingness to respond, despite a clear emphasis on keeping staffing under close control. Conceivably, increased overtime might have provided an alternative for meeting the staffing needs associated with these performance metrics. Certainly, NFG should be asking itself whether that is true and answering the question based on analysis, and not arbitrary limits. For that reason, we address in our process reviews management's use of analytically based judgments in balancing staffing resources. That management's actions may appear responsive (after performance declined) may raise a question. The types of processes we recommend for optimizing staffing bring the greatest value in dynamic operating environments, where sizing resource needs for conditions and problems not yet fully formed is at play. Certainly, NFG's approach tends to work best in stable environments that not only produce predictable, but largely unchanging needs. In any event, these matters are best addressed in the process portion of the analysis, given that the numbers simply did not give us reason for substantial concern.

Certainly, the broad scope of a general management audit would look at other indicators of service quality, given its extension to activities excluded from our scope (*e.g.*, customer service, vegetation management, meter reading). We thus offer caution in extending our quantitative observations about service beyond those that we decided were directly useful in examining staffing in the areas designated for our work. Whether similar staffing approaches apply there and whether service expectations are being met there raise different questions, and require different analyses.

3. Our productivity analyses produced favorable results for NFG.

Liberty conducted a number of analyses that probed connections to staffing adequacy and productivity. First, we measured the ratio of FTEs applied to a variety of company characteristics (*e.g.*, FTEs per unit sales). NFG compared favorably in this analysis, with values below those of the Reference Utility in all categories except sales, where NFG matched. That sales result was positive, given NFG's comparatively very low level of sales. Second, our 9ers analysis for NFG showed the best productivity of the eight utilities in the sample. And, our model results showed a match for all categories save one (capital) where NFG's staffing was lower than model results.

While none of those results takes on much significance in isolation, the commonality shown by all gave confidence that NFG staffing was effective.

4. NFG made minimal use of overtime, with levels low in the extreme when compared with other utilities in New York and elsewhere.

NFG relied on overtime to a very unusually low degree. Overtime played, generously speaking, a minimal role at NFG. On the whole, overtime levels across the state were fairly high, making NFG even more of an outlier. It is not correct simply to conclude that the lower the overtime the better the efficiency or effectiveness. The direct hourly cost premium is generally not great; rather, cost penalties are more a function of the diminishing productivity returns and other consequences of overusing the resource.

NFG's extraordinarily low use of overtime begs the question of how it can operate effectively with levels that other state utility operators exceed, in some cases by an order of magnitude. With overtime displacing other resources (internal or contractor), we looked for indicators of overstaffing in those other two categories. Finding none, we could find no quantitatively based reason for concern. Our process reviews still evaluated the Company against our base criteria and we continue to believe that it remains important to analyze overtime correctly, even at NFG. We simply found no quantitatively based reason for concern.

5. NFG's use of contractors was in line with expectations.

NFG projected slightly increasing levels of contracting, but its use still remained less than Reference Utility values. In analyzing the mix of resources, it is appropriate to look at combined internal resources (straight time plus overtime) when comparing to others, recognizing the extremely small overtime component at NFG. In such a comparison, NFG's split between all internal resources (Straight Time plus Overtime) and contracted resources matched the Reference Utility values.

F. Recommendations

We did not identify any recommendations for NFG on the basis of our quantitative analyses.

Chapter III: Process Analysis

A. Resource Planning

1. Summary of Improvement Opportunities

NFG conducted a mature resource planning process on a highly decentralized basis. Managers throughout the organization prepared annual budgets and work plans that helped drive plans for staffing. The state's other operations generally made use of more developed, formal approaches, methods, and processes for resource planning. NFG's approach placed a high degree of reliance on the knowledge, understanding, and experience of its management team in developing annual work plans and budgets for each functional area of the organization.

Like other utilities in the study, NFG did not develop quantitative FTE or person-hour estimates for forecasted workloads during the bottom-up development of its work plans. The resource planning process can be enhanced by developing these estimates, by using: (a) historical person-hour amounts from past contracts to project unit rates, or (b) engineering estimates to quantify these workloads at the program level.

NFG has an opportunity to improve resource planning processes that quantitatively define future workloads, using these values to evaluate trade-offs for overtime and contractors at the functional/work group level. In particular, a more rigorous analysis of the use of overtime (which NFG uses at an unusually low level), as a staffing resource pool, can prove valuable in leveraging current internal staff capabilities. Resourcing decisions, based on developing resource plans that state all forecasted work for straight time, overtime, and contractors in person-hours and FTEs, would improve NFG management's understanding of overall workload requirements and allocation of staffing resources. NFG could then develop ongoing data-driven methods for comparing the equivalent cost of each of these resources in the resource plan.

2. Findings

a. <u>Overview</u>

NFG had a mature and highly decentralized resource planning process. Managers throughout the organization prepared annual budgets and work plans, with minimal central staff support. Formal resource planning processes were not as developed as those used by the larger state utilities. Development of annual work plans and budgets for each functional area relied on the knowledge, understanding, and experience of its management team. This organizational approach and process was adequate in the past, given the size of the organization, the relatively stable nature of the business, and the depth of experience for managers in the functional areas. Continuing to rely on the talents of incumbents, however, creates risk from loss of experienced personnel. Therefore, it will remain important for management to ensure that it retains a strong core level of experience. That core needs to remain sufficient to ensure that institutional knowledge, which stands in lieu of well-developed and documented processes at NFG, continues to be passed along.

Capital and O&M forecasts identified and prioritized work using rigorous analytical frameworks and risk analyses. Forecasts considered overall guidance, past spending levels, identified future capital projects (on a risk-prioritized basis), and incremental O&M spending requests.

Management had some staff support for building bottom-up workload plans, tied to capital and O&M forecasts. For the most part, however, individual managers had to analyze workload requirements and develop budget requests to resource this work. Engineering had primary responsibility for the capital budget. The operating organizations had primary responsibility for the O&M budget.

b. Assessment of Key Resource Planning Elements

i. Organization

Management and staff throughout the engineering and operating units performed resource planning during the annual budget development cycle. Budget preparers (staff) within the gas-engineering group prepared the capital budget. Staff and managers within the operating organizations prepared expense budgets. Budget staff from the central finance group provided some staff support and guidance to budget preparers and responsible managers and staff responsible for preparing budgets.

Budget preparers (engineering managers and staff) implemented top-down guidance (from senior executives) during the annual budget preparation cycle. They used a variety of information and tools. Managers responsible for planning/budgeting had broad and deep familiarity with work throughout the gas organization. These managers, however, had only limited support from analysts during the budget development. NFG's systems could provide extensive historical data and capital budget information. Only limited capabilities existed for analyzing and balancing workload. Managers and staff within the engineering organizations used a variety of tools to analyze system requirements and determine both capital and expense work priorities. This approach had been used for many years, and therefore was very mature.

ii. Information

A broad range of information tools and processes captured and supported the analysis of data relating to workloads and future budget requirements. Key resource planning information came from a series of tools, including:

- NFG's PeopleSoft financial system provided historical expenditure data (both capital and expense). PeopleSoft also enabled the entry of O&M financial budget requests.
- Management used Excel spreadsheets for capital budgeting, then transferring budgets to the PeopleSoft Projects module for capital expenditure review, tracking, and monitoring.
- Spreadsheet templates drove projections of headcount information for each organizational unit; these projections formed an underlying basis for deriving associated O&M budget requests
- Management had access to historical dollar expenditures for internal, overtime, and contractors. Limited person-hour data existed for each of the functional budget categories. Management tracked and forecasted all work on a dollar basis. Historical cost data existed for internal, overtime, and contractors. Managers demonstrated familiarity with associated units of work. However, their work planning processes did not include a systematic, formal process to build workload-based (person-hours and units of work) plans tied to budget requests. They had access to unit rate and person-hour data available for some work functions. Some functional managers used such data in developing their budget requests.

- NFG personnel projected staffing levels for internal resources based on workload estimates at the organizational unit level. Determination of needed staffing levels took attrition forecasts into account.
- Historical expenditure information for contractors existed. Management also had data showing units of work related to these costs in some cases. Even so, management did not track historical workloads or estimate future workloads forecasted using person-hours or FTEs of work.

The information that managers assembled in developing their budget requests included:

- Work for historical periods tracked and forecasted for future periods on a dollars basis.
- Units of work available for many types of internally assigned work and contractor work units available for some types of capital work.
- Planning information including some breakdowns for hours and costs for internal resources (straight time and overtime).
- Staffing levels for internal resources projected based on past headcount levels.
- Accounting for attrition in determination of needed staffing levels.

Like other utilities throughout the state, NFG limited planning information for work to be performed by contractors largely to past and future dollar expenditures. In some cases, management had access to units in the case of work assigned to contractors in the past. Management did not track historical workloads or forecast future workloads on a person-hours. For the study, management could, however, estimate historical contractor hours using expertise of engineering estimators, using average labor hours per dollar contracted for different types of work.

iii. Processes and Tools

Like most utilities, those involved understood the annual budgeting cycle (and associated reviews of underlying workloads) whose long use made it settled and mature. The cycle began early in the calendar year with the development and issuance of guidance from senior management about financial constraints and key issues or initiatives. Development of initial budgets occurred in the early spring timeframe. Then, submissions of budget requests involved a series of presentations, reviews, and challenges. More detailed requests formed at lower levels were rolled-up for review on a more consolidated basis. At various points throughout this process, line and engineering management had the opportunity to make cases for funding changes and increases. Those opportunities had particular importance when requests exceed guidance provided for the current cycle or spending levels of the past. The annual budgeting cycle culminated in late summer typically, with presentation of budget to the Board of Directors for approval by September (the end of the fiscal year).

NFG's budgeting and resource planning process recognized key underlying workload drivers. Reasonably sophisticated analyses of system requirements drove capital budgets; for example:

- Plans incorporated risk-based identification and prioritization of capital needs for gas work
- Robust processes drove identifying and prioritizing five-year capital spending requirements.
- The Pipeline Replacement Evaluation Program (PREP) comprised the primary risk model to evaluate and prioritize pipeline replacements.

- Capital spending frameworks and risk analyses (mandatory work, customer work, etc.) operated consistently for all organizations and functions.
- Management used sophisticated software to identify and set priorities for main replacement on a risk-weighted basis.
- Spreadsheets established the forecast capital projects and PeopleSoft Projects tracks capital expenditures as work progresses.
- Management used monthly tracking meetings (attended by engineering managers, operating superintendents, and executives) for tracking current capital execution and adjusting capital budget plans, as required.
- This process also informed the next cycle of plans in the ensuing annual planning cycle.

O&M spending forecast development followed a less rigorous course. Forecasts for some key activities, such as leak response and repair estimates resulted from the use of historical leak rates and average costs. Management used these types of analyses to determine incremental spending levels; *i.e.*, compared to historical spending levels. Operating managers reviewed past spending levels, and identify emerging requirements being experienced within the operating units to develop estimated budget dollars and associated workload levels for future years.

iv. Resource Planning for Overtime and Contractors

Resource planning for overtime relied heavily on historical use patterns for certain functions and plans reflect past overtime levels, with little analysis. Management recognized that different work groups and work types should have different levels of planned overtime, driven by differences in the nature of the work. We found, however, that all NFG work groups used extremely low amounts of overtime, compared to the other gas operations we studied. Overall overtime levels fell in the low, single digit range. NFG's resource planning processes did not use quantitative studies of the trade-offs (advantages versus disadvantages) and cost effectiveness of increased use of overtime. We also did not observe any one-time examinations of the cost-effectiveness of overtime as a staffing resource.

NFG's use of contractors varied by work function, and recognized constraints in maintaining a qualified contractor workforce under its circumstances. Management sought to keep available enough OQ contractor personnel to supplement the capabilities of its internal workforce. The region's short construction season (typically April to November) had a significant influence on contractor use. A large force of contractors, working on blanket contract and fixed bid bases (as discussed more extensively below), performed most capital work.

Resource plans and annual budgets identified future contractor workloads on a total dollar basis only. The measurement of cost included all labor, materials, vehicles, and administrative costs. Historical information for work done by contractors included only expenditures, and not information about hours worked to accomplish capital and O&M work. Planned contractor levels resulted more from patterns of past use (*e.g.*, skills, work types) than from structured analyses of whether contractor use was economically more advantageous.

Planning processes explicitly accounted for contractor assignments on different work functions. Management did not perform studies of specific functions or capital projects to determine what types of work to assign to which resource type in plans and budgets.

3. *Conclusions*

Liberty based these conclusions on our evaluation of Company practices and processes against specific Resource Planning criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The organization for coordinating and supporting manpower Resource Planning should be treated as a specialized activity, with dedicated resources.
2. Complete and accurate Information about units of work performed and costs by work function, by region, and by staff resource type should be available.
3. Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.
4. Overtime should form a clear part of the process of identifying required resources, and should rely on an analytically supportable method for determining optimum levels for each work function.
5. Contractor use should form a clear part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

1. NFG's decentralized approach to resource planning and its processes for developing and reviewing resource plans were generally appropriate.

NFG had a very mature budgeting process that considered staffing resource requirements for the future. Budgeting and planning for staffing resources was decentralized. Managers throughout the organization had responsibility for preparing annual budgets and work plans, with minimal central staff support. Formal staffing resource planning processes were not as structured and standardized, as those we observed at the larger state utilities. Development of annual work plans and budgets for each functional area relied on the knowledge, understanding, and experience of its management team. This organizational approach and process was adequate given the size of the organization, the relatively stable nature of the business, and the depth of experience for managers in the functional areas. It does however pose future risks, should the business go through a period of rapid change or should NFG lose a large group of experienced personnel through attrition.

Despite this general conclusion, however, as noted in the Contractor Use subsection below, NFG did face challenges specific to the need for ensuring access to the increased resources necessary to meet the demands its future pipe replacement program will produce.

2. Resource planning processes for identifying and understanding overall workload, including reliance on cost data as a measure of contractor work load, did not optimize the process of balancing resources.

Resourcing decisions, based on formal, consistent development of staffing resource plans linked to budget requests would improve NFG management's understanding of overall workload requirements and allocation of staffing resources. For each organizational unit budget request, this approach to resource plans would quantitatively define all forecasted workload for straight time, overtime, and contractors stated in person-hours and FTEs of underlying workload.

Identification of contractor workloads (historical and forecast), using only a total dollar basis, provides insufficient information for effective resource planning; *i.e.*, balancing workload among all staffing resources. Historical information for work done by contractors, based only upon expenditures, does not provide sufficient information for understanding past capital and O&M workloads performed during any given year. If forecasted contractor workloads cannot be understood in terms of person-hours or FTEs, it is not possible to compare the amounts of work forecasted for contractors to work forecasted for internal resources (straight time or overtime) and effectively make decisions for balancing these resources.

3. NFG was not making regular use of ongoing, structured analyses of the effectiveness of overtime and contractor use at the functional level.

In addition, the effective use of overtime and contractors at the functional/work group level in resource plans cannot be accomplished without ongoing, data-driven analysis. Use of limited scope studies for accomplishing these types of analyses and reviews during the resource planning process is not sufficient for determining the most effective balance of internal staff, overtime, and contractor resources for each type of work. Ongoing data-driven methods for comparing the equivalent cost of each of these resources for accomplishing different types of work in this resource plan would provide management with the ability to optimize this mix, during resource plan reviews.

4. Recommendations

1. NFG should enhance its resource planning process to include total workload, including expanding measures of contractor work load to include FTE- or person-hour based values.

As a first priority, management should develop quantitative FTE or person-hour estimates for forecasted workloads within each major program for each organizational unit budget request. These workload person-hour/FTE forecasts of the amount of work to be performed are crucial to understanding total work proposed during the bottom-up development of budgets. A formal, consistent staffing workload plan, tied to budget requests, is essential to providing management a complete view of workload underlying each budget requests. Such a linkage would provide the basis for an objective management review of the total amount of work being proposed, as well as the relative amounts of work to be performed by internal resources (straight time FTEs and overtime FTEs) versus contractor FTEs in each proposed work group and functional work plan and budget request.

2. NFG resource plans should include data driven analyses that help management evaluate the trade-offs for overtime, contractors, and internal staff at the functional and work group levels.

Management should enhance its ability to incorporate the use of comprehensive workload and expenditure data into an ongoing, data driven process for evaluating the trade-offs for overtime, contractors, and internal staff at the functional and work group levels. The annual process should be formalized to require each organizational unit to develop these "total workload" bottom-up workload forecasts, linked to the budget expenditure requests.

Management should develop methods for comparing the equivalent cost of each of these three resource types in accomplishing the different types of work for these functional work groups. Meaningful comparisons of the equivalent cost of each of these three types (on a work type by work type basis) will enable a more informed resource plan for optimizing straight time, overtime, contractor mixes for each organization. Such comparisons can also be used to evaluate requests for changes to internal staffing levels.

B. Work Force Management and Performance Measurement

1. Summary

a. Work Force Management

NFG needs to accelerate current plans to explore the creation of an enterprise-level, comprehensive, integrated Work Management System. Management did not have an approach, system, or tools that, in accordance with current usage, would constitute such a system in a programmatic sense. The last management audit of the Company included a high-priority recommendation to begin a process of implementing an "enterprise state-of-the-art work management system, including a compatible units based work order module, scheduling module, and jobsite, travel and delay reporting capability, as recommended in other chapters." Discussion in those other chapters of the management audit report addressed other components (*e.g.*, time reporting and a structured project management approach) that we consider important elements of an enterprise-level, integrated Work Management System.

Management had deferred implementation of this recommendation until 2017, in order to allow it first to complete backbone IT and other systems having a role in integrating work management. Management had committed only to study the introduction of a new Work Management System. It correctly observed that such systems can impose very large costs, which need to be examined carefully in deciding what level of expenditures can be justified. The Company's preliminary $4 million estimate, provided in its recommendation implementation plans, appeared low, given the level of change needed. Very large companies have estimated costs in the range of $100 million for gas Work Management Systems. While that sum is well above the amount likely involved for NFG, it does make evident the importance of proceeding on the basis of a firmer sense of costs. Certainly, NFG offered a substantial base of work across which to spread the costs of creating, maintaining, and using a comprehensive work management approach, system, and tools. Nevertheless, its size limits clearly called for a sharp understanding of system implementation and ongoing costs.

Liberty understands the importance of the other systems on which NFG was working as we completed field work. Nevertheless, it remained a matter of high importance to do as much work on the WMS as it could, in order not to unduly delay its institution. Our discussions with management did not produce a clear understanding of what it viewed as the goals and objectives of such a system, the specific gaps that existed in reaching them, or an effort before next year to begin to examine the costs of getting to a comprehensively defined future state. In any event, there is value in keeping the "ball rolling" in order to ensure that studies and analyses lead promptly, where appropriate to actual, material change.

b. Performance Measurement

NFG did not comprehensively and consistently measure levels of work performed in relation to resource inputs. Management did not use measures of performance in a structured, analytical way to identify resource needs and optimize its resource balance. As a first priority, NFG needs to develop a more comprehensive set of performance measures addressing replacement and installation of pipe. Management should also develop as part of its evaluation of a new Work Management System a plan for instituting a system of tracking performance measures comprehensively and using that information to inform staffing decisions.

2. Findings

a. Work Force Management Systems

The work-related systems that NFG employees used had largely been designed to accommodate planned and emergent maintenance activities. The current tools originated in the 1990s when NFG hired a manger from another gas utility. NFG's robust pipe replacement program has involved significant capital expenditures. The Company had not, however, had a large number of individual capital projects. The work management tools supporting capital project execution did not reflect an integrated, comprehensive Work Management process.

The July 2013 report on the management audit conducted for the Commission made a significant number of recommendations falling within the ambit of what the industry now defines as integrated work management. Many of them remained in progress as of the last report addressing audit recommendation implementation, and according to our discussions with management. The overarching one was a high-priority recommendation to begin in fiscal 2015 an RFP process leading to implementation of a state-of-the-art, enterprise-level work management system. This series of recommendations conformed largely to the observations that Liberty made during field work in this engagement. The implementation plans addressing these recommendations were sound, and had already been subjected to Commission Staff oversight. They provided a sound path for proceeding, subject to two specific concerns:

- The pace at which NFG proposed to complete implementation
- The sense that NFG in a number of cases was less committed to undertaking investigations and analyses "leading to" efficient and effective change, as opposed simply to determining "whether to" institute change.

Liberty understands the need for care in evaluating costs and benefits, and therefore supports reasoned decisions that balance them. However, we do not believe that the question of whether productive change of some form can occur in the areas remains in question. We have confidence that management had also crossed this conceptual threshold. The concern lies in the lack of a clear, concise description of the goals and objectives that should guide the analysis. The failure to describe them created a risk of further delay in performing detailed analyses and in sharply judging alternatives. NFG should work now to describe a desirable range of acceptable end states, and specify those areas where current approaches, systems, organizations, resources, and tools fall short of them. Surely the dimensions of other key initiatives such as the new Customer Information System cited by NFG as a critical first step, have or will soon have sufficient clarity to begin a more than highest-level examination of where and how improvements in work management can be secured.

The last audit report cited a variety of areas consistent with our observations, use of compatible units, scheduling, productivity-related reporting, project management, and time reporting among them.

Operating as a natural-gas-only distribution utility, NFG used a flat management structure that managers described as "informal." This approach promoted more robust direct knowledge of and closeness to work in the field by management. A resulting strength came from knowledge gained directly, rather than through a reporting structure that, however sound, tends to create distance from what drives work and resource needs. This strength provided some mitigation of the kinds of impacts that reliance on well-dated approaches to work management can produce.

Over the past, much of NFG's workload came in the form of maintenance activities, pipeline replacement, leak response, and customer connections. There were not many capital projects that individually had great size. Management cited the recent replacement of the Chautauqua compressor station at a cost of approximately $2 million, as the only major capital project in recent history.

b. WMS Documentation and Training

Liberty observed no documentation of the NFG work management processes. No documentation existed for either maintenance or capital work. We did observe some diagrams and flow charts, but no descriptive documentation. We also found that management did not provide documentation regarding use of the tools supporting work management processes and activities. Similarly, there was no formal training, leaving knowledge about work management processes to be learned on the job.

c. Program and Project Scheduling

NFG operated a process generating two-year forward-looking schedules, but did not use longer-term scheduling. It performed scheduling for less than one year on a manual basis. Management did use a structured process for the identification, design, scheduling, performance, reporting and closing of work. However, it applied that process to maintenance work having comparatively short lead times and schedules. There were no long-term schedules.

Management also used a link between its Geographical Information System (GIS) and its Customer Information System (CIS) to identify customer issues and assist in the dispatch of crews for emergent issues.

Much planning and scheduling occurred through manual processes. Management used programs in the Microsoft Office suite to do data entry, and support the process. Company vehicles had mobile data terminals used to assign emergent work (*e.g.*, leak detection) for dispatching and recording time for this work. Management assigned and reported capital work, however, using manual work packets and time sheets.

d. Program and Project Monitoring

NFG did capture some performance data, but not at a range or level of detail sufficient to fully support staffing plans, implementation, and effectiveness analysis and optimization. A Productivity Improvement Team was formed to address specific problems uncovered during project close-outs.

Monthly meetings among managers and executives served as the principal means of assessing progress and problems on maintenance and capital projects and programs. PeopleSoft's Project Portfolio Management module supported tracking of costs and unit data.

e. Program and Project Management

Employees served on a part-time basis as project managers (*i.e.*, they had other responsibilities). No job descriptions existed. Project managers required no training until recently and management did not expect them to become certified. Some other New York energy utilities used the Project Management Institute (PMI) as a source of certification. Broadly used by others in the industry, PMI has operated for nearly 50 years, and is the world's leading not-for-profit professional membership association for the project, program and portfolio management profession. PMI has globally recognized standards and certifications, offers resources and tools, and provides professional development courses. NFG offered a high-level, generic training course in 2014, but it did not address any company-specific issues. The most recent report from NFG on implementation of recommendations from the most recent management audit observed that internal development of tailored requirements remained open.

f. WMS Treatment of Overtime and Contractors

We did not find a comprehensive and formal process connecting work management information with overtime and contractor use policies and measurements. However, management used corporate guidelines in determining how to assign work to contractors on a short-term basis. An important element of an effective Work Management System is the capture and analysis of performance data for both internal and contract forces. Optimization calls for the use of such data in future resource planning. The PeopleSoft Project Portfolio Management module captured costs and hours for internal personnel, while a system called Nfuel recorded contractor data. A Performance Improvement Team had been created by NFG to use the data to identify and address specific concerns revealed by the data.

g. Quality Assurance and Control

Management used a formal approach to Quality Assurance and Quality Control. A QA department within the Mechanical group (*i.e.*, outside the Operations group) had responsibility for performing QA functions. Locating the functions in the Mechanical group provided for a level of independence from field operations.

Management applied a formal process for reporting and documenting inspections.

h. Performance Measurement

Management provided a Work Management Job Description Manual dating from 2003. The manual listed approximately 100 discretely defined operations and maintenance activities.

Management prepared monthly reports for each. Those reports provided production and production rates for each activity monthly and year-to-date, detailing work units, actual hours and calculating hours per unit. The reports showed data for each of 10 geographic regions and for NFG as a whole. Management did not use the data in a structured way to identify and plan for staffing needs.

Due to the limitations of the legacy computer system, as well as a corporate philosophy which "tries not to get mired down in analysis," management did not focus on the use of measured performance and productivity except at general levels. To some extent, the unavailability of hard data was offset by the direct knowledge of operations and the experience of managers, who demonstrated broad and deep understanding of company operations.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Work Management and Performance Measurement criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These seven criteria are:

1. The systems and tools used to support Work Force Management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.
2. Comprehensive, adequate documentation of the Work Management processes, systems and tools should exist and be supported by appropriate training.
3. Management should have and regularly employ well defined processes for the short- and long-term planning and scheduling of capital and O&M.
4. Management should apply an appropriate approach, resources, and methods to program and project management.
5. Systems and tools should capture and enable the analysis of data respecting use of all types of staffing resources.
6. There should exist an appropriate approach to and organization for Quality Assurance and Control.
7. Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness resource use and balancing.

1. NFG has the opportunity to improve its work force management processes in order to fully develop the capacity to optimize resources; these improvement address systems, documentation and training, scheduling, project management, and performance monitoring.

A sound agenda existed for moving in that direction. It was in process for some time following the last management audit conducted of NFG for the Commission. Given the mid-stream status of that agenda and its linkage to other, related changes, and given its progress under the oversight of the Commission Staff, we believe that the best means for ensuring near term progress lies not in the creation of a parallel set of recommendations, but in endorsing the set that exists, with the proviso that we consider it important to advance implementation completion.

There was a lack of substantial documentation of and training related to work force management. Process, activity, and tools documentation were limited to diagrams and flow charts; there was no descriptive information. There was no formal training either. We understand that changes in work force management then underway would and should control documentation and training for the longer term. In the meantime, however, basic descriptive documentation and training of current processes, activities, and tools should exist.

A number of scheduling gaps also existed, particularly with respect to longer-term scheduling and the use of manual processes. The then-current effort to examine work management issues needed to address scheduling needs.

Liberty found a lack of a fully structured and supported approach to and implementation of program and project management. Action plans from the past management audit have addressed the need for improvements in project management. NFG did capture some performance data, but its range and level of detail needed to expand.

2. **NFG took a formal approach to quality assurance and control, and provided a structure supporting its independence.**

3. **NFG did not apply performance measures to work load projections and performance, incorporate a structured analysis of performance measurements into the decision-making process on staffing, or maintain a fully comprehensive set of performance measures to determine production and productivity levels.**

A mitigating factor was that managers stayed very close to the work. They could factor the knowledge that closeness brings into their decisions and decision-making process qualitatively. Liberty did observe that, for the data and metrics management did maintain, it was collected timely, at an appropriate level, and communicated to the appropriate individuals in the organization.

4. Recommendations

1. **NFG should move as expeditiously as possible to address the recommendations of its last management audit; those recommendations address concerns that Liberty has found in the areas of work management approach, systems, tools, documentation, and training, scheduling, as well as project and program scheduling, management, and reporting.**

The core work force management recommendation from the last management audit of NFG was the one, categorized as high in importance, for NFG to implement "an enterprise state-of-the-art work management system, including a compatible units based work order module, scheduling module, and jobsite, travel and delay reporting capability." That recommendation cited the existence of a number of related needs, which corresponded in large measure to those found by Liberty and discussed earlier in this chapter.

We recommend a strong emphasis on early implementation and on a holistic basis to address these related needs. The creation and implementation of a new CIS serves as a pacing item for much of the work needed in work management. The new CIS will, of course, itself address some, but not all those needs. It will also enable solutions to others. However, the schedule for its implementation applicable during our field work called for what appeared to be a "go live" date of January 2017.[1]

[1] Management's August 2016 comments on a draft of this report noted that the new CIS went live in May 2016, which would obviate concern about delay in its operation.

In our experience, new CIS implementation often proves more difficult than expected, taking more time to complete than scheduled. With a go-live date so far in advance, it appears reasonable to consider the risk of material delay. Should that delay occur, a failure in the interim to make what progress is achievable in work management and will delay enhancements there as well. Moreover, to the extent that a new work management system remains an "if" as opposed to a "when," then future improvements become even less assured. Understanding that much work will remain on work management even after CIS completion, it nevertheless remains important for management to establish a clear plan now. That plan should describe what exists now and, with respect to staffing:

- The gaps it produces in seeking to optimize resources short- and long-term
- The alternative means available for addressing those gaps to produce a range of desired end-state, ongoing capabilities
- Recognizing that not every gap may be closeable at costs commensurate with benefits, a prioritization of gaps
- The firmest derivable sense of the costs and benefits those ways and means are likely to produce
- Identification of the primary alternatives that appear to produce a reasonable value proposition
- Identification of near-term work that can and should occur whatever post-CIS system(s) may be selected
- Plans, resource commitments, and schedules for completing that work
- The best discernible overall plans and schedules required for work following CIS completion.
- A clear delineation of the activities that would require delay or other adjustment in the event of CIS delays.

Liberty also recommends that new Work Management System development seek as much as possible to integrate fully maintenance and capital work, retain those advances management has already made to its current system (*e.g.*, mobile technology), and link adequately to other systems (*e.g.*, financial and HR).

2. As a first priority, NFG should develop detailed performance measures for replacement and installation of pipe, in order to support its ability to optimize resources over the long term.

Pipe replacement and installation is far and away the biggest contributor to capital cost, and will be increasing by approximately one-third over the next several years. Further, replacement comprises a very long-term program, which NFG expects will take over 20 years and cost hundreds of millions of dollars. The market for skilled engineering, management and labor to perform those activities has tightened and will continue to do so as all utilities in New York and most in the United States face the same issues and problems associated with replacement of leak-prone pipe. This resource concern makes it critical for the Company to focus on performance monitoring and measurement in this area.

3. NFG should also develop, in the context of current efforts to address its Work Management System, a plan for instituting performance measures on a corporate-wide basis.

Management is notably close to and aware of the business, and displays a broad and deep knowledge of its operations. While commendable, those attributes do not fully substitute for comprehensive data collection, analysis, and use. Rather, the combination of broad and deep knowledge and solid analytics combined should form the basis for a highly effective management process.

NFG needs to first develop a plan for capturing work unit measurements using the data capabilities of its existing data systems. Work units measurements should include both the number of units, cost per unit and hours per unit. A comprehensive work unit measurement system will track and inform productivity levels, inform current staffing level needs and allow for better forecasts of future staffing needs.

The following list typifies the types of measures that should be subject to regular reporting and that should be used to assess the effectiveness and efficiency of staffing resources, and to help in driving forecasts of resources required to meet forecasted requirements in a manner that optimizes the balance among straight internal time, overtime and contractor use.

As part of the generation of statewide data on a consistent basis (for use by Staff) all of the companies, including NFG, should work toward the ability to provide data in a format similar to that shown below.

Monthly Overall Staffing Monitoring – Actual versus Planned (FTE):

(a) Straight Time
(b) Overtime
(c) Contractors
(d) Total Company – ST, OT, Contractors displayed as stacked bars

Internal / Contractor Mix – Actual versus Planned (Functions with major contractors), as appropriate:

- Construction – Main Renewals, Replacements and Upgrades
- Construction – Services Renewals, Replacements and Upgrades
- Construction – New Customer Additions – Services
- Construction - System Additions - Mains

Internal Resource Replenishment (Headcounts) – Actual versus Planned:

(a) Total Workforce
(b) Attritions (based on historical data, adjusted for anticipated future conditions)
(c) Retirement (based on potential retirees, adjusted for anticipated future conditions)
(d) New Hires (based on qualifications and training duration required to become fully qualified)

High-level Performance Indicators on Productivity:

- Hours per Mile of Main Replaced
- Hours per Service Replaced
- Hours per Meter Replaced
- Hour per Mile of Main Installed
- Hours per Leak Repaired

- Hours per Trouble Job Ticket Responded

C. Internal Staffing

1. Chapter Summary

NFG's internal staffing processes served it reasonably well in providing adequate staffing. They depended far more on the skills and experience of a seasoned team than upon sophisticated processes and tools. The static nature of internal staffing (and overtime as well) did not suggest a dynamic view of resource balancing among internal, overtime, and contractor resources.

NFG operated under reasonably detailed and comprehensive forecasts of medium and long-term capital and O&M work requirements. We found management's grasp on attrition and retirement solid, with its forecasts sufficient to identify where departures in the future had the potential for threatening the sufficiency of critical worker skill sets. We found training and development programs adequate to provide support for ongoing and long-term staff requirements. Management had also forged useful and productive relationships with local educational institutions via development of energy-related curriculums. Management leveraged those programs to augment its work force when appropriate.

Management operated with a well-defined, but essentially static sense of its base internal staffing needs. It adjusted the work between capital and O&M activities as needs changed. Management did not consider that REV, or other potential market or business model disruptions, will have any effect on staffing needs in the next five years. Because NFG provided all engineering internally, it did not have existing relationships with outside firms to provide technical resources, which may prove helpful, should this view of the future not prove correct.

NFG had and projected to continue having remarkable stability in its numbers of internal FTEs (and headcount as well, given extremely low levels of overtime use). Its 232 FTEs would increase by only four by 2019 according to projections provided by the Company. To the extent there is any significant variance from the business model that drives its staffing, NFG would likely struggle to adapt quickly.

Most significantly when it comes to internal staffing, is recognition that reliance on senior, experienced personnel, which we believe had served the Company well, was at once its greatest strength and its greatest risk. With high levels of retirement eligibility, management could not afford to rely on tradition to support the transfer of institutional knowledge more generally. More specifically, the same concern existed with respect to transactional and operational knowledge of: (a) what is relevant to resource planning, analysis, execution, and optimization, and (b) how to apply it to maintain its strength. Management did not have clear, documented, and controlled processes on which to rely. Nor should it rely on a belief that retirements from among a large pool of those eligible will not cause a loss of traditional means of knowledge and experience transfer. To be successful in continuing with a less formal approach to structure and process, NFG needs to take a more formal approach to ensuring that it gets what it can and what it must transferred to succeeding generations of key contributors and managers when it comes to staffing planning, analysis, and optimization.

2. *Findings*

a. General

NFG operated in a highly stable manner with respect to assessing and providing internal staffing. Its approach reflected that of very "hands-on" management operating in what it viewed as a small, lean utility operation. As a result, the staffing processes and procedures used were fairly direct and simple, but well-understood by those applying them. Headcounts (not the applied FTEs that we have used to compare performance among the operations we studied) formed the basis of staffing projection during the annual budgeting process. Department heads and Human Resources worked together to develop resource requirements, with the departments the primary contributor and Human Resources more in a support role. Management described planning for internal staff applied to O&M activities as part of a "zero-based" budgeting process. In fact, it began with the previous year's staff levels. Such practice was fairly common in the industry, but diverged from a truly zero-based approach. Given the very remarkably static levels of internal staffing over both the historical and forecasted portions of our study period, we would characterize resource planning as "exception-driven," rather than zero based. Management was comfortable with and therefore planned no changes in organizational responsibilities, processes or procedures underlying the planning or execution of internal staffing strategies.

b. Process

As part of the overall annual budgeting cycle described earlier in this report, the identification of staffing needs occurred as part of the O&M budgeting process, which the Finance group guided toward completion. Management in each budget area began by developing an internal staffing forecast for the fiscal year. This forecast's segmentation was by NFG's 34 departments, which included two (Operations and Engineering) of principal interest to our study. NFG did not employ a separate organization or department dedicated to supporting staffing planning.

This early development began with a review of the number of employees by employee type for the previous year. Projections at this level were then formed for the next three years. Departments were encouraged to provide numbers of certain resource types where they could. Starting, in effect, with current staff levels, budget developers considered the base levels of work to be accommodated. Budget developers within each department reviewed their needs, considering retirements, transfers, and leaves of absences. Human Resources aggregated those needs, and shepherded plans for filling them, using the various channels available (*e.g.*, college recruiting).

NFG employed a handwritten requisition process for new staff. Each new hire required presidential approval. Management accompanied these restrictive measures with an assumption of a one-for-one replacement ratio for each forecasted departure.

The approach to staffing for O&M activities sought to identify a supportable base workload on a year-round basis. It then sought to augment the resource levels associated with that workload with contractors as necessary. The general approach was fairly common. What distinguished NFG was that what sounded like a process that should produce some variation over time, in fact produced only immaterial change in the internal staff complement for 10 years (five projected). Although management said that it determined staff levels from assessment of work volumes, it did not trend expenditures or other measures of staffing use from previous years. Management indicated that its volume of O&M work varied little from year-to-year, which produced great stability in the level of staff required for work performance.

A collection of PeopleSoft modules provided the primary system support for NFG's resource monitoring and planning. Its tools enabled breakdown of staff complements and associated costs for key resource components (*e.g.*, numbers and costs by function, department, region, and resource type. Human Resources used PeopleSoft's Human Resource Information System (HRIS) to capture employee information. The capability existed to capture staff information by job title, location, department, and division. Management tracked units of work by region using the Work Management System. It did not break out straight time and overtime hours for internal resources at the individual activity level. However, management indicated that it monitors productivity by tracking units of work performed and earned hours.

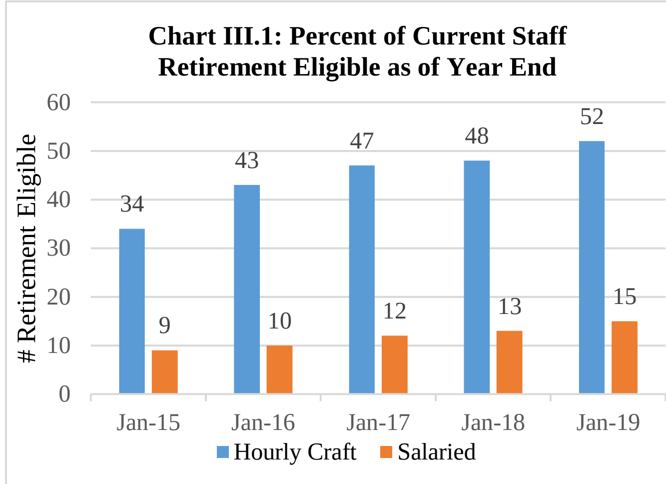
Management did not conduct central monitoring of where losses in key personnel, or numbers of key personnel, might significantly impact performance. Individual departments had to develop, monitor and identify those items. Consequently, NFG did not use metrics or key performance indicators to determine whether departments were meeting internal staff requirements. Management developed attrition forecasts by region and work type. Management observed that NFG's attrition was comparatively very low - - at approximately half of the industry average. It expressed confidence in its retirement rate predictions, which had occurred at about the rates projected. Productivity metrics existed at the division level. The tracking that occurred took place within each department, without tracking at higher levels.

Management also forecasted labor loaned from and borrowed to other parts of the overall National Fuel Gas Company level (*e.g.*, NFG engineering personnel may perform work for the pipeline subsidiary or mid-stream affiliated operations). The same could happen within NFG utility operations between departments and between the New York and Pennsylvania divisions. Not surprisingly, NFG made minimal allowance for overtime in yearly and forecasted staffing forecasts. Management indicated that it did not use overtime to avoid hiring full-time staff. Each department presented its own overtime budget. Management noted that it typically allowed for overtime in about the three percent range for planning purposes. Therefore, headcount and FTE numbers converged closely. Management believed, based on observation rather than structured analysis, that it experienced no differential in productivity between straight time and overtime work. The extremely low levels of overtime used tended to support that observation.

c. Demographics

Concern about the rate at which the utility workforces is "graying," or getting, on average, uniformly older, has been an industry-wide issue for many years now. The phenomenon threatens the loss of skill sets earned over many years, if not decades that become increasingly difficult to replace as retirements pick up steam. Utilities not only face the loss of resources with traditional core competencies, but must address the dual challenge of replacing core competencies and attracting additional, younger staff with new skill sets in areas such as data analytics, advanced digital technologies, cyber security, and business development. A simultaneous, slow drain of critical skills and need to attract new skills cannot be easily or fully addressed by the use of contractors.

NFG was not immune to this issue. The accompanying chart shows a steadily increasing number of craft and salaried employees (excluding clerical personnel) becoming retirement eligible through 2019. The next four years were expected to see growth in retirement eligible staff (among those employed as of January 1, 2015) that is small in number, but very large in magnitude -- 53 percent for craft and 7 percent for salaried personnel.



The accompanying chart shows that the percentage of retirement-eligible staff that actually retired fluctuated significantly through 2014. The critical point is that the retirement rates shown were high among both craft and salaried personnel. This pattern gave NFG a comparatively high level of possible staff replacement requirements for both craft and salaried resources.

Table III.2: Rates of Actual Retirement

	2009	2010	2011	2012	2013	2014
Hourly Craft	23%	17%	37%	50%	33%	16%
Salaried	60%	38%	50%	50%	21%	31%
Total	**31%**	**20%**	**39%**	**50%**	**31%**	**20%**

The increase in retirement eligible staff was accompanied by reductions in average age and tenures. It shows that NFG was exposed to decreasing levels of experience as well. The next two charts show the average age of salaried employees decreasing by three years and the average tenure by five or six years between 2009 and 2014. Craft resources showed similar but flatter trends with average age and tenure declining one year and two years, respectively.

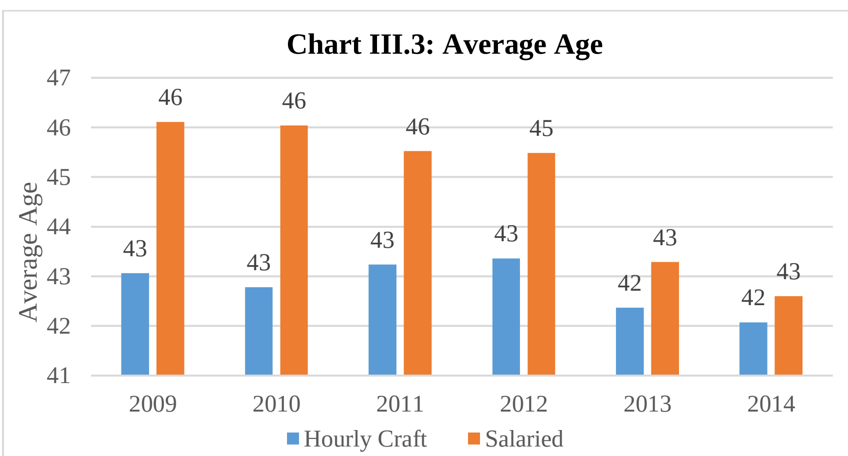
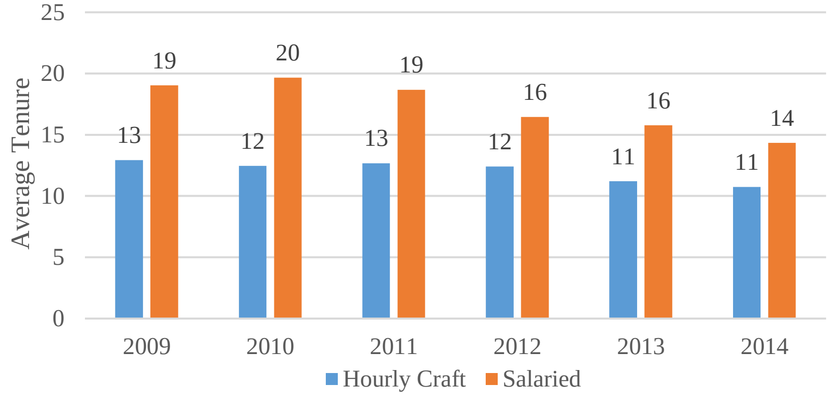


Chart III.4: Average Tenure



Management assumed a 1:1 replacement ratio for each forecasted departure. The Company also cites that its implementation of "a carefully planned approach to hiring, training and resource replacement" meant that it has identified no "areas of exposure to skills and experience gaps."

d. Monitoring, Training, and Development of Critical Skills

NFG offers four separate series of initial employee training cycles per year, and provides for requalification and refresher training spread out over a three-year cycle. NFG also uses vendors to conduct classes on specific topics (*e.g.*, trenching and shoring, work area protection). The Company lists the following joint efforts with outside training and development resources:

- NGA (Northeast Gas Association): Operator Qualifications
- Baker Corporation: Trenching and Shoring
- DiVal Safety: Work Area Protection and Flagger Training
- New York State Police: Commercial Vehicle Inspection.

Management cited relationships with local colleges and universities where it proactively searched for supervisory candidates. It cited internal programs for high potential business and engineering students. These programs allowed selected individuals to join the Company in a "rotating" capacity, which permitted cross training before permanent assignment. Management considered it a highly successful program. NFG was a founding partner (in 2008) of a vocational/technical training certificate (the Energy Utility Technology Certificate) at Erie Community College. This program served hourly worker needs by providing a vehicle for individuals to join NFG in the capacity of Serviceman.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Internal Staffing criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These six criteria are:

1. There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.

2. Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.
3. There should exist sufficient sources of complete, accurate staffing information by region and by function.
4. Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.
5. Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.
6. Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

1. NFG had reasonably comprehensive and sufficiently detailed forecast of medium- and longer-term capital and O&M work requirements.

We found this forecast sufficiently detailed to identify likely resource requirements over those time frames. NFG had a reasonably structured, well-understood work plan development process based on the identification of work to be performed translated into hours and costs and resource targets. Projections extended over a five-year time horizon, and involved appropriate line and management personnel.

NFG's capital and O&M work forecasts had an adequate factual and analytical foundation to support staffing projections. The identification of work requirements resulted from a multi-step process driven by the departments and subject to multiple layers of review and examination. Conversion of those work requirements into resource needs followed a straight-forward process proceeding directly from the work forecasts. Notably, management projected an internal staff complement at a constant level for both the historical and forecast portions of our 10-year study period (2009 – 2019). This highly unusual situation suggested a non-dynamic approach to forecasting internal resource needs; *i.e.* one seeking to maintain the status quo.

Management had a clear sense of staffing needs for base business requirements, and believed that potential future changes were unlikely to have an impact on staffing structure, locations, and numbers.

2. NFG had access to sources of complete and accurate information about staffing by region and by function.

PeopleSoft and a number of its modules supported budgeting and staffing related forecasts. The information generated provided sufficient data at an appropriate level of detail to allow reasonable and appropriate access to staffing related information.

3. NFG had forecasts of likely losses through attrition and retirement of internal resources by function, region, and work type.

Management tracked, monitored, and reported on attrition, retirement and other similar demographic characteristics, and was able to produce forecasts of those characteristics down to region and function.

4. Attrition and retirement was occurring at high levels at NFG, highlighting the need for focused attention on its potential implications for retaining key resources.

Management considered its levels of attrition to be comparatively low. The data we reviewed showed actual retirements of those eligible to retire at average rates of over 30 percent from 2009 through 2014.These high rates applied to craft and to salaried personnel. Comparatively heavy reliance on the skills and experience of its resource planners (in lieu of sophisticated processes, documentation -- as described in the Resource Planning chapter) heightens concern about the impact of losses of experienced personnel at NFG.

5. Training and development programs were sufficiently robust to provide adequate support for long-term staff requirements.

Internal training programs were reasonable, long standing, and oriented toward effective support of the line organizations. Management also had relationships with a local community college and some national organizations.

4. Recommendations

1. NFG should conduct a bottom-up staffing planning exercise at the next opportunity when it can do so as part of its annual planning cycle.

The policy and history of maintaining constant internal staff levels has some useful benefits from some perspectives, but it is generally not consistent with a changing utility industry. This is not to say that staff levels should be reduced or increased (then-current levels appeared adequate) – only that it is likely to be increasingly difficult to maintain a policy in the face of an industry, albeit unlike electricity, that may be faced with significant future change.

We recommend that the next planning cycle include a bottom-up approach that considers not only immediate, but near-term staffing requirements and expectations.

2. NFG needs to reassess its conclusion that pending retirements do not create potential gaps in key resources, and develop plans for ensuring the ability continually to provide for the transfer of the knowledge and experience on which it depends for successful performance.

Part of the justification for the belief that NFG did not face such gaps was the perception that NFG retirement rates were comparatively low. That did not appear to be the case based on our study. NFG should examine eligibility and actual retirement rates at the detailed work group level for skill sets defined as critical. That work should be accompanied by an examination of age and tenure changes as they may affect changes in skill levels over time. Given reliance on a senior, experienced group to perform resource planning activities (see the Resource Planning chapter), this area merits special attention, both to resource loss directly and to its mitigation through a more structured set of planning tools and processes.

Relying on past success in transferring institutional knowledge and understanding of approaches and methods would take too much for granted. The lack of a more formal approach to defining, documenting, and controlling procedures and methods makes inter-“generational” transfer of knowledge through reasonably formal mentoring and other techniques too important to leave to chance. We developed a significant level of confidence in the ability of “seasoned” senior personnel to replace what many would call a more programmatic approach to resource planning.

Maintaining comfort with that more informal approach under the circumstances, however, depends on a more formal approach than is often required for companies with higher resource numbers, and more structured and formally documented, communicated, and applied processes. Even they can suffer material, unexpected institutional knowledge loss when they have, as NFG does, high levels of retirement eligibility looming.

D. Overtime

1. Summary

NFG consistently experienced overtime below its established target of three percent. The ability to maintain control at such a low level was remarkable. The degree to which NFG deviated from its peers in overtime expenditures evidenced a fundamentally different approach to doing the work as opposed to simply a performance question. There was no shortage of analytical capabilities at NFG for addressing overtime. Managers and supervisors in key positions were knowledgeable and effective in managing productivity and resource issues.

2. Findings

Liberty has often found in other work that overtime among utilities does not generally receive a degree of organizational attention commensurate with its importance in cost and staffing analysis and planning. The magnitude of work done on overtime, the negative impacts on personnel from high overtime, the reduced productivity associated with overtime, and issues of control, especially with emergency requirements, argue that overtime planning and management should get more attention in most organizations.

NFG's processes underlying its management of overtime appeared sound. We saw no process areas displaying significant weaknesses, either on an absolute basis or relative to the other state utilities.

Management carried out an approach of using overtime only for peak-shaving and emergencies. It employed a goal to limit overall overtime to three percent. NFG's historical overtime rate was kept below three percent. Management remained intimately involved in daily operations and most decision-making. The supporting staff provided information for the key managers to perform required analyses. Management did not use overtime to avoid new full-time hires.

During the annual budgeting cycle, the overtime guidelines were issued as part of the budgeting instructions. For capital work, the overtime assumption was specific to the functional level; *e.g.*, capital additions at 4 percent, main replacement at 3 percent, services replacement at 4 percent, and other internal work at 4 percent. Management set overtime for O&M work at 5 percent at the aggregate level.

Management collected overtime information only at the capital functional level. Management collected expense (O&M) overtime information at the aggregate level. Management had to undertake special efforts to allocate overtime hours to the expense functions to support our study's information needs.

The fundamental question that NFG's approach raised, considering much different experience among its peers, is how management maintained such low overtime rates. Contributing factors included:

- Seeking to limit overtime to emergency response, to ensuring the continuation of services, and to meeting customer schedules in capital projects.
- Maintaining a sufficiently large pool of qualified workers to maintain low overtime on a consistent basis.
- Increasing the regular-time pool of workers by training all service workers and meter readers to be first responders.
- Using an arrangement with Erie Community College for training utility workers as potential candidates to be absorbed into the regular workforce, when workload demand increased.
- Minimizing overtime potential by scheduling some crews to work four-ten hour shifts, and by using jobsite reporting for some crews on smaller jobs or emergency calls.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Overtime criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. There should exist an analytically supportable method for determining optimum levels of overtime.
2. Overtime planning and use should consider the relationship between amounts of overtime use and productivity and costs.
3. Overtime determinations should be uniquely applied to differing work functions and types.
4. Overtime use considerations should occur as a formal part of the process of identifying required resources.
5. Overtime use should conform to assumptions used for determining resource requirements.
6. Overtime use should comprise part of an integrated process for balancing internal, overtime, and contractor resources across all functions we are examining.

1. NFG did not find value in using overtime at the far greater levels typical of the state and the industry.

Management maintained overtime consistently at less than three percent for five years and its overtime hourly labor cost was also the lowest in the State in 2013.

2. NFG did not employ an analytically supportable method for determining optimum levels of overtime.

Management did not use an analytically driven model to determine optimum overtime levels, considering it not useful, given the extremely low overtime levels of the past five years. Management accepted the then-current, low overtime as optimum, despite a lack of analytically supportable process.

3. NFG did not routinely consider the interrelationships among overtime, cost, and productivity in its decision-making related to overtime.

The very low overtime rates obviated the need to analyze overtime impacts on productivity and costs, given that such rates fall well below the point where high overtime use would begin to have significant negative impacts. Managers observed that qualitative observations indicated no decline in productivity during overtime use. That result was not surprising, given the extremely low overtime levels at NFG. Nevertheless, management did not have the capability to compare productivity during normal shift and overtime periods. The work management tools could not differentiate productivity between straight time and overtime periods.

4. NFG did not apply overtime planning and analysis at the functional level.

Management recognized that different work groups or work types should and do have different levels of overtime based on the nature of the work. Planning at this level, however, did not go down to the functional level. Overtime expenditures were not monitored at the O&M functional level. Most utilities see the functional level as the ultimate basis for effective planning and control of costs in general, although the abilities to implement such a strategy vary widely. Liberty therefore recommends more, not less, attention at the functional level. The degree to which such functional attention is desirable in the overtime realm needs to be evaluated and determined at the individual utility level and it does not appear appropriate here, given the low use of overtime.

5. NFG adequately considered overtime in its resource planning and budgeting functions.

With overtime rates this low, the need for overtime time charges to be converted to internal staff positions was non-existent.

6. NFG succeeded in keeping overtime under planned and budgeted levels.

Management used established guidelines to budget capital function overtime at historical level and overall overtime at five percent, and reviewed overtime performance monthly using overtime reports and productivity reports from work management tools. Management successfully maintained actual overtime rates within the budget assumptions.

7. NFG did not use overtime significantly enough to justify planning for its use on an integrated basis with the other resource elements.

A company with an effective integrated process can balance internal and external resources with the optimal level of overtime. For NFG, the overtime level is so low that it becomes a non-factor in this balancing process.

4. Recommendations

1. NFG should conduct data-driven analysis to verify that its minimal overtime use does not cause it to lose opportunities for optimizing resources.

The more typical context for our overtime recommendations in this study was high or increasing overtime use. NFG's rates were extraordinarily low and stable. Management needs no changes to improve its control of overtime. The question that exists is whether it could improve performance by making more use of the resource. To the extent that NFG will continue to operate in an extremely stable environment, it does not appear likely that cost improvement opportunities are substantial. Should changing work balances arise in the future, however, the same might not be true, either in terms of cost effectiveness or ability to respond timely to emergent needs.

We do not recommend an exhaustive analysis or detailed work to address factors like productivity differentials, given that NFG's approach, which appears culturally ingrained, does not make it a candidate for likely overuse of overtime. What we suggest is more in the nature of a focused consideration of how resource balance would have changed in the past, had overtime been used differently and, more importantly, how changes in overtime use would affect that balance (and its resultant costs and service metrics) when planning future resource levels. That future look should consider the types of contingencies to which overtime use presents an appropriate response, without producing penalties should those contingencies not come to fruition.

We do not make this recommendation with the expectation that it will necessarily lead to changes, particularly in the immediate term, in overtime use categories or amounts. What it will do, however, is ensure that decisions about overtime use do not over-rely on long-standing, ingrained percentage limits.

E. Contractor Use

1. Summary

NFG's contracted services types generally conformed to industry practice, and employed appropriate qualitative rationales for determining where and when to contract. The reasonably broad base of construction contracting firms and the maintenance of strong relationships with them, provided sufficient diversity and access to resources in emergency conditions. NFG contracts used appropriate pricing mechanisms and management employed an effective structure for managing its contract operations.

Management recognized and acted to address needs for increased contractor resources. Its high proportion of contracts with longer terms comported with the increasing level of competition for gas contractor resources. In responding to needs for attracting talent to the industry, management worked with trade organizations and local colleges to develop training, rotational, and internship programs.

Management, however, should more directly link contractor compensation to performance. It did evaluate contractors, and its evaluations could affect future contract decisions (or lead to contract termination in severe cases). Management also needs to examine plans for increasing resources to meet the needs of its pipe replacement program. Miles replaced were forecasted to increase by about 25 percent from 2013 activities. Others in the state and region will be making increases as well, which will tighten market conditions. A structured effort is needed to ensure sufficient qualified employees and contractors can be secured and maintained to meet expected program needs.

2. Findings

a. <u>Contracting Levels & Types of Contracts</u>

The level of contractor use and the types of contractors retained were supported by a contractor strategy that appropriately considered work volume, quality, timeliness, costs, and other relevant considerations. NFG contracted about half of its construction work and about thirty percent of its O&M. For construction, it used a mix of "project" work, bid out on a lump sum basis, and "blanket," or unit price contracts. Project work typically involved the installation of more than 4,000 feet of pipe. In recent years, the ratio of project to unit price work was approximately 60/40.

For O&M, NFG contracted all inspections and a substantial portion of leak survey work, the latter of which varied year-to-year depending on internal staff availability. Unlike most other New York utilities, management performed most of its line locating and mark-out activity in-house. Leak repair all took place in-house.

b. Data-Driven Understanding of Contractor Usage

Management had data-driven understanding of the costs of using contractor versus internal resources, and applied a good qualitative rationale supporting the use of contractors in lieu of internal resources. Management made contracting decisions on the basis of factors other than cost. For capital construction, management sought to balance a number of competing constraints:

- Limiting the number of construction employees to those who could be kept busy during the off-season, when weather conditions prohibit construction.
- Retaining enough contract firms and crews to support resource availability during emergencies, recognizing that contractors give preference to their regular client companies, making other parties secondary.

For O&M, management contracted some relatively low skill, high volume repetitive work, such as leak surveys.

Direct comparison between the costs of contractor versus in-house construction crews challenged management, because NFG crews were Operator Qualified in many areas and used for various other activities in addition to construction. Thus, a NFG crew constructing a section of pipe could be interrupted to respond to an emergency or for other higher priority work. This flexibility impaired construction productivity as measured nominally, but management considered it an effective overall strategy from both cost and emergency response perspectives. It also provided the reason why management assigned crews to smaller, shorter term construction jobs, while contracting larger jobs.

Management annually performed a rough unit cost comparison study to compare contractor versus in-house costs. We found that study non-rigorous and inconclusive.

c. Base of Contractor Firms

Management kept a broad base of contractor firms under contract or pre-screened and pre-qualified for activities and tasks for which contractors were regularly used or anticipated to be used. NFG had some eighteen firms qualified for construction, of which ten were active bidders, and eleven of which had blanket contracts.

d. Contractor Oversight and Management

NFG used local firms, with which it had long-standing relationships. This approach enabled some sharing of longer term plans to provide assurances to contractors that the demand for services from NFG would continue.

Management had begun a new rotational program for engineers, using input from the American Gas Association and the Interstate Natural Gas Association, among others. Management was also working with local colleges to develop an internship program.

NFG used a comprehensive contractor evaluation form, addressing some 50 dimensions and attributes, which it used to rate contractor performance. QA inspectors were National Fuel employees. Management tracked all jobs and contingencies, and conducted a post-mortem on projects deviating from initial estimates by five percent or more. Procurement, invoicing and payment processes were handled through normal company processes, which provided appropriate separation of activities.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Contractor Use criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The level of contractor use and the types of contractors retained should be supported by a contractor strategy that considers work volume, quality, timeliness, costs, and other relevant considerations.
2. There should exist a data-driven understanding of the comparative costs of using contractor versus internal resources, and apply a good qualitative rationale for choosing between contractor and internal resources.
3. Management should retain a sufficiently broad base of firms should remain under contract, pre-screened or pre-qualified for activities and tasks for which contractors are regularly used or anticipated to be used.
4. (Gas only) Where contractor resources are limited in terms of numbers of crews available or skill sets to meet anticipated future needs, the utility should be working to promote development of a skilled pool of resources.
5. Contractor strategy should be supported by appropriate contractor management processes.

1. NFG's use of contracted services was generally consistent with industry practice.

Management contracted approximately half its construction and varying levels of leak surveying. It performed all Quality Assurance in-house. It leveraged its internal work force by performing multiple activities as needed while allowing contractors to focus on the larger jobs.

2 NFG had reasonable and appropriate qualitative rationales for contracting.

No reliable quantitative studies were available, but managers demonstrated a broad and deep understanding of all aspects of operations. Management had logical, considered rationales for the functions performed internally and externally.

3 NFG used a sufficiently broad base of contractors for construction.

Management retained a substantial number of local contractors with whom it had strong and, for the most part, continuing relationships. This approach provided a continuing and diversified field of contractors to provide services directly, and to remain available for emergencies. Management also employed a sound mix of project and unit price contractors.

4 NFG's contract durations were reasonable and consistent with industry practice.

Most contracts had terms of three years, which was very common in the state.

5 NFG had taken some steps to increase the number of resources forecasted to be required to support its construction program.

Management recognized the difficulty in attracting talent, and worked with trade organizations and local colleges to develop training, rotational, and internship programs.

6 NFG had an effective support structure for its contract operations.

Management used standard company contractor processes for payment processing and control. Quality assurance was administered by Gas Engineering, and included a regular presence at all construction sites, along with monthly meetings with each contractor and a comprehensive contractor rating system.

7 NFG did not link contractor compensation to performance.

While management employed a comprehensive oversight program, including a detailed evaluation form, ultimately it operated as a pass-fail system. Absent performance so poor that it warranted termination, contractors were hired based primarily on price, although performance quality could enter in an evaluation if costs were in the same range. Overall, if performance proved minimally acceptable, there was no link to compensation or to the selection process for subsequent solicitations.

4. Recommendations

1 NFG should develop and implement plans for increasing internal staffing, the contractor base, or both to meet the needs of the future pipe replacement program.

National Fuel's pipe replacement program was relatively stable for the past five years, but was forecasted to increase by about 25 percent from 2013 to 2016 in terms of miles replaced. This further increase will be taking place while similar increases are taking place at many other companies throughout New York State and the Northeast. Management needs to take immediate action to ensure that a field of qualified employees and contractors is available to continue the program.

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

Final Report: National Grid
Case 13-M-0449

Presented to:

Public Service Commission
State of New York

Presented by:

The
Liberty Consulting Group

February 21, 2017

279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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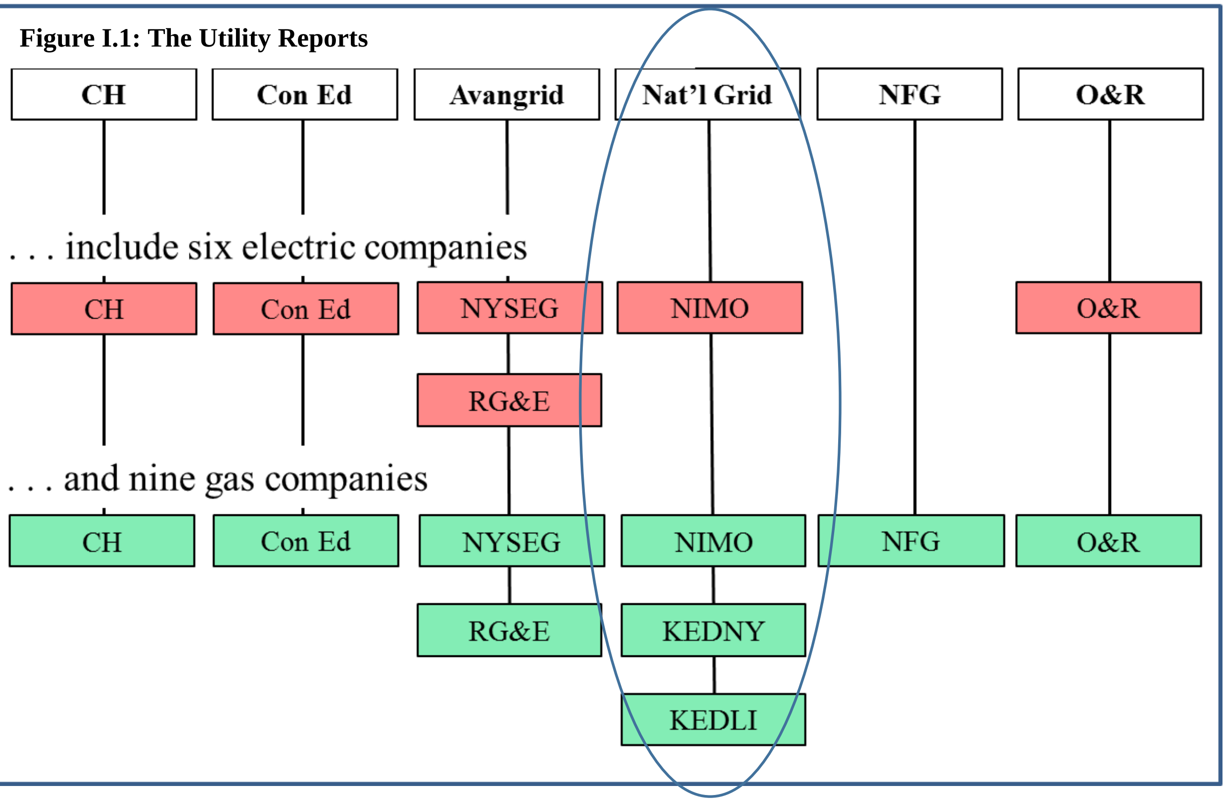
Chapter I: Background

The Liberty Consulting Group completed an extensive study of a prescribed set of staffing patterns and practices (the scope of which the Statewide section of this report addresses) at fifteen utility operations operating within six enterprises in New York State. The first part of this report addresses the results of our study from a statewide perspective. This part describes our study and presents its results as they relate directly to the two National Grid utilities (electric and gas) examined.

Figure I.1: The Utility Reports



Our study examined staffing in quantitative and qualitative manners. This part of the report describes the results of our analyses regarding National Grid quantitative staffing data and a qualitative review of the processes associated with staffing at the electric and the gas utilities. That data and the comparisons we have made with other New York utilities require a framework that explains the relevant characteristics in context with the other state utilities.

U.K.-based National Grid operates an international group of electricity and gas network operations. With roots in electricity and natural gas transmission, National Grid owns and operates the transmission systems of England and Wales, operates the transmission system of Scotland, and operates and partially owns electricity transmission interconnections to France and the Netherlands. National Grid also operates several natural gas distribution utilities in England. National Grid maintains its U.S. headquarters in the Boston area and a number of central services operate from Brooklyn and Syracuse. The U.S. utility operations extend beyond New York to include Rhode Island and Massachusetts, following divestiture of New Hampshire electric and gas operations a few years ago. Utility operations in those other states include New England Power

Company, Massachusetts Electric Company, Nantucket Electric, Narragansett Electric Company, Boston Gas Company (including the former Essex Gas Company, and Colonial Gas Company).

New York utilities comprise by far the largest portion of National Grid's U.S. utility operations, which include over three million electric and natural gas customers combined. New York operations include Niagara Mohawk (NIMO), which has both electric and gas operations, and two companies that serve natural gas customers -- KeySpan Gas East Corporation (KEDLI) and The Brooklyn Union Gas Company (KEDNY). The next chart shows that the four separate (for our purposes) operations that make up these companies all give National Grid significant asset and customer bases in the US, with each comprising a comparatively sizable entity in its own right. NIMO is the second largest electric utility in the state as measured by most metrics. KEDNY and KEDLI are in the top three gas utilities.

Table I.2: National Grid's New York Utilities – Comparative Size

	Asset Base (as of 3/15)	Customers (as of 2013)
Niagara Mohawk (electric)	$4.45 billion	1.7 million
Niagara Mohawk (gas)	$1.06 billion	0.62 million
KEDLI	$2.15 billion	0.57 million
KEDNY	$2.39 billion	1.2 million

Our study examined a ten-year period - - five of them historical and five projected. We conducted field work in 2014, which presented a challenge in treating that year's data. We collected year-to-date actual data and budgeted or forecasted data for the remainder of the year. Differences in systems, fiscal years, reporting and approaches to forecasting to-go data provide examples of the difficulties in identifying a way to split 2014 into actual and forecasted portions or to reflect it on an amalgamated basis. Those difficulties eventually led us to determine that we could not find a way to report 2014 data meaningfully for use in our study.

In 2015, progress on this project halted for a period of many months, during which we sought to resolve major difficulties regarding gaps and errors in data reporting. We observed that the hiatus in work and the need for data correction provided an opportunity to alter project scope to permit collection of actual data for all of 2014 and to update projections for future years. It was decided not to do so. Therefore, we continued to work with the split nature of 2014 data and with earlier forecasts for future years, which included 2015.

When making utility-to-utility comparisons one must remain mindful of the need to avoid comparing "apples to oranges." The complex analyses involved here and the unique circumstances of utilities even across the fairly narrow geographic range of a single state certainly do make it impracticable to reduce comparative evaluations of performance and results simply to algorithms. Nevertheless, it is possible, with care, to provide data comparable enough to assist in the formation of useful judgments. They can have value even in complex circumstances, particularly when performed on a multi-dimensional basis and only when accompanied by the application of industry expertise in the underlying applications and activities.

We thus undertook our quantitative analyses recognizing the need to understand and reflect the differences that drive staffing among the state's group of utilities. Among the challenges present in doing so, our work provided a significant advantage as well. Despite the differences among its members, this advantage arose from the ability to derive commonly defined, contemporaneous data sets from a utility population that: (a) number enough to allow the use of statistically derived measures, (b) operate under the authority of a single regulatory authority, and (c) encompass what is a remarkably, if not uniquely narrow geographic range, when contrasted with other comparative studies we have seen in the industry.

We operated nevertheless with the recognition that superficial application of data would not serve. We sought to understand and define the characteristics of the utility operations within the scope of our study and how they vary in the utility population. This starting point set the stage for effective structuring of the data to be collected and then analysis of that data.

In comparing the utilities, we begin with attributes of common interest that might have some impact on staffing levels. These initial attributes might be termed as potential "hard" drivers of staffing. These drivers correspond to system attributes that utilities generally cannot control. For example, the number of customers a utility has surely affects required staffing, but that parameter is a function of the environment in which the utility operates. The number of customers represents neither a performance statistic nor a value that management can influence. The relevance here of such factors lies in their ability to help clarify the "givens" that define a utility's relative size in the industry.

We also examined "soft" drivers" of staffing. While these are not "givens," they do concern things that management decisions and actions influence, and those decisions and actions that do, or at least may, affect both staffing and performance. For example, a utility chooses the number of gas mains it will replace each year; that decision affects staffing requirements.

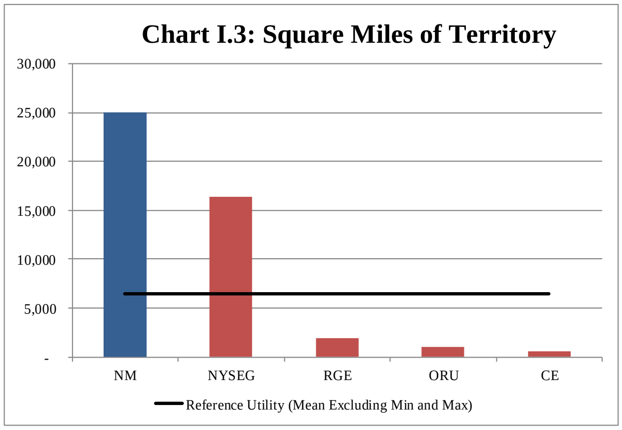
A. The Reference Utility

Our many comparisons of staffing frequently refer to the "Reference Utility." We combined data from all the operations we studied to produce a composite for comparative purposes. This part of the report sets forth many charts and accompanying discussions of attributes or sets of attributes related to staffing in comparison to the Reference Utility. These uses of a Reference Utility provide a common indicator for how the various utilities differ from the composite. For example, if a utility has the same number of customers as the Reference Utility, we can state that utility's number of customers as 1.0. If another utility has 50 percent more customers, we can state its customer count as 1.50. These measurements provide a way of illustrating the relative position of any utility in comparisons with others. This approach provides a dimensionless variable for selective use in other calculations. Comparison to the Reference Utility never provided a basis for conclusions, but rather is a way to put each of the companies we studied in a statewide context and to assist in identifying areas useful for inquiry into staffing numbers, distribution, and adequacy.

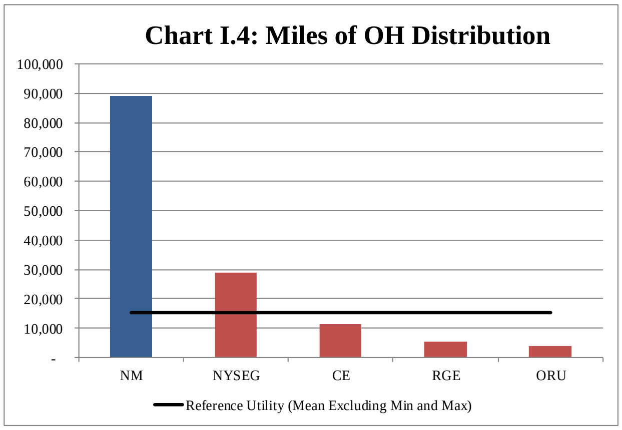
In defining the value for the Reference Utility, one option would have been simply to use the average of the state utilities. Some circumstances, however, make this approach impractical. For example, one or two very large utilities can dominate the data, calling for mitigation of the impact of the outlier(s). This phenomenon encourages the use of a median rather than an average. A similar approach might use the average of the utilities, but calculated after removing the minimum and maximum values. For electric attributes, we used the median or average excluding the minimum and the maximum. After examining the gas attributes, we reached the same conclusion.

B. Specific Electric Attributes – Hard Drivers

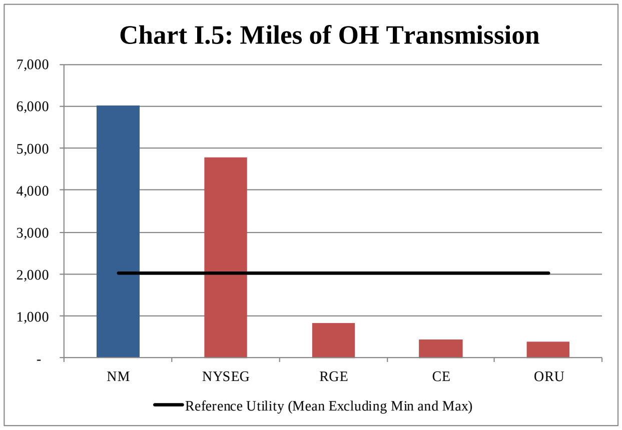
This section describes what we determined to be system attributes comprising hard drivers of staffing. The size of a utility's service territory and quantities derived from it (such as customer density) should have some impact on staffing. Sparse service territories likely experience higher costs, as employees require greater travel times, with resources spread over a greater area. A larger service territory can also require more distribution facilities, in turn producing higher maintenance demands.

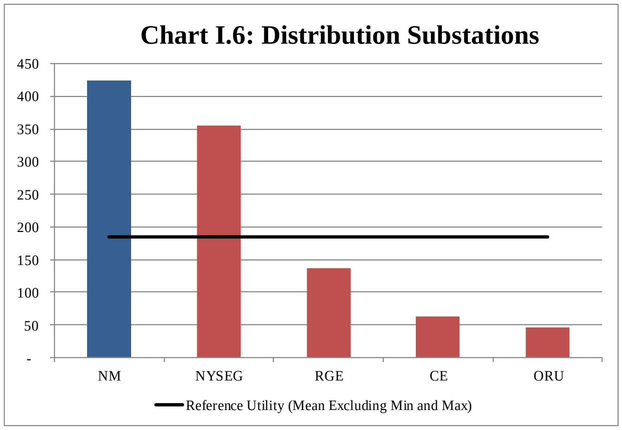


NIMO has, by far, the largest service territory of the state's electric utilities. As one would expect, its territorial dispersion also results in by far the largest distribution system in terms of miles of overhead distribution lines. NIMO has more than three times as many miles as its nearest competitor (in the range of six times more than the Reference Utility value). Clearly, its far outlying position in this attribute has a large role in NIMO's relative resource position.



Not surprisingly, NIMO also has the most miles of overhead transmission lines and of distribution substations. Transmission does not play nearly as large a role in the infrastructure of most of the other electric operations we studied, but for NIMO, transmission comprises a far more substantial portion of its infrastructure.





The four parameters we discussed so far define the geographically related attributes. They create a clear picture of NIMO as a large, territorially dispersed electric utility. While large on a state scale, NIMO would be more accurately characterized as mid-sized when viewed nationally. Today's industry consolidating brings comparative challenges to those remaining, smaller operators. Comparative size alone does not make NIMO comparatively more efficient, but larger operators frequently start in some areas from a more advantageous position than their smaller neighbors. Factors such as comparative size illustrate the value in examining multiple drivers when analyzing staffing drivers, rather than searching for a single "silver bullet."

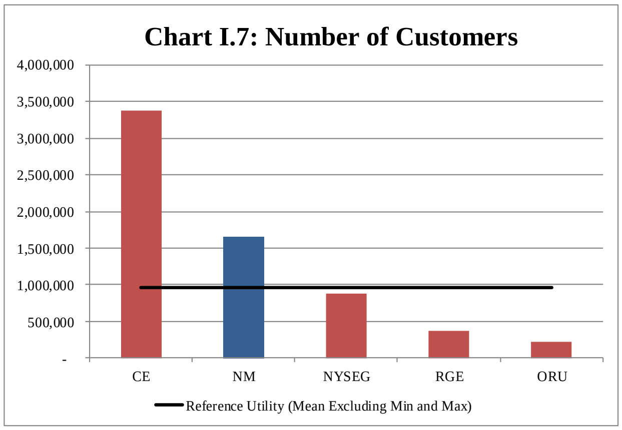


Chart I.7: Number of Customers

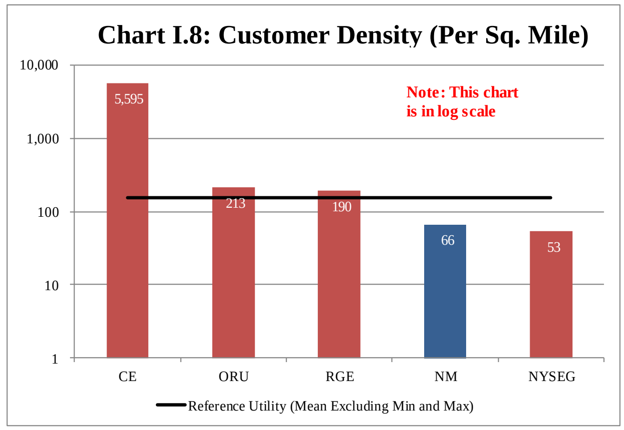


Chart I.8: Customer Density (Per Sq. Mile)

When we turn to non-geographically related parameters, NIMO's relative position in several other size-related attributes does not change significantly. For example, in number of customers, NIMO remains large among the state's utilities, but no longer occupies the top position. An off-shoot of customer count, customer density represents the number of customers per square mile of service territory. Intuitively, one would expect this factor to be comparatively important in terms of staffing, among other performance parameters. One can expect staffing efficiencies to exist for utilities with denser service territories. However, efficiencies can become penalties at very high densities, where work can become logistically more difficult and expensive. In any event, NIMO, as expected, operates in a territory far less customer dense than do the other state utilities. Its density is about one-third that of the Reference Utility value (66 customers versus 190, as shown in the log-scale chart above).

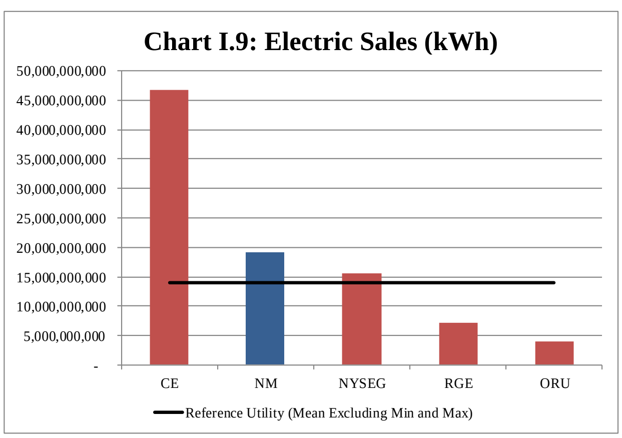


Chart I.9: Electric Sales (kWh)

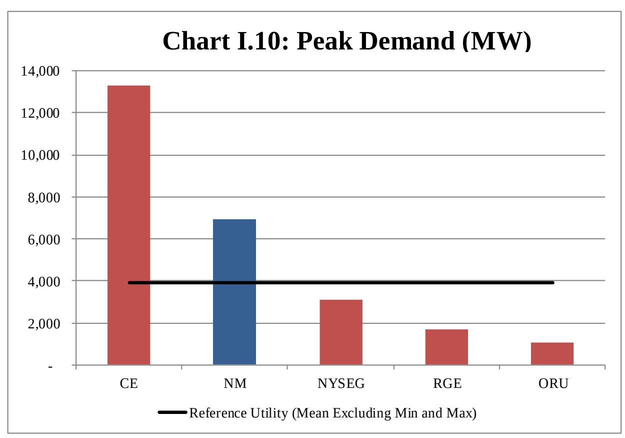
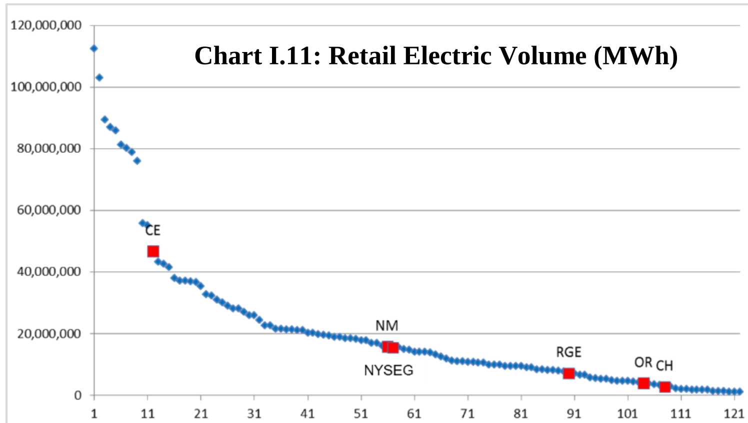


Chart I.10: Peak Demand (MW)

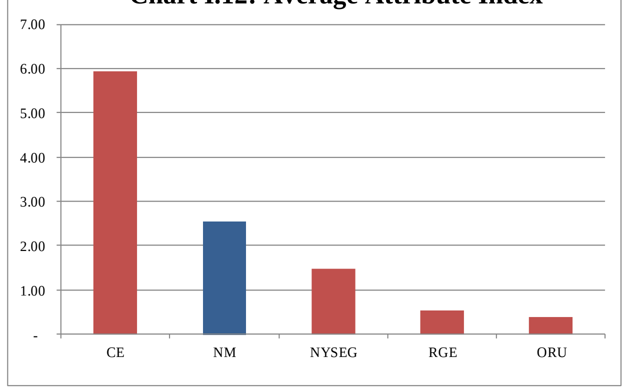
Peak system demand offers a typical indicator of utility size, although one having at best an indirect influence on T&D staffing. Here, NIMO mimics its customer profile ranking as the second largest of the operations we studied. Sales also provide a similar illustration of size. The closeness of the pattern among the companies when measured by demand or sales is as one would expect, if the operations share similar load factors. In any event, sales, like peak demand, have at best an indirect influence on staffing. From a sales perspective, the state utilities are not particularly large on a national scale, with the obvious exception of CECONY. Five of the six state utilities fall at or below the national median. Three, including NIMO, lie at the median.

Chart I.11: Retail Electric Volume (MWh)



The accompanying chart (Average Attribute Index) depicts the attributes discussed above into an average. It then indexes that average. We presented charts above illustrating the relative size of each utility based on different attributes. In each case, we quantified size in relation to the Reference Utility value. A utility with a measure of 1.5 would be 50 percent higher than the Reference Utility, for that particular attribute. We can therefore measure size on the basis of a single attribute, but we would also like to measure size based on *all* attributes. Simply taking the values for all of the attributes and averaging them provides a rough indicator of a utility's overall size versus the others in our study. We call this the "average of all attributes index."

Chart I.12: Average Attribute Index



Measuring NIMO this way gives it a size value more than twice the size of the Reference Utility's value -- a representative overall characterization. While not determinative of anything material to staffing, the measure emphasizes NIMO's relative position vis-à-vis the other state utilities. Any analysis of NIMO's staffing must consider the impact of company size.

C. Full-Time Equivalent Electric Resources

In order to provide a common parameter for the analysis of staffing levels, Liberty selected "full time equivalents," or FTEs. We defined this FTE parameter as follows for purposes of this study:

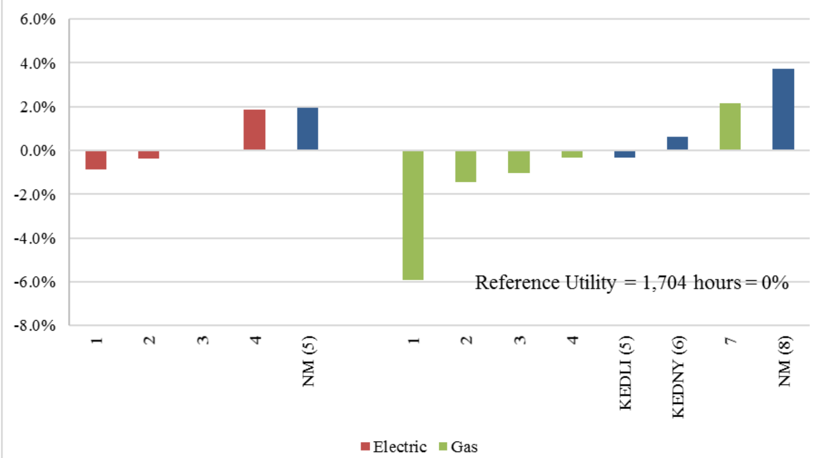
- For utility employees: reported hours divided by available hours
    - Using available hours provided by each Company
    - Available hours excluding holidays, vacation, training, and other off-the-job hours

- For contractors: reported hours divided by 2,080 (52 weeks per year multiplied by a 40-hour work week).

We chose to use this FTE approach to approximate the number of workers employed. It makes it easier to understand staffing data than other bases (*e.g.*, hours) would. While this approach provided a way to model numbers of applied FTEs, it remains important to consider differences among the operations we studied. The number of available hours per FTE varied among those companies. For example, one utility had available hours per employee of 1,800 per year, while another had 1,650. Theoretically, the first utility can provide the same number of available hours with 9 percent fewer employees.

The following chart shows the variance of each operation from the 1,706 hours we calculated for the Reference Utility (by averaging the available hours for all the electric and gas operations we studied).

Chart I.13: Added Staffing Required due to "Available Hours"



Most of the operations centered around the Reference Utility value. The gap between the high and low gas operations, however, showed a total value of 10 percent. Perhaps the only significant points of interest here for Grid were the NIMO gas levels and, to a lesser extent, those for NIMO electric. Our chart suggests that they had a gap of four percent and two percent respectively when compared against the other utilities. In other words, NIMO gas required four percent more hours, and hence four percent greater staffing levels, to accomplish the same amount of work as the Reference Utility value (all other things being equal). This handicap grew to 10 percent when measured against the negative outlier for gas companies shown on the chart (Bar 1 in the gas category).

One cannot calculate contractor FTEs on the same basis as one would internal resources. Contractor employees certainly have off-the-job time as well. However, when contractor employees are off (for vacations or training, for example), contractors rotate and shift resources to keep crew (or other applicable group) complements full. Thus, 2,080 hours provides a valid number to use for a contractor FTE. On the surface, that number appears to make a contractor FTE more effective. However, the hours advantage gets substantially mitigated by higher contractor costs. The rates a company pays for contractors builds in the costs of contractor-employee off-time. With all else equal, a contractor FTE, as we use the term in this study, is equivalent to about 1.22 utility FTEs in terms of hours worked. The FTE measure that we use provides a meaningful and intuitive understanding of staffing levels, but care in applying that understanding remains important.

The earlier, size-based attributes showed NIMO as the second largest of those we studied in terms of size. The next chart shows that NIMO occupied a generally corresponding position in terms of total staffing. This comparison was not determinative, but also did not raise obvious concerns. The next four charts, using our FTE approach, show this consistency. Beyond raw rankings, they also illustrate no shifts in the shape of the staffing charts compared with the "all attributes" chart above.

Chart I.14: FTEs - Total

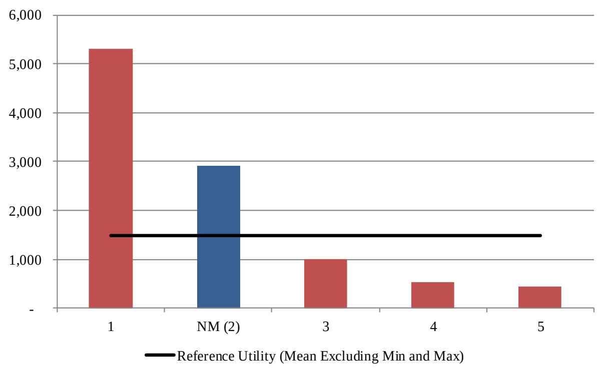


Chart I.15: FTEs – O&M

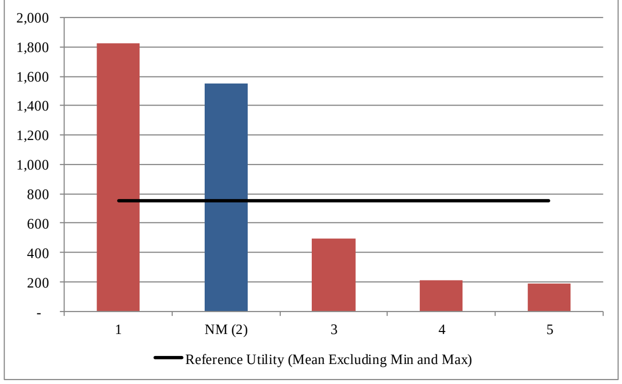


Chart I.16: FTEs – Capital

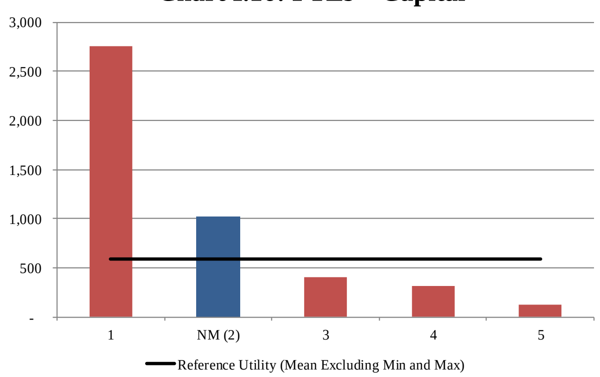
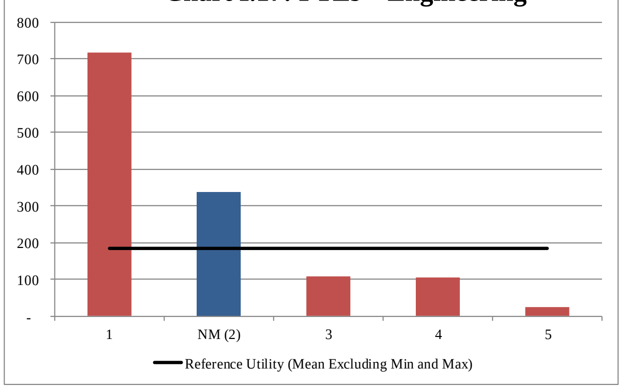
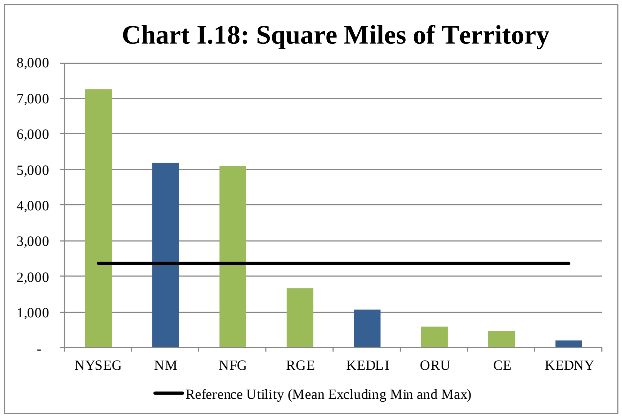


Chart I.17: FTEs – Engineering



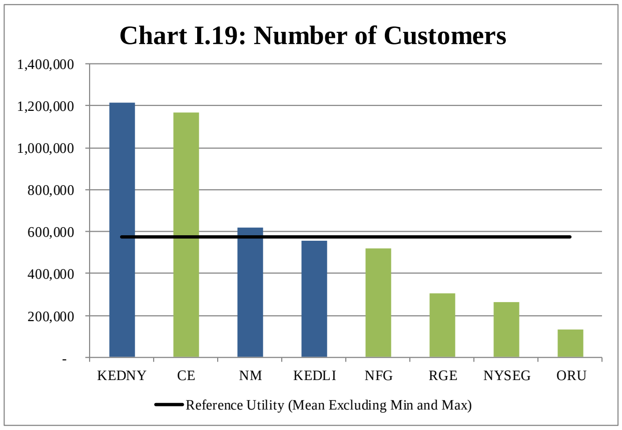
D. Specific Gas Attributes – Hard Drivers

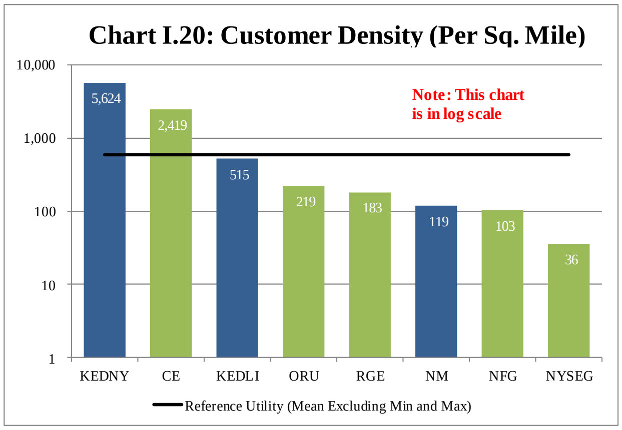
1. Territory and Customers



The size of a gas utility's service territory and its customer density can also be expected to influence its staffing. Travel times, the level of distribution facilities, and the number of service centers and crew support locations present examples of such impact. Additionally, the gas delivery business exhibits other variables (not present in the electric business) that affect staffing directly and indirectly. Virtually every occupied structure in an electric utility's service territory has electric service. This is not the case for gas distribution utilities. Competition from oil, propane, electricity, and other fuels affects penetration rates for gas utilities. Moreover, many customers in the state do not have access to gas service, residing too far from transmission and distribution pipes to be served economically. Many electric customers do not have gas, either because it is unavailable or because they choose not to take it. However, virtually every gas customer is an electric customer. For those reasons, there are many more electric than gas customers in the state.

The next two charts show numbers and density of gas customers. The chart showing customer density employs a logarithmic scale (the only way to portray the immense density differences that exist among the gas operations we examined). From a visual perspective, it minimizes those differences, but the numbers shown in each of its bars make the magnitude of the differences more clear. The state's gas operations include two very large companies, each with over one million customers. Three other mid-size companies cluster around the Reference Utility value of just under 600,000 customers. The next three smaller companies have two hundred thousand or fewer customers. As expected, customer density is very high for the metropolitan companies, and significantly lower for the upstate companies, particularly those serving more rural areas.





NIMO operates a gas utility across a broad swath of upstate New York. NIMO has the second largest service territory, including a number of small to mid-size cities and a large rural area. Combining its dispersed territory (shown in the subsequent chart) with a customer population at about the Reference Utility level, puts NIMO's customer density toward the lower end of the state range.

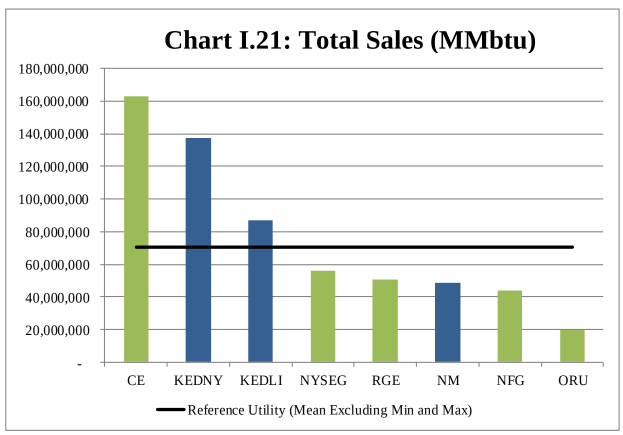
KEDLI operates within a small territorial footprint of just over 1,000 square miles. Its service territory consists primarily of Long Island's Nassau and Suffolk Counties. KEDLI is one of those five relatively compact operations that fall well below the three upstate utilities, with their large, sprawling territories. KEDLI lies near the Reference Utility level in terms of customer numbers. CECONY and KEDNY represent a class unto themselves with densities five or more times those of KEDLI, the third ranking company. KEDLI's urban and suburban areas produce a mix that make it much larger than the remainder of the gas operations we studied, with a customer density of more than two times its closest comparator, and well over ten times the least dense operation.

KEDNY and CECONY each have roughly twice the retail customers of the state median. KEDNY's 1.2 million retail customers make it the largest of the operations we studied. KEDNY also serves by far the smallest footprint, despite having the most retail customers. The combination of the smallest territory and the largest number of customers gives it an extraordinarily high customer density. Even CECONY, (the next most customer dense) has less than half the customer density of KEDNY (5,642 versus 2,419 customers per mile). Of the remaining state gas operations we examined, KEDNY's customer density is 11 times that of the closest comparator, and more than 150 times denser than the least customer-dense state operation.

The unusual mix of KEDNY's customer base drives much of the density difference between it and CECONY. KEDNY has over half a million "cooking gas" customers. Cooking gas customers (as the name implies) use a minimal volume of gas each month for cooking. Such customers frequently reside in a centrally heated apartment building. Thus, a 100-unit apartment building in Manhattan with a single gas master meter represents one customer, while a similar 100-unit building in Brooklyn may have 100 separate cooking gas customers.

2. Sales

We next examined total sales on a comparative basis. The accompanying chart summarizes the results. Customer mix explains why the companies with the largest numbers of customers lie at the left of the chart, but for the others, the ranking by number of customers does not necessarily match the ranking by level of sales. Companies with large commercial and industrial loads tend to have the highest level of usage per customer. These large customers tend to concentrate in the major metropolitan areas today, but that was not always the case. In decades past, upstate regions housed many major industrial customers who are now long gone. Losing these large loads often allows upstate



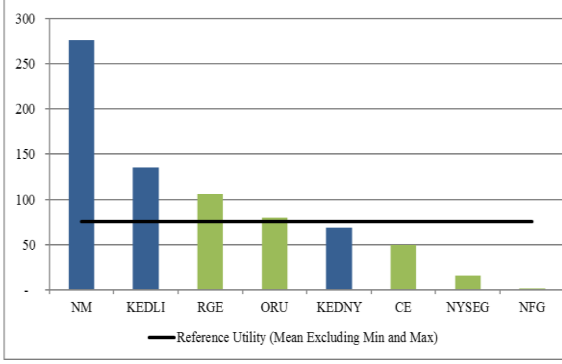
gas companies to add new customers now without requiring significant capacity additions, thus, all else equal, reducing resources needed for capital work.

NIMO sales levels are the median of the five state operations with the lowest sales. The remaining three, KEDNY, KEDLI, and CECONY have sales so much larger as to distinguish them significantly from the smaller five. ***KEDLI***, despite its compact territory, has higher than average sales levels and customer density. It requires more transmission pipe than does the Reference Utility. Its combination of service territory, customer density, and sales levels place it third highest in miles of distribution main and numbers of services. Each of these two levels significantly exceed the Reference Utility values. ***KEDNY*** sales show a large difference from those of CECONY, despite commonality between the two companies in other attributes. The cooking gas phenomenon contributes to this difference.

3. Transmission Infrastructure

The accompanying chart compares miles of transmission main. Transmission in the gas business more generally falls to pipeline rather than distribution companies. Most gas utilities, however, have some facilities classified as transmission under certain technical and operating characteristics of the facility (typically around 200 psi when measured by operating pressure). Transmission facilities in a distribution utility moves large volumes of gas over relatively longer distances within service territory locations where pipeline companies do not have facilities.

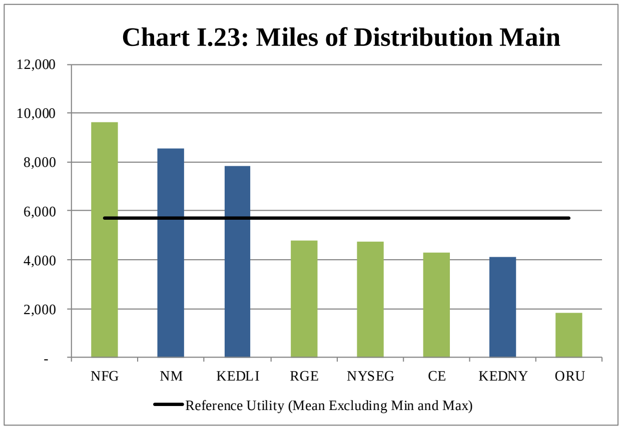
Chart I.22: Miles of Transmission Main

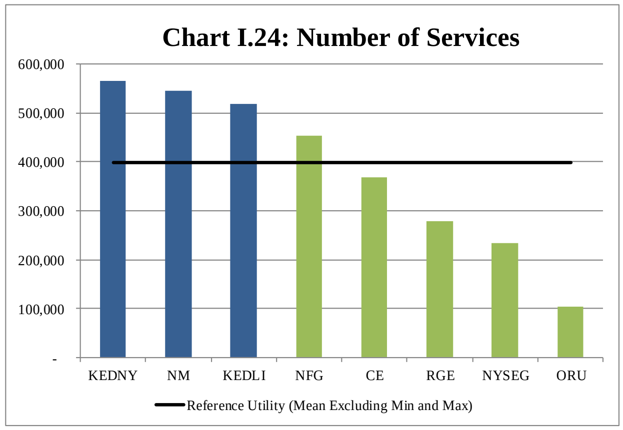


NIMO has a comparatively very high amount of transmission facilities. NIMO has the most transmission main, at about 275 miles, due to its large service territory, relative lack of transmission company backbone pipelines, and a number of concentrated population centers in the small cities. ***KEDLI***, despite its compact territory, has a comparatively high number of transmission miles. Its higher than average sales level and customer density necessitate more transmission pipe than the Reference Utility value reflects. ***KEDNY***'s very high sales volume and its key location relative to Con Edison and KEDLI have led to more transmission main (more than 50 miles) than one might expect for a compact utility.

4. Mains and Services

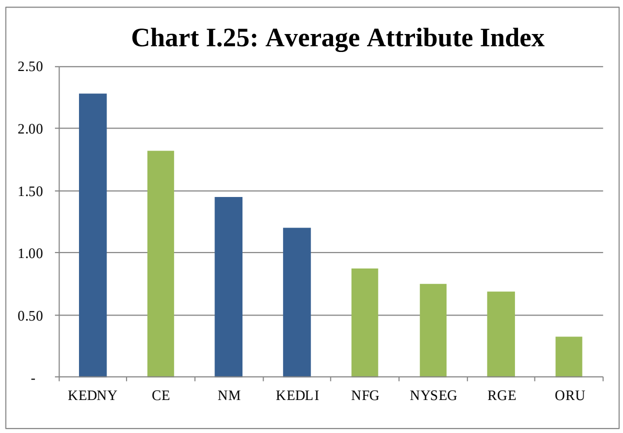
We next compare the National Grid operations in terms of numbers of distribution main miles and of services to customers. The next two charts show the results.





NIMO, as expected, has distribution main miles and number of customer services near the upper end of the state range. Particularly in the rural and suburban area, the ratio of services to customers approaches 1:1. ***KEDLI***'s combination of service territory, customer density, and sales levels place it third highest with respect to miles of distribution main and numbers of services. Each of these two levels significantly exceed the Reference Utility value. ***KEDNY*** has roughly twice the customer numbers, when compared with NIMO and KEDLI, but the numbers of services among the three are similar, for reasons we explain below. KEDNY has a much smaller comparative number of miles of distribution main, driven predominantly by its very high customer density.

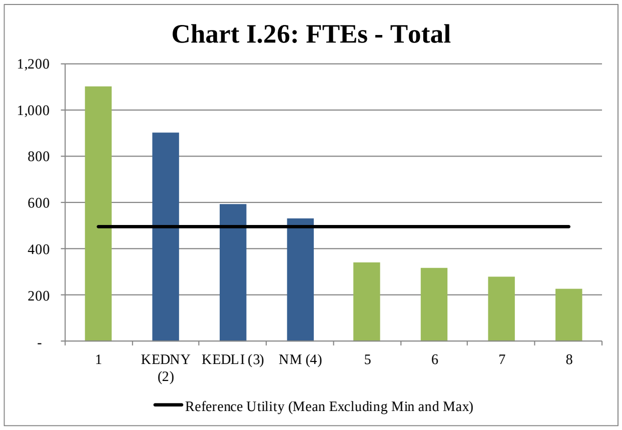
5. Averaging the Attributes

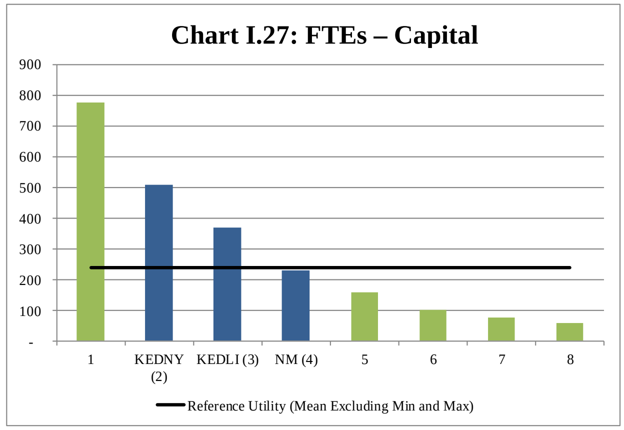


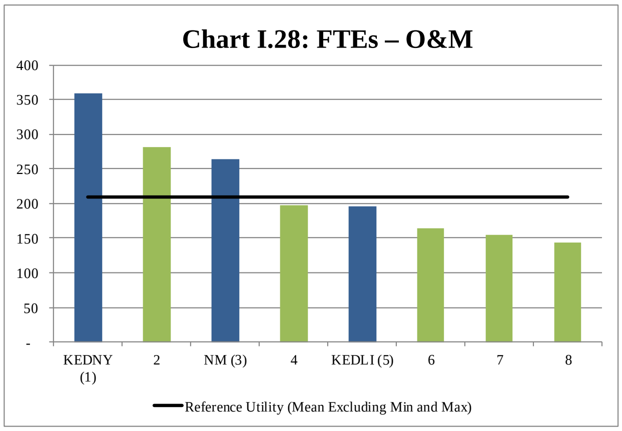
The chart to the right (Attributes Indexed to Reference Utility) depicts the attributes discussed above into an average, similar to what we showed for the state's electric operations. This index offers a broadly structured measure of comparable size. ***NIMO*** places toward the higher end, behind the two metropolitan New York Companies. ***KEDLI*** places fourth, approximately in the middle of the pack, or about where expected. ***KEDNY*** remains first by a large margin, driven by its largest number of customers, highest customer density, and second highest level of sales.

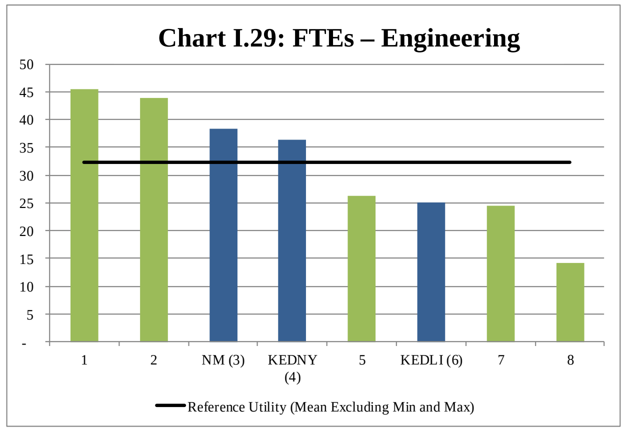
E. Gas FTEs

This section compares the 2013 gas FTEs of NIMO, KEDLI, and KEDNY with those of the other New York gas operations we studied. The next four charts show total FTEs and breakdowns for capital, O&M, and engineering for the three National Grid gas operations. Recall that, lacking reliable 2012-13 data for the Grid companies, we applied, where necessary, 2011 values for those next two years.









NIMO fell at the Reference Utility value, which was low compared to its miles of infrastructure, but commensurate with its all-attributes ranking. NIMO's number of O&M FTEs exceeded the Reference Utility value, but were commensurate with its comparatively high levels of infrastructure. NIMO's 2013 capital FTE fell slightly under the Reference Utility value, reflecting its steady state pipe replacement program. We did not find anything remarkable when viewing NIMO's FTEs in this context. ***KEDLI*** had the third highest number of total 2013 FTEs, which exceeded the Reference Utility value by about 20 percent. KEDLI fell close to the Reference Utility value in the all-attributes measurement. KEDLI's total 2013 FTEs were, however, comparable to its infrastructure size. ***KEDNY*** placed second, driven by the Capital and O&M FTEs described below.

As measured by the size attributes addressed earlier, the National Grid companies occupied three of the top four spots in the state, generally with a KEDNY-NIMO-KEDLI ordering. The FTE charts show a reasonably conforming pattern.

Chapter II: Data and Analysis

Transition to a new SAP financial system in November 2012 left all the National Grid companies unable to capture and record 2012 and 2013 functional cost and person-hour data accurately, and at the level needed for this study. That loss has had significant consequences for the ability of NIMO, KEDLI, and KEDNY to analyze a wide range of data that would have been useful for planning their staffing resources. Later chapters of this report discuss them. KEDLI and KEDNY planned extremely large increases in resources across the forecasted portion of our study period (2015 through 2019). Very recent (following the completion of our field work) commitments to pipe replacement drove much of the forecasted resource increases. As we will discuss, work planned for the coming years should be accompanied by an understanding of production and productivity expectations. In many important respects addressed in later chapters, the three gas operations remained hampered by the loss of historical data and pending (at the time of our field work), efforts yet uncompleted to restore key analytical capabilities

This chapter provides our analysis of historic staffing measures. The most recent full historical year at the time of our field work was 2013. We conducted that work in mid-2014. Working mid-year required us to combine actual year-to-date data with budget or forecast to-go information for all companies. Those difficulties eventually led us to determine that we could not find a way to report 2014 data meaningfully. We encountered an additional problem with National Grid data. The transition to SAP left data for 2012 and 2013 inaccurate and uncorrectable, despite attempts between Liberty and management to find a solution. We therefore performed comparisons (in the case of National Grid) by comparing its 2011 data with 2013 information for the remainder of the state's utilities. National Grid's model results (presented below) used a three-year average of 2009 to 2011 data, while results for the others used actual data for 2009 through 2013.

Despite concern about the mismatch in years, this approach proved preferable in that it provided a more recent comparative benchmark. The comparisons made on this basis also serve to heighten the significance of the kinds of data gaps that preclude the National Grid companies from taking full advantage of the kinds of historical performance information that should support expectations about future production and productivity levels and that should underlie plans for what we will later describe as extremely large expansions in gas staffing resources.

A. Resource Planning/Total Staff Assessment

1. *Total Staff Assessment – Electric*

This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for electric distribution and transmission and substation functions at NIMO.

a. Electric Distribution Staffing Trends

The next chart shows historical and forecasted staffing resources for electric distribution functions for the period 2009-2019, broken down by resource type - - internal staff straight time, internal staff overtime, and contractors. A following chart breaks down the same data by type of workload - - O&M, capital, and engineering work. We depict staffing resources and workload in terms of Full Time Equivalents (FTEs). An FTE equates to the amount of work provided by one employee for a year, a common way of depicting staffing/workload levels for different types of staffing resources.

Figure II.1: Niagara Mohawk Electric Distribution FTEs by Resource Type

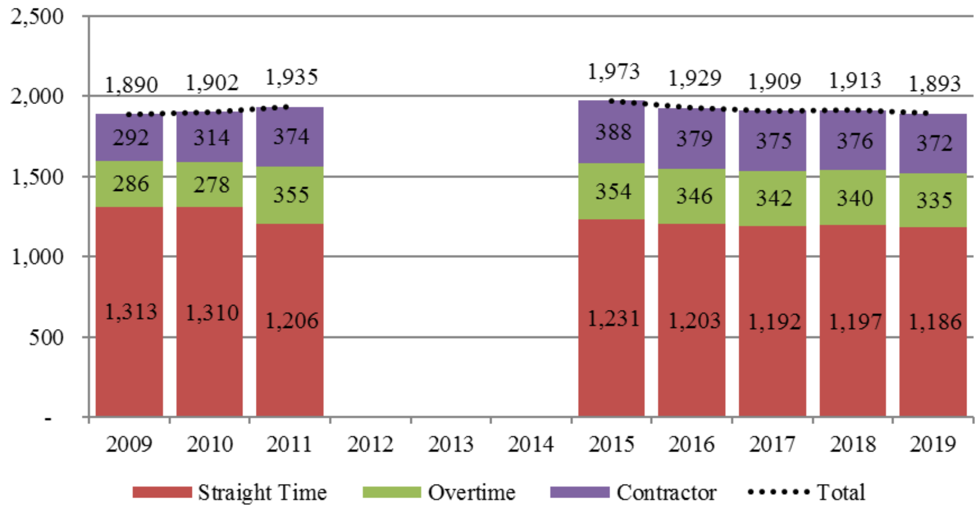
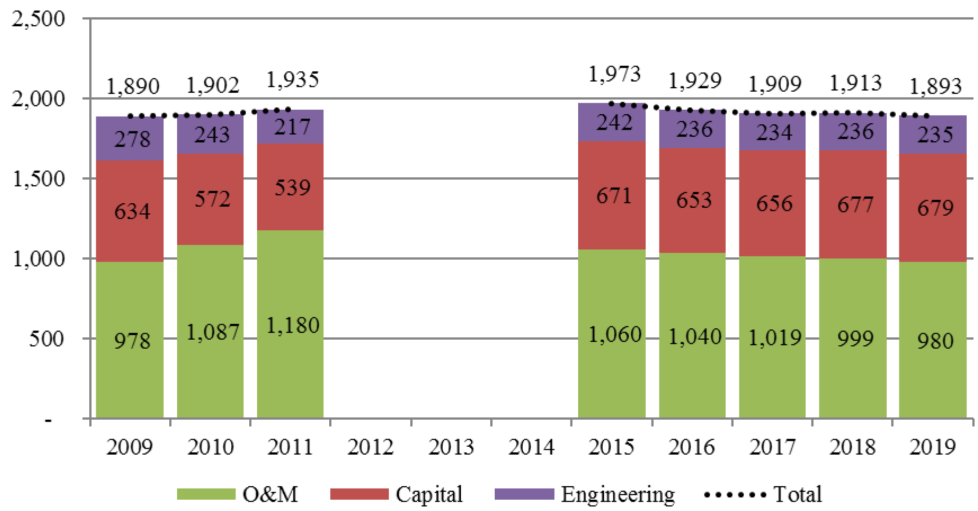


Figure II.2: Niagara Mohawk Electric Distribution FTEs by Work Type



The charts here (and similar ones throughout the remainder of this report) leave years 2012 through 2014 blank. The reason for excluding 2012 and 2013 entries is the unreliability of National Grid data for these two years. We did not include data for any of the companies (including NIMO) for 2014, because of the data incompatibility issues discussed above. The preceding two charts show total staffing resources for 2009 through 2011 and for 2015 through 2019, as forecasted by company management.

Total FTE staffing throughout the 10-year study showed great stability. Total FTEs varied only two percent historically (from 1,890 to 1,935). The variation during the forecast period changed only by four percent, and in the other direction (from 1,973 down to 1,893). Straight time FTEs decreased by 107 between 2009 and 2011. A 28 percent increase in contractor FTEs (just over 80 FTEs) and a 24 percent increase in overtime (about 70 FTEs) made up the difference from the combination of reductions in straight time FTEs and the modest 2 percent growth in overall workload.

An early 2011 rate order imputed savings from synergies arising from the KeySpan/Narragansett merger, from a voluntary early retirement program, and from a distribution operations improvement program. The decline in FTEs performing electric distribution work began at roughly the same time as the cost reductions underpinning the 2011 rate order.

With overall work remaining relatively constant, these changes may be best described as a “rebalancing of resources.” Management forecasted capital workload to increase by approximately 120 FTE from historical periods, while forecasting O&M workload to decrease by approximately the same amount. The result was fewer remaining employees required to work higher sustained levels of overtime and a contractor work force increasing significantly - - largely to address the forecast increase in capital work during the 2015-2019 timeframe.

Table II.3: Electric Distribution Resource Mix

Actual Resource Mix - Historical Period		
Source	**NM**	**RU**
Straight Time	62%	67%
Overtime	18%	13%
Contractor	19%	20%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**NM**	**RU**
Straight Time	63%	65%
Overtime	18%	10%
Contractor	20%	25%
Total	100%	100%

Management forecasted the increased use of contractors to continue through the end of our study period. Between 2015 and 2019, straight time projections showed a decrease by another 20 FTEs, while contractor FTEs remained in the same range as 2011 levels. The accompanying table’s comparison of NIMO’s resource mix to the Reference Utility value makes the continued use of its historical ratio apparent.

NIMO’s percentages (taken from 2011 actual data) for internal resources (straight time 62 percent, overtime 18 percent) exactly matched the Reference Utility values - - both at a total of 80 percent. By 2019, NIMO’s percentage of internal versus contractor resources remained the same (80 percent internal, 20 percent contractor), while the Reference Utility percentage changed to 75 percent internal/25 percent contractor. Thus, while others in the state forecast higher use of contractor resources by 2019, NIMO expected this percentage to remain the same.

NIMO made significantly greater use of overtime, as compared to the Reference Utility value. NIMO’s historical 18 percent overtime rate (shown as continuing according to management’s projections) well exceeded the Reference Utility values for the historical period (13 percent) and for 2019 (10 percent). These significantly higher levels of past and projected overtime percentages relative to Reference Utility percentages for electric distribution work create an area of concern about the sustainability of this approach over the long term - - especially should major storms require additional overtime from this already high base.

b. Reliability Performance

We examined changes in reliability through 2014 (the year covered by the most recent reliability reports available from the Commission). We did so to determine whether any apparent correlations between reliability metrics and staffing might appear.

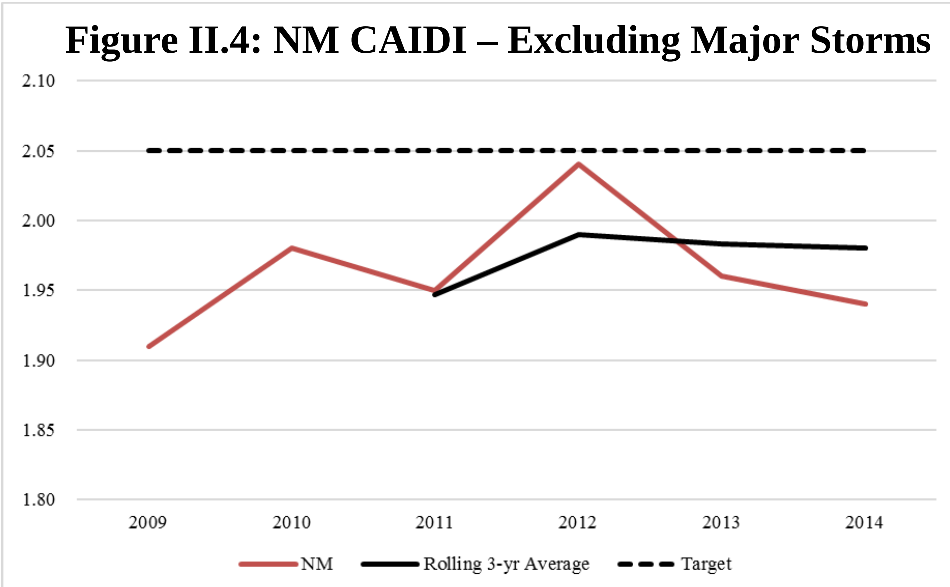
In addressing the reliability of electric service, we looked at two measures for which the Commission has adopted standards and for which it requires reports. The electric industry commonly uses both as measures of service reliability. The first of those measures, SAIFI (System Average Interruption Frequency Index), consists of the average number (frequency) of customer interruptions that a customer could expect to experience. We chose not to use this measure, even though it does have, in our view, some connection to staffing. Applying resources to inspect, maintain, and operate electricity delivery infrastructure clearly has a bearing on the frequency with which outages occur. The difficulty in using SAIFI for our purposes lies in the time lag involved; *i.e.*, the fact that systems decline over time when a company underperforms such activities.

With consequences of staffing curtailment in these areas delayed by some and perhaps many years, it becomes impossible to connect staffing changes over fairly short durations with outages. For example, following a period of short staffing, a utility may engage in a "catch-up" program designed to restore infrastructure to desired conditions. As that work proceeds, outages owing to work not performed years ago and still not "caught up" in a cycle of heightened activity may occur. While tempting, it could well be wrong to assign causation to current staffing levels. In addition, the scope of our study excluded vegetation management (*e.g.*, tree trimming) by design. The failure to provide proactive, comprehensive, and diligently executed vegetation management can also affect customer outages, particularly their frequency. An inability to consider this factor further diminishes the already tenuous value of using SAIFI to gauge staffing in the areas our study was charged with examining.

We found the second measure, CAIDI (Customer Average Interruption Duration Index), more pertinent to our purposes. The industry uses CAIDI commonly as a measure of reliability. It sums all the durations of all customer outages (usually across a period of a year), and divides that sum by the number of customer interruptions experienced. Utilities perform restoration work largely internally (often supplemented substantially in cases of widespread, severe outages by crews from outside those normally available to the utility) when it is of manageable scope. Measures of CAIDI generally exclude extreme events. Thus, longer outage durations do give reason to question the numbers of internal staff.

Vegetation management (outside the scope of our study) also can affect CAIDI (*e.g.*, spotty vegetation management can produce overgrown trees that take more time to clear as required to provide crews with the access needed to repair and replace the equipment needed to restore service). However, the exclusion of extreme events mitigates this effect. Moreover, the effect of vegetation management on CAIDI is less substantial than its effects on SAIFI after exclusion of such events.

We therefore focused our review of reliability on CAIDI. The next figure shows NIMO's CAIDI performance for 2010-2014, excluding major storms.



CAIDI performance deteriorated coincidentally with NIMO's reduction in straight time FTEs from 1,313 FTE to 1,209. Durations rose from 1.95 to 2.04 in one year. Each of the next two years showed improvement, but 2014, durations still exceeded those attained in the first year of our study period.

c. Electric Transmission and Substation Staffing Trends

The next chart shows historical and forecasted staffing resources for electric transmission and substation functions for the period 2009-2019, broken down by resource type (internal staff straight time, internal staff overtime, and contractors). The ensuing chart breaks down the same data by type of workload – O&M work, capital work, and engineering work.

Figure II.5: Niagara Mohawk Transmission & Substation FTEs by Resource Type

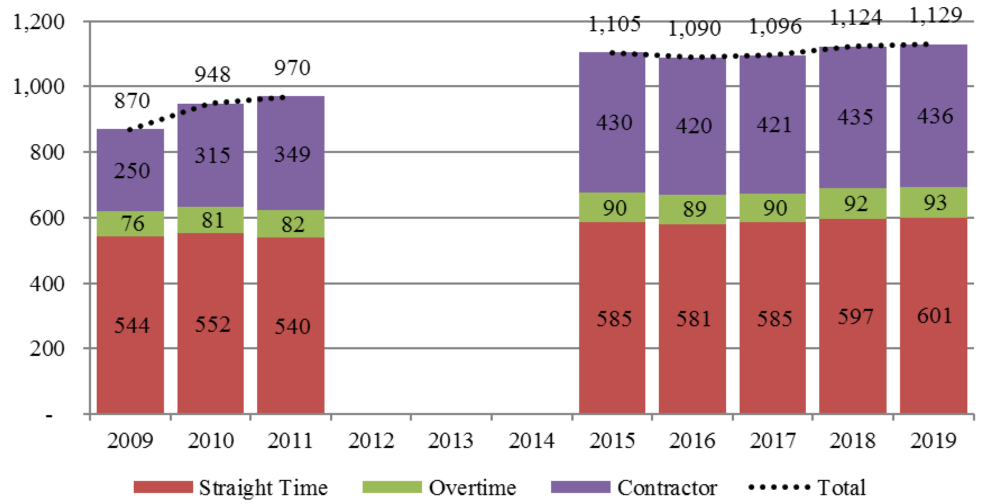
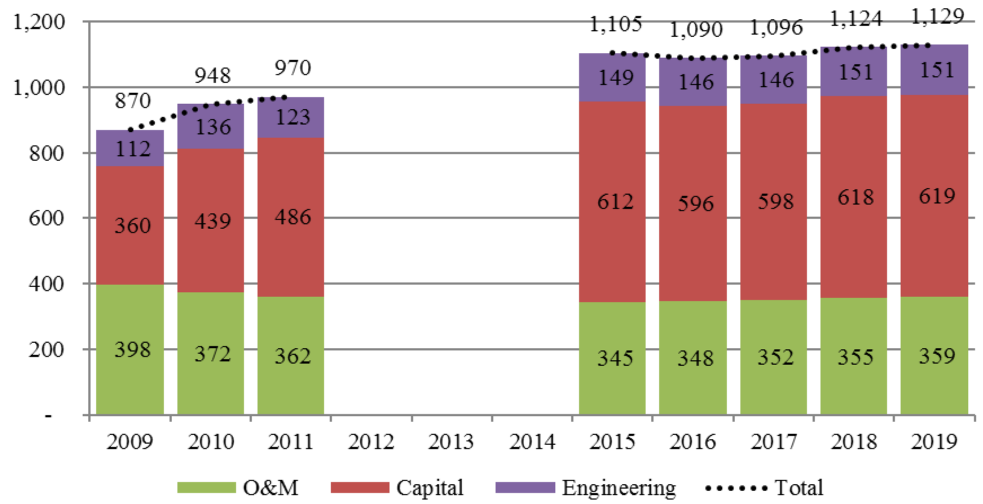


Figure II.6: Niagara Mohawk Transmission & Substation FTEs by Work Type



Again, we used 2011 values for 2012 and 2013 FTEs because of the data problems associated with the transition to SAP. The pattern for transmission and substation FTEs differed from what we observed for distribution. Historical actual total FTE levels for T&S work increased significantly, by 12 percent. Forecasts showed a continuing increase into the future, reaching levels sustained between 1,105 and 1,129. These levels represented an increase in the range of 13 percent above those of 2011. Straight time employees and overtime remained stable in the historical period. NIMO met increased T&S workload by adding approximately 100 contractor FTEs and through a small increase in overtime. With decreased FTEs applied to O&M workload (by approximately 10 percent), essentially all increased contractor and overtime resources went to capital work.

For the 2015-2019 years, management forecasted a workload increase amounting to 130-150 additional FTEs. At the time of our field work, NIMO forecasted 45-60 additional straight time FTEs, approximately 10 overtime FTEs, and 80-85 contractor FTEs. This approach reflected an anticipation of a significant increase in capital work. Management forecasted no increase in O&M FTEs, anticipating a continuation of the lower levels experienced during the historical years.

Table II.7: Electric T&S Resource Mix

Actual Resource Mix - Historical Period		
Source	**NM**	**RU**
Straight Time	56%	56%
Overtime	8%	8%
Contractor	36%	36%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**NM**	**RU**
Straight Time	53%	53%
Overtime	8%	7%
Contractor	39%	40%
Total	100%	100%

The accompanying table compares NIMO's transmission and substation resource mix to that of the Reference Utility. NIMO's historical mix corresponded precisely to that of the Reference Utility. That match continued, according to the forecasts provided during study field work. Rather than continuing the same resource balance as was done in distribution work, NIMO forecasted the addition of contractors to meet the majority of capital workload increases.

d. Electric Staffing Levels

This section examines how NIMO's FTE staffing levels compare to other state utilities. Our comparisons used two approaches: ratios of staff versus key system attributes and three-year average FTE levels (2009 through 2011) compared to estimates from Liberty's staffing model.

The next table compares NIMO's 2011 FTE levels with those of the other electric operations we studied. The comparisons shown in the chart use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility value divided by the "all attributes" index from the "Hard Drivers" subsections earlier in this report. This measure roughly indicates the overall total FTEs as a function of the size of a utility. If the number of FTEs for each utility were proportional to its size, and no other factors were considered, this index's value would be 1.0 for every utility. A higher index value suggests FTEs higher than expected based on size alone.

Table II.8: Total Electric Staffing Ratios

Parameter	NM	All NY Utilities Low	RU (Median)	High
Distribution FTEs				
Per Customer	1.13	0.66	1.00	1.40
Per OH Line Mile	0.46	0.46	1.00	6.46
Per Unit Sales	1.43	0.47	1.00	1.43
T&S FTEs				
Per OH Line Mile	0.52	0.24	1.00	13.49
Per Substation	0.28	0.28	1.00	4.22
Total				
Per Customer	1.10	0.72	1.00	1.27
Per Unit Sales	1.43	0.59	1.00	1.43
Per Average of All Attributes	1.13	0.67	0.97	1.16

NIMO's FTEs per customer and per unit of sales both exceeded the Reference Utility values. However, NIMO's 0.46 FTEs per overhead line mile reflected the lowest value of all the operations we studied, indicating very low staffing as a function of overhead infrastructure amounts. This mix of values for these measures was consistent with the larger service territory and hybrid urban/rural nature of the NIMO distribution system. NIMO's FTEs for transmission and substation work also fell far below Reference Utility value, again representing the lowest value among the operations we examined. The Reference Utility had a value three times higher.

Identifying variances like these provides one basis we used to raise questions about staffing. NIMO's position under the infrastructure-based metrics does give pause. Clearly, NIMO's comparatively very low customer density (about one-third that of the Reference Utility) raises staffing issues. NIMO's staffing per customer lay among the highest in the state. Nevertheless, staffing per unit of infrastructure placed it lowest in the state.

Next we examine how NIMO's average staffing levels for the historical portion of our study period compared to staffing levels estimates from the model we developed. We developed the model using the data provided by all the utilities we studied. The model correlates actual staffing levels (the dependent variable) with key infrastructure attributes (the independent variables). This model produces staffing level estimates, broken down by capital, O&M, and engineering for each utility. The estimates consider how the utility's unique combination of attributes vary with staffing levels, compared to how the other state utilities staffing levels vary for the same combination of attributes. The model provides a more sophisticated way to consider each utility's staffing levels, normalized for each utility's unique mix of infrastructure. The model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Those variances provide one of the bases used to question issues and perform analyses of staffing.

The next tables show three-year average actual FTEs versus model results for distribution and for transmission and substation activities. The tables break the results down by capital, O&M, and engineering functions. Note the two instances (Substation Capital and Transmission Capital) where we show "No Model." In these cases, we report only NIMO's actual values. Observing a very high level of volatility in all companies' year-to-year expenditures for transmission and substation capital functions, we determined that we could not construct a statistically valid model, for such work, given that we had only five years of data (three from National Grid) to use.

Table II.9: NM Electric Distribution Five-Year Average FTES (2009-2013)

Distribution			Transmission & Substation				
Type	Actual	Estimate	Type	Function	Actual	Estimate	Note
Capital	582	586	Capital	Transmission	273	273	No model
				Substation	156	156	No model
O&M	1,082	1,133	O&M	Transmission	64	73	-
				Substation	313	365	-
Engineering	246	240	Engineering	T&S	124	160	-
Total FTEs	1,909	1,959	Total FTEs	T&S	929	1,026	-

For electric distribution functions, results of modeling showed a remarkable level of consistency between NIMO's actual numbers and the model's results:

- For capital work, three-year average staffing levels fell within one percent of model estimates.
- For O&M work, three-year average staffing levels fell within five percent of model estimates.
- For engineering work, three-year average staffing levels fell within two percent of model estimates.

Electric distribution average staffing levels fit reasonably well with the model estimates for these functions. The model results placed three-year average staffing levels for these functions within the range of expected staffing levels for NIMO's facilities, compared to other state utilities, somewhat countering an observation that low levels of FTEs per overhead line miles could be of concern. With values somewhat lower than the model however, the plan to continue decreasing O&M FTEs remains a matter of concern.

For transmission and substation activities, we could only develop models for substation O&M, transmission O&M, and T&S engineering. Under the model, NIMO's three-year average FTEs were low:

- For substation O&M work, three-year average staffing levels fell 14 percent below model estimates.
- For transmission O&M work, three -year average staffing levels fell 14 percent below model estimates.
- For T&S engineering work, three -year average staffing levels fell 29 percent below model estimates.

NIMO's divergence was consistent with the simple ratio analysis (FTE per substation and FTE per mile of OH line) shown above, but NIMO's results did not diverge as widely as did the simple ratios compared to the Reference Utility. This confirms the earlier observation that NIMO's infrastructure serves a very large, low load density area, and reinforces our concern about adequate staffing levels to maintain and design T&S infrastructure.

2. Productivity – Electric

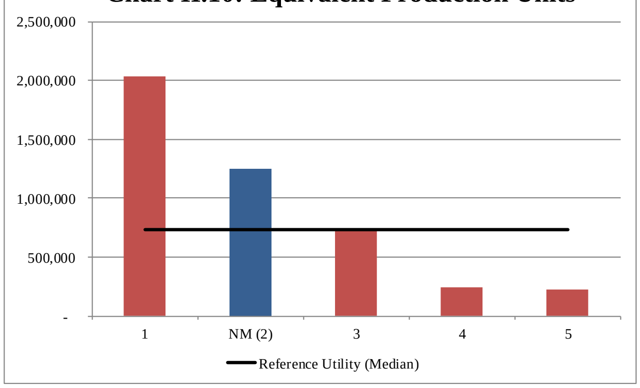
We addressed productivity from several perspectives. We undertook comparisons of the operations we studied as a function of staffing per unit of a variety of commodities or attributes. We also developed a concept we termed New York normalized unit rates (NYNURs or 9ers). The Productivity chapter of the Statewide report describes this concept. Our 9ers present a common measure of production (equivalent production units, or EPUs) that facilitates comparisons across commodities and organizations. The number of hours, or FTEs, or dollars expended per EPU provides an indicator of productivity.

In developing the 9ers concept we learned that the utility data available was not sufficiently comprehensive to allow us to apply it to all the hours spent on the work activities within the scope of our study. We did, however, find sufficient data to develop usable measures for about half of the hours each utility expended. The partial nature of the results dictates caution in carrying any performance conclusions too far. Nevertheless, we believe the concept has value as another indicator which, when supported by others, can be informative.

a. Equivalent Production Units

An EPU equals the number of hours the Reference Utility expended to produce one unit of a given commodity. Stated in another way, the EPU quantifies the Reference Utility actual unit rate value for that commodity. For example, if the Reference Utility unit rate for "widgets" equals 10 hours per widget, then installation of one widget earns a utility 10 hours. Examining production this way creates a common denominator for production, allowing us to add EPUs together at any level of detail or for any organizational breakdown.

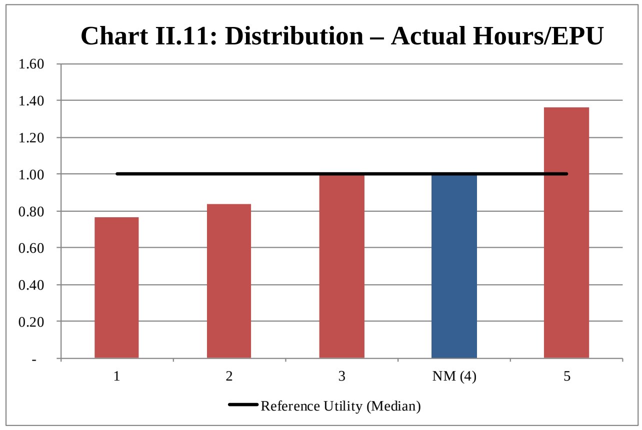
Chart II.10: Equivalent Production Units



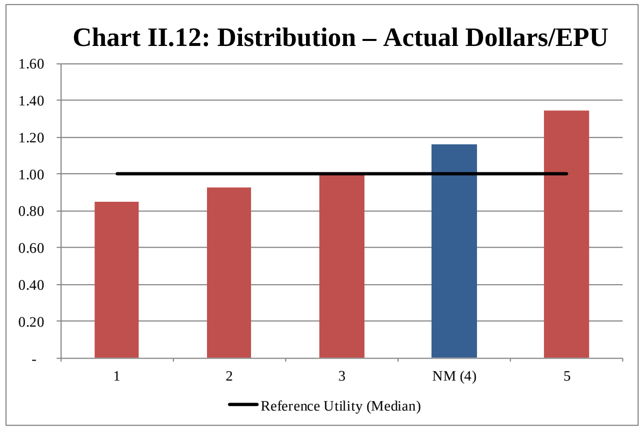
For the limited scope covered by our analysis, NIMO earned the second largest production value of the electric utilities. The absolute number of EPUs measures unit output, but means little on its own. It derives usefulness when constructed to represent a comparable production level among companies. The ability to measure the number of employees per EPU at a total company level may be the ultimate, but not perfect, measure of productivity.

b. Productivity

We use the term physical productivity here to mean the actual hours per EPU. The next chart illustrates the hours each utility spent in the limited scope areas per EPU. Note that the Reference Utility value is 1.0 here by definition, because we defined an EPU as the Reference Utility's actual unit rate. NIMO essentially matched the productivity of the Reference Utility value for these functions. Given the wide disparity in characteristics among the utilities, the distribution around the Reference Utility proved surprisingly small.



We define cost productivity as the dollars of labor cost expended to achieve an EPU. We normalized this data to the Reference Utility value, whose cost productivity was $81.13 per EPU. NIMO's composite hourly labor rate,[1] was the highest among electric utilities, reducing its relative competitive position, but it still fell within a reasonable range of the Reference Utility value.



On balance, we found no indicators of concern for NIMO.

3. Total Staff Assessment – NIMO Gas

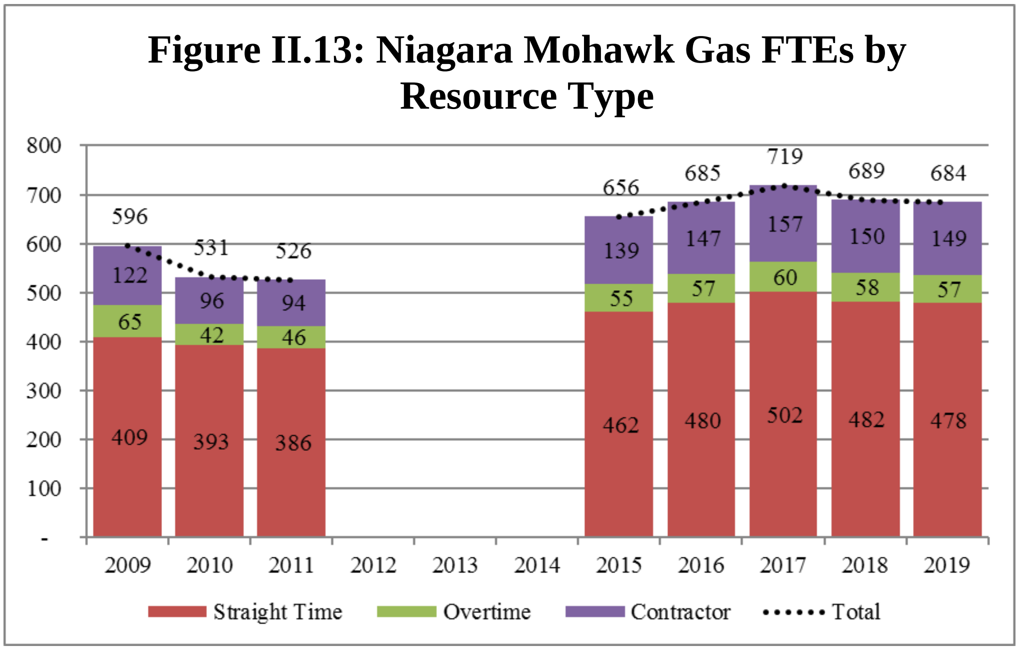
This section provides an overview of historical (2009-2013) and forecast (2015-2019) staffing resources for gas functions at NIMO.

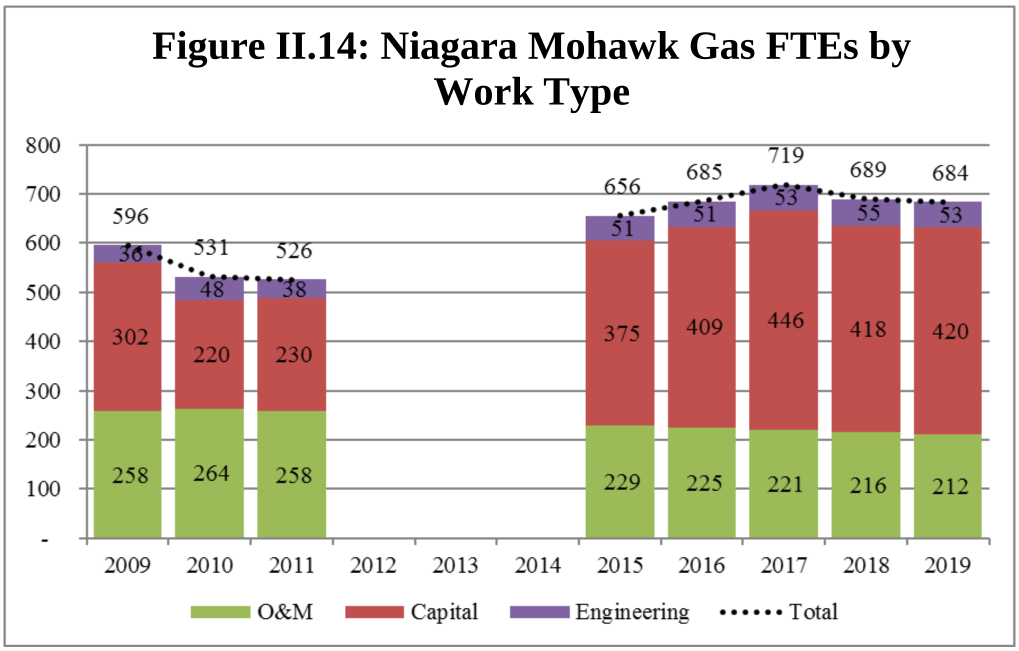
a. Gas Staffing Trends

The next chart shows the 2009 through 2019 historical and forecasted gas staffing resources by resource type (internal staff straight time, internal staff overtime, and contractors). As was true for all the state's utilities, we were not able to secure consistently derived data for 2014, which was in progress during our field work.

The charts show the total staffing resources for 2009-2011 and for the 2015-2019 forecast period. We applied NIMO's 2011 values to 2012 and 2013, due to the data problems associated with the transition to SAP.

[1] The composite hourly labor rate includes all internal straight time, overtime, payroll loadings, and all contractor hourly rates, weighted by hours.





Between 2009 and 2011 total gas FTEs decreased by 70, a drop of 12 percent. Capital work witnessed the entire decrease. All three staffing resource types contributed to the reduction. Straight time decreased by 23 FTEs, overtime by 19, and contractors by 28.

Management's forecasts showed dramatic increases beginning in 2015 for capital and engineering activities. Accelerated pipeline replacement was the primary driver. At the same time, forecasts of O&M FTEs showed a significant decrease. The forecasts showed straight time and contractor FTEs ramping up significantly, and then remaining at levels 125-190 FTEs higher than 2013 levels. This ramp up reflected a 24 to 36 percent increase above 2013 levels. It clearly will take significantly increased staffing resources to achieve accelerated pipeline replacement. What is less clear is the rationale behind the belief that O&M work will simultaneously decrease by more than 10 percent, absent more current information about O&M workload demands. Should additional O&M work await, it will likely have a strong impact on overtime requirements, as the most likely short term resource available to meet added work requirements.

Table II.15: Gas Resource Mix

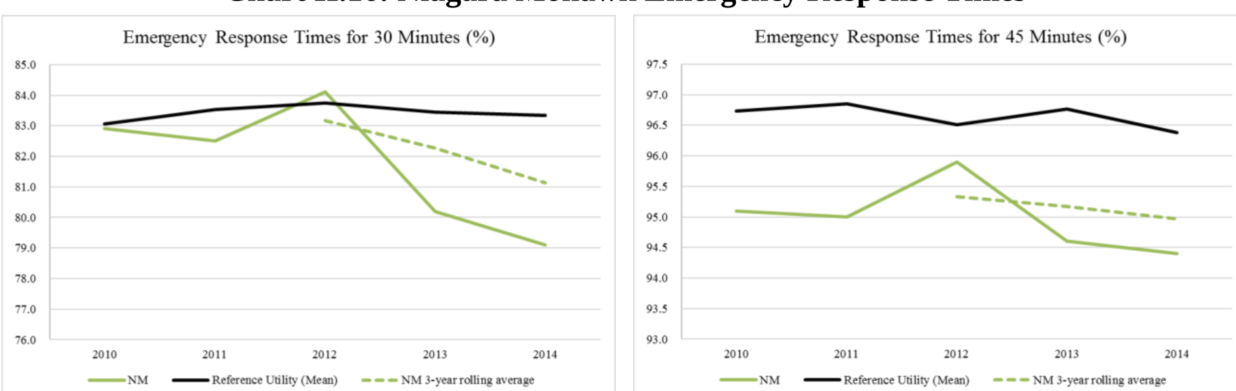
Source	NM	RU
Straight Time	73%	62%
Overtime	9%	8%
Contractor	18%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**NM**	**RU**
Straight Time	70%	59%
Overtime	8%	8%
Contractor	22%	33%
Total	100%	100%

The accompanying table compares NIMO's overall resource mix (percentage of straight time, overtime, and contractors) to that of the Reference Utility. The table shows essentially the same overtime levels for NIMO and the Reference Utility, both historically and as forecasted. Significant variances, however, existed in the split between straight-time internal and contractor resources. The variance was significant historically, and grew, based on the forecasts that management provided. Reliance on contractors is the dominant method for meeting increased pipe replacement requirements in the industry generally, and among the New York gas operations we studied. NIMO, however, projected making only two thirds the use of contractors despite its ramp up in replacement work.

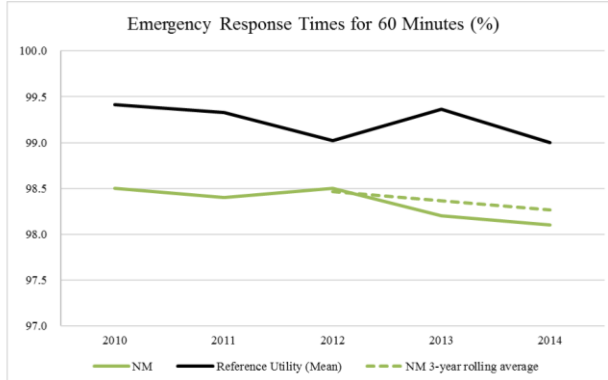
b. <u>Performance Metrics</u>

We examined historical changes in gas performance metrics as reported to the Commission. The next charts summarize the results. We considered leak-response times and backlogs of leaks as defined in 16 NYCRR Part 255; *i.e.*, Types 1, 2A, and 2).

Chart II.16: Niagara Mohawk Emergency Response Times



Measured against all three established time windows, NIMO experienced declining performance during the historical portion of our study period. Although the 30-minute data is notable, the 45 and 60 minute declines were, at worst, minimal. Nevertheless, all three metrics fell below those of the Reference Utility. Certainly, NIMO's territorial dispersion makes response times more difficult to minimize. Observing a decline in staffing coincident with declining performance raised a concern. The data showed declining staffing from 2011 to 2015, but data about the intervening years was lacking. The inability to secure reliable O&M resource data for 2012 and 2013 made it impracticable to determine the existence of a possible association exists between declining performance and O&M staffing, Nevertheless, the matter deserves management attention.



NIMO did experience through the historical portion of our study period a comparably low number of backlogged leaks (shown in the following two charts). However, that number grew steadily during that period, although remaining comparably low. Nevertheless, this increase brings further attention to the question of internal resources performing gas O&M activities. Forecasts of future declines gave questions about O&M staffing a higher level of concern.

Chart II.17: Backlog of Potentially Hazardous Leaks: 2014

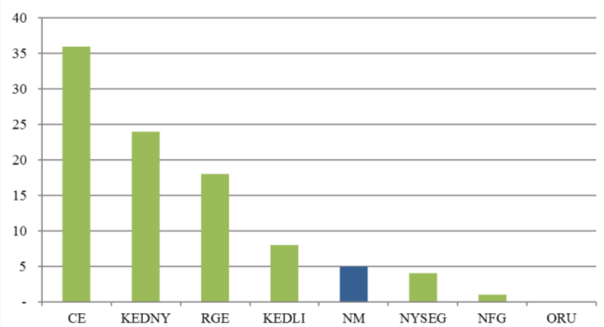
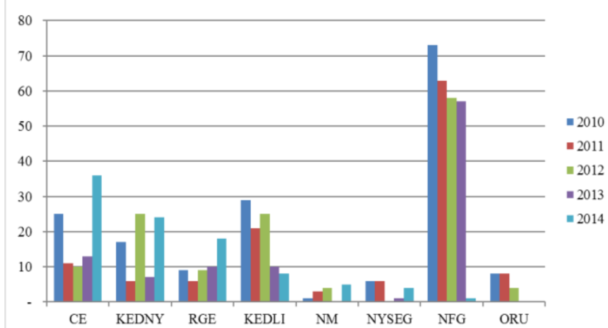


Chart II.18: Backlog of Potentially Hazardous Leaks: 2010-2014



c. <u>Gas Staffing Levels</u>

The next table compares NIMO's 2011 FTE levels with those of the other gas operations we studied. As we did for electric FTE levels, the comparisons use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index from the "Hard Drivers" subsections earlier in this report. This measure roughly indicates the overall total FTEs as a function of company size. A higher index suggests that FTEs are higher than expected based on size alone.

First, we compare how NIMO's 2011 FTE levels compare to other state utilities in the study on a simple ratio basis for certain key system attributes.

Table II.19: Gas Staffing Ratios

Parameter	NM	All NY Utilitites Low	RU (Median)	High
Gas FTEs				
Per Customer	0.95	0.70	1.00	2.32
Per Mile of Main	0.85	0.49	1.00	3.60
Per Unit Sales	1.44	0.60	1.00	1.82
Per Average of All Attributes	0.90	0.80	0.96	1.49

Like NIMO's electric distribution ratios, the Company had higher gas FTEs per unit of sales when compared with the Reference Utility. However, NIMO's FTEs per customer of 0.95 and the FTE per mile of main of 0.85 indicated a comparatively lower level of gas staffing on an infrastructure and a per customer basis, compared to other state utilities.

Next, we examine how NIMO's three-year historical staffing levels compared to staffing levels estimated from our model. As observed earlier, the model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure.

The accompanying table compares NIMO gas FTEs with model results for gas capital, O&M, and engineering work activities. The results show strong consistency between NIMO's actual numbers and the model's results. The model generated staffing levels within one and two percent of actual NIMO levels for all key functions:

Table II.20: NM Gas Three-Year Average FTEs (2009-2011)

Gas		
Type	Actual	Estimate
Capital	251	256
O&M	260	264
Engineering	41	40
Total FTEs	552	560

- For capital work, three-year average staffing levels fell less two percent from model estimates.
- For O&M work, three-year average staffing levels were within two percent of model estimates.
- For engineering work, three-year average staffing levels were three percent higher than model estimates.

Average staffing levels fell well inside the range of accuracy for model estimates for these functions. Based upon model results, NIMO's average staffing levels for these functions were within the range of expected staffing levels for NIMO's facilities, compared to other state utilities. However, deterioration of performance measures continues to concern us about O&M staffing levels in the long term.

4. *Total Staff Assessment – KEDLI Gas*

This section provides an overview of historical and forecasted (2015-2019) staffing resources for gas functions at KEDLI.

a. <u>Gas Staffing Trends</u>

The next chart shows historical and forecasted staffing resources for gas functions for the period 2009-2019, broken down by resource type (internal staff straight time, internal staff overtime, and contractors). The ensuing chart breaks down the same data by type of workload (O&M work, capital work, and engineering work). We continue to depict staffing resources in terms of Full Time Equivalents (FTEs). The charts also continue to show the total staffing resources for both the 2009-2011 historical period and 2015-2019 forecast period.

Figure II.21: KEDLI Gas FTEs by Resource Type

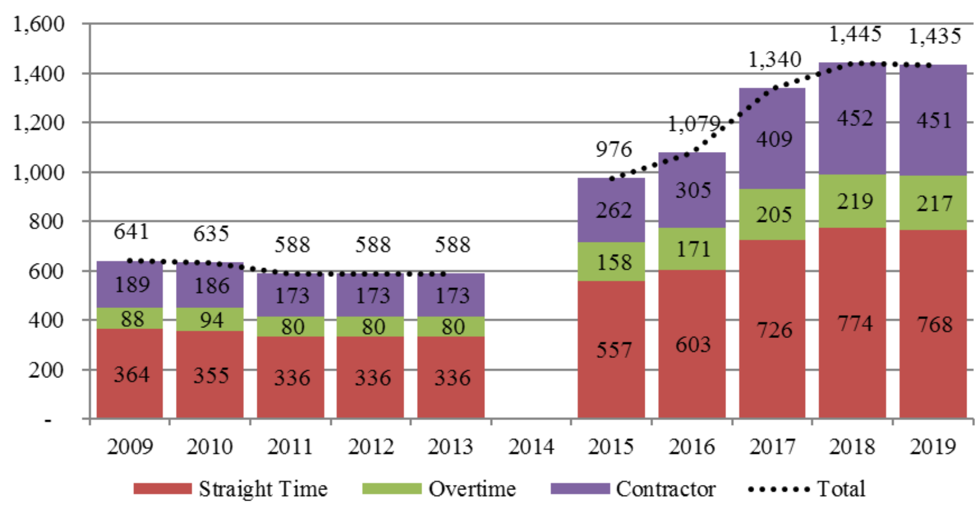
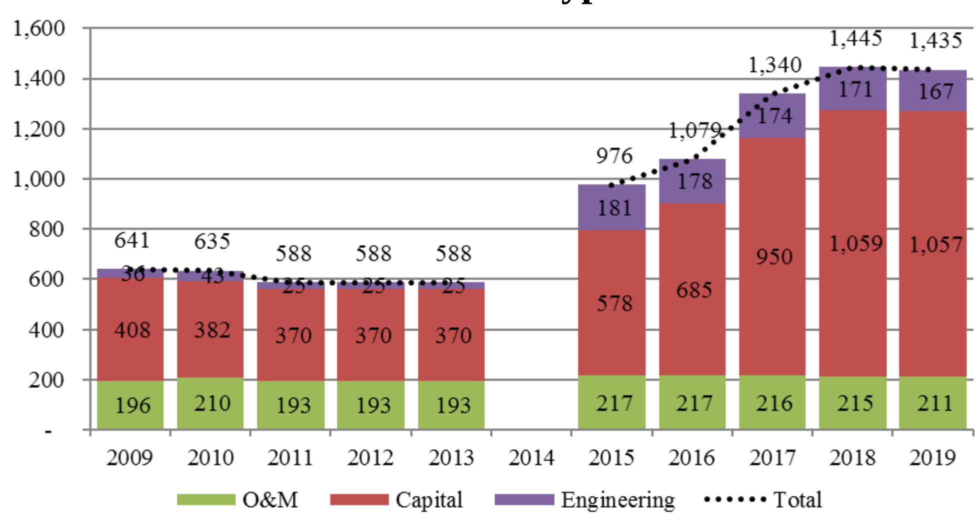


Figure II.22: KEDLI Gas FTEs by Work Type



The forecasts showed striking increases from historical levels, which reflected National Grid's pipe replacement acceleration, particularly under very recent KEDNY and KEDLI commitments. Such large accelerations by no means represent "business-as-usual" for a gas utility. Nevertheless, operators undertaking acceleration programs in many regions have failed to approach program the work with a full understanding of the need for different approaches to assure timely, economic, and effective execution. The projected KEDNY and KEDLI staff increases will essentially remake their staffing composition.

The same program complexities and magnitudes that will drive the increases shown in these charts also require improvements in governance, organization, management approach, systems, tools, data collection and reporting, performance analysis, contracting and contract management, materials management, engineering and design, field work methods, quality assurance and control, government relations (*e.g.*, for permitting processing and compliance), and customer service (*e.g.*, appointment and restoration management).

These changes apply even to an organization mature in its construction management approaches. For the National Grid companies, activities ongoing at the time of our field work (*e.g.*, in data system rebuild, analytical capability restoration, construction and contractor management development, and likely others as well) increased the challenges dramatically. Competing with organizations already having a substantial head start in organization, resources, and processes and tools, National Grid planned to increase KEDLI gas FTEs in the areas of concern to our study by more than 2.5 times before 2019. The list of needs described above will likely impose significant staffing requirements in related areas as well. When we turn to KEDNY's numbers below, we will see another 2.5 times increase.

The combined FTE increases totaled more than 2,200 FTEs. The magnitude of these increases, the public safety implications of performing the work promptly and safely, and the immense potential customer costs of doing it at less than optimum efficiency likely make the challenges unprecedented for National Grid. No greater need among those relevant to our work exists than the compelling requirement for management to approach its monumental staffing needs (as part of all the elements it will take to make its program successful and efficient) through comprehensive program planning.

We did not observe at National Grid, or at the other gas operations we studied, a recognition that the massive program that lies ahead (in terms of level of effort) should be characterized and consequently treated as a super-project; *i.e.*, one requiring world-class program management. Given the tens of billions of dollars at stake in pipe replacement in New York, the "world-class" requirement is not an exaggeration. Liberty believes, and has observed first hand[2], that the notion that a gas utility can simply take on such work as if it were business as usual is unsound. New people, systems, and processes are required to cope with a challenge that is orders of magnitude beyond "business as usual." Given that utilities will spend billions over decades, the world class people, systems and processes are both justified and affordable.

[2] Please refer to Liberty's recent audit of the accelerated main replacement program of Peoples Gas Light Company.

In performing this staffing project, we observed a fine-tuning approach (certainly not a quantum change approach) on the part of the New York utilities in confronting the main replacement challenge. This challenge is especially difficult for KEDLI and KEDNY, where the estimated labor requirements have produced forecasts of extreme growth in personnel. We did not see substantial planning on how the companies will gear up to: (a) acquire those resources, (b) provide them with the skills and tools they need, (c) manage the resources, (d) support the resources with adequate supervision and planning, and (e) support management with sophisticated systems and tools.[3] Our scope was limited to staffing, which these needs certainly implicate. More broadly, and ultimately more importantly, the challenges of meeting vital public safety objectives at total (not just staffing) costs and over a time period in a reasonable manner comprise overriding priorities for both the companies and their stakeholders.

Between 2009 and 2011 total FTEs decreased by 53, producing a drop of about 10 percent. Most of the decrease resulted from reductions in capital and engineering activities. All three staffing resource types fell - -straight time by 28 FTEs, overtime by 8, and contractors by 15. By significant contrast, management's forecasts during our field work showed a dramatic increase in capital and engineering FTEs, beginning in 2015. As was true for NIMO (and was true generally across the state for gas operations), accelerating pipeline replacement activity served as the principal driver. Management also forecasted FTEs applied to O&M work to increase by about 10 percent.

The forecasts showed straight time, overtime, and contractor FTEs ramping up significantly, and remaining at levels (400-900 FTEs) more than 100 percent above historical levels. Clearly, it will take a large increase in resources to achieve accelerated pipeline replacement targets. Nevertheless, the immense magnitude of the change calls into significant question KEDLI's ability to ramp up internal resources so much over so short a period.

Management's forecasts also showed a similarly large increase in contractor use. That increase appeared consistent with the State's and the industry's reliance on contractors to absorb a high proportion of the work that accelerated main replacement programs have caused and appear destined to cause in the coming years. Growing use of contractors reflects what we believe is a significant statewide need for caution, with gas utilities throughout the Northeast and beyond ramping up the use of contractors for accelerating their pipe replacement programs. Combining forecasts for much higher contractor use with the extreme ramp up in internal resources makes the concern about securing adequate resources an acute one for KEDLI. The need to focus on assessing markets for skilled resources and in participating in efforts to expand those resources will comprise a major priority for some time to come.

[3] Management's August 2016 comments on a draft of this report observed that its recent rate case filing does show significant staffing increases and that it has a staffing plan under which it is now preparing to recruit and train added resources.

The accompanying table compares KEDLI's overall resource mix (percentage of straight time, overtime, and contractors) to that of the Reference Utility. In both the historical and forecast periods, KEDLI's internal (straight time and overtime) versus contractor FTEs matched the Reference Utility value closely. KEDLI did differ by a great deal, exhibiting a much higher share of internal FTEs applied on an overtime basis. Forecasted contractor use by KEDLI and the Reference Utility remained close on a forecasted basis. This result reflected the ramp-up of use of contractor resources for accelerating main replacement programs across the state. [4]

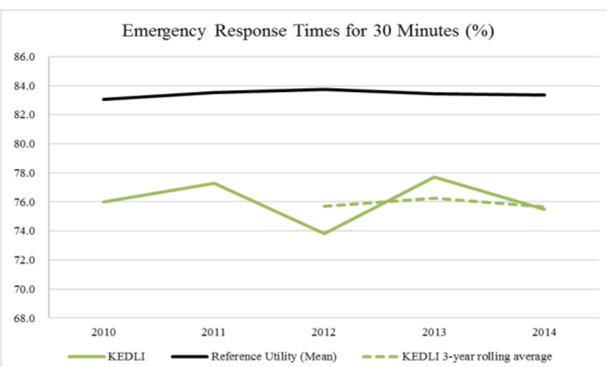
Table II.23: Gas Resource Mix

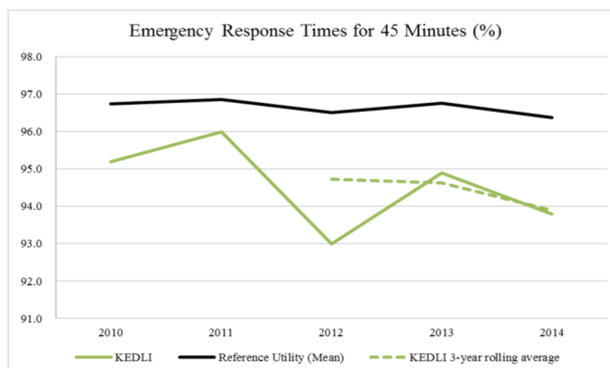
Actual Resource Mix - Historical Value		
Source	**KEDLI**	**RU**
Straight Time	57%	62%
Overtime	14%	8%
Contractor	29%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**KEDLI**	**RU**
Straight Time	53%	59%
Overtime	15%	8%
Contractor	31%	33%
Total	100%	100%

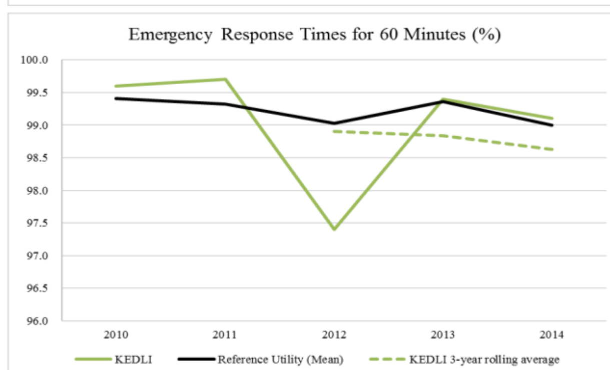
b. Performance Metrics

We also examined KEDLI's historical changes in gas performance metrics as reported to the Commission. We again considered leak-response times and backlogs of potentially hazardous leaks. The next charts summarize the results.

Chart II.24: KEDLI Emergency Response Times







A steady response time pattern emerged for the Reference Utility value. KEDLI, like NIMO, however, experienced a decline, except for the 30-minute metric, where performance remained steady.

[4] Management's August 2016 comments on a draft of this report state that current forecasts do not show such high levels of overtime.

The next two charts show leak backlog data. KEDLI's leak backlogs fell at the median for 2014, and did decrease substantially during the historical portion of our study period. The data show some level of concern about KEDLI's O&M staffing levels, but not to the degree present for NIMO. KEDLI also distinguished itself from NIMO in that it projected increases in O&M staffing levels. In terms of O&M staffing, the difficulties in achieving the very large ramp up in internal FTEs (driven largely by capital work) need to be addressed, in order to provide the ability to apply FTEs to O&M work in the numbers expected to be required.

Chart II.25: Backlog of Potentially Hazardous Leaks: 2014

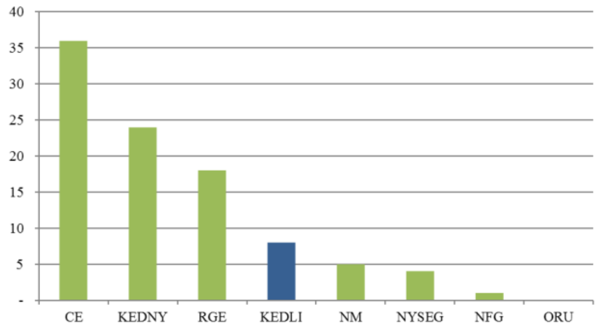
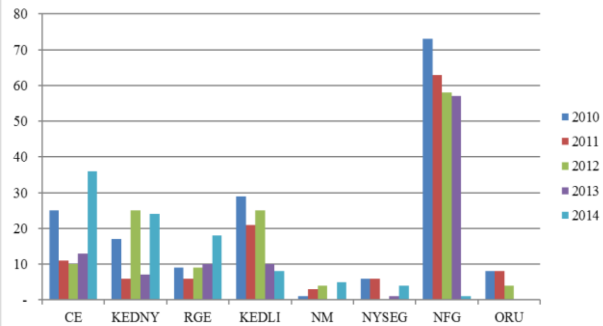


Chart II.26: Backlog of Potentially Hazardous Leaks: 2010-2014



c. <u>Gas Staffing Levels</u>

The next table provides comparisons of KEDLI 2011 FTE levels with those of the other state gas operations. The comparisons use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" parameter reflects the number of FTEs versus the Reference Utility divided by the "all attributes" index from the "Hard Drivers" subsections earlier in this report. A higher index suggests more FTEs than expected based on size alone.

First, we compare how KEDLI's 2011 FTE levels compare to other state utilities in the study on a simple ratio basis for certain key system attributes. KEDLI's ratios placed it reasonably close overall to the Reference Utility value.

Table II.27: Gas Staffing Ratios

Parameter	KEDLI	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	1.16	0.70	1.00	2.32
Per Mile of Main	1.05	0.49	1.00	3.60
Per Unit Sales	0.99	0.60	1.00	1.82
Per Average of All Attributes	1.19	0.80	0.96	1.49

Next, we examine how KEDLI's three-year average staffing levels for the period 2009-2011 compare to staffing level estimates from our model. As observed earlier, the model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure

The accompanying table compares KEDLI gas FTEs with model results for gas capital, O&M, and engineering work activities.

Table II.28: KEDLI Gas Three-Year Average FTEs (2009-2011)

Gas		
Type	Actual	Estimate
Capital	387	392
O&M	200	213
Engineering	35	61
Total FTEs	622	666

The results of modeling show strong consistency between KEDLI's actual numbers and the model's results for capital and O&M functions. The model generated gas staffing levels within 1 percent of actual KEDLI levels for these functions:

- For capital work, three-year average staffing levels fell within one percent of model estimates.
- For O&M work, three-year average staffing levels fell within one percent of model estimates.

Average staffing levels fell inside the range of accuracy for model estimates for these functions. Based upon model results, three-year average staffing levels for these functions were within the range of expected staffing levels for KEDLI.

KEDLI's engineering average staffing levels fell about 40 percent lower than model estimates. This gap needs to be considered, particularly considering the significant ramp up of capital work related to pipe replacement in the forecast period. However, forecasts for 2015-2019 showed engineering FTEs ramping up from 35 FTEs to more than 175 FTEs in the future. Management appeared to be planning to close an apparent historical gap in engineering resources for the future.

5. *Total Staff Assessment – KEDNY Gas*

This section provides an overview of historical and forecasted (2015-2019) staffing resources for gas functions at KEDNY.

a. Gas Staffing Trends

The next chart shows historical and forecasted staffing resources for gas functions for 2009 through 2019 by resource type (internal staff straight time, internal staff overtime, and contractors). The ensuing chart breaks down the same data by type of workload (O&M, capital, and engineering work). We discussed earlier the inability to secure reliable 2012 and 2013 data from management and the inability to derive useful measures for 2014.

Figure II.29: KEDNY Gas FTEs by Resource Type

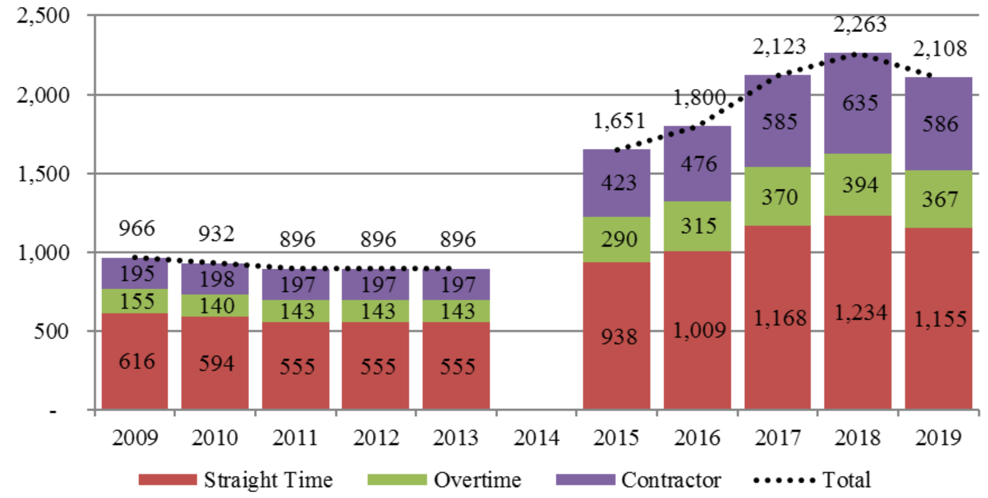
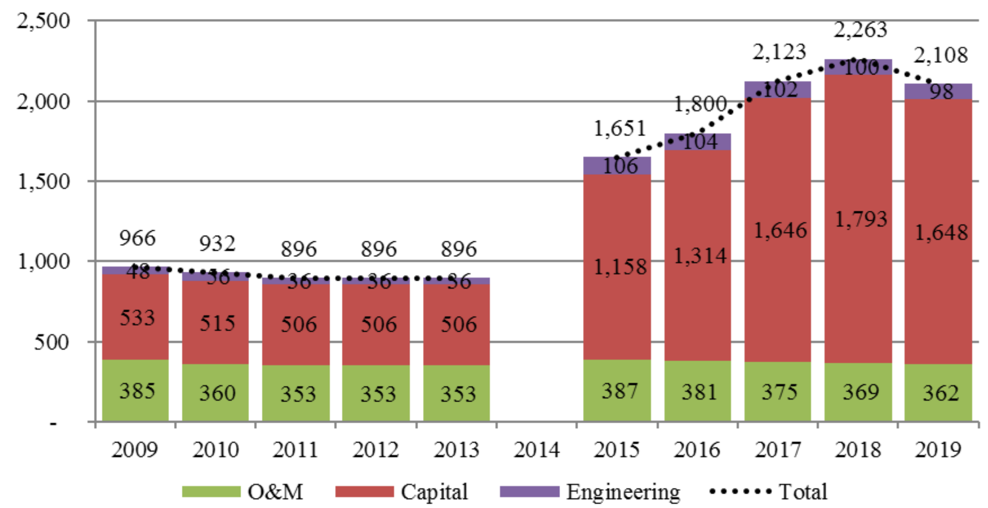


Figure II.30: KEDNY Gas FTEs by Work Type



Between 2009 and 2011 total FTEs applied fell by 72 FTEs, for a drop of eight percent. Management spread the decrease roughly equally among capital, O&M, and engineering activities. Internal staffing resources fell by 61 straight-time FTEs and 12 overtime FTEs. Contractor FTEs remained nearly constant.

KEDNY management, as was the case for KEDLI, provided forecasts showing dramatic FTE increases for capital and engineering activities, beginning in 2015. Accelerating pipe replacement was also the main driver of these increases at KEDNY. Management forecasted a much more moderate (10 percent) increase in FTEs performing O&M activities. The forecasts showed all three resources types (straight time, overtime, and contractor FTEs) ramping up significantly, and remaining at levels 800-1,400 FTEs higher than 2011 levels. These increases indicated an increase in the range 80 to 120 percent above 2011 levels. As was true for KEDLI, the need for large additions of staffing resources to achieve accelerated pipeline replacement was clear. However, KEDLI's future will be contemporaneous and very large. The ability for the two operations to make such large simultaneous increases over such a short time, must be considered extremely challenging. Their combined straight-time increases over a three-year period amounted to 600 (in 2015) and 1,300 (in 2019). How this rate of increase can be achieved is not clear, given the increased demands for skilled personnel across the region.

The forecasts that KEDNY management provided also showed very large increases in contractor use. They reflected the already existing and likely to grow pattern of ramping up contractor resources to meet accelerating main replacement programs. The same caution we observed about KEDLI's substantially growing use of contractors exists for KEDNY, given its internal needs and the likely needs of other operators in the region.

Table II.31: Gas Resource Mix

Actual Resource Mix - Historical Value		
Source	**KEDNY**	**RU**
Straight Time	62%	62%
Overtime	16%	8%
Contractor	22%	30%
Total	100%	100%
Forecast Resource Mix - 2019		
Source	**KEDNY**	**RU**
Straight Time	55%	59%
Overtime	17%	8%
Contractor	28%	33%
Total	100%	100%

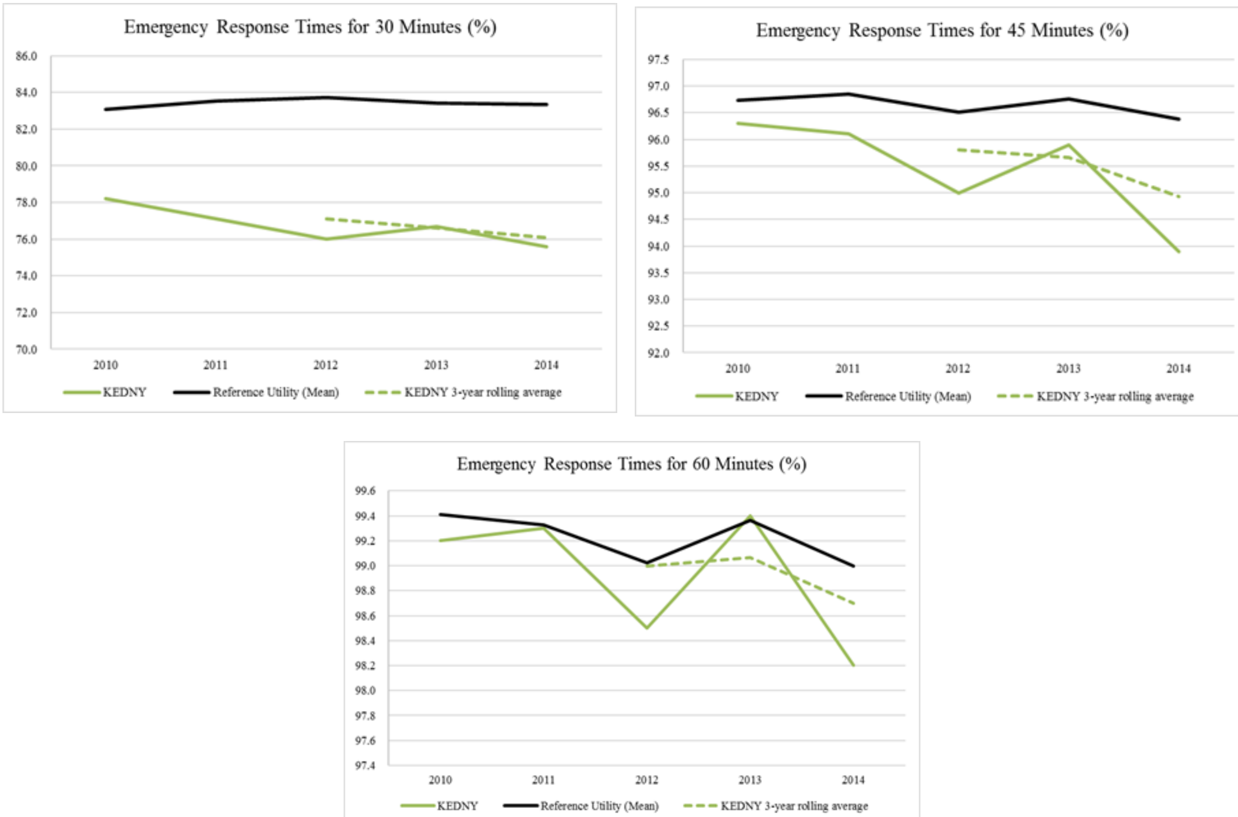
The next table compares KEDNY's overall resource mix (percentage of straight time, overtime, and contractors) to that of the Reference Utility. KEDNY's 2011 straight-time staff percentage equals that of the Reference Utility, but the overtime percentage was twice as high (similar to the KEDLI circumstances). KEDNY's forecasted increase in the share of work performed through overtime called for it to continue reliance on that resource component at a level about twice that of the Reference Utility value. KEDNY also showed a more significant drop in the share of work to be performed by internal straight-time resources. KEDNY's forecasted contractor use increased more, but remained under the share that the Reference Utility value indicated. KEDNY's projected high level of overtime raises a concern, especially given the anticipated high ramp up rates for internal staff. Failure to achieve a very aggressive ramp up in internal staff will further pressure already high forecasted overtime rates.[5]

b. Performance Metrics

We also examined KEDNY's historical changes in gas performance metrics as reported to the Commission. We again considered leak-response times and backlogs of potentially hazardous leaks. The next charts summarize the results.

[5] Management's August 2016 comments on a draft of this report state that current forecasts do not show such high levels of overtime.

Chart II.32: KEDNY Emergency Response Times



A steady response time pattern emerged for the Reference Utility. KEDNY, however, like the other two National Grid gas operations, experienced declines in its performance. Its response times in the 30- and 45-minute categories began below those of the Reference Utility. More tellingly, those times declined through 2014. KEDNY's backlog of potentially hazardous leaks (shown in the two charts below) were also high and increasing through 2014. Overall, KEDNY's data underscore questions about the sufficiency of O&M staffing levels. Forecasted increases, while moderate, may produce positive results. However, it remains the case that forecasted O&M FTE levels never returned to those of 2009. It remains important, however, for close attention on O&M staffing at all three National Grid gas operations.

Chart II.33: Backlog of Potentially Hazardous Leaks: 2014

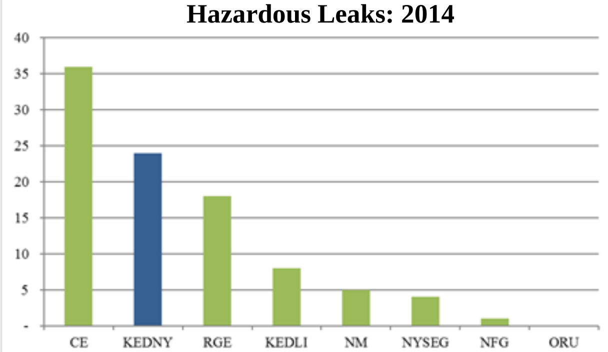
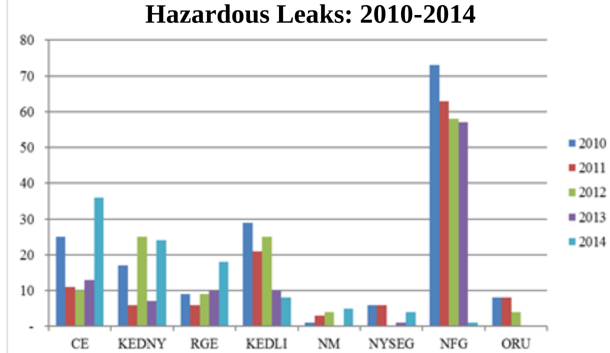


Chart II.34: Backlog of Potentially Hazardous Leaks: 2010-2014



c. Gas Staffing Levels

The next table compares KEDNY 2011 FTE levels with those of the other gas operations we studied. The comparisons use a simple ratio basis for certain key system attributes. The "FTEs per all attributes" measure roughly indicates the overall total FTEs as a function of the size of a utility. First, we compare how KEDNY's 2011 FTE levels compare to other state utilities in the study on a simple ratio basis for certain key system attributes.

Table II.35: Gas Staffing Ratios

Parameter	KEDNY	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	0.83	0.70	1.00	2.32
Per Mile of Main	3.06	0.49	1.00	3.60
Per Unit Sales	1.08	0.60	1.00	1.82
Per Average of All Attributes	0.93	0.80	0.96	1.49

KEDNY's FTEs per mile of main had a much higher value than did the Reference Utility. KEDNY's FTEs per customer of 0.83 indicated a comparatively low level of gas staffing per unit of sales and per customer basis, compared to other state utilities. The relatively high FTE per mile of main reflected the very dense, urban nature of KEDNY's territory.

Next, we examine how KEDNY's three-year average staffing levels for the period 2009-2011 compared to staffing level estimates from our model. The accompanying table compares KEDNY's gas FTEs with model results for gas capital, O&M, and engineering work activities. The results of modeling show (when compared with the results for the other two National grid gas operations) somewhat less conformity but still no very large variances between KEDNY actual numbers and the model's results for capital, O&M, and engineering functions. The model generated the following -staffing results for KEDNY:

Table II.36: KEDNY Gas Three-Year Average FTEs (2009-2011)

Type	Actual	Estimate
Capital	518	569
O&M	366	382
Engineering	47	54
Total FTEs	931	1,005

- For capital work, three-year average staffing levels were within eight percent of model estimates.
- For O&M work, three-year average staffing levels were within four percent of model estimates.
- For engineering work, three-year average staffing levels were with 10 percent of model estimates.

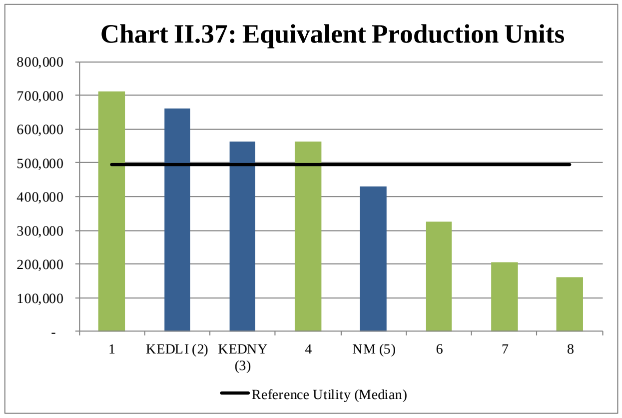
Average KEDNY staffing levels fell inside the range of accuracy for model estimates for these functions. Based upon model results, three-year average staffing levels for these functions were within the range of expected staffing levels for KEDNY's facilities, compared to other state utilities. However, deterioration of performance measures continues to concern us about O&M staffing levels in the long term.

6. Productivity – Gas

As we did for electric operations, we addressed productivity from multiple perspectives, including comparing utilities as a function of staffing per unit of various commodities or attributes.

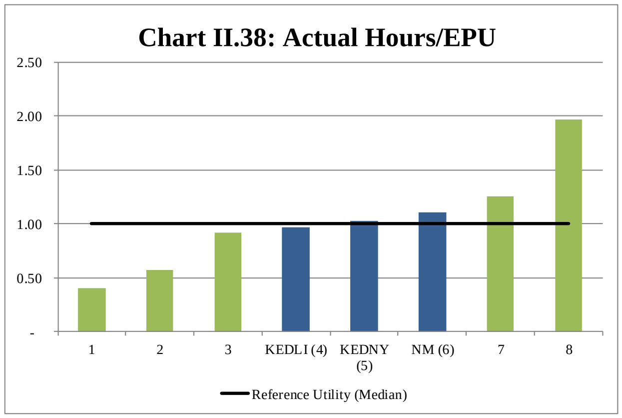
a. Equivalent Production Units

From a gas infrastructure production perspective, NG represents about half of the gas EPUs in New York State. KEDLI, KEDNY, and NIMO ranked second, third, and fifth respectively in terms of both EPUs and hourly expenditures among the eight companies. KEDLI and NIMO experienced a high EPU count in Main Replacements, while KEDNY did so in Main System Additions.

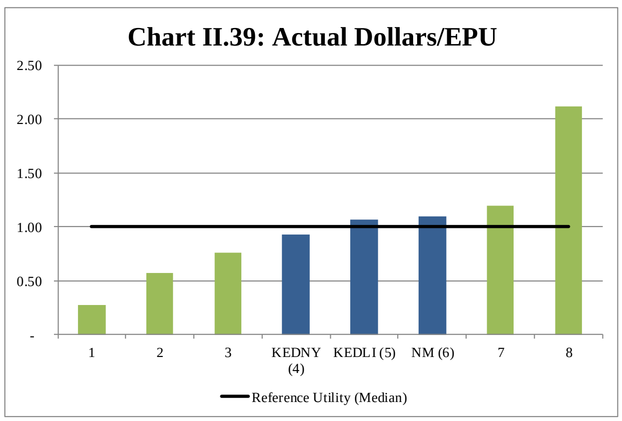


b. Productivity

Physical productivity for KEDLI, KEDNY, and NIMO were all in line with the Reference Utility. All three National Grid companies displayed reference level performance at the aggregate level. These positive results proved somewhat of a surprise for the downstate utilities, for whom we would have expected higher than average unit rates. That surprise makes the KEDNY and KEDLI results appear even better.



The median cost productivity for all the state gas utilities was $94.69 per EPU. When we consider cost productivity ($ per EPU), the Grid companies ranked again around the middle-of-the-pack. The composite hourly labor rates were not unusual but were different to the slight extent that the ranking changed somewhat from the cost productivity figures. In any event, the results did not raise concerns.



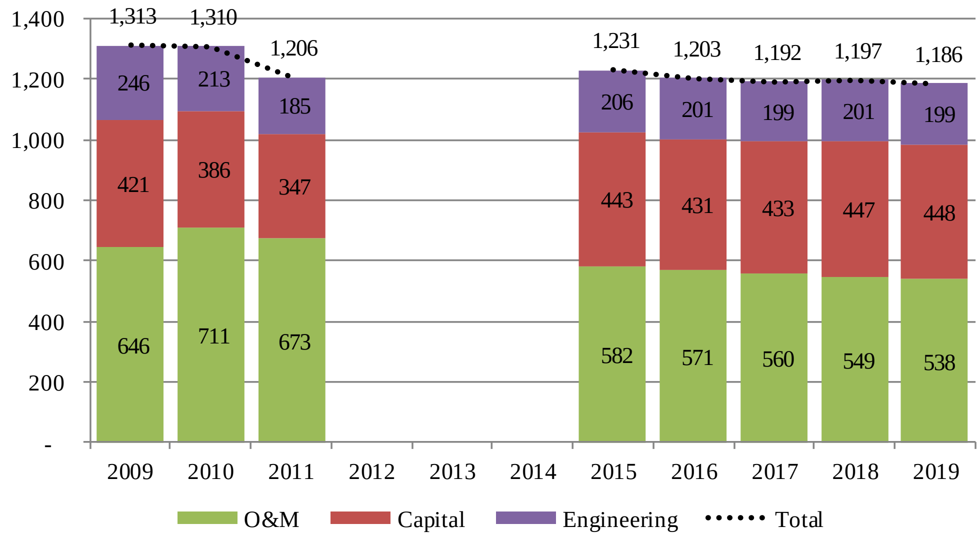
B. Internal Staffing

1. Electric Distribution Internal Staffing - NIMO

The next figure shows overall internal staffing levels for electric distribution, including O&M, capital and engineering. Following a drop in 2011, those levels, according to management's forecasts, were projected to remain stable in total through 2019, but with a shift in emphasis from

O&M to capital work activities. We continued to use 2011 values for 2012 and 2013, and to exclude values for 2014.

Figure II.40: Niagara Mohawk Electric Distribution Straight Time FTEs by Work Type



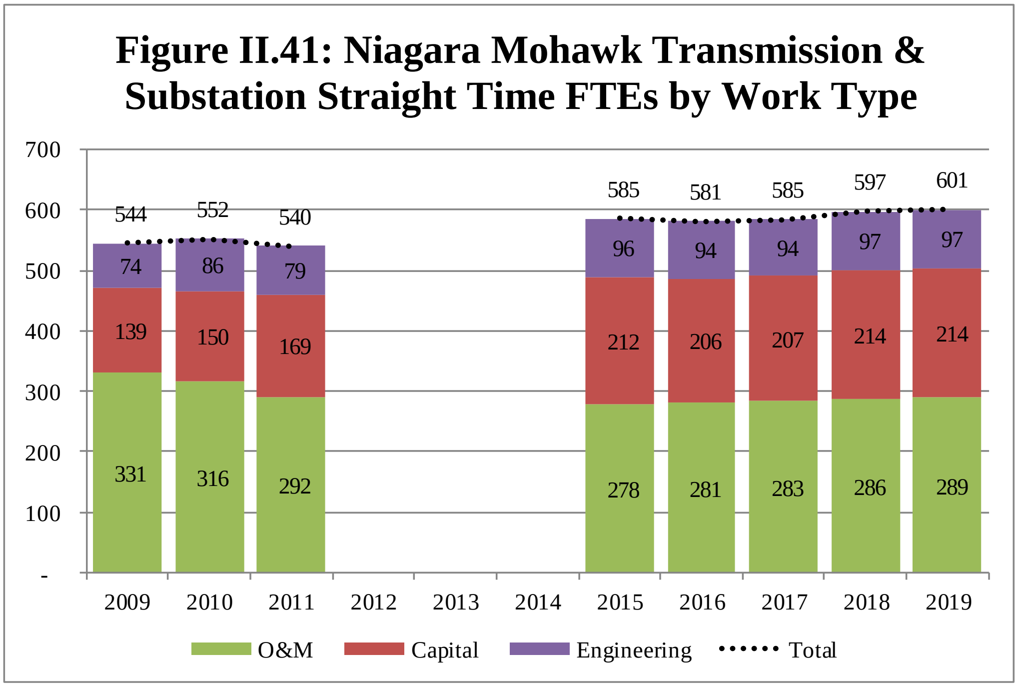
NIMO internal staff in 2009 totaled just over 1,300 FTEs, dropped by about 100 in 2011, and throughout the forecasted period was expected to remain about the same, ending with 1,186 FTEs by 2019. This type of staff stability is unusual over such an extended period of time.

Straight-time internal shifts between capital and O&M work activities occurred throughout the study period. For example, O&M FTE levels in 2010 totaled 711 but forecasts showed them dropping to 538 by 2019 (almost 25 percent). NIMO's 386 capital-related FTEs in 2010 were projected to rise to 448 by 2019 (an increase of 16 percent). NIMO was slowly but very steadily reducing its O&M related FTEs, while doing the opposite with capital related FTEs. The forecasts showed continuation of total straight-time FTEs at a nearly constant level.

Engineering resources, absent some major driver, often remain fairly stable over extended periods. That stability reflects consistency of work year-to-year and (to the extent that there are transitory differences) the difficulty of obtaining and retaining qualified technical resources to meet them. Management's forecasts showed an overall stable level of engineering-related resources throughout the study period, following the eight percent decrease that occurred by 2011. Ultimately, forecasted 2019 levels varied from actual 2011 levels by less than two percent.

The next figure shows historical and forecasted transmission and substation (T&S) straight-time internal staff FTEs. Straight-time FTEs performing O&M work dropped between 2009 and 2011 by about 12 percent, and on a forecasted basis showed very little change. Capital FTEs grew by 18 percent by 2011. Management's forecasts showed them continuing to increase, by another 45 percent above historical levels, rising in 2015, and then remaining essentially flat through 2019.

The growth that engineering showed from historical levels corresponded closely to the growth in capital FTEs.



The operations we studied generally showed variation in T&S internal staff levels over the forecast portion of our study. Those variations typically result from the "lumpiness" in capital programs. NIMO however forecasted little variation in relative and absolute amounts of FTEs among O&M, capital, and engineering during the 2015 – 2019 period.

2. *Staffing Levels*

The next table compares NIMO's 2011 FTE levels with those of the other electric operations we studied. The ratios shown roughly indicate the overall straight-time FTEs as a function of utility size. Interestingly, NIMO compared roughly the same when measuring straight-time internal FTEs (shown below) as when measuring total FTEs (as we showed earlier). The major difference appeared in FTEs per substation. While still very low at 0.43 here, that value was close to twice the value when computed on the basis of total FTEs.

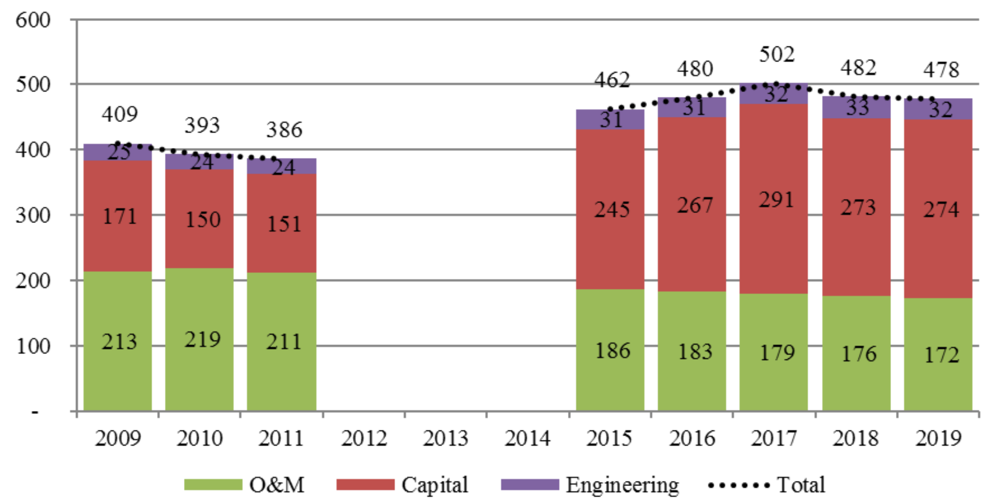
Table II.42: Electric Straight Time Staffing Ratios

Parameter	NM	All NY Utilities Low	RU (Median)	High
Distribution FTEs				
Per Customer	1.18	0.63	1.00	1.71
Per OH Line Mile	0.50	0.50	1.00	6.70
Per Unit Sales	1.49	0.45	1.00	1.49
T&S FTEs				
Per OH Line Mile	0.85	0.42	1.00	29.16
Per Substation	0.42	0.42	1.00	8.35
Total				
Per Customer	1.03	0.62	1.00	1.36
Per Unit Sales	1.30	0.44	1.00	1.30
Average of Total	1.17	0.53	1.00	1.33
Per Average of All Attributes	0.92	0.57	0.77	1.09

3. Gas Internal Staffing – NIMO

The next chart shows straight-time internal FTE levels in gas operations.

Figure II.43: Niagara Mohawk Gas Straight Time FTEs by Work Type



We observed a very large discontinuity between historical levels (measured from 2011, the last historical year for which we had reliable data) and those shown in the forecasts provided. The 2009 through 2011 period showed essentially flat levels (both in total and by category). By the first forecasted year of 2015, overall FTE levels showed a jump of 20 percent above those of 2011. Capital work drove all of that increase and more, rising by 62 percent, while O&M FTEs dropped by 12 percent. The forecasts showed that trend continuing across the rest of our study period. Forecasted O&M FTEs continued to drop steadily through 2019, while capital FTEs continued to rise over the forecast period as a whole (peaking in 2017 and then falling modestly thereafter).

The ramping up of gas main replacement programs in the forecast period formed the key driver of the increased number of total and capital related staff FTEs. Forecasted internal engineering resources remained steady, suggesting management confidence in a stable internal engineering force to provide the technical resources necessary to see it through a significant increase in capital program activity. Increased activity in the planned capital program, though, may strain these resources and it will be useful to NIMO to carefully monitor the work demands on its engineering staff as its expansion program proceeds.

The next table provides comparisons of NIMO 2011 FTE levels. The comparisons use a similar ratio basis for certain key system attributes. This measure roughly indicates straight-time FTEs as a function of the size of a utility. The comparisons did not indicate any surprises, given NIMO's customer and infrastructure conditions.

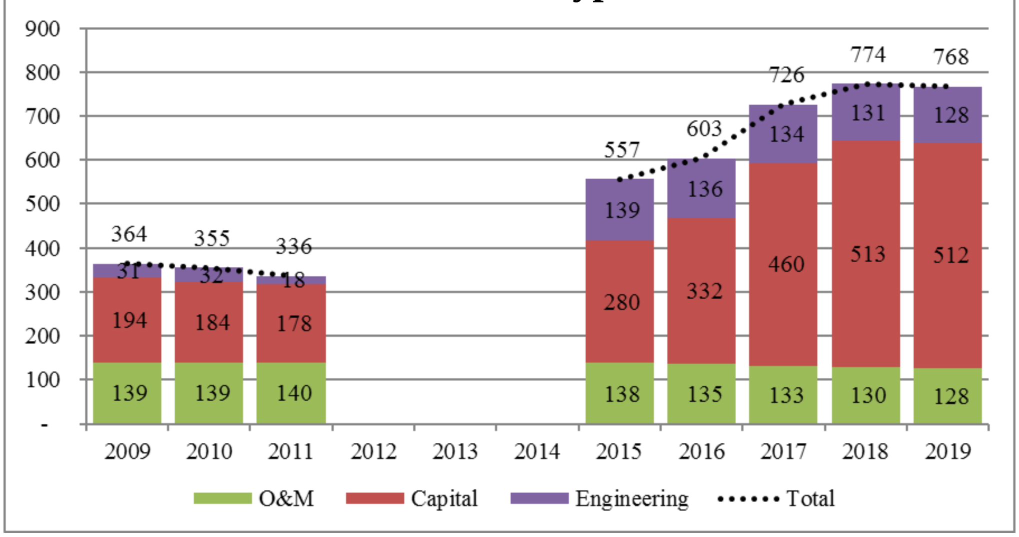
Table II.44: Niagara Mohawk Gas Straight Time Staffing Ratios

		All NY Utilitites		
Parameter	NM	Low	RU (Median)	High
Gas FTEs				
Per Customer	1.15	0.52	1.00	2.46
Per Mile of Main	0.97	0.54	1.00	2.94
Per Unit Sales	1.72	0.44	1.00	1.90
Per Average of All Attributes	1.28	0.50	1.00	2.43

4. *Gas Internal Staffing – KEDLI*

The next figure shows KEDLI's straight-time internal staff levels in gas operations.

Figure II.45: KEDLI Gas Straight Time FTEs by Work Type



The dichotomy between historical levels (again using 2011 levels as the last for which we received reliable historical information) is remarkable. Between 2009 and 2011 straight-time internal FTEs dropped by eight percent, with engineering and capital work absorbing all that reduction. Then, by

2015, straight-time internal FTE levels jumped by over 66 percent. O&M FTEs continued to remain flat, with rises in both engineering and capital activities showing FTE increases in the range of 100. As dramatic as the 2015 increase may appear, forecasts showed a near doubling of straight-time internal FTEs (83 percent) on capital work between 2015 and 2019 (from 280 to 512). Management forecasted only modest changes in O&M and engineering FTEs between 2015 and 2019. In engineering, it appears that forecasts largely made up for an apparent historic shortage of engineers.

The next table provides comparisons of KEDLI 2011 gas FTE levels. The comparisons show a very close correlation between KEDLI and the Reference Utility.

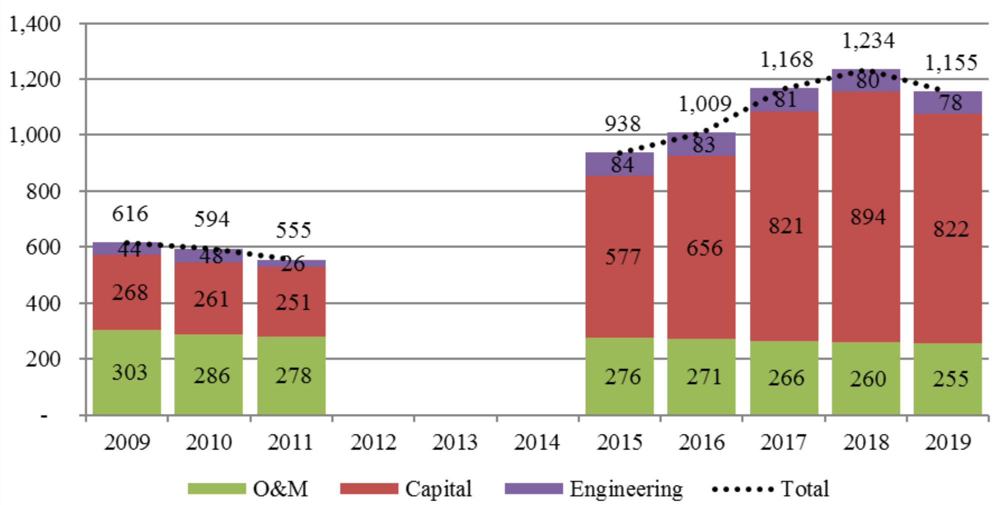
Table II.46: KEDLI Gas Straight Time Staffing Ratios

Parameter	KEDLI	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	1.09	0.52	1.00	2.46
Per Mile of Main	0.93	0.54	1.00	2.94
Per Unit Sales	0.92	0.44	1.00	1.90
Per Average of All Attributes	0.98	0.50	1.00	2.43

5. Gas Internal Staffing – KEDNY

The next chart shows straight-time internal FTE levels for KEDNY's gas operations.

Figure II.47: KEDNY Gas Straight Time FTEs by Work Type



The historical and forecasted portions of the study period showed for KEDNY the same kind of dichotomy that we saw for KEDLI. Total FTEs dropped by 10 percent between 2009 and 2011, with O&M activities absorbing a somewhat greater drop than did capital work. Forecasts provided for 2015 showed a 69 percent rise above the 2011 level. Straight-time internal resources continued to rise over the forecast period, growing by another 32 percent above 2015 levels. In all, the 2009 levels will have doubled by 2018 according to management's forecasts. Capital work explained the difference, with management projecting O&M FTEs to drop steadily from 2015 onward, by about two percent per year. The 894 projected FTE work levels for 2018 were more than three times higher than 2009 levels. Management forecasted 2018 engineering FTE levels at more than three times the 2009 levels. As the Resource Planning/Total Staff Assessment section described, main replacement acceleration provided the dominant driver of capital and engineering FTE growth. Management's forecasts for KEDLI showed the same phenomenon. One difference at KEDNY, however, came in the forecast of an O&M FTE decrease (as opposed to KEDLI's increase) over the 2015 through 2019 period.

Given management's earlier problems with its transition to SAP, it is possible, perhaps likely, that indicated staffing trends from the earlier period do not accurately reflect what actually occurred. Nevertheless, even allowing for that possibility, the extreme ramp up in the forecast period raises clear risks in the ability to manage a massive replacement program's resource requirements. The forecasted increase in capital-related FTEs from 577 in 2015 to 894 in 2018 set an extremely ambitious target likely to strain the ability of the Company to secure and manage those resources effectively.

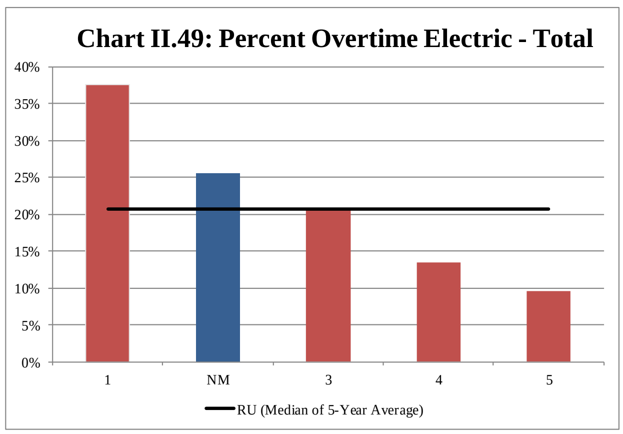
The next table provides comparisons of KEDNY 2011 FTE levels. The comparisons use a similar ratio basis for certain key system attributes. Notwithstanding the very significant jump in reported internal staff FTEs in 2015, KEDNY appeared as an average performer relative to the Reference Utility in FTEs per customer and per sales. It ranked the highest among state gas utilities in FTEs per miles of main, but given its compact service territory, that was not surprising.

Table II.48: KEDNY Gas Straight Time Staffing Ratios

Parameter	KEDNY	All NY Utilitites		
		Low	RU (Median)	High
Gas FTEs				
Per Customer	0.84	0.52	1.00	2.46
Per Mile of Main	2.94	0.54	1.00	2.94
Per Unit Sales	1.08	0.44	1.00	1.90
Per Average of All Attributes	1.62	0.50	1.00	2.43

C. Overtime

1. *Overtime – Electric*



The accompanying chart compares NIMO's electric overtime average over the 2009-2013 period.[6] The remaining bars represent the four other state electric operations we studied. The historical charts here are limited to 2009-11 for the Grid companies NIMO's rate of about 25 percent fell well above the Reference Utility value.

[6] All overtime reported in this chapter excludes any engineering functions.

The charts below separate NIMO's comparative overtime performance between electric distribution and transmission/substations work activities. The charts show that NIMO's relatively high overtime levels overall resulted primarily from a distribution level of 30 percent. Transmission/substations overtime was at the Reference Utility value.

Chart II.50: Percent Overtime Electric Dist.

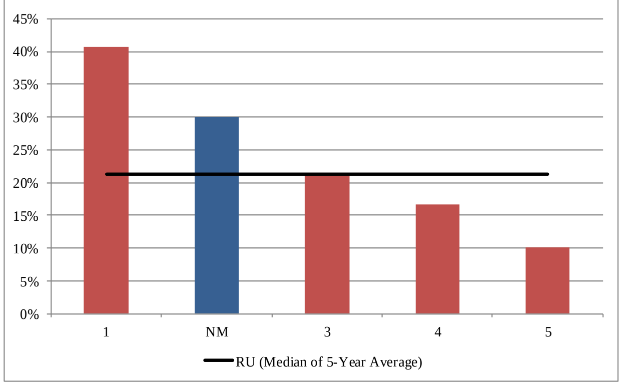
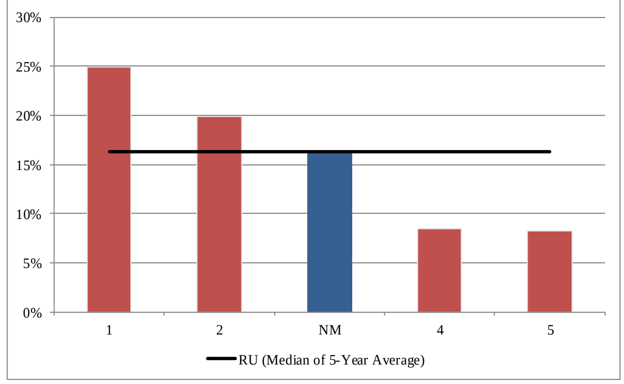


Chart II.51: Percent Overtime Electric Trans.



The Reference Utility value does not set an absolute standard for judging overtime levels. Generally, however, the Reference Utility overtime value for electric function we studied exceeded 20 percent, which itself is considerable. The Reference Utility value equated to an extra day per week, which while not important in isolation, is significant when observing that it represents the average for the total force for 52 weeks per year. Accordingly, materially exceeding the Reference Utility value raises a concern.

The next charts show NIMO's actual and forecasted overtime trends. The charts showed distribution overtime trending higher and management forecasts at continued high levels. NIMO's forecasted values fell well above those of the Reference Utility, calling for management attention.

Chart II.52: Distribution OT - All Work

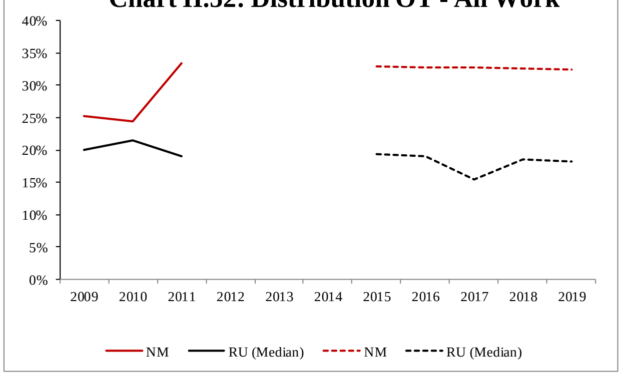
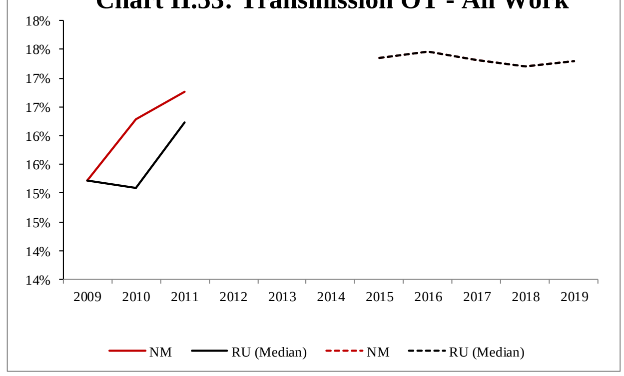


Chart II.53: Transmission OT - All Work



Transmission/substations overtime also trended higher, although levels there were below those of distribution. The question of why higher levels are necessary calls for management attention.

Distribution overtime in O&M primarily drove NIMO's comparatively high levels. These levels were unusual in our experience. NIMO's dependence on overtime was well above that of the others we studied. Some 20 percent of NIMO's labor requirement (one of five FTEs) was met by overtime. When viewed from this perspective, the question of mix becomes important, and the need for its optimization should be a priority. In the case of NIMO, it appears likely that reduced overtime would better optimize resources.

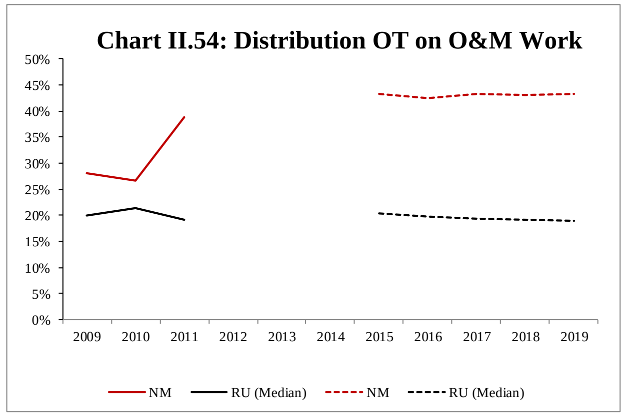


Table II. 55: Distribution Overtime Mix in the Resource Stack

Description	NM	RU (Median)
OT as a % of Total FTE	20%	14%

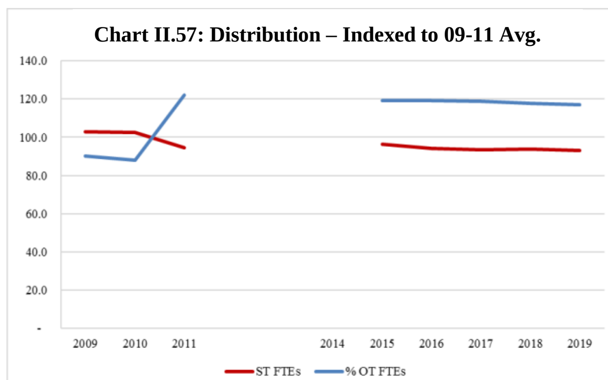
The next chart trends overtime levels for transmission/substations. It shows that overtime played a more moderate role in the resource balance. NIMO equaled the Reference Utility value.

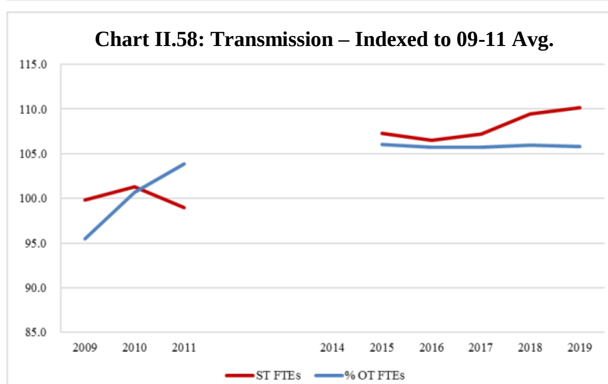
Table II. 56: Transmission Overtime Mix in the Resource Stack

Description	NM	RU (Median)
OT as a % of Total FTE	9%	9%

The next chart examines the relative trends in staffing and overtime for NIMO distribution. The chart depicts the relationship between changes in levels of staffing and overtime. On a statewide level, we observed some limited correlation between staff reductions and increases in overtime, and vice versa.

We chose the 2009 through 2011 averages as a baseline for our index approach, assigning that average a value of 100. We then plotted the other data of interest on the same basis. For NIMO distribution, a slight correlation existed between declining staffing and increasing overtime in the 2009-13 window. The extent of the correlation was not enough to prove convincing. The two lines moved roughly together in the forecasted portion of our study period.

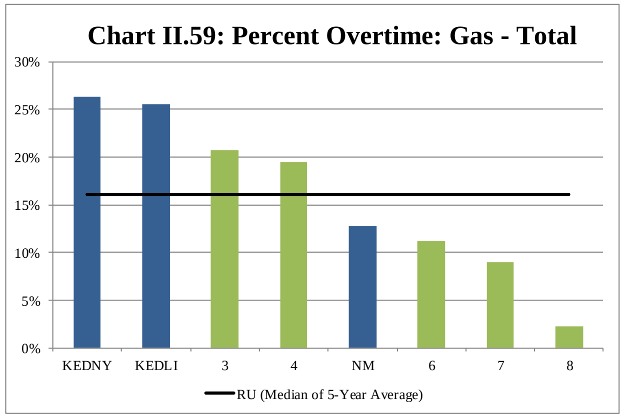




Examining transmission/substations data showed a similar pattern, but forecasts had a different character than distribution exhibited. NIMO projected a significant increase in staff, but did not expect that to offset any overtime. We found that expectation unusual.

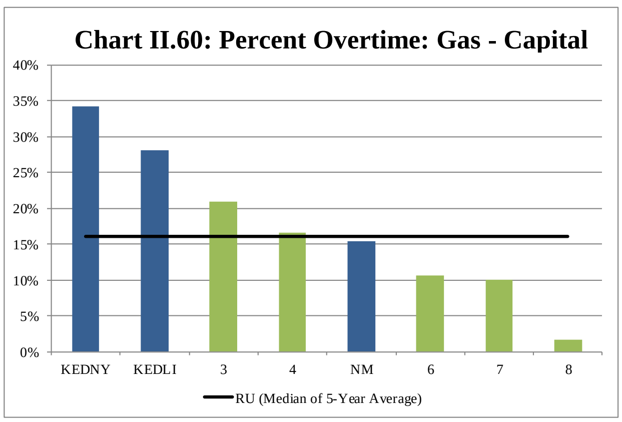
2. Overtime - Gas

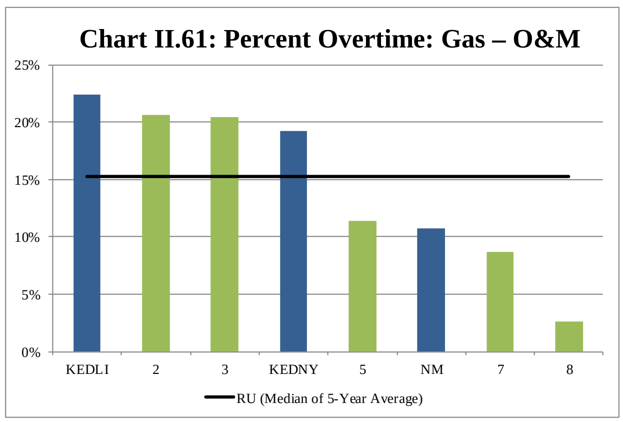
The two downstate Grid gas utilities, KEDNY and KEDLI, had the highest overtime levels among the gas operations. NIMO overtime, by contrast, fell below the Reference Utility value and at half the rate of KEDLI and KEDNY. Values of more than 25 percent were especially high for the state gas business.



The Reference Utility gas overtime rate of 16 percent was below that of the electric Reference Utility level, but remained substantial. Further, the three utilities that had rates of about 10 percent appear to establish a lower bound of what was possible, at least before considering unique extenuating circumstances.

The next two charts split overtime between capital and expense work. It becomes clear that KEDNY's principal overtime driver came from capital work, where overtime was 35 percent. KEDNY's O&M overtime was much lower.





An examination of recent trends and future forecasts for KEDNY and KEDLI (shown in the next two charts) raises questions. KEDLI levels consistently and significantly exceeded Reference Utility values across our study period. The forecast of about 30 percent raises particular concern. Management forecasted already-high levels to grow even further, increasing the gap from Reference Utility values.

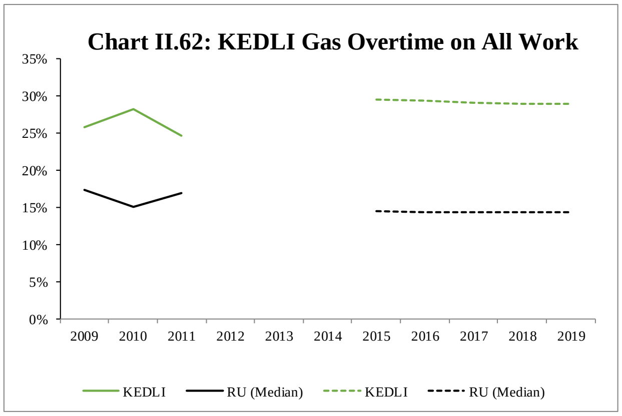


Chart II.62: KEDLI Gas Overtime on All Work

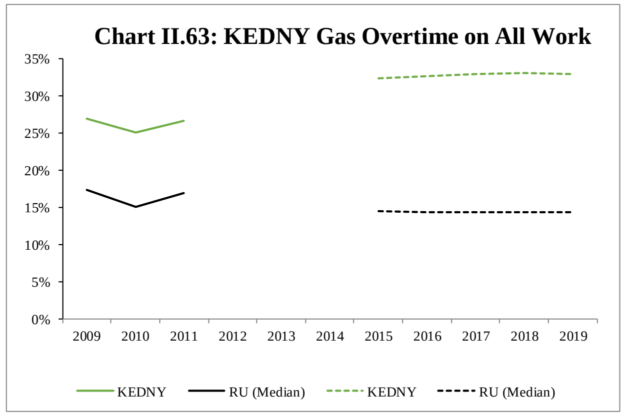


Chart II.63: KEDNY Gas Overtime on All Work

KEDNY showed very similar circumstances. Consistently high historical levels became even higher forecast levels. The forecasts showed a substantial increase over prior years and created a greater variance from Reference Utility values. KEDLI and KEDNY already had the highest overtime historically. Management's forecasts kept them there, and widened the gap between them and the other opearations we studied.

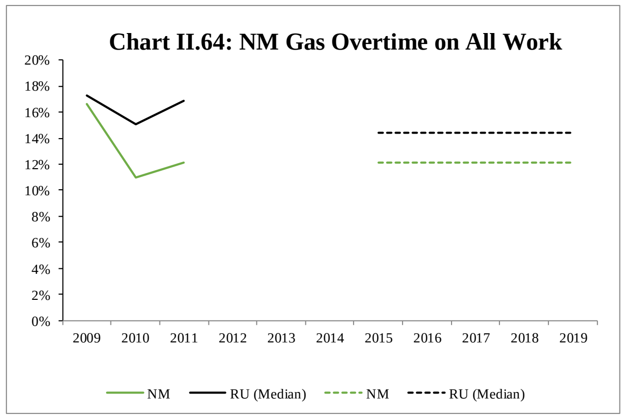


Chart II.64: NM Gas Overtime on All Work

NIMO exhibited a quite different pattern. NIMO overtime remained under the Reference Utility value and forecasts showed it remaining so.

The following charts use the indexing approach we applied above in discussing electric operations overtime, again setting 2009-11 staffing and percent overtime averages at a value of 100. The KEDLI results confirm the earlier observations about significant increases in overtime. Surprisingly, the forecasted increase in overtime occurred simultaneously with an even greater increase in staffing. Such a forecast is counter-intuitive. Ordinarily a benefit of increased staffing as large KEDLI's would an expected decrease, not an increase, in overtime. Why KEDLI's result occurred and what it might indicate about achievability of increases in resource numbers merit significant management attention.

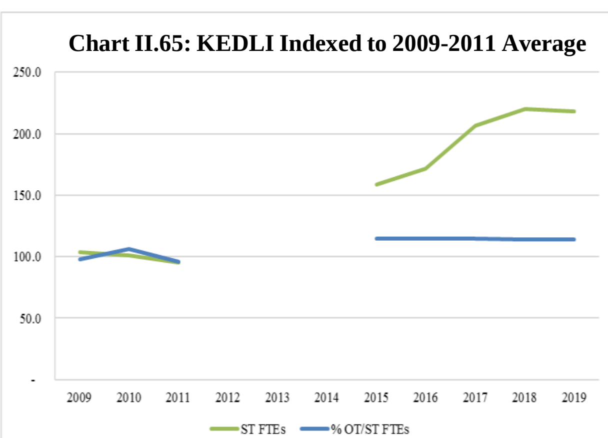


Chart II.65: KEDLI Indexed to 2009-2011 Average

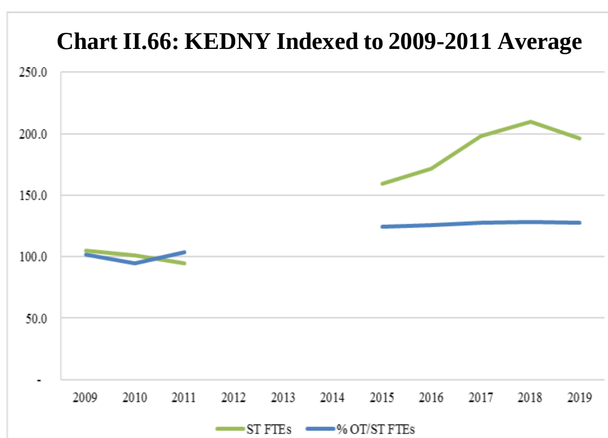
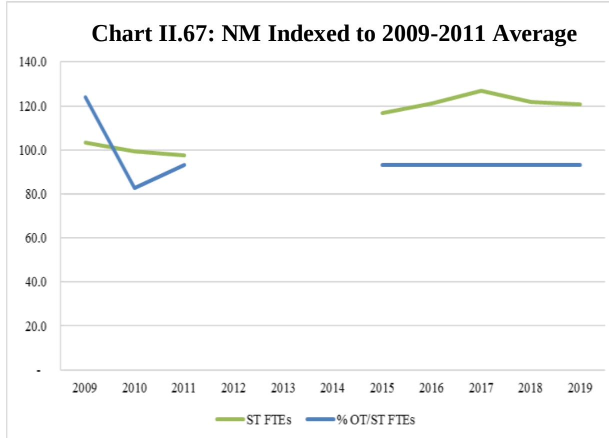


Chart II.66: KEDNY Indexed to 2009-2011 Average

KEDNY's data exhibited similar anomalies. The overtime increase exceeded that of staffing, but again, the principal concern is that both moved in the same direction and at a rapid pace. The coincidence of vast personnel increases (itself a major challenge) accompanied by the compounding effect of added overtime did not appear to reflect a sound planning basis.



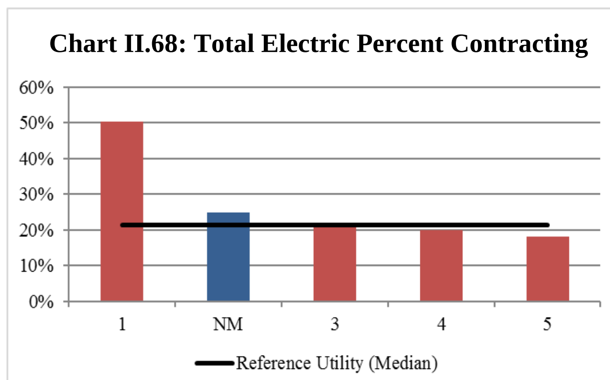
Interestingly, NIMO also projected staffing increases, but overtime remained somewhat stable and at lower levels.

D. Contractors - Electric

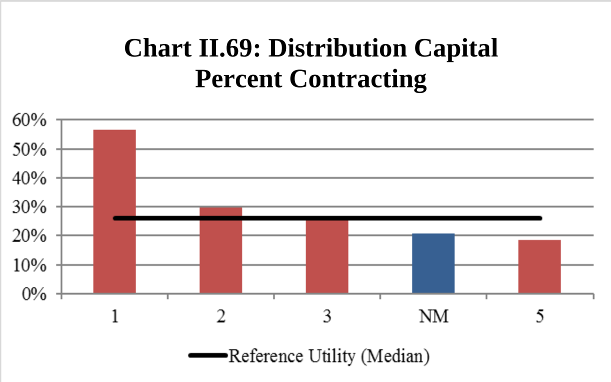
NIMO's level of electric contracting typified that of the industry. Future projections suggested increases in contracting but not enough to put NIMO out of line with the industry or the Reference Utility.

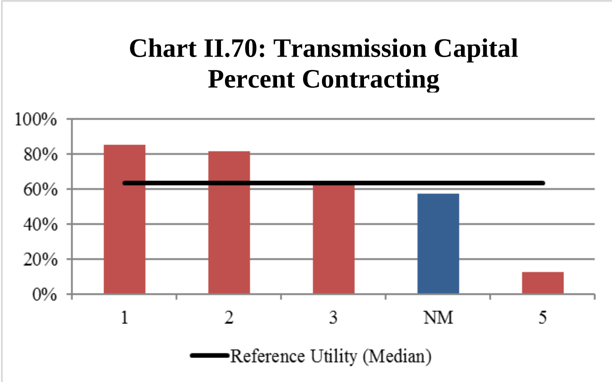
1. Historical Level of Contracting

The accompanying chart compares contracting levels. Except for a single, very large outlier, contracting by the other electric operations we studied clustered in a narrow range. Within the clustered group, the share of work contracted by NIMO fell very close to the median. NIMO operates in a large service area with large rural segments. Alone, it accounts for 64 percent of all the overhead line miles in New York. If we except CECONY, NIMO also has about half of the URD underground lines of all the non-CECONY companies combined. NIMO is also the only operation of those we studied that operates a substantial sub-transmission system.

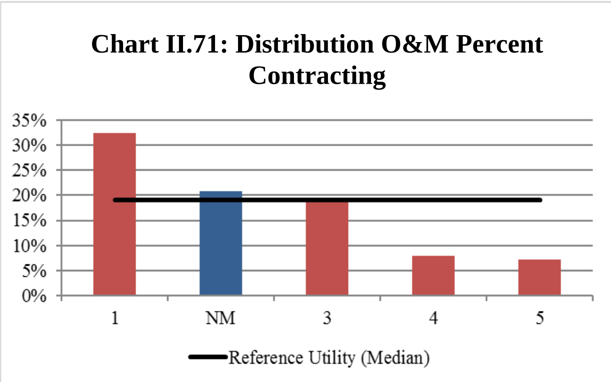


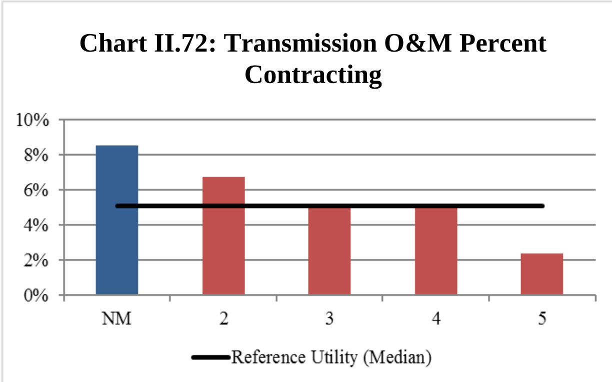
The next two charts show that capital contracting shares fell below the median for both distribution and transmission/substations. NIMO has committed to maintaining an internal staff of 760 overhead line workers. The resulting reduction in contracting opportunities contributed to NIMO's comparatively lower contracting percentages measured on an FTE basis. NIMO's challenge in this regard was to get the internal line workers assigned to work before using contractors, even if in situations where contractors might be marginally more efficient to engage. Of course, in cases such as these, the employee/contractor cost trade-off is, at least implicitly, made as part of the bargaining process. Once made, examining trade-offs on a purely incremental basis becomes inapt.



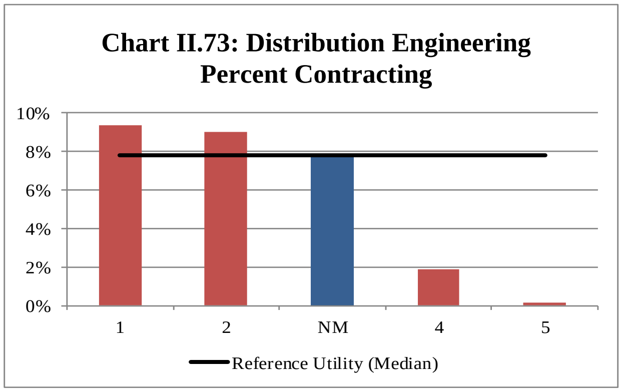


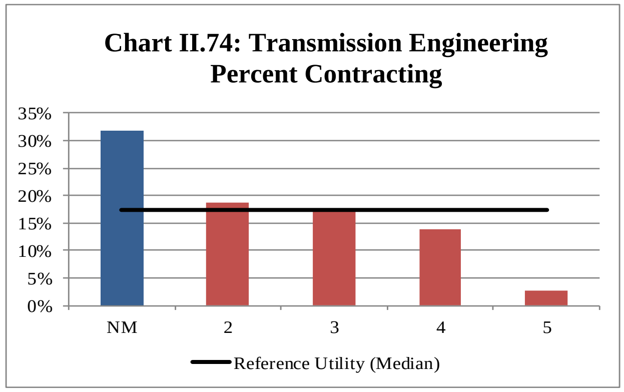
What brought NIMO slightly above the contracting median was O&M work. The next two graphs show higher than median shares of O&M contracting. NIMO was highest in transmission O&M contracting, although all companies contracted out only very small portions of transmission O&M work. We observed that the comparatively more rural nature of its service area made it effective to use contractors more heavily for lower-value pole work. NIMO also often bundled line patrols and O&M work items into one package for contracting. NIMO's particularly high percentage of transmission/substation O&M contracting was a function of the large amounts of sub-transmission lines in its system. Such facilities required O&M practices more similar to distribution than to transmission lines. Many of the line voltages classified as sub-transmission lines at NIMO would be classified as distribution lines at other companies. All else equal, this classification issue tended to add to NIMO O&M contracting for transmission and to subtract from its corresponding distribution contracting.





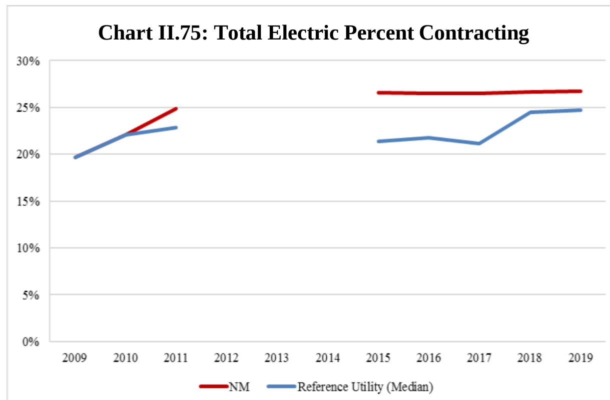
The next charts show engineering contracting levels. Distribution engineering contracting slightly exceeded the Reference Utility value. Transmission/substation engineering contracting was the highest of the group by a large margin. NIMO contracted almost 60 percent of substation final design work, but retained all critical preliminary and conceptual design work in house. Major work in the Buffalo area increased the percentage of engineering work contracted.



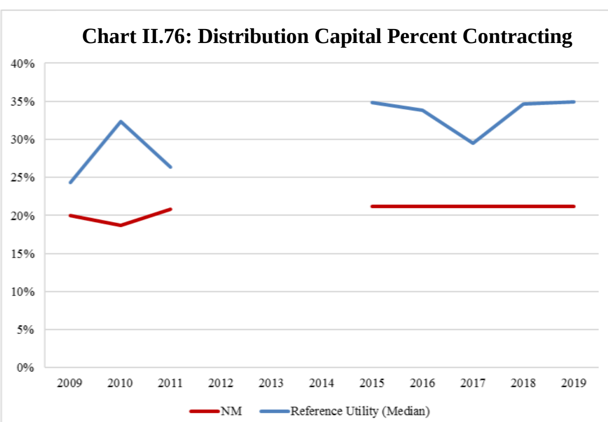


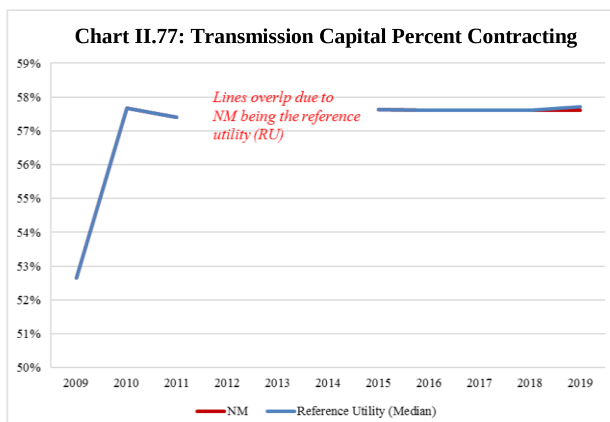
2. *Contracting Trends*

The accompanying chart shows NIMO total electric contracting for 2009 through 2013 at levels conforming closely to those of the Reference Utility. As before, we substituted 2011 values for the two years (2012 and 2013) affected by the SAP transition. The increase in contracting from 2009 to 2011 resulted in large measure from transmission/substation capital work and distribution O&M work. The chart shows forecasted contracting levels remaining about the same.

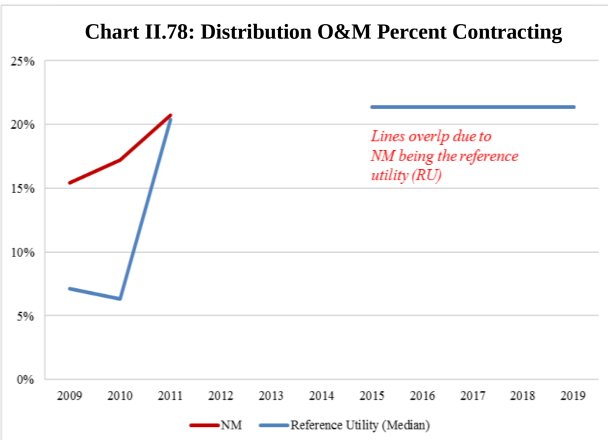


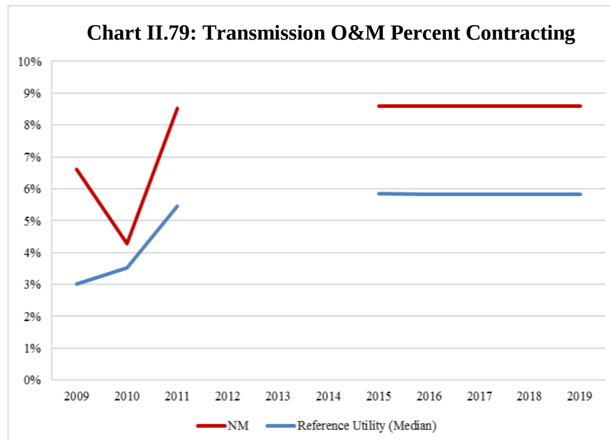
In the 2009 to 2013 period, distribution capital contracting levels (see the graphs below) remained fairly constant. This commitment to a 760 staffing level minimum factored significantly into that constancy Future contracting levels showed little change. Transmission/substation contracting climbed in 2010, due to increased workload, primarily from Buffalo-area replacement of metal-clad switchgear and sub-transmission cable replacement. Forecasts showed future contracting levels in the same range.



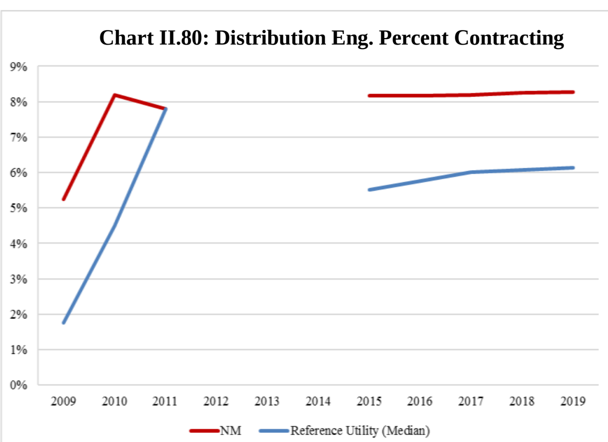


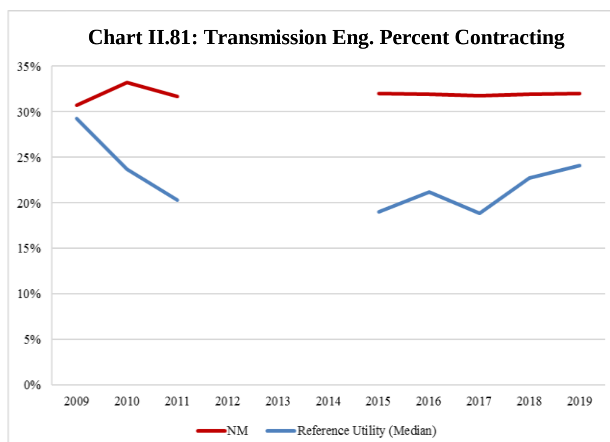
Distribution O&M contracting levels (see the graphs below) climbed early in the historical portion of our study period. Future contracting levels were anticipated to remain the same, at levels above the Reference Utility value. The transmission/substation contracting levels fell well above the Reference Utility value, and experienced a more varied pattern. This pattern resulted in part from sub-transmission network needs. Sub-transmission work was done by the crew best suited for the job (transmission or distribution) depending on the line configuration (wood poles or steel towers). Future contracting levels were anticipated to remain above the Reference Utility value.





The distribution engineering contracting levels were in line with the Reference Utility value. Future contracting levels were anticipated to remain the same. The transmission/substation engineering contracting levels fell well above the Reference Utility value. This gap was primarily driven by the contracting of a significant portion (about 60 percent) of the final substation design work. All preliminary and conceptual design work stayed in house. The future contracting levels were anticipated to remain the same.





We plotted future contracting trends (see the next two charts) to show electric contractor and internal resource use on an index basis, to show their movement relative to each other. In the 2009 to 2011 period the distribution contracting index increased, driven by increased O&M work. Future index tracks were projected to remain at the 2013 levels. Similarly, the transmission/substation contractor index tracked upward, driven by the increased capital work in the Buffalo area. Future index tracks were projected to remain at the 2013 levels.

Chart II.82: Distribution Internal vs. Contractor Indexed to 2009-2011 Average

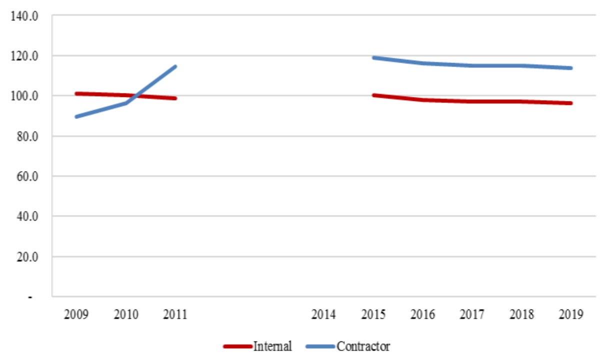
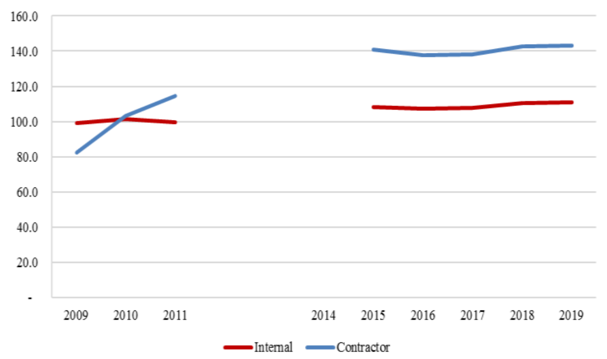


Chart II.83: Transmission Internal vs. Contractor Indexed to 2009-2011 Average



E. Contractors – Gas

Historical gas contracting levels were at comparatively low levels, except for engineering. Management forecasted them to continue that way, but the very high increased demand for contractors in the future, in terms of numbers of people, will pose challenges.

1. NIMO Historical Contracting Levels

The following charts show overall gas contracting levels.

Chart II.84: Gas Total Percent Contracting

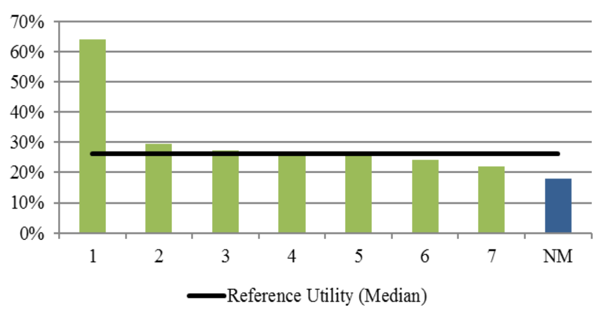


Chart II.85: Gas Capital Percent Contracting

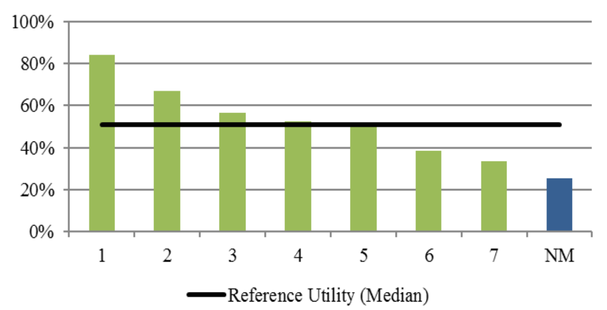


Chart II.86: Gas O&M Percent Contracting

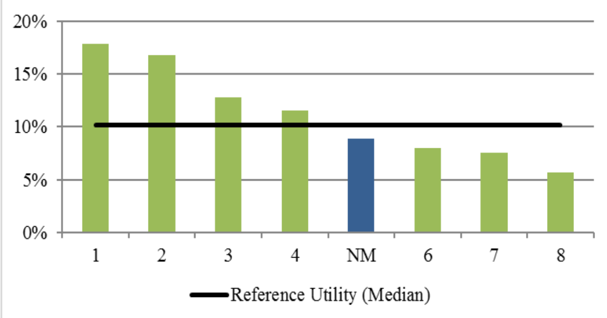
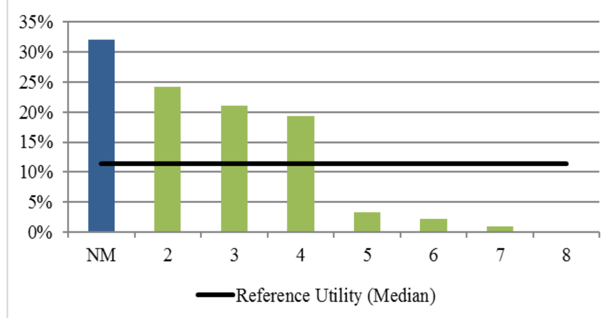


Chart II.87: Gas Engineering Percent Contracting

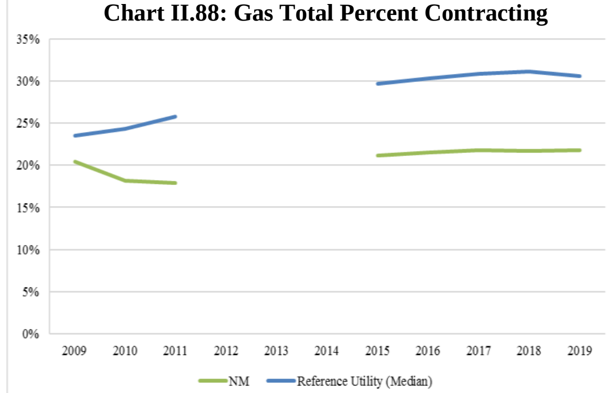


Gas contracting, as percent of total FTEs in the study, generally fell in the range of just under 20 percent to about 30 percent. The total contracting chart shows that one outlier contracted at percentages more than twice as high as the Reference Utility value. NIMO, at just under 20 percent was the lowest of the state's gas operations. NIMO had by far the lowest percentage of contracting for capital, well below that of the Reference Utility. NIMO's O&M contracting fell near the low end and somewhat below the Utility. NIMO engineering contracting was the highest. Four of the operations we studied performed almost all engineering in house. Four others contracted in a range of about 20 to 25 percent.

2. NIMO Contracting Trends

The accompanying chart shows that NIMO's total contracting reflected only marginal change overall across the historical and forecasted periods of our study. The level remained well below that of the Reference Utility. Both showed a moderate step up in the forecasted portion of the period. NIMO had a comparatively stable pipe replacement program, forecasted to continue at approximately the same level as the historical period showed. This lack of growth in an area affecting the others far more substantially explains the relative stability in contracting.

Chart II.88: Gas Total Percent Contracting



The next charts break NIMO's contracting into capital and O&M activities. The effect of a flat projection for replacement work showed particularly in the capital contracting chart. Apart from NIMO, the Reference Utility showed much higher forecasted contracting shares, reflecting the expansion that typifies replacement programs for the rest of the state. The fact that four of the state's gas operations pursued an almost totally in-house approach to engineering limits the usefulness of the engineering chart.

Chart II.89: Gas Capital Percent Contracting

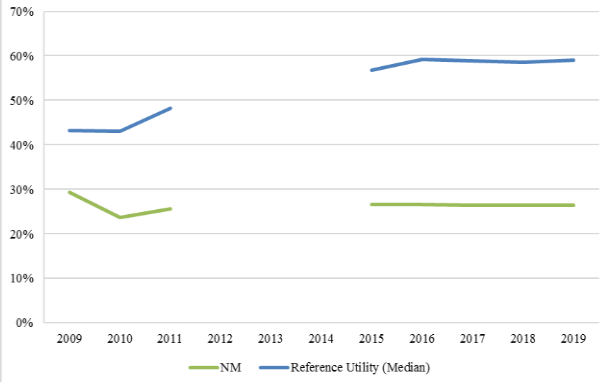


Chart II.90: Gas O&M Percent Contracting

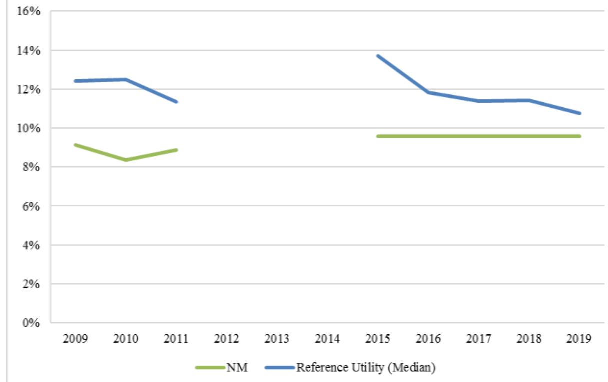
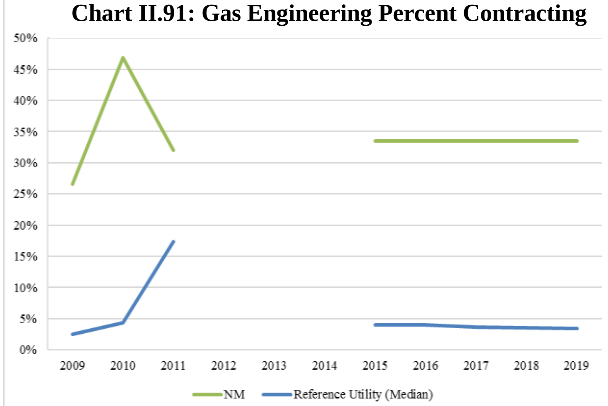


Chart II.91: Gas Engineering Percent Contracting



Future contracting trends remained stable compared to the Reference Utility and the 2009-2011 baseline. We also plotted (see the next two charts) gas contractor and internal resource use on an index basis, to show their movement relative to each other. The major contributor was NIMO's stable pipe replacement program, expected to continue at approximately current levels through 2019. The apparent dramatic increases in Reference Utility FTEs (shown in the capital contracting chart above) relative to the base period are somewhat overstated because the base period reflected the earlier stages of the ramp-up to address pipe replacement.

Chart II.92: Gas Contractor FTEs

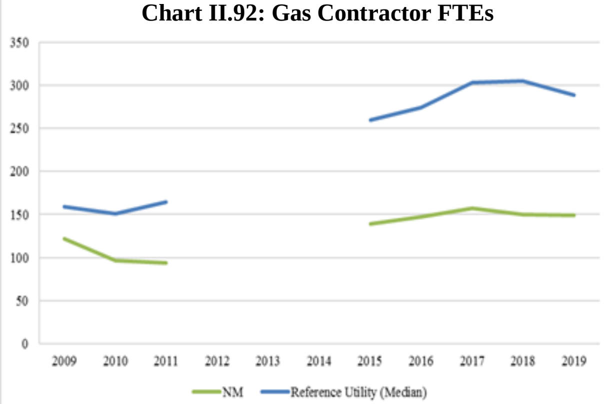
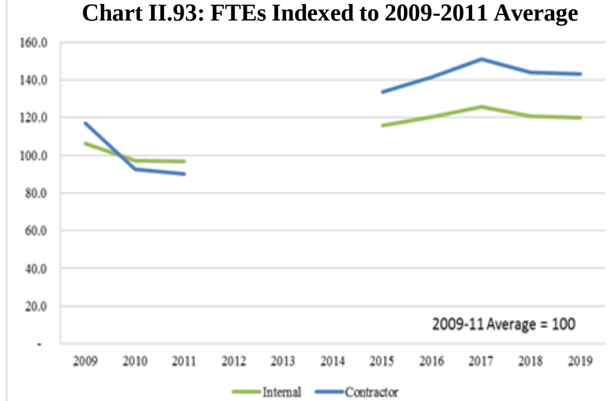
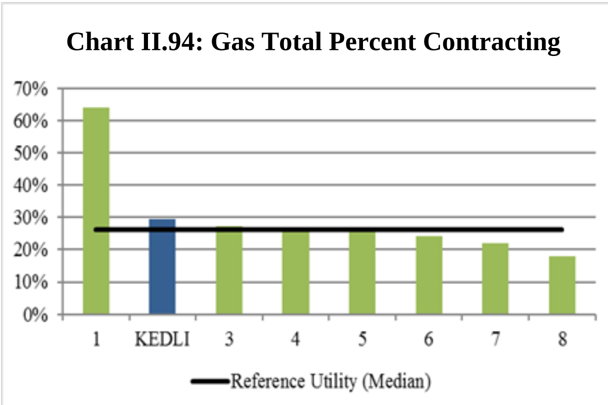


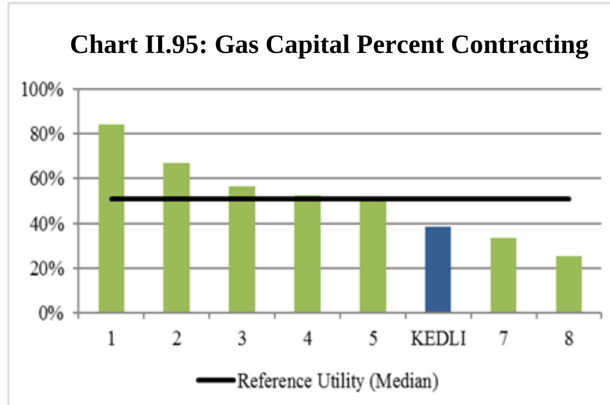
Chart II.93: FTEs Indexed to 2009-2011 Average

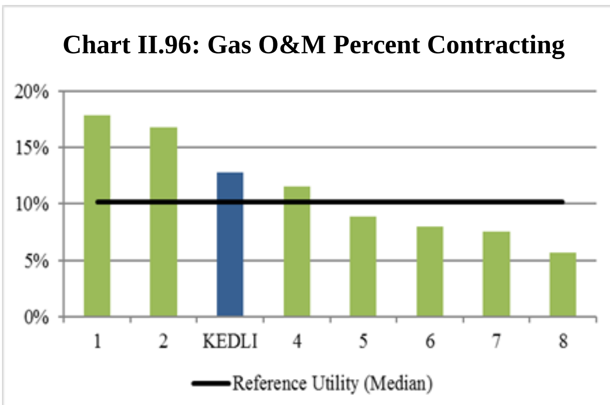


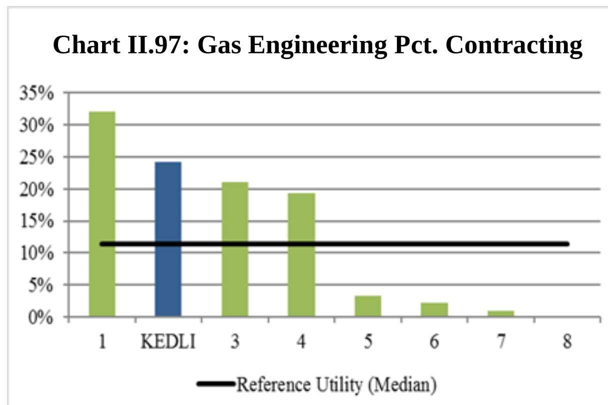
3. KEDLI Historical Level of Contracting

The next four graphs summarize KEDLI's gas contracting ratios for 2011.









KEDLI's overall level of contracting was close to the median. In this case that was true for all of the companies (save the single, large outlier), given the narrow range around which contracting for the remaining operations cluster. Capital contracting fell below the Reference Utility, while O&M and engineering contracting were above it. The comparatively late expansion of KEDLI's pipe replacement program relative to others in the state overall gave it a low historical contracting rate. Utilities generally contract a very large share of such work. While KEDLI O&M contracting fell above the median, the difference was small. All of the gas operations we studied performed over 80 percent of O&M in-house, which leaves a small range of contracting between the high and low values. KEDLI performed most of its gas engineering with in-house resources, contracting out about 25 percent, well over the Reference Utility but behind one other utility.

4. KEDLI Contracting Trends

The next four charts show historical and forecasted trends in KEDLI's contracting.

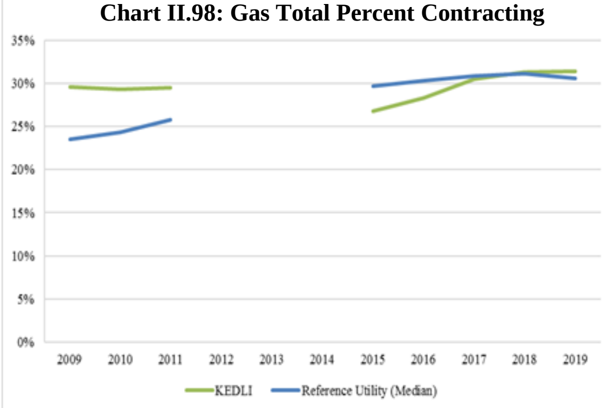


Chart II.98: Gas Total Percent Contracting

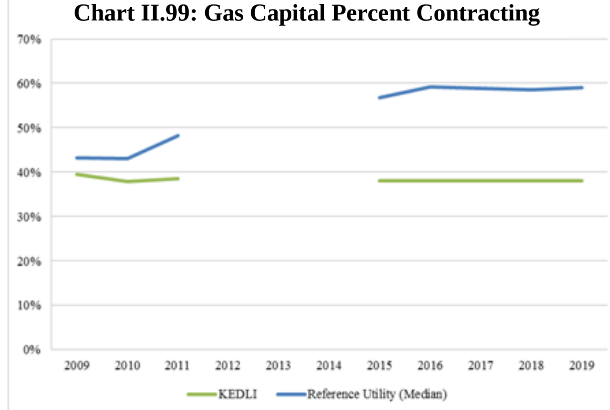


Chart II.99: Gas Capital Percent Contracting

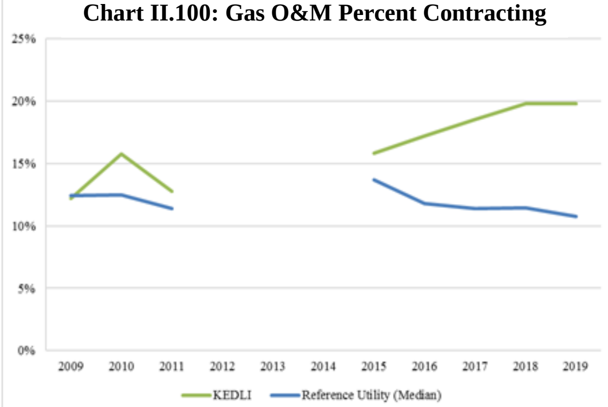


Chart II.100: Gas O&M Percent Contracting

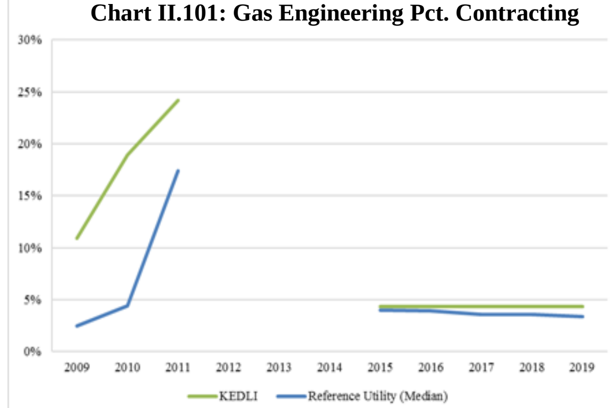


Chart II.101: Gas Engineering Pct. Contracting

KEDLI’s overall historic level of contracting tracked very closely to the Reference Utility level and remained fairly stable over the historic period, trending upward slightly to reflect an increase in the rate of pipe replacement. Overall, KEDLI’s forecasted contracting share also tracked that of the Reference Utility. Substantial escalation in pipe replacement across the state, made the forecasted capital contracting percentage of the Reference Utility behave as one would expect. It rose substantially, reflecting the dominance that contractors generally have in performing such work. KEDLI’s forecast remained flat, predicting no change from historical levels. Just the opposite happened in the case of O&M contracting. The Reference Utility value was close to KEDLI’s 2011 level, descending steadily from 2015 onward. KEDLI’s forecasts showed a marked increase in O&M contracting percentage. As was true for NIMO, we find the engineering data unrevealing, given the near-total in-house approach of so many of the gas operations we studied.

KEDLI's historic trend line for contractor FTEs was close to that of the Reference Utility. The apparent dramatic increases in the slope of the KEDLI contract FTE line and in both KEDLI and Reference Utility FTEs relative to the base period are somewhat overstated, because the base period reflected earlier stages of the ramp-up to address pipe replacement. As we did for electric operations, we also plotted (see the next two charts) gas contractor and internal resource use on and index basis, to show their movement relative to each other.

Chart II.102: Gas Contractor FTEs

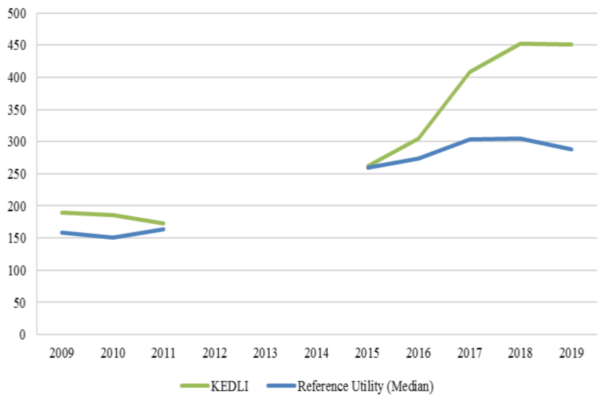
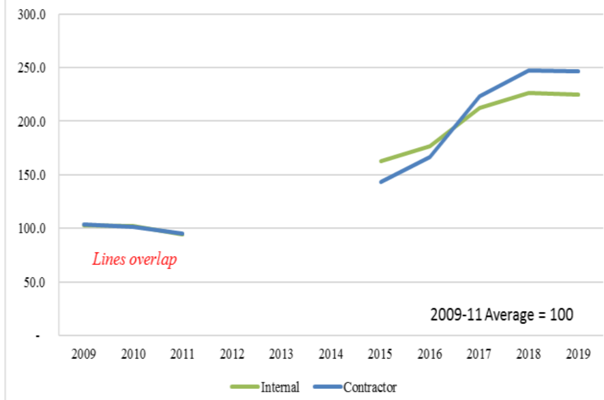


Chart II.103: FTEs Indexed to 2009-2011 Average



5. *KEDNY's Historical Level of Contracting*

The next four graphs summarize KEDLI's gas contracting ratios for 2011.

Chart II.104: Gas Total Percent Contracting

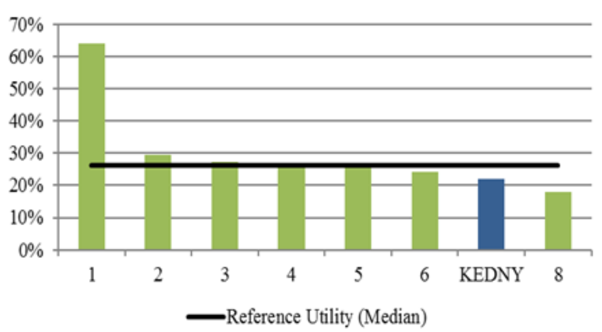


Chart II.105: Gas Capital Percent Contracting

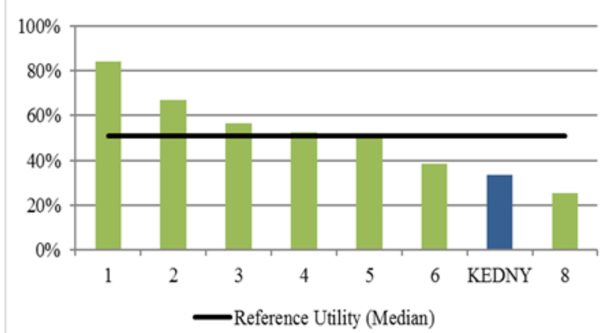


Chart II.106: Gas O&M Percent Contracting

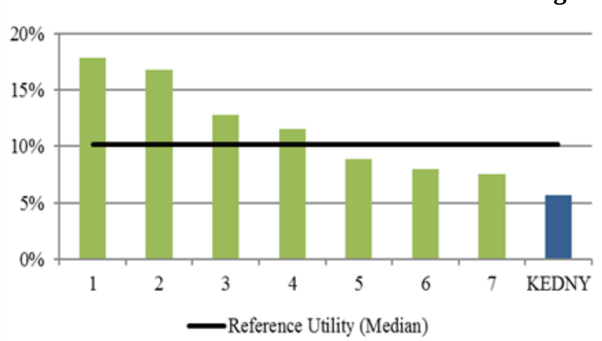
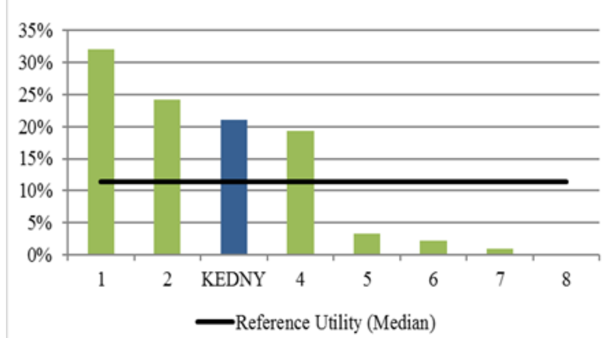


Chart II.107: Gas Engineering Pct. Contracting



Gas contracting, as percent of total FTEs in the study, generally fell in the range of just under 20 percent to about 30 percent, except for one outlier at approximately 63 percent. KEDNY was close to the median overall, but well below in both capital and O&M work, offset by a comparatively high rate of engineering contracting. Earlier expansions of pipe replacement programs across the rest of the state help explain the relatively low level of capital contracting. Historical gas contracting as a percent of total FTEs generally fell in a narrow range of 20 percent to 30 percent across the utilities. KEDNY's 22 percent level was in the range, but only because high engineering contracting counterbalanced low capital and O&M contracting percentages. However, forecasted KEDNY capital and O&M contracting brought it to levels comparable with others, as its replacement program ramped up.

While comparatively low in O&M contracting, KEDNY's amount still fell reasonably close to the levels that generally apply. Six of the state's gas operations we studied contracted in a range of less than 10 percent, with the highest of those six at only about 14 percent. KEDNY's engineering contracting level paralleled that of KEDLI, with both well above the median levels.

As we did for electric operations, we also plotted (see the next two charts) gas contractor and internal resource use on and index basis, to show their movement relative to each other. KEDLI's future contractor FTEs (see the left chart) were extremely high compared to the Reference Utility. The lower right chart illustrates that the growth in contractors was proportionately matched by internal resources.

Chart II.108: Gas Contractor FTEs

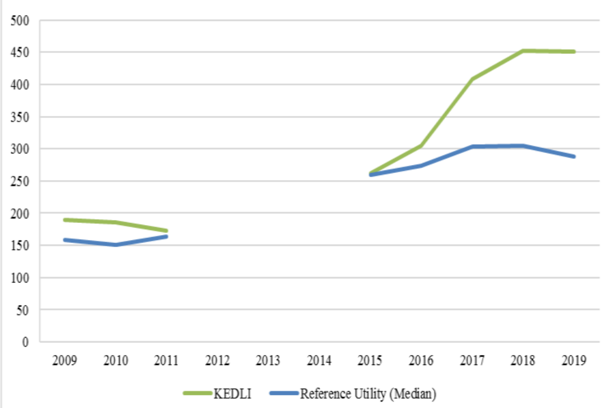
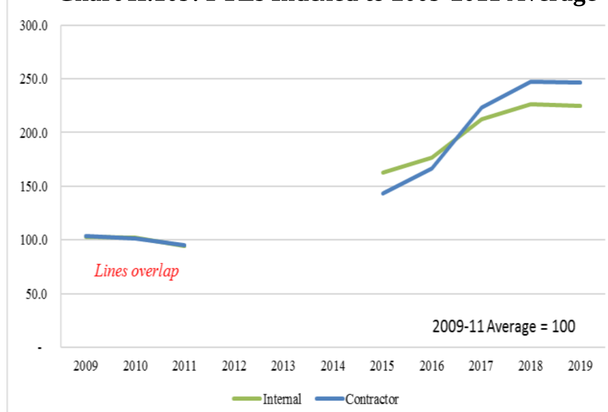


Chart II.109: FTEs Indexed to 2009-2011 Average



6. *KEDNY Contracting Trends*

The next four charts show historical and forecasted trends in KEDLI's contracting. For both the historical and forecasted portions of our study period, KEDNY's trend lines tracked the slope of the Reference Utility values very closely, but, as we saw in the preceding section, at lower levels for capital and O&M contracting, and at higher levels for engineering contracting.

Chart II.110: Gas Total Percent Contracting

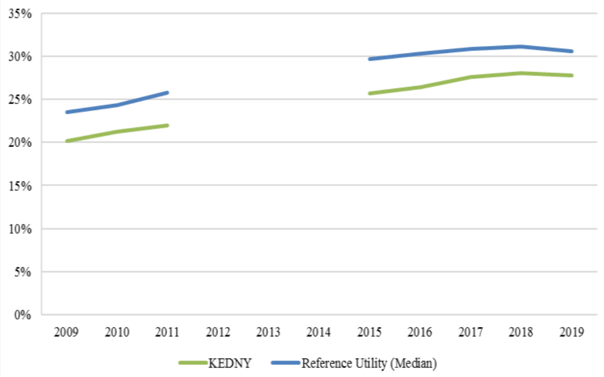


Chart II.111: Gas Capital Percent Contracting

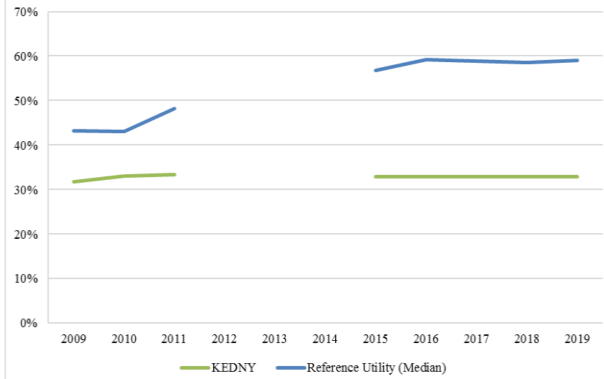


Chart II.112: Gas O&M Percent Contracting

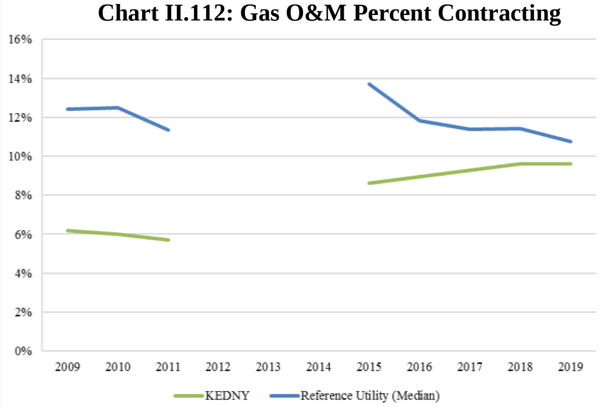
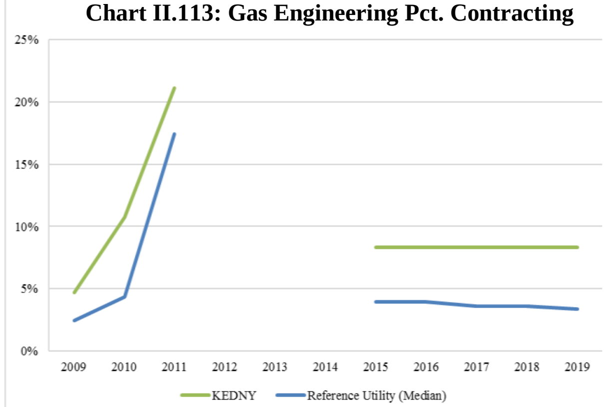


Chart II.113: Gas Engineering Pct. Contracting



While KEDNY's historic total contracting FTEs were consistent with the Reference Utility for the 2009 to 2011 base period, the forecast period of 2015 to 2019 showed significant increases in projected FTEs for the Reference Utility, which was in line with a statewide increase in pipe replacement. KEDNY’s numbers however increased dramatically versus the Reference Utility in this period. While the Reference Utility value showed an effective doubling of projected numbers of gas FTEs for the forecast period, KEDNY’s projections reached triple their 2011 total by 2018.

As we did for electric operations, we also plotted contractor FTEs (see bottom left chart). The KEDNY requirement was high compared to the Reference Utility value. Meanwhile, the lower right chart illustrates that the growth in contractors was significantly greater than the growth in internal resources.

Chart II.114: Gas Contractor FTEs

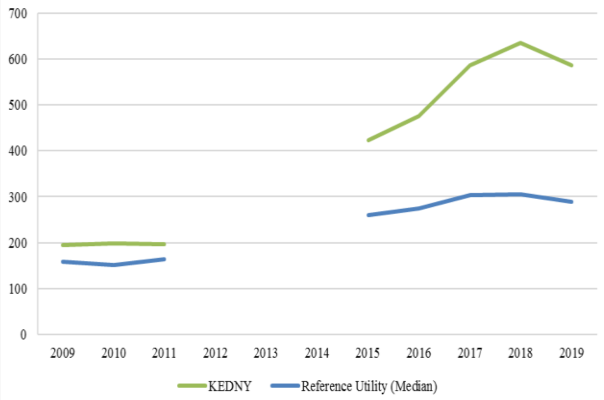
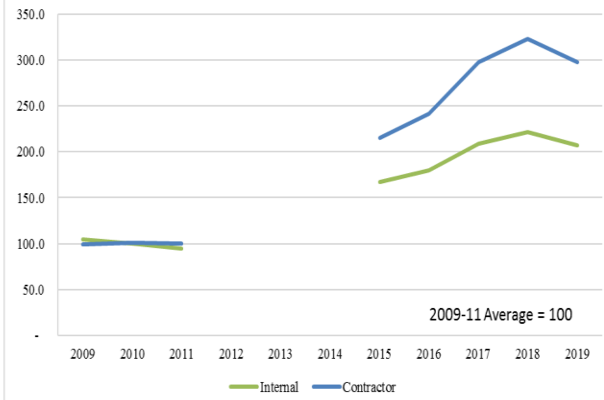


Chart II.115: FTEs Indexed to 2009-2011 Average



F. Conclusions

As a preliminary note, the lack of valid 2012 and 2013 data for the National Grid companies needs to be remembered in addressing conclusions and recommendations for the three operations. In addressing staffing adequacy, we begin from the premise that there is no one indicator and certainly no simple algorithm that can provide a definitive answer. We have approached the question of adequacy by weighing the contributions of multiple perspectives, which we found on many occasions support inferences in opposite directions. We formed judgments about staffing adequacy considering the balance of the weight of the "evidence."

Some of our bases for making such judgments had mathematical underpinnings, but our conclusions on adequacy do not approach (nor could they have) anything like mathematical certainty. They represent our best judgments based on the data we had and our analysis of that data. They are informed as well by the results of our process reviews.

We offer these judgments about adequacy as our best contribution to a process that the companies and their stakeholders should (and do, from all that we saw) agree is critical – – continually seeking out all means possible to ensure that staffing decisions result from the broadest possible range of insights, challenges, and perspectives.

These conclusions reflect our contribution to what will certainly remain an ongoing, dynamic, and fluid staff optimization process, as infrastructure needs, customer expectations, workforce demographics, technological advancements, and policy change continue to bring opportunity and risk to the electric and gas utility businesses.

1. Major data management problems became apparent after management's decision to implement SAP financial and operational information systems; they handicapped management's ability to monitor and effectively manage elements of its operations, including staffing-related matters.

These problems have affected National Grid now for a number of years. The lack of reliable data inhibited our study in some respects, but the more important impact lies in how it has affected and continues in some ways to hamper the Company's New York electric and gas operations. The difficulties faced by management in getting the data it needs to effectively manage operations have been the real consequences of significance.

2. Material indications of staffing insufficiency at NIMO (electric and gas), when combined with projected declines in O&M, raise concerns going forward.

Liberty examined numerous indicators of staffing adequacy, some of which provided indicators of staffing at less than optimum levels. They do not support a firm conclusion that staffing was clearly unreasonable. As was frequently the case in our study, different perspectives produced some conflict among observations. Making firm conclusions without a strong preponderance of the evidence is not helpful. Doing so should take strong concurrence of the signals available. For example, a utility with declining staffing, declining reliability, and excessive overtime will be highly suspected to be under-staffed.

In the case of NIMO electric operations, we observed indications from the model (O&M) and from a relatively high use of overtime. But without confirmation from other signals, we did not conclude that understaffing is an issue. It was in looking to the future that we developed concerns about staffing. Management's forecasts indicated plans to decrease O&M resources further. The reduction was considerable in gas and less so in electric operations. With indicators of concern already, the prospect of future reductions is discomforting.

The significant model variance in T&S Engineering is also of concern, and warrants examination of forecasts in that area as well.

3. Numerous indications point to insufficient staffing at KEDLI and KEDNY.

The indicators of understaffing concern at KEDLI and KEDNY also fail to be conclusive, but are much stronger than what we found in the case of NIMO. We found a confluence of indicators, not all of them major, but nevertheless going in the same direction. These indicators include our model, high reliance on overtime, slight decline in leak response, and very large forecasted future workload and FTE increases.

4. The vast staffing increases that KEDLI and KEDNY proposed, largely in connection with pipe replacement acceleration, raise major questions of achievability.

The companies see their resource requirements increasing by very large numbers. KEDLI was seeking to move from about 600 to about 1,400 in gas FTEs in total, and KEDNY was expecting its 900 to move to about 2,100, both of which represented a 134 percent increase. Main replacement programs formed the primary driver of these increased resource needs.

The effort required to acquire this level of skilled resources, in what is becoming an increasingly tight market for main replacement trades, will present a major challenge, one requiring a coordinated, focused program to acquire and develop the requisite skills. While commitments to major expansion of pipe replacement may be new, Liberty did not observe an aggressive program either in place or in the works. Such a program clearly needs to exist and now, in order to produce confidence that a sound path to securing and maintaining the required resources exists.

5. Lying beyond the challenge of securing the increased resources is the perhaps greater one of employing them effectively; it is not clear that needed plans, processes and systems

are in place to effectively implement and manage the vast capital workload that lies ahead for KEDNY and KEDLI

Assuming that sufficient resources can indeed be put in place, the equally critical question of how to manage such an expanded workforce and level of effort follows. Such a large increase in the construction effort opens the door to major organizational changes, significantly improved capabilities in program and project management, and enhancement of associated systems and processes. Management needs to undertake structured consideration of changes to address issues and needs like these, if it is to mobilize effectively.

6. Overtime in electric distribution at NIMO and in gas at KEDLI and KEDNY, already very high on an historical basis is forecasted to increase even further.

Overtime use was already high when measured on an absolute basis, in relation to other utilities, and against the Companies' own targets. We found overtime excessive and management attention to the issue needed. Management forecasted that historic rates, which we already found concerning, will rise further, and moreover apply across a far larger base. There was not a sound basis for considering such projections part of an optimum resource mix. They threaten higher costs and lower productivity. When considering the expected large increase in the workforce, these inefficiencies can have a large cost impact.

7. Dependence on contractors was generally in line with the other utilities and, although forecasts showed the number of contractors increasing sharply in the future, their relative mix stayed about the same.

We found nothing unusual or concerning in current use of contractors. It was interesting to note that the contractor mix remaining unchanged despite the need for a massive increase in the workforce. Others have responded to increases more through using additional contract resources. Management's approach for KEDLI and KEDNY further emphasized the challenge involved in growing and in supporting such large quantum changes in staffing.

8. Historical gas engineering staffing levels at KEDLI and to a lesser extent KEDNY did not appear sufficient, but significant forecasted increases in engineering staffing appeared to respond to this gap.

Liberty indicators, especially our model, raised concerns about KEDLI and KEDNY staffing in gas engineering. The point may be moot, however, given the increases currently projected for the future.

G. Recommendations

1. NIMO management should evaluate current understaffing with the intent, if appropriate, to revise its plans for future O&M staffing.

2. KEDLI and KEDNY should identify potential understaffing situations, and assure the modest staff increases planned for O&M are sufficient.

3. KEDLI and KEDNY should develop aggressive comprehensive plans for the acquisition of the required future resources, especially for main replacement work.

4. **Given the large expansion of the workforce and associated workload, KEDLI and KEDNY should implement changes in organization, program and project management approaches, processes, and systems to support the expanded effort.**

5. **With high past levels of overtime and still higher projections at NIMO, KEDLI, and KEDNY, management should determine optimum overtime levels, and implement plans to manage overtime at resulting, reduced levels.**

Chapter III: Process Analysis

A. Resource Planning

1. Summary

Our field work found National Grid engaged in major efforts to improve the organization, resources, approaches, and methods that support resource planning. Some changes had already been made and others were in progress. We consider completion of those efforts an important priority. The reason is that we found its resource planning processes, tools, and capabilities at and in the period leading up to our field work the weakest among the other large operations we studied here. Management has been grappling with SAP-related problems as far back as 2012 and 2013. Those problems included the loss of capabilities and resources, with efforts to replace some of them still in progress. Resolving them has taken a very long time. That duration has been a barrier to producing resource planning improvements.

A comprehensive initiative begun during 2015 has focused on developing resource planning processes, information, analysis tools, and approaches for the electric and gas organizations. We observed improvements in organization, information, and processes, either implemented or into development. Plans called for defining and developing improved resource planning approaches and tools by the end of 2016. Electric operations was ahead of its gas counterpart in making improvements and in developing experience and maturity in using new approaches, methods, and tools. While management efforts in this regard were noteworthy, it remains essential to focus on completing them as thoroughly and as promptly as possible.

At a more detailed level, we observed at National Grid a common gap seen at other operations we studied. That gap consisted in relying on cost data (as opposed to measures of work performed, such as person-hours or equivalent FTE) in balancing resources among internal and contractor options. Management needs to develop a sound basis for examining contractor workloads in terms of equivalent internal person-hours or FTEs, in order to optimize its resource balance. We also found a need for management to move toward regular use of structured analyses of the effectiveness of overtime and contractor use, again to support efforts to optimize its resource balance. Management had committed to improving the analysis of straight time, overtime, and contractor use in the future, planning to complete an optimization analysis to determine the optimal internal employee straight time, overtime and contractor usage. Management anticipated completion of the analysis in 2017.[7]

2. Findings

a. <u>Overview/Summary</u>

Of the larger utilities in this study the National Grid companies (Niagara Mohawk, KEDLI, and KEDNY) had the weakest Resource Planning process, organizational support, resource planning tools, and information to support development of quantitative resource plans. Management drove planning financially from top-down goals. Short term capital resource plan development employed

[7] During field work, management advised that it anticipated completion in 2016, but offered the revised completion date of 2017 in its August 2016 comments on a draft of this report.

a detailed bottom-up approach, but O&M plans resulted from a more incremental approach. Management was revamping the process during our field work. Organizationally, while some experienced personnel were available to support the process, we found only limited experience in analysis personnel. A 2015 reorganization added personnel, who were gaining experience during 2015 and 2016 planning cycles. The National Grid companies formerly had relatively robust information and analysis tools available to support resource planning, but much of the capability was lost following the conversion of financial systems to SAP in 2012 and 2013.

Key elements of the annual resource planning process included:

- Both electric and gas processes identified and prioritized capital and O&M spending levels using analytical frameworks and risk analyses.
- Forecasts took into account appropriate considerations, which included overall guidance, past spending levels, identified future capital projects, risk-prioritization of those projects, and incremental O&M spending requests.
- After financial levels were set by the budget development and review processes, resource plans were developed to as part of detailed work plans to fit these expenditure levels.

At the time of our field work, a significant effort was underway (called the “Strategic Workforce Planning Project”) to develop resource planning processes, information, analysis tools, and approaches for the electric and gas organizations. Management initially structured this initiative under separate project teams to address electric and gas resource planning needs. Late in 2015, management merged these efforts into a single initiative to insure consistency of approach. Plans called for defining and developing improved resource planning approaches and tools by the end of 2016.

b. Assessment of Key Resource Planning Elements

i. Organization

Centralized resource planning and investment planning groups began to operate in the 2005-2007 timeframe. A 2015 reorganization placed groups into the operating departments (electric and gas). Our field work found a small body of personnel (very experienced in the process and use of SAP tools and information) available to support managers with budgeting and resource planning information requirements, as those managers worked to develop their budgets. Much experience was lost during the transition to SAP. Management was still struggling with regaining these capabilities, as the organization continued efforts to rebuild expertise.

The reorganization in 2015, added resource planning and investment planning personnel within the decentralized organizations. The 2015 and 2016 planning cycles gave these new resources the opportunity to begin developing experience. Management combined electric organization resource planning and investment planning into a single organization reporting to a single vice president, and added personnel. Gas operations created resource planning groups within the project management and construction organization (for capital work), and within a more customer-focused organization (CMS) for O&M work. By the end of 2015, the electric organization had approximately five people in place to support resource and investment planning. The gas organization had 10 people devoted to these planning functions.[8]

Management was also re-examining resource planning capabilities and organizational requirements as part of the Strategic Workforce Planning Project improvement initiative.

ii. Information

Management used information tools and processes for analyzing workload data at the organizational unit level, and future budget requirements were still being developed during. Then-current tools and information included:

- The SAP Business Intelligence tool provided key resource planning information.
- Management used Primavera for defining, planning, and tracking capital projects. This tool included the capability to define staffing resource (person-hours) requirements.
- PowerPlan provided the tool for entering consolidated budgets.
- Ultimately, all work forecasts and tracking used dollars as the basis. Management did not have current information available for tracking work units and unit rates for forecasted workloads levels at the functional and organizational level. Detailed information, at the project level existed for capital work. O&M work tracking occurred at the program level.
- Workload plan and information development occurred following the setting of financial targets by the budgeting process. Information included detailed breakdowns for hours and costs for internal resources (straight time and OT).
- Ready availability of electric information did not exist on a regional basis. However, company-level breakdowns for internal resources, OT, and contractor existed. Management did not track person-hours for contractors. Management developed workload forecasts at the level of each project or program, and rolled them up to produce the overall forecast, supported by the use of sophisticated project management software (P6).
- Gas forecasts at the program level did not include regional breakdowns and they employed less sophisticated (spreadsheet) tools. Management was, at the time of our field work, defining tools to support a five-year resource forecast, which would make gas forecasting more consistent with the approach used in electric operations.
- Plans for contractors included costs and, in some cases, units but did not track historical workloads or future workloads forecasted in person-hours.
- Staffing level projections for internal resources derived from workload estimates.
- Determination of needed staffing levels took attrition forecasts into account.

National Grid followed the prevailing practice among the utilities we studied in that it largely limited planning information for work to be performed by contractors to cost data. Management did have access in some cases to unit-based based information for work assigned to contractors. National Grid did not, however, track historical workloads in either person-hours or FTEs. Management did not develop projections of contractor workloads from unit rates and forecasted in person-hours. This factor distinguished its contractor forecasting from the methods used to develop internal workload forecasts. In providing data for our study, management was able to use

[8] Management's August 2016 comments on a draft of this report cited significantly larger numbers than existed at the time of our field work. A resource planning initiative was underway at that time, but the organization as not as developed as the comments indicate.

the expertise of engineering estimators to provide estimates of historical electric and gas contractor hours. The historical estimates provided used average labor hours per dollar contracted for different types of work, and applied these average unit rates to contractor expenditure levels.

Management had substantial difficulty in providing data to support our analyses. These difficulties proved instructive to our understanding of information and data analysis shortcomings that must have been affecting its staffing planning and analysis. We encountered difficulty in several areas. Management has much difficulty in providing past and current electric work function data (types of capital and O&M work) for each operating organization (regions and work groups). Management also encountered difficulty in producing gas operations functional breakdowns per components of work that most gas companies use for internal purposes. Those difficulties appear to have resulted from transitional issues being addressed by current improvement efforts.

Some of the past data issues related to tracking functional workload data for each organization unit appear to have been addressed in a mid-2014 SAP release. Nevertheless, such data problems pointed to the need for management to ensure that it can track information at a more disaggregated level in the future, and that it can develop sufficiently detailed information to support bottom-up development of workload based resource plans.

iii. Processes and Tools

The annual resource planning and budgeting cycle used processes, and information sources that still remained in the process of development and change following the transition 2012 and 2013 transition to SAP. This annual process began in late spring under top-level guidance that addressed financial constraints and key issues or initiatives. Initial development of work plans and budgets designed to meet the financial goals and targets occurred through early summer each year. Then, using a series of presentations, reviews, and challenges, budgets at the lowest organizational levels underwent increasing levels of roll-up to higher organizational levels. The iterative processes used during this part of the cycle gave line management the opportunity to make a case for funding and priority changes. These cases became especially important when exceeding the guidance under which initial development occurred, and when amounts exceeded past spending levels. The process culminated in November or December, with a presentation supporting board of directors' review of consolidated, vetted, and management-approved resource plans and budgets.

As stated earlier, management's resource tools and capabilities were still evolving during our field work. Some approaches had changed after new capabilities and tools became available. Others were in the planning stage as part of the Strategic Workforce Planning Project. Characteristics of the company's current approach included a number of notable features:

- Budgets drove staffing and work plans developed for each program. Plans incorporated risk-based identification and prioritization of capital and O&M needs for electric and for gas work.
- Capital forecasts, both electric and gas, identified and prioritized work using rigorous analytical frameworks.
- Electric planning used Primavera (P6) to identify, plan, and track capital requirements at a highly-detailed level. Electric planning set priorities based upon risk-based analysis.

- Gas planning employed analytical models to set capital priorities. The resulting capital plans were less sophisticated than their electric counterparts. Management was developing a five-year resource loaded plan for implementation in phases, beginning in 2016.
- Gas O&M spending forecasts did not have the same rigor as their electric counterparts. They had more of an "incremental" character, being based upon historical spending levels. We found consistency in O&M spending frameworks and risk analyses (*e.g.*, mandatory and customer work) across businesses and programs.
- Management used the PowerPlan tool to consolidate budget requests and provided budget reports for electric and gas.
- Throughout the year, senior management used a monthly review process to track whether current year budgets remain on track, and to adjust forecasts. Tracking provided input for adjusting future-year forecasts.
- Forecasts for contractor resources relied on projecting dollar based expenditures, instead of developing person-hour/unit rate based forecasts. Electric planning used P6 to model all work, regardless of resource, on the basis of people hours. Resource plans, however, used a dollar expenditure basis. Gas resource plans for contractors were also dollar based.

Management has committed to significant enhancements to its capabilities and approaches to development of bottom-up staffing resource plans. These improvements conformed to recommendations and commitments arising from a prior gas management audit. Planned improvements included:

- Unit costs and productivity metrics were being developed across Gas and Electric Maintenance, Construction, and CMS.
- Additional analytical capabilities had been added. Unit costs had been developed in draft form.
- Productivity metrics employed a comparison of estimated to actual hours per job/unit/project.

iv. Resource Planning for Overtime and Contractors

Resource planning for overtime relied heavily upon historical use for certain functions and plans reflect past usage levels. Management recognized that different work groups and work types need different levels of planned overtime and contractor use, given differences in the natures of their work. Planning considered internal limits for overtime for certain type of crews. When plans indicated greater overtime levels, management moved work to contractors. Robust analysis tools existed prior to 2012, but we did not observe the existence of any recent studies that examined the cost-effectiveness of overtime versus other resource sources as part of resource planning.

Companies generally use similar general contractor strategies. They tend to contract for work that is low-value, specialized, schedule-dependent, and peak-load. National Grid planning for contractor use did recognize in a qualitative way the value in keeping some level of sustained contractor "on-site" presence. We found, however, no quantitative analysis intended to optimize the level of such presence. Management's historical information for work done by contractors used expenditures. Management did not include information about hours worked to accomplish capital and O&M work. Unlike budgets for internal resources (straight time and overtime), contractor budgets were translated person-hours or FTEs required for functional work requirements during the development of work plans.

Resource plans and annual budgets identified future contractor workloads on a total dollar basis only. This cost information included all labor, materials, vehicles, and administrative costs. Management kept historical information on contractor-performed work only on the basis of upon expenditures; it kept no information about hours consumed to accomplish capital and O&M work.

Prior to 2012, management used studies of specific functions or projects to determine types of work to assign to contractors. This capability was lost during the SAP transition. We did not, observe any recent structured analyses seeking to determine optimal contractor use.

Management has committed to improving the analysis of straight time, OT, and contractor use in the future. Comparisons based on person hours/FTEs will be performed and management plans to explore resource planning tools in support of this goal. Plans existed for an optimization analysis for both gas and electric operations, seeking to determine the optimal internal employee straight time, overtime and contractor usage. Management anticipated completion of this review in 2017.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Resource Planning criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The organization for coordinating and supporting manpower Resource Planning should be treated as a specialized activity, with dedicated resources.
2. Complete and accurate Information about units of work performed and costs by work function, by region, and by staff resource type should be available.
3. Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.
4. Overtime should form a clear part of the process of identifying required resources, and should rely on an analytically supportable method for determining optimum levels for each work function.
5. Contractor use should form a clear part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

1. National Grid had the least effective resource planning processes, tools, and capabilities among the larger utilities in the study, but was taking significant steps to improve them.

Of the larger utilities in this study the National Grid companies (Niagara Mohawk, KEDLI, and KEDNY) had the least structured, comprehensive, and supported resource planning processes. Organizational support, resource planning tools, and information to support development of quantitatively based resource plans were not strong. Significant change was planned and in many cases in progress during our field work. Organizationally, while some experienced personnel were available to support the process, availability of experienced analysis personnel was limited. A 2015 reorganization added personnel, who were beginning to develop experience for use during 2015 and 2016 planning cycles.

The National Grid companies formerly had relatively robust information and analysis tools available to support resource planning, but much of the capability was lost following the conversion of financial systems to SAP in 2012 and 2013.

During 2015, management chartered the "Strategic Workforce Planning Project" to develop resource planning processes, information, analysis tools, and approaches for the electric and gas organizations. We observed improvements in organization, information, and processes either implemented or under development. Plans called for defining and developing improved resource planning approaches and tools by the end of 2016.

2. Gas operations lagged electric operations in tools and approach to resource planning, but was making appropriate progress toward closing the gap.

The electric organization used a wider range of information and tools to support development of its work plans and budgets, particularly for capital programs. Work in enhancing gas resource plans was in the early stages of development and implementation at the time of our field work. Development of gas tools and training personnel was in earlier stages, but moving in directions similar to those taken on the electric side. When management initiated the Strategic Workforce Planning Project, separate groups were working to define and develop improvements to resource planning approaches. The sound decision to combine efforts under a single, coordinated group should promote consistency of approach across electric and gas groups.

3. Like the state's other utilities, National Grid's reliance on cost data as a measure of contractor work load did not optimize the process of balancing resources.

Identification of contractor workloads (historical and forecast) on a total dollar basis provided insufficient information for effective resource planning. Historical information for work done by contractors, based only upon expenditures, does not provide sufficient information for understanding past capital and O&M workloads. If forecasted contractor workloads cannot be understood in terms of person-hours or FTEs, it is not possible to compare the amounts of work forecasted for contractors to work forecasted for internal resources (straight time or overtime) and effectively make decisions for balancing these resources. The collection and use of such information is also important in managing contractor work.

4. National Grid did not make regular use of structured analyses of the effectiveness of overtime and contractor use.

Effective use of overtime and contractors at the functional or work group level in resource plans cannot be accomplished without ongoing, data-driven analysis of how the results of using overtime and contractors compare to the use of internal staff, and to each other as well. Use of one-time, limited scope studies for accomplishing these types of analyses and reviews during the resource planning process is not sufficient for determining the most effective balance of internal staff, overtime and contractor resources for each type of work.

Management has committed to improving the analysis of straight time, overtime, and contractor use in the future. Comparisons based on person hours/FTEs will be performed and management plans to explore resource planning tools in support of this goal. For both gas and electric operations, plans existed to undertake an optimization analysis to determine the optimal internal employee straight time, overtime and contractor usage. Management anticipated completion of the analysis in 2017.

4. Recommendations

1. National Grid should improve resource planning, and should focus on development of information and tools to support data-driven development of resource plans

Management committed to improving resource planning capabilities when it initiated the Strategic Workforce Planning Project during 2015. Management reinforced this commitment by reorganizing and augmenting its resource and capital planning organizations in mid-2015. Management's efforts were designed to close observed gaps in planning and executing work, to ensure that these efforts succeed in reasonably short order to define, develop, and implement improved information tools and processes that will produce comprehensive, data-driven resource plans. In particular, management should plan and take specific actions to develop a broad base of electric and gas unit costs and productivity data for use as the basis for developing bottom-up forecasts of workload to drive future resource plans.

2. National Grid should aggressively enhance gas operations' resource planning tools and methods.

Much progress has been made and more is planned. Development during 2016 of its first cycle of five-year gas capital resource plans provides an indicator of management's commitment to improve in this area. Focused efforts are required to continue making steady progress along the lines that gas operations identified, and that promise to bring its resource planning capabilities and methods to a level commensurate with that of electric operations. These capabilities include information, tools and analytical processes. Planned improvements currently being defined for the electric resource planning process should serve as an important guide in completing plans for improving gas capabilities.

3. National Grid should plan and track contractor work load using FTE- or person-hour based values.

Management should develop quantitative FTE or person-hour estimates for forecasted workloads within each major functional capital and O&M program and organizational unit in the electric and gas organizations. Management needs to view person-hour/FTE forecasts of the amount of work to be performed by contractors as a critical element to understand and to use in identifying and planning to meet total work requirements that emerge from the bottom-up development of work plans. These plans feed budget requests for each organization. The resource planning processes can be enhanced by developing these estimates, either by using historical person-hour amounts from past contracts or by projecting workload requirements for the work or by using engineering estimates to quantify these workloads at the program level.

4. National Grid should conduct regular, data driven processes designed for evaluating the trade-offs among overtime, contractors, and internal staff at the functional/work group level.

Management needs to complete efforts to develop ongoing, quantitative methods for comparing the equivalent cost of each of the three resource types in accomplishing the different types of work. Meaningful comparisons of the equivalent cost of each of these three types (on a work type by work type basis) will enable a more informed resource plan for optimizing straight time, overtime, contractor mixes for each organization. Such comparisons can also be used to evaluate requests for changes to internal staffing levels.

B. Work Force Management and Performance Measurement

1. Summary

a. Work Force Management

Management recognized that it had gaps in access to data and in documentation outlining Work Management processes. Management also reported the assignment of an individual to address the need for improved documentation of processes.

Management recently began planning for a multi-year "Gas Enablement System" initiative seeking to simplify and standardize its gas work management and asset management processes and systems. It adopted interim manual fixes. The Gas Enablement System initiative will replace, consolidate and simplify and integrate its legacy gas work and asset management systems, including those addressing gas leak management. Management was seeking to standardize work and asset management processes that directly support gas work, improve forecasting, scheduling and planning, improve analytics and data insight, enhance field device mobility, improve the customer experience.

We also observed that management had lost the ability to collect and analyze some detailed performance data for internal and contractor resources in gas operations. Management reported recently that it had developed a model that would regain this capability, observing that it was in the "scrubbing" stage.

Management established a Gas Long Term Resource Planning group as part of its Gas Asset Management/Investment Planning Department. The group's role was to prepare three- to five-year resource plans for gas operations. The goal was for those plans to identify resource levels required for both capital projects and operating and maintenance activities. Expecting to complete implementation by mid-2016, the long-term resource plans include four phases:

- I – Physical work associated with Capital expenditures and associated O&M
- II – Physical O&M work
- III – Vehicles / Equipment / Materials
- IV – Back Office / Field Support.

An Electric Long Term Resource Planning group had been in place inside the Electric Investment Planning Department for a number of years. It too sought to prepare three- to five-year resource plans for electric operations.

b. <u>Performance Measurement</u>

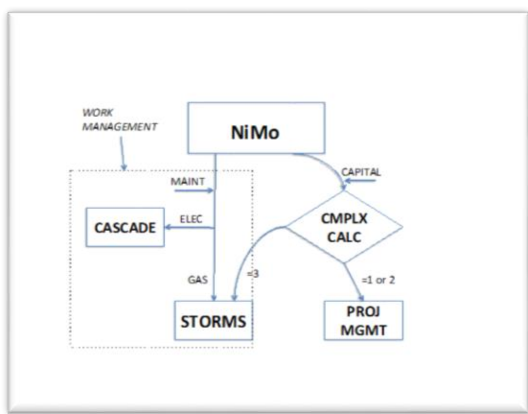
The recent management audit of National Grid's New York gas utility operations found that management did not use its work management systems or apply work measurement standards to manage its workforce. We found a lack of targets or estimates for work to be performed and a lack of sufficiently focused productivity measurement. We found a similar lack of performance measurement on the electric operations side. Management agreed that gaps existed with respect to electric and gas performance metrics. It reported efforts to develop metrics and KPIs that will support improved work scheduling and management.

Addressing these management audit issues is a priority for improving efforts to identify and balance resource requirements. Management had plans for doing so. It reported plans to complete an initiative for developing estimated productivity measures, and for defining hours per unit metrics to manage productivity. While the management audit of gas operations served as an initiating factor, efforts to improve performance measurement included electric operation as well, where National Grid was developing unit cost reporting and productivity measures. By the end of 2017, management anticipated completion of an analysis that will seek to optimize internal employee straight time, overtime and contractor use. Successful completion of these activities should substantially enhance resource planning, thus making completion a priority from a staffing optimization perspective.

2. Findings

a. <u>Work Management Systems</u>

NIMO, KEDNY, and KEDNY used different Work Management systems, but their underlying processes had a fairly consistent scope. Management had not integrated these systems at the enterprise level. A system called STORMS formed the core of NIMO's Work Management System. Ancillary systems addressed accounting, scheduling, and time reporting. Grid also used STORMS for all but one of its New England utilities. KEDLI and KEDNY used Maximo as their Work Management system, and supported it with a number of ancillary programs. The KEDLI and KEDNY use of the Maximo system and processes pre-date Grid's acquisition of these downstate gas utilities.



All three National Grid operations ran parallel systems to manage work in their respective operations. Management placed projects whose complexity (a function of eight variables, including cost) crossed a numeric threshold on its Project Management track, which used processes and tools specific to qualifying projects. Maintenance work and simple capital projects below the Project Management threshold routed to the companies' respective Work Management Systems.

The Work Management Systems operated through a combination of processes, programs, and technologies that allowed management to meet the needs of maintenance and simple capital work, but exhibited gaps in documentation and training, and, more significantly in performance data collection and use. Efforts underway to address performance data collection and use stemmed from the recent management of National Grid's New York gas utility operations, but extended as well to enhancements in electric operations.

National Grid's New York operations did not use distinct Work Management organizations. A Resource Planning organization addressed Work Management in each company. NIMO's Network Strategy (IT) and Operations groups also had roles in the administration of the Work Management process and tools. The Work Management Systems did not operate on an enterprise basis, but consisted of platforms provided by different vendors and linked together.

The tools supporting Work Management were generally appropriate and effective at all Company operations. All designed their Work Management tools for maintenance work, rather than large capital projects. The latter require longer planning, design and construction times. All used mobile data terminals for gas maintenance crews, for dispatch, work assignments and time reporting. Electric crews and construction crews used manual input.

Documentation and training, differences between electric and gas processes and, critically, the inability to capture performance data for all work, need to be corrected. A recent gas management audit addressed the issue of performance data capture.

b. <u>WMS Documentation and Training</u>

Documentation of the processes comprising Work Management was not complete. The documentation by the Work Management systems focused on how tools work, rather than the processes that underlie the tools. The KEDLI and KEDNY manual on Maximo consisted of screen shots of the input screens and reports. In contrast, the documentation and manuals for the common Project Management focused on the processes with step-by-step detail of not just what steps must be taken, but why.

The breadth and depth of formal training for and documentation of the tools used to support the Work Management processes was mixed. NIMO operated a formal training program in the use of STORMS and ancillary programs. It was designed for use in a classroom setting. To repeat, however, the focus of this training was on the tools, and not the underlying processes. The STORMS training material was not kept fully updated. The training material bore an issue date of March 2009; management confirmed that it was the most current version. A review of the material disclosed outdated references to tools no longer used, and conversely a lack of references to certain tools then in use.

The KEDLI and KEDNY training material consisted of instructions in filling out each screen in Maximo for the desired objective. It was presented sequentially for review, but it was not clear whether it was designed for classroom or individual study. As was the case at NIMO, the aim of this material was to teach the use of the tool, rather than the processes behind the tool. Separate training materials existed for the Project Management team.

As noted earlier, both KEDLI/KEDNY and NIMO used a distinct Project Management structure for the two most complex classes of capital projects. Both used the same project management systems. They operated primarily on a manual basis, because there tended to be relatively few complex capital projects at any time. The Project Manager position was full time. NIMO indicated that there were open positions during our field work. NIMO used separate groups to provide Project Management for electric and gas capital work. A formal training program existed for project managers. The Companies each established certification by the Project Management Institute as a goal for project managers. Project managers typically came from each company's engineering group.

Training materials and manuals existed for project managers. They included a "Project Management Playbook" for NIMO electrical operations and a "Gas Project Management Playbook" for NIMO gas operations and for KEDLI and KEDNY. These manuals had a recent vintage (2013), and were written as training and resource documents.

c. <u>Program and Project Scheduling</u>

Primavera served as the electric project scheduling and project management tool, with iScheduler used to schedule crews. For both electric and gas operations, multiple steps covered the scheduling of long- and short-term projects. Annual meetings established long-term schedules using both manual (for complex projects) and automated systems (iScheduler for simple projects). Monthly meetings (Portfolio Calibration Meetings, regional Program Management Meetings, and regional Construction Meetings) reviewed schedules, and adjusted as necessary. Weekly sessions of a Resource Control Group in each region made short-term adjustments to schedules as necessary, based on immediate changes in priorities (*e.g.*, effects of storm restoration).

The KEDLI and KEDLI processes operated similarly to those of NIMO, but employed a different scheduling tool (Maximo). As we finished field work, management was considering a move to Primavera for scheduling.

d. <u>Program and Project Management</u>

The Work Management processes and tools addressed maintenance and routine capital projects. Major capital projects fell within a defined Project Management process, which all three operations used. Each utility's Resource Planning group had responsibility for releasing capital projects. Upon release, each project underwent a "complexity rating" process. The three National Grid operations ranked capital projects using a three-level Complexity Factor. This factor incorporated the eight variables of cost, number of sub-projects, types of outages required, complexity of the assets in the project, need for land or rights of way, need for permits, special procurement issues (*e.g.*, long lead time material or equipment), and need for community outreach. Documentation provided tables for assigning numeric values to each variable, depending on its potential impact on the project. Summing these individual values produced a score that generated a three-tiered complexity ranking. The highest two rankings led a project to the Project Management team. The third, least complex ranking meant that each utility's respective work management system handled the project. We found this use of a quantitative, multivariate tool a strong element of the use of work management. It reflected a best state practice.

Project management team members scheduled these two highest ranked project types. They entered the schedules manually into each utility's respective scheduling tool. Gas operations used a similar approach, but, unlike Electric operations, had not used Primavera (an industry leading platform frequently used in the utility industry for managing large portfolios of projects).

Management stated that gas operations will be adopting some of the electric operations work management tools soon.

With the diversion of the two most complex forms of capital projects to the Project Management team, Work Management Systems focused more on maintenance activities. NIMO electric operations used Cascade to schedule maintenance and issue work packets.

Oslo-based DNV GL, which operates in over 100 countries through 15,000 professionals, developed the Cascade software specifically for energy utilities. The platform supports technical asset management and predictive maintenance, in order to minimize failure risk, maximize equipment lives cost effectively, increase reliability, manage compliance, and optimize operations and assets. Cascade supports a reliability-based approach to managing infrastructure, combining asset condition and operational data and criticality to enable prioritization of maintenance activities. It integrates data, permits failure impact analysis, and supports integration with industry-leading enterprise resource planning systems and utility-specific software.

Gas operations was in the process of moving to Cascade for its maintenance work during our field work completion. For emergent or emergency work, there was a link between NIMO's Customer Service System and STORMS, and between KeySpan's CIS and Maximo.

e. Program and Project Monitoring

Management used regular (quarterly, monthly and weekly) progress and reporting meetings to review schedule and budget status. The Work Management Systems could extract electric budget and other financial data automatically from payroll databases. Gas operations at NIMO was moving towards using SAP, but were extracting data manually. KEDLI and KEDNY could extract their data also. However, none of the three operations could develop performance data. Migration to SAP in 2012 left them unable successfully to upload historic performance data.

f. Treatment of Overtime and Contractors

We also examined the degree to which work management systems and processes captured performance data, not just for internal, but also contractor forces, and whether management used that performance data for resource planning. The Project Management and Resource Planning groups fell under the electric and gas Process and Engineering groups at each utility. Decisions regarding the use of contractors and overtime resided there as well. When scheduling work, Resource Planning looked at all alternatives: transfers of internal labor among divisions/regions, use of overtime, and use of contractors. Certain types of work were automatically assigned to contractors, especially those of very low skill level or a specialty skill that did not reside within the utilities.

The Work Management System did not capture performance data for internal and contract forces in a comprehensive and structured manner. NIMO's electric operations did not maintain information on performance. The electric operation group had established Process Excellence teams to develop metrics for both internal and contract work. Full implementation was expected in the months following the completion of our field work.

NIMO's gas operations organization was unable to produce detailed performance data and productivity measures since March of 2012, when the transition to SAP produced an inability to carry historical data forward. KEDLI and KEDNY lost their ability in September 2012 for the same reason. All three operations were extracting limited productivity data for internal resources only. Both gas groups were working to restore full capability using the existing systems when our field work ended.

g. Quality Assurance and Control

Quality Assurance for gas operations fell under separate QA/QC groups, residing in the separate NIMO and KEDLI/KEDNY Safety and Compliance organizations. These groups had responsibility for inspections of all gas work and documentation required under state and federal regulations. NIMO housed its electric QA function under a Work Methods group. This group performed quality audits of the work both during and after construction. The QA group reported directly to NIMO management.

h. Performance Measurement

i. Electric

NIMO was not performing substantial measurement at the work unit level. They did not compare actual to estimated hours. Existing systems had the capability of capturing the data at a granular level, but they cannot match the two. Crews charge time and vehicles to work orders. All time went to work orders. The Companies were not tracking details, such as job site or "wrench" time.

NIMO was not maintaining information on units of work performed for electric work. The primary measurement focus lay on measuring work plan effectiveness. "Process Excellence" teams were working to develop metrics to measure the effectiveness of electric operations. NIMO was measuring key milestones such as design complete, construction start and construction complete.

ii. Gas

All three National Grid gas operations had independently developed, fairly mature, well-developed performance monitoring and productivity measurement systems. They were abandoned in 2012 and 2013 with the conversion to the corporate-wide SAP system. The SAP rollout could not accommodate continuation of historical measurements or flow the underlying data through to the new locations housing such data. Plans existed to match up hours and dollars from the SAP system with units from the Work Management Systems (Maximo at KEDLI and KEDNY; STORMS at Niagara Mohawk), and begin to roll out the program in mid-2015. The initial plan was to have 10 programs on the capital side, which would capture about 75 percent of the spending, and the remainder the following year. On the O&M side, management expected a similar rollout, although the percentage of spend to be captured was uncertain. However, at the time of our field work we did not observe specific milestones or targets, which produced uncertainty as to what will be achieved when. The overall goal was to replicate the outputs of the previous systems.

Data denominated by hours, dollars and units were available in various reports, but accumulated separately and not matched.

3. *Conclusions*

Liberty based these conclusions on our evaluation of Company practices and processes against specific Work Management and Performance Measurement criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These seven criteria are:

1. The systems and tools used to support Work Force Management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.
2. Comprehensive, adequate documentation of the Work Management processes, systems and tools should exist and be supported by appropriate training.
3. Management should have and regularly employ well defined processes for the short- and long-term planning and scheduling of capital and O&M.
4. Management should apply an appropriate approach, resources, and methods to program and project management.
5. Systems and tools should capture and enable the analysis of data respecting use of all types of staffing resources.
6. There should exist an appropriate approach to and organization for Quality Assurance and Control.
7. Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness resource use and balancing.

a. Work Force Management

1. Performance data capture gaps existed at all three National Grid state operations.

The inability of the gas operations to collect or analyze detailed performance data for both internal and contractors caused a gap in Work Management/Project Management Systems. The loss of the ability of the respective gas operations to produce insightful information about the productivity and performance of internal crews and to produce similar data for contractors adversely affects the ability to gain understanding material to planning staffing resources. Steps were being taken by the respective utilities' gas operations to regain as much of this ability as possible, consistent with recommendations from the recent management audit of these utilities' gas operations. The implementation plans from that audit presented a reasonable means for addressing the gaps.

NIMO's electric operations group did not have sufficient ability to maintain information on units of work performed. Properly informed plans for staffing require the use of productivity data to determine current needs (*e.g.*, internal vs. contractor crews) and long-term needs (number of staff needed to achieve future capital and maintenance work).

2. WMS documentation was not complete and training material was outdated.

The documentation describing the Work Management processes and tools (STORMS, Maximo) was not complete and the associated training material was outdated. There was no documentation describing overall the Work Management processes. Users of Work Management tools should be adequately knowledgeable about the processes, and relationships among these processes. The training material for STORMS was six years out of date, and did not reflect the current status of the NIMO Work Management system or its components.

3. The National Grid operations performed scheduling effectively.

National Grid's New York utilities used structured processes for long- and short-term scheduling. It was appropriately supported by organizations that prepared, monitored, and adjusted schedules as required.

4. Appropriate feedback and reporting mechanisms exist to inform management and other affected organizations about project progress.

Management used monthly meetings to allow schedule and budget status review by upper management. Monthly meetings before the Project Control Group reviewed project progress. Sufficient capability existed to extract the data supporting such reviews. NIMO electric operations data extraction occurred automatically. Manual processes provided the gas data. KEDLI and KEDNY could obtain data automatically.

5. The Project Management organizations were adequate for electric and for gas operations.

The use of a multivariate formula to determine which capital projects are assigned project managers reflected best state practice. The current training and certification process for Project Managers was comprehensive. The Project Managers' responsibilities as outlined in the respective "Playbooks" were comprehensive and appropriate.

Locating both Work Management and contractor/overtime policy responsibilities in the same Resource Planning Group reflected a sound approach. The same managers who helped plan and schedule capital and maintenance work also had responsibilities to administer the overtime and contractor policies. There were less likely to be disconnects or miscommunication between these functions.

6. Quality Assurance and Quality Control were located appropriately.

For both electric and gas operations, these quality control and assurance processes were administered outside of the Work Management and Project Management systems, and outside of Resource Management. This approach helped to ensure independent examination of the work.

b. Performance Measurement

None of the National Grid operations in electric or gas operations had a work-based monitoring system in place. There was not structured, comprehensive capturing of unit costs and unit hours on the electric side, and therefore no ability to develop productivity reports. On the gas side, those attributes were captured but not brought together for analysis. Management was still testing the capabilities of SAP in regard to work unit measurement. The various systems could capture data on a granular level, but were unable to mate them together.

Until this measurement gap is closed, it will not be practicable to apply performance measures to work load projections and performance, comprehensively incorporate performance measures into staffing decision-making, or to maintain on a routine, continuing basis performance measures to determine production and productivity levels comprehensively.

4. Recommendations

1. The National Grid Companies should close already recognized WMS gaps effectively and promptly.

National Grid recognized that it had some gaps in access to data and in documentation outlining Work Management processes. Management also reported the assignment of an individual to address the need for improved documentation of processes. We found initiatives and actions reported by management appropriate. It is important to ensure that momentum behind them remains strong and that they be completed with dispatch.

Examples include the "Gas Enablement System" initiative, standardization of work and asset management processes that support gas work, improvements in forecasting, scheduling and planning, and analytics, completion of the model designed to collect and analyze performance data for gas internal and contractor resources, implementation of the Gas Long Term Resource Planning group's three- to-five-year resource plans for gas operations, and full implementation of the Electric Long Term Resource Planning group's three- to-five-year resource planning process.

2. The National Grid companies should create documentation that fully outlines Work Management processes, and update training material to reflect current processes and tools.

Documentation of the processes used to plan, schedule, engineer, design, execute and close work, under the Work Management tools, for both gas and electric (which currently have minor differences), will allow users of the current systems to better understand the relationships of the work groups necessary to accomplish the work. Such documentation should also transcend the tools being used. In addition, training modules are over six years old and are outdated. To make them relevant, they need to be current.

3. As a first priority, the National Grid Companies need to develop and employ comprehensive performance measures for replacement and installation of pipe.

They also need to use the information such measures provide to plan for the levels and balance of resources required to complete replacement timely and efficiently.

Pipe replacement and installation will prove a dominant contributor to capital cost, and high levels of expenditure are expected to continue under the program recently adopted as part of recent rate proceedings. Costs will run into the billions of dollars. Already the market for skilled engineering, management and labor to perform those activities has changed as other utilities in New York and across the country face the same issues and problems associated with replacement of leak-prone pipe. Thus, market conditions affecting labor availability, skills, and experience will remain challenging in the future.

4. Beyond the preceding, immediate and overriding priority, the National Grid Companies need to improve performance measurement across the electric and gas functions this study addresses.

This effort should first include a comprehensive plan for capturing work unit measurements using the data capabilities of the existing SAP global platform. Work unit measurements should include both the number of units, cost per unit and hours per unit. A comprehensive work unit measurement system will track and inform productivity levels, inform current staffing level needs and allow for better forecasts of future staffing needs.

The following list typifies the types of gas measures that should be subject to regular reporting and that should be used not only to assess the effectiveness and efficiency of staffing resources, but also to help in driving forecasts of resources required to meet forecasted requirements in a manner that optimizes the balance among straight internal time, overtime and contractor use.

Monthly Overall Staffing Monitoring – Actual versus Planned (FTE):
(a) Straight Time
(b) Overtime
(c) Contractors
(d) Total Company – ST, OT, Contractors displayed as stacked bars

Internal / Contractor Mix – Actual versus Planned (Functions with major contractors), as appropriate:
- Construction – Main Renewals, Replacements and Upgrades
- Construction – Services Renewals, Replacements and Upgrades
- Construction – New Customer Additions – Services
- Construction - System Additions - Mains

Internal Resource Replenishment (Headcounts) – Actual versus Planned:
(a) Total Workforce
(b) Attritions (based on historical data, adjusted for anticipated future conditions)
(c) Retirement (based on potential retirees, adjusted for anticipated future conditions)
(d) New Hires (based on qualifications and training duration required to become fully qualified)

High-level Performance Indicators on Productivity:
- Hours per Mile of Main Replaced
- Hours per Service Replaced
- Hours per Meter Replaced
- Hour per Mile of Main Installed
- Hours per Leak Repaired
- Hours per Trouble Job Ticket Responded

C. Internal Staffing

1. Summary

We evaluated internal staffing processes at KEDNY, KEDLI, and NIMO in light of lingering problems from the past and the large resource challenges that lay ahead. These operations sat in some key respects suspended between these features of their past and future. We found management engaged in significant efforts to rebuild data and related analytical capabilities, examine and change management approaches and methods, and, particularly to engage important public safety objectives through very large expansion of its pipe replacement program. Management needs to remain aggressive in completing those efforts. Far more importantly, management needs to engage in a fundamental and thorough examination of how to identify, recruit, and develop the resources it will take to meet forecasts of the FTEs needed to perform future work activities. It would clearly be preferable for these staffing activities to occur in more stable organization, approach, and process contexts.

The ability to acquire (and then to apply effectively) such a large new body of resources are matters of great immediacy. Going about that acquisition and application without a comprehensive, long-term plan would create undue cost, schedule, quality, and safety risks under a program that will require billions of dollars of expenditures. The continuing implementation of organizations, approaches, methods, and systems changes underway during our field work and the very recent disposition of ratemaking issues involved with pipe replacement expansion may underlie lack of completion of a comprehensive planning understandable as of the time of our work. Moving aggressively to complete such planning as of now, however should be considered a first and paramount priority for gas operations.

In particular, robustly addressing the imposing needs for increased internal and contractor resources command attention. Our experience, however, also compels the observation that staffing is only one of the elements that requires planning to ensure cost, schedule, quality, and safety objectives.

Management made a number of changes to support more effective planning for long term internal staff needs, but faced lingering issues associated with the 2012 conversion to SAP. The Companies lost access to much historical data, whose availability would better support analyses beneficial for staff resource planning. Current processes and procedures (some remaining in development) appeared reasonably well understood and communicated. The transition to SAP, an enterprise wide resource planning and management system, caused many processes, procedures and data resident in its earlier platform to be lost or to become difficult to access. Management has been engaged for a number of years in significant efforts to rebuild certain its analytical capabilities, including the data needed to support them. Examples include productivity tracking and performance metrics, lost in the transition to SAP. We consider successful completion of those efforts central in optimizing staffing effectiveness.

2. *Findings*

a. General

Management had a reasonable understanding of then-current gaps in critical skills and resources and, of all the state utilities, provided the most comprehensive and insightful analysis of long term workforce needs. We did not observe, however, fully developed and concrete plans to acquire and retain the changing skill sets identified as needed for the future. Training and development programs appeared comprehensive and well designed, but will need to be aggressively executed to meet the major resource addition needs. KEDLI and KEDNY, and NIMO (to a lesser but still significant extent), projected substantial increases in gas operations internal staffing levels to accommodate main replacement and infrastructure expansion. Management's ability to acquire the projected resources presented a primary challenge for gas operations going forward.

b. Process

A new budgeting process began in January 2014. Internal staffing deliberations occurred as part of that budgeting process. A Financial Planning and Analysis (FP&A) group managed the budgeting process overall. The group provided strategic plan assumptions and guidance to functional managers in the operating companies. A number of factors were taken into account when providing guidance, including staffing levels. Resource Planning, an internal organization, provided the internal labor, overtime, and contractor resources required to execute work, after budget approval. Resource Planning used the prior year's staff levels as the baseline from which to project near term staff levels.

Long term financial forecasting at National Grid took place annually as part of development of the Business Plan. The Business Plan established a 10-year, strategic view of company direction, but headcount forecasts and staffing information came later. After receiving the Business Plan, Resource Planning prepared an Annual Plan including all capital and O&M work. This Annual Plan's detailed work information served as the primary tool for identifying resource requirements. Electric Resource Planning loaded the Annual Plan into Primavera P6, an industry-standard program management package, provided by Oracle. P6 supports planning of complex projects, balancing resource capacity, allocating resources, tracking progress, and analyzing alternative plans. Electric Resource Planning used P6 to establish capital work levels for internal staff and to identify needs for contractor resources. Gas Resource Planning was using MS Excel.

Long-term O&M planning did not include either the same levels of functional cost detail or staffing needs. Managers in the line organizations had primary responsibility for determining their individual staffing needed to deliver O&M related work. Management described Human Resources as providing strategic workforce planning support. Examples included identifying needs for skill sets and talent solutions in the long term. This role for Human Resources was new during our field work, with its first execution taking place in electric and gas operations.

Managements of the National Grid companies were not systematically preparing workforce analysis reports, but did have plans to use a new workforce planning tool to conduct regular analyses. At the time of our field work, management was in the process of re-establishing a workforce planning function to assist line organizations in conducting staffing analyses. The prior lack of such support hindered the establishment of timely and actionable forecasts of internal staff levels.

SAP's Business Objects and Micro Strategies provided a sound platform for supporting queries of data systems relevant to staffing analyses and decisions. Management was not, however, maintaining for any of the National Grid operations information on units of work performed. Management did cite ongoing work to develop metrics to measure the effectiveness of electric operations. There was also no process applied to comparing the use of overtime against other alternatives for electric work. There was similarly no productivity analysis comparing straight time versus overtime.

Management considered likely changes in staffing from attrition and retirements when developing medium and long term staffing plans. Pending ongoing efforts to recreate the capability to do so, however, such plans did not have data-driven historical basis. Shortly before our field work, the Companies initiated a process of forecasting attrition and retirements for critical jobs.

c. Demographics

i. NIMO

Concern about the rate at which the utility workforces is "graying," or getting, on average, uniformly older, has been an industry-wide issue for many years now. The phenomenon threatens the loss of skill sets earned over many years, if not decades that become increasingly difficult to replace as retirements pick up steam. Utilities not only face the loss of resources with traditional core competencies, but must address the dual challenge of replacing core competencies and attracting additional, younger staff with new skill sets in areas such as data analytics, advanced digital technologies, cyber security, and business development. A simultaneous, slow drain of critical skills and need to attract new skills cannot be easily or fully addressed by using contractors.

NIMO projected a workforce set to grow modestly in electric operations (in transmission and substation activities) and significantly in gas operations over the 2015 – 2019 period. We requested demographic data related to retirement eligibility for both craft and salaried employees, actual retirements versus those eligible to retire, and average age and tenure for craft and salaried employees. Management advised that it did not track employees eligible to retire by operating company, by year.

Management did, however, provide historical data on average age and tenure for craft and salaried internal staff in electric and gas operations. The next two charts summarize the data provided for electric craft and salaried staff. Average age remained essentially constant (at 45 – 46 years) for salaried and craft resources through 2014. The same held true for average tenure, with a slight decrease in craft tenure (from 18 to 17) and a slight increase in salaried tenure (from 16 to 17).

Table III.1: NIMO Average Age - Electric

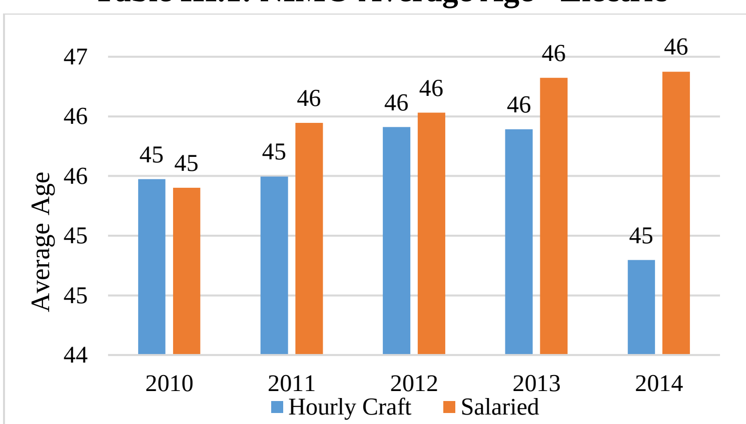
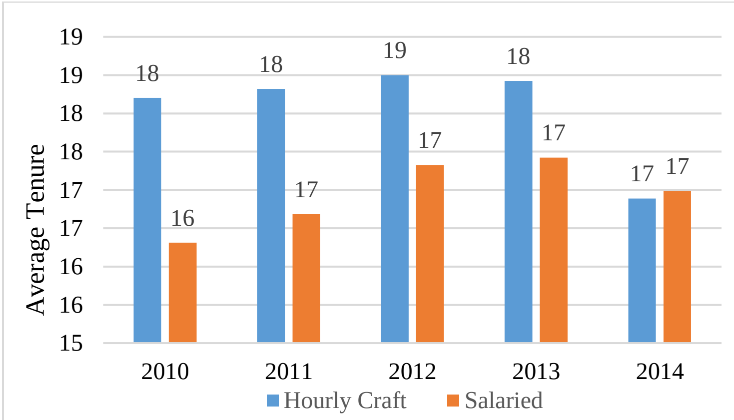


Table III.2: NIMO Average Tenure - Electric



The next two charts for gas operations showed a similar profile and trends. Average salaried employees' age increased from 46 to 48 and average craft resource age remained flat at 47 years. Average tenure for salaried staff increased from 19 to 21 years and average tenure for craft resources remained constant at 18 years.

Table III.3: NIMO Average Age - Gas

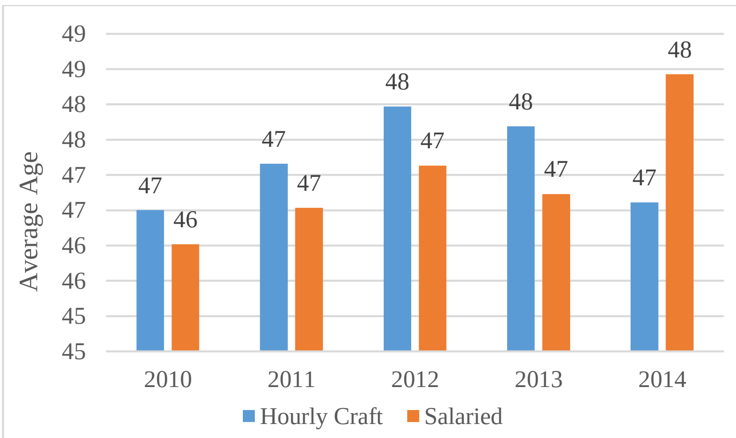
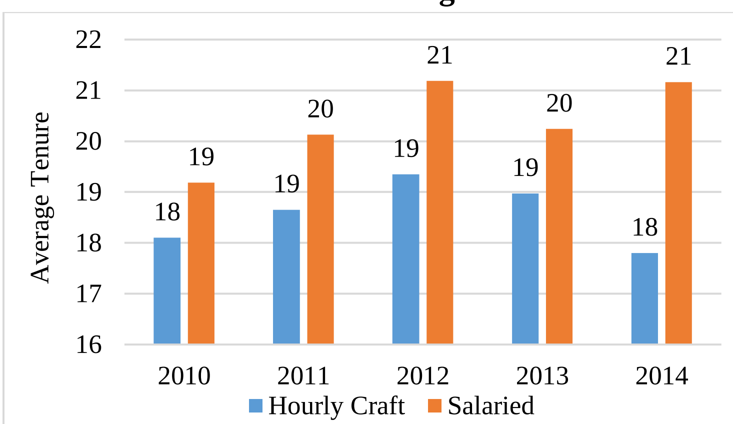


Table III.4: NIMO Average Tenure - Gas



ii. KEDLI

KEDLI projected a significantly higher internal resource growth level over the period ending in 2019. Its management also reported that it was not tracking employees eligible to retire by operating company, by year. Management did, however, provide historical data on average age and tenure for craft and salaried internal staff. The next two tables summarize the results. Average age for craft and salaried staff remained relatively steady, but a sizeable drop in tenure would raise concern, given very large planned resource additions. However, the data that management provided shows average tenure remaining stable through 2014. Management provided forecasts showing an extraordinary number of additions to internal FTEs over the 2015 – 2019 period (see the earlier chapter describing our quantitative analyses of internal staffing). Daunting to begin with, the challenge would grow greatly with a loss of "mentoring" and other associative benefits that would necessarily accompany so great a reduction in craft tenure.

Fortunately, historical tenure data do not evidence a concerning trend. Nevertheless, the size of the forecasted resource additions makes it important for management to examine closely its means for ensuring the breadth and depth of knowledge and experience transfer that a strong core of long-tenured personnel will need to provide to accelerate the integration of so large a body of new people.

Table III.5: KEDLI Average Age - Gas

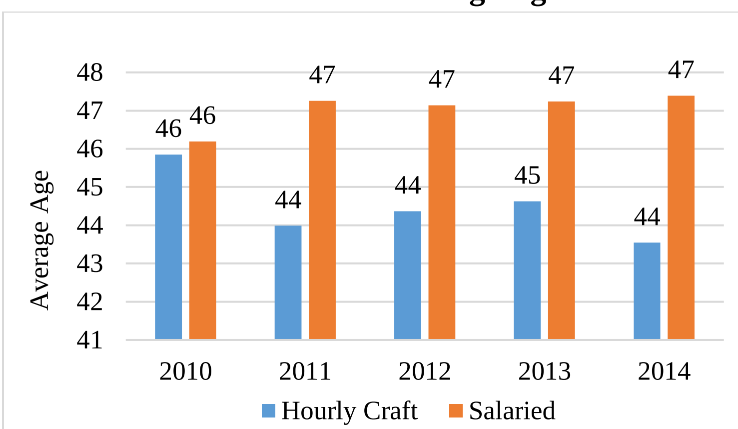
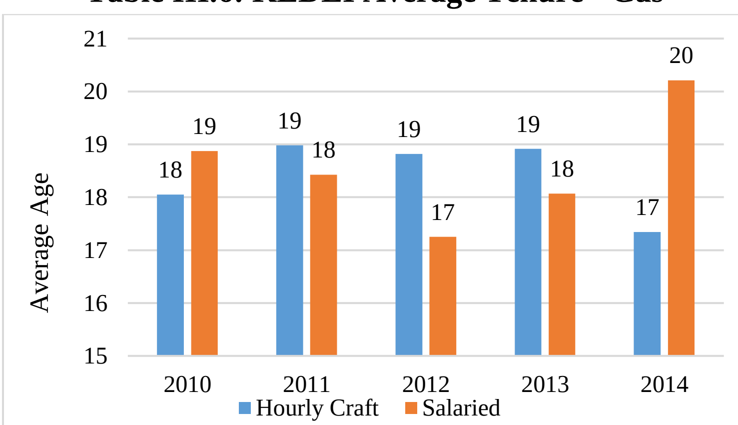


Table III.6: KEDLI Average Tenure - Gas



iii. KEDNY

Like KEDLI, KEDNY management provided forecasts showing extraordinary growth in internal FTEs during the 2015 – 2019 period. It too, however, was not tracking employees eligible to retire by operating company, by year. Management did provide data on historical average age and tenure for craft and salaried internal staff. The next tables summarize the results. Average craft age remained unchanged at 43 from 2010 to 2014. The average age for salaried staff fluctuated mildly, increasing from 44 to 46 between 2013 and 2014. As for KEDLI, the historical data that management provided did not show an adverse trend in tenure. Our earlier observations about knowledge and experience transfer at KEDLI apply at KEDNY, given large forecasted internal resource additions.

Table III.7: KEDNY Average Age - Gas

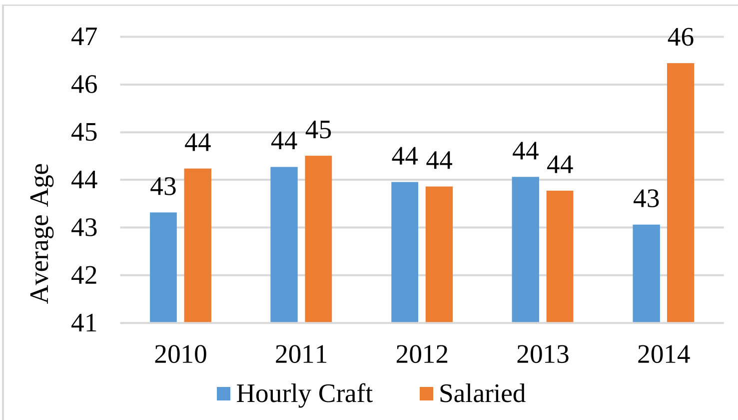
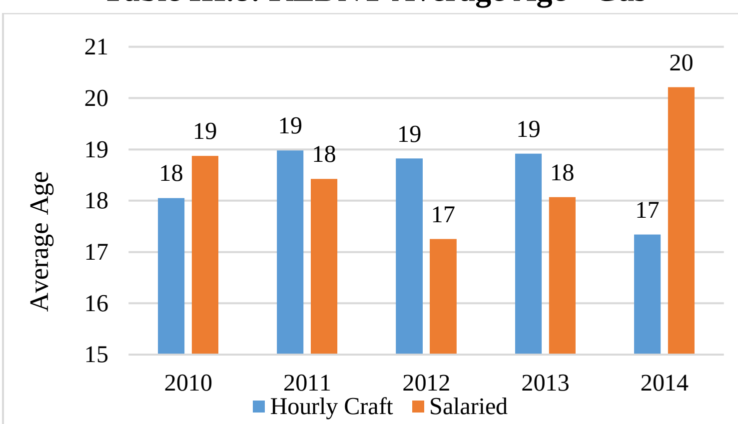


Table III.8: KEDNY Average Age - Gas



d. <u>Monitoring, Training, and Development of Critical Skills</u>

As noted, the vast expansion in internal resources required a major effort in recruiting, training, and development. Beyond those overriding needs, management's assessment of future skills requirements identified three areas of particular focus:

- NIMO Gas: gaps in welders and instrument and regulation workers (who install, operate, and maintain pressure regulating, system automation and monitoring, and gas quality and conditioning facilities), partially driven by an increase in transmission and pipeline work due to the San Bruno incident

- NIMO Electric: gaps in cable splicers need to address increased work in cable replacement programs
- KEDLI and KEDNY Gas: gaps in the welders, instrument and regulation workers and field trainers, partially driven by an increase in transmission and pipeline work due to the San Bruno incident.

Management indicated that it was continuing to review the magnitude of those gaps, in order to determine the number of FTEs likely to be needed. Steps were being taken to address these areas of need. Management cited new bargaining agreements allowing it to hire and train more internal welders, along with hiring qualified welders from outside the company. New agreements also provided a basis for hiring and training instrument and regulation mechanics. NIMO electric operations assigned certain types of work (in residential underground developments, for example) to contractors, in order to free internal underground splicers to work on cable replacements. It was not clear, however, how effective these actions had been.

National Grid used eight electric and gas specific Learning Councils for areas such as gas field operations, overhead electric, underground electric, and electric substations. The Councils developed annual plans in each discipline to address training requirements for existing employees and new hires. The Councils used a planning horizon of up to three years.

National Grid delivered training via a variety of vehicles. They included the National Grid Academy (Learning and Development), which had specific responsibilities for safety, regulatory, and electric and gas technical training and delivery. Internal as well as contract resources also delivered this training. Internal Academy instructors typically served about two-thirds of training volume.

National grid participated in the Troops to Energy Jobs Program, and partnered with the Center for Energy Workforce Development on its “energy industry fundamentals” program. Among other activities, management cited its support for the design and implementation of an Energy Industry Technology certificate, which then focused on developing future line workers. An expansion to include gas fundamentals was underway.

The Company cited a number of partnerships and relationships that assisted in meeting staffing needs:

- Partnerships with eight local community colleges to deliver Electric Utility Technology Programs to produce future electric line workers.
- The National Grid Engineering Pipeline Training Program, which management described as a development program for youth.
- Support of Energy Tech, a six-year New York City high school program designed to produce future energy industry employees.
- Partnership in the development of the Western New York Regional Energy Workforce Development Center, whose goal is establishing a world-class training center to serve New York State electric and gas utilities.

- Work with the Northeast Gas Association to explore the feasibility of establishing a gas Certificate Program with local community colleges to create a pipeline of future workers.

Each of these programs and initiatives sought and may lead to positive results in terms of fulfilling long term staffing needs, but the direct or indirect impact of such programs on staffing had not yet been identified.

Management cited examples of what it considered “best practices.” They included programs with Erie Community College and Hudson Valley Community College to assist in getting talent into entry level line positions. Management also cited active engagement in the hiring of veterans through career days and “buddy” systems. Management also considered noteworthy its creation of Engineering Our Future, an effort to focus on high school students to inspire interest in engineering and related disciplines.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Internal Staffing criteria established for this review. The statewide report discusses in more detail these criteria and the reasons why they are important. These six criteria are:

1. There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.
2. Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.
3. There should exist sufficient sources of complete, accurate staffing information by region and by function
4. Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.
5. Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.
6. Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

1. The National Grid operating companies had reasonably comprehensive forecasts of medium- and longer-term capital and O&M work requirements to identify likely resource requirements, but the magnitude of forecasted resource needs will require extraordinary efforts.

Management applied common internal staffing processes across its New York operating companies. Those processes appeared well-understood, documented, and were based on the identification of work to be performed translated into hours and costs and resource targets. While needs identification appeared generally sound, significant challenges lay ahead in meeting those needs, given the more than doubling of internal gas FTEs over the forecasted portion of our study period.

2. National Grid's capital and O&M work forecasts had a factual and analytical foundation to support staffing projections, but were not yet rebuilt to replace all capabilities lost during the transition to SAP.

The identification of work requirements resulted from a multi-step process driven by significant line organization input and subject to multiple layers of review and examination. Conversion of those work requirements into resource needs used a straight-forward process proceeding directly from the work forecasts. However, management remained in the process of rebuilding tools for analyzing productivity and workload data lost in the transition to SAP.

3. National Grid had sources of complete and accurate information about staffing by region and by function.

Management's use of SAP provided sufficient data at an appropriate level of detail to allow broad coverage of staffing related information.

4. Forecasts did not exist of likely losses through attrition and retirement of internal resources by function, region, and work type.

Management was recreating the capability to prepare workforce planning reports on a regular basis. That capability did not exist during our field work. We have concerns about the accuracy of the tenure information that management provided. Subject to questions of accuracy, however, the data appeared to show a KEDLI and KEDNY intent to build a very large new body of internal staff onto a craft resource base that appeared to have experienced a very large reduction in tenure. If true, management's already great challenges in building a large new staff will be greatly increased by the loss of seasoned craft workers to serve in model, mentor, and real-time, exemplary capacities.

We could not judge effectively how well attrition and retirement forecasts conform to historical trends, recent experience, and expected regional conditions. The ability to provide attrition and retirement forecasts will not be available until completion of implementation of workforce planning functions and tools in development during our field work.

5. Management had a sound and comprehensive understanding of areas where losses in key (or in mere numbers of) personnel have most significantly affected work performance.

Management had identified a number of skill sets requiring immediate reinforcement, and skill sets likely required in a restructured market. It had not, acted on the latter by the time we completed field work.

6. Training and development programs provided generally adequate support for long term staff requirements, but the large growth in forecasted internal resources at KEDLI and KEDNY required close monitoring and control.

Internal training programs appeared well developed, and oriented toward effective support of the line organizations. Management had relationships with schools, associations, and the Center for Energy Workforce Development, each of which contributed to an effective training and development environment. Notwithstanding the effectiveness of the training and development program, management used no key performance indicator that measures whether resource goals or staffing targets were being achieved.

Given the major efforts in gas operations to bring on hundreds of new staff over the next few years, and the uncertain but changing needs in electric operations, there needs to be greater and focused accountability for meeting internal resource targets. To the extent that the tenure reduction numbers provided by management were "real" they also pointed to the need for aggressive efforts to assure that new personnel access to the learning benefits that seasoned field resources can provide.

4. Recommendations

1. National Grid should re-examine and augment as necessary its structures for resource recruitment, training and development, in order to ensure that they will have the capacity to support expansion of internal gas FTEs by more than double those of historical levels.

The level of growth, the short period for producing it, and the growing competition for skilled resources across the region will take far more than normal efforts. An inability to produce the large resource growth forecasted, particularly for KEDNY and KEDLI, would threaten replacement program work efficiency, cost and schedule. Management needs to examine its support structures carefully, ensure that resource plans are given adequate support, that staffing goals are realistic, and that work programs reflect realistic staffing goals.

2. National Grid should rebuild capabilities in areas affecting long term internal staffing, such as capturing and analyzing workload data and preparing productivity analyses.

The identification of work requirements and internal staff requirements was built on a number of key parameters including the ability to analyze at a detailed level workload data and associated productivity. Management was in the process of rebuilding such tools for analyzing productivity and workload data lost in the transition to SAP.

3. National Grid should rebuild its workforce planning capabilities, in order to provide credible support to long term internal staffing projections.

Management was recreating the capability to prepare workforce planning reports on a regular basis. Without completing the reinstitution of such capabilities, a level of uncertainty will likely cause the planning process to produce sub-optimal planning results.

4. National Grid should re-examine and augment where necessary training and development programs and capabilities, in order to ensure that they can effectively address the training of hundreds of new gas internal staff over the next few years.

Key performance indicators should be established to support close, timely monitoring of progress against staffing goals. The operating companies, particularly KEDNY and KEDLI, had identified the need for many new internal staff resources over the coming four to five years. The ramp rate in adding such resources will undoubtedly strain the capabilities of training staff directly. Managing to fit them into the existing organization, already great, will be made more difficult if the craft tenure numbers provided by management are sound.

In addition, notwithstanding the effectiveness of the training and development program, we found no key performance indicator measuring achievement of resource goals or staffing targets. The major staff additions planned in gas operations over the next few years, and the changing needs in electric operations call for greater, focused accountability for meeting internal resource targets.

D. Overtime

1. *Summary*

Overtime regularly exceeded established targets in gas and electric distribution. Levels of overtime were high on an absolute basis and relative to peers. Further, rates were forecasted to increase significantly through 2019. Adequate analytical capabilities existed, but management had not been effective in overtime planning and execution.

2. *Findings*

Liberty has found in other work that overtime among the utilities does not generally receive a degree of organizational attention commensurate with its importance in the cost and staffing equation. The magnitude of overtime costs, the negative impacts on personnel from high overtime, the reduced productivity associated with overtime, and issues of control, especially with emergency requirements, argue that overtime planning and management should get more attention in most organizations.

An examination of National Grid's overtime indicates concerns. The processes underlying its management of overtime appeared sound, notwithstanding planning and execution issues that drove a failure to achieve targets. Liberty observed opportunities for process improvement that were moderate, at most. We saw no process areas representing significant weaknesses, either on an absolute basis or relative to the other state utilities. Process, however, does not always equal performance. As the next table shows, results were not good.

Figure III.9: Comparison of National Grid Overtime Levels vs. the Reference Utility

	Electric		Gas		
	NM Dist.	NM Trans.	KEDLI	KEDNY	NM
Recent History	High	Average	Very High	Very High	Low
Future Projection	Higher	Higher	Higher	Higher	Same

Management was attentive to overtime, and employed a strategy to limit overtime to 25 percent. For electrical operations, overtime was projected in the annual manpower plan based on historical usage and established guidelines for the use of overtime. Each business area reviewed its overtime usage on an ongoing basis. Management typically used overtime for trouble work or reliability issues requiring immediate response to meet customers' needs. For gas operations, overtime budgeting relied on historical usage. Overtime use occurred mostly for emergency work, such as storms, municipal requests, emergency response to gas leaks and repairs. In certain instances, working after hours can enable the crews to finish a mostly-completed job, or can mean that a downtown area becomes less congested with traffic, making conditions safer and less restrictive.

Management also cited a bargaining unit agreement on overtime policy. When using external resources for normal work performed by employees during the months of May through August, employees in the affected department and work locations had to be offered a minimum of four hours of overtime per week. However, even assuming that this rule "built in" 10 percent overtime in the affected areas for one-third of the year, it could not explain the far higher overtime levels employed.

We found no quantified analyses on how overtime affected productivity. No metrics or reports quantified the relationship of overtime use to productivity and costs. The companies had difficulty in generating relevant productivity measurements since transitioning to the SAP system. Management relied on the financial reports to identify cost issues, which we consider ineffective. Key performance indicators on cost information were previously available for analysis at a functional level. However, this capability was lost during the transition to the current work management system.

Both gas and electric management considered overtime use as a formal part of identifying potential resource additions during the budget preparation process. During the year, NIMO used the Incremental Resource Spreadsheet to review required resources. KEDLI and KEDNY used the Work Plan Tracker to review resources.

Management described how the resource planning process led to the addition of a number of splicers to its resource mix. The data provided showed the addition of some splicers in 2013. However, adverse overtime trends did not demonstrate the sufficiency of the magnitude of the resources added.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Overtime criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. There should exist an analytically supportable method for determining optimum levels of overtime.
2. Overtime planning and use should consider the relationship between amounts of overtime use and productivity and costs.
3. Overtime determinations should be uniquely applied to differing work functions and types.
4. Overtime use considerations should occur as a formal part of the process of identifying required resources.
5. Overtime use should conform to assumptions used for determining resource requirements.
6. Overtime use should comprise part of an integrated process for balancing internal, overtime, and contractor resources across all functions we are examining.

1. National Grid management provided a significant level of planning, monitoring, and oversight to the management of overtime, and demonstrated acceptable analytical capabilities.

The degree of attention to overtime as a management parameter varies among utilities, but was not neglected at National Grid. Budget targets and caps existed, but their effectiveness appeared limited. Tradeoffs in staffing decisions underwent appropriate level of analysis and management consideration. The skills and capabilities applied to analysis and decision-making were appropriate.

2. National Grid did not employ an analytically supportable method for determining optimum levels of overtime.

Management determined that the appropriate level of overtime was about 25 percent, and an internal consensus and rationale supporting that figure existed for gas operations. Some electric operations managers described the process in great detail. Its application went down to the functional level, separated between capital and expense categories. Management viewed the 25 percent target at the aggregate level as optimum, but not based on any documented process or analysis we could find. Management examined and considered historical overtime percentages, but did not derive its percentage target quantitatively.

One should begin consideration of overtime on the basis of whether the extent of its use makes it significant enough to deserve sophisticated, analytically-based methods to determine optimum levels. Some utilities make very constrained used of overtime levels. Each utility needs to answer this question based on its individual circumstances. In this case, National Grid's level of overtime levels use was sufficiently high to warrant consideration of improved approaches to optimization.

3. National Grid did not routinely consider the interrelationships among overtime, cost, and productivity in its decision-making related to overtime.

We found no quantitative analyses performed by gas or electric operations to assess how excessive overtime affected productivity and costs. We did observe a widespread, qualitative understanding of the benefits gained from overtime (*e.g.*, easier access and installation because of customer's presence, downtown area not as congested during afterhours) that mitigated potential productivity loss due to excessive overtime. Monthly overtime reports issued to the business areas permitted monitoring of overtime, with expenditures tracked under appropriate categories of work.

To the extent that a large fraction of overtime in a company results from "no choice" situations, productivity concerns diminish. However, large amounts of overtime present a diminishing-returns issue. Management needs to understand its exposure and the extent to which overtime penalties should be better understood and considered in decision-making.

4. National Grid did not apply overtime planning and analysis at the functional level.

Management recognized that different work groups or work types should and did have different levels of overtime based on the nature of the work. This level of planning did not go down to the functional level. Most utilities see the functional level as the ultimate basis for effective planning and control of costs in general, although the abilities to implement such a strategy vary widely. Liberty therefore considers more, not less, attention at the functional level to be required. The degree to which such functional attention is desirable in the overtime realm needs to be evaluated and determined at the individual utility level.

5. National Grid adequately considered overtime in its resource planning and budgeting functions.

Managers did consider historical overtime levels in long-term resource planning strategy and trending. Overtime parameters were adequately considered and integrated into budgets and plans. Management cited an historical example of how resolution to address excessive overtime resulted in additional resources (the addition of nine chief line mechanics and 38 line mechanics).

6. NIMO electric and KEDLI and KEDNY gas overtime levels were excessive, and were projected to grow higher in the years ahead.

Overtime levels fell well above the Reference Utility values, and well above those that we have generally seen at other utilities. We found plans to increase those levels further, even while increasing staffing, difficult to accept as an effective approach.

7. National Grid failed to manage overtime to budgeted levels.

Although management was unable to provide valid 2012 and 2013 overtime data due to the transition to SAP, we understand that the electric budget assumption of 25 percent was met by transmission, but not distribution operations. KEDLI and KEDNY exceeded the budget assumption of 25 percent. In such situations, one must decide whether the target is unsound (a planning failure), the management scheme did not work (a control failure), or both. Given the frequency and magnitude of deviations from the target, we could not conclude that the targets were credible.

8. National Grid appropriately considered overtime as an element of the resource stack, and appropriately planned its use on an integrated basis with the other resource elements.

Management described the annual workforce planning process as practiced during the budgeting season. It included consideration of current productivity, training requirements, amount of unproductive time, and workload demands in establishing baseload internal resource levels.

NIMO-Gas used the Incremental Resource Spreadsheet to match internal and contractor resources to the annual work plan. Units of work were divided into major categories for both capital and expense work. Historical productivity rates by geographical region were then applied to the projected units to determine hours required. Headcounts, work volume, and projected units formed the prime variables. Management considered historical overtime level as part of this integrated process.

NIMO-Electric divided into major categories for both capital and expense activities, and considered work volumes by geographic region. Crew availability and headcounts were confirmed by yard. Applicable work was assigned to in-house resources, with the remainder of the work performed by contractor resources. Management did not have an established process for comparing the use of overtime with other alternatives in connection with electrical work. Management considered historical overtime levels as part of this integrated process.

KEDLI and KEDNY also considered historical work volumes by geographic region. Crew availability and headcounts were confirmed by yard. Applicable work units were assigned to in-house resources, with the remainder of work going to contractor resources. Management considered historical overtime levels.

4. Recommendations

1. Management should develop a more analytical process to determine the optimum level of overtime.

Each utility's circumstances should dictate its needs for an analytically optimized solution for overtime. Such sophisticated approaches will be more appropriate in cases where: (a) overtime expenditures are large, both absolutely and relative to other staffing related costs, (b) planned levels of overtime are relatively high; (c) productivity issues exist, (d) non-economic issues exist, or (e) control issues are present.

We observed the existence of a number of these conditions. Management should undertake more robust analytical determination of an optimized level and strategy for overtime. Liberty therefore recommends study and analysis of alternate schemes.

In making this recommendation, Liberty believes that a study of overtime within the framework of a "control zone" approach (see the Statewide report's treatment of overtime) can be beneficial. Nevertheless, National Grid's circumstances and needs may be more basic, given regular, substantial overruns of overtime targets. Targets, however derived, become irrelevant if not achievable, which appeared to be the case at National Grid. Any determination of an optimum level must therefore be accompanied by an ability to control to that target (or range).

Notwithstanding these basic complications, more work remains at National Grid. While the focus lay on the 25 percent target, actual levels were much higher, meaning the costs and stakes were considerably higher. Management appeared to have concluded that then-current levels were too high (and hence not optimal). Otherwise, we presume it would have increased the target. A credible analysis that balances the issues, including the control issues, and arrives at an optimum result are in order.

More extensive analysis appears necessary to give management the confidence that either: (a) overtime can and should be made lower, or (b) the negative consequences of 30+ percent overtime, while highly undesirable, nonetheless remain the lesser evil.

In order to craft a suitably analytical approach, management needs to develop and equip managers and supervisors with the necessary quantitative monitoring tools, such as productivity measurements, hourly labor cost, overtime charts, contractor production rates, and unit rates. Most of these tools require development. In their absence, management generally has to make decisions based on their own experience and self-developed tools. Even if an undocumented or unofficial process existed, its effectiveness cannot be assured. Armed with the knowledge of an optimum overtime level, in conjunction with an effective integrated process of balancing internal and external resources, management can effectively predict quantitatively the magnitude and types of resources required.

2. National Grid should develop and include all relevant factors in its decision-making on overtime.

National Grid's very large utility businesses, both electric and gas, make it appropriate to spend considerable effort and resources to develop strong control capabilities to manage overtime.

We do not recommend that management undertake expensive analytical exercises that may offer no real return. Rather, management needs to ensure that it has a strong understanding of the negative impacts of overtime, and considers those impacts as practicable in its decision-making processes.

3. National Grid should expand the use of functional planning, budgeting, and monitoring for overtime.

Overtime produced high costs at National Grid. We believe that functional analysis of overtime would be very productive. Such analysis proves especially relevant because operations have not been able to reach overall targets. It is reasonable to expect that the bulk of deviations come from only a few functions. If overtime is not planned, budgeted, and monitored in at least those functions, then solutions are not likely to be forthcoming in a reasonably timely way.

We therefore recommend that management consider an expanded role for functional management of overtime, if not for all functions, then for at least those functions likely to be the most fruitful.

4. National Grid should re-evaluate its current plans that call for substantial increases in its already too high overtime levels.

There did not appear to be a sound basis for future increases to overtime. In fact, then current levels did not have clear justification. We recommend that management, after determining a more optimum range of potential overtime expenditures, revises plans to balance this resource with base internal staffing and contractor use.

5. National Grid should plan and manage overtime within a reasonable control zone.

Deviations beyond the 25 percent targets caused targets no longer to have credibility as a control parameter. Continued operation outside a reasonable control zone would invalidate the control process. Our review found management functioning in such an environment. It is appropriate to re-establish a credible target or range and implement suitable control measures. Monitoring of overtime in problem functions, analysis of deviations, and implementation of corrective measures should be considered minimum requirements.

While the establishment of a credible control zone is an essential first step, it may not be sufficient. To the extent managers and supervisors have lessened focus and control of overtime, any control scheme will face challenges. Accordingly, management must re-establish the priority of overtime, establish a credible control base, and force execution of the scheme.

E. Contractor Use

1. Summary

The massive forecasted increase in gas resources, driven in major part to support accelerated pipe replacement, made gas operations' historical approach of relying on a very small number of gas contractors working under very short-term contracts insufficient. Ensuring that sufficient contractor resources can be acquired and then retained as competition for them continues to increase will be critical. Gas operations made some moves to increase firms under contract and to lengthen contract terms. These moves, while in the right direction, need to occur under a well-developed plan that promotes longer-term relationships with contractors, incents them correctly, assesses their performance comprehensively, and remains dynamic enough to address an uncertain marketplace.

Particularly given the very large increases projected for KEDNY and KEDLI internal gas resources, ensuring continuing access to flexible, expandable contractor relationships remains critical to ensuring that greatly accelerated work requirements get met efficiently and timely. Management had underway during our field work changes in organization and processes for managing gas construction, acknowledging the need for them to mature. Developing, managing to, and adapting comprehensive plans for contractor use (integrated with equally aggressive plans for growth in internal resources) will remain a principal challenge and a first priority for this organization across the coming years.

Carrying through on plans observed during our field work to begin contracting overhead line inspections would strengthen NIMO's already sound overall approach for determining where to use electric contractors. NIMO should design and implement continuing efforts with recognition of and respect for requirements and targets for maintaining minimum levels of internal workers. NIMO had access to sufficient numbers of electric contractors, and employed effective methods for managing them, except for a lack of structured, regular comparisons of the costs of contractors versus internal resources (engineering, however, did perform cost comparisons between internal and external design groups).

2. *Findings*

a. Electric Operations

NIMO operated under reasonably clear guidelines for contractor use. Management sought to keep available line contractors having the capability to perform both overhead and underground work and civil contractors. NIMO had two line contractors and three civil contractors during our field work. Management based all distribution contracts on unit rates. NIMO generally contracted underground residential and commercial development trenching and wire pulling. It performed wire splicing with internal resources. Contractors performed network civil work (*e.g.*, duct banks, manholes and vaults). NIMO also contracted underground inspection work. The Company historically performed overhead line inspections in-house, but decided to begin using contractors for such work starting in 2016.

NIMO had for a number of years operated under an agreement to maintain minimum internal line worker staffing of 760 overhead line workers. Management also worked to a number of non-contractual target levels. They included 106 union engineer designers, 30 substation crew workers, 60 to 75 base substation workers in each division, 147 underground line workers, 48 transmission construction line workers, and about 63 clerical and support personnel.

NIMO performed substation maintenance and typical construction work with in-house resources. Each division had a 10-person construction crew for travel to work sites as needed. Contractors performed about sixty percent of final substation design engineering work.

Internal resources performed preliminary and conceptual design work. The contracted work included final detail design. A Master Service Agreement (MSA) process governed engineering contractor arrangements. NIMO established service agreements with multiple, pre-qualified engineering firms in each category of service. Service agreements existed with more than 10 engineering firms.

NIMO did not undertake regular, structured comparisons between line contractor and internal workforce costs. Management did on an ongoing basis for engineering work perform comparisons between in-house and external design costs. These analyses converted engineering hours billed for projects to equivalent FTEs. These analyses had led management to believe that, where used, internal staffing proved about one-third more cost effective.

A bargaining agreement provided employees with options in cases where NIMO used external resources for work normally performed by employees during May through August. NIMO had to offer those employees in the affected departments and work locations a minimum of four hours of overtime for each week of such use. This agreement applied only to work on infrastructure (*e.g.*, to line work). Using its list of contractors and their work locations, management planned as it could to minimize the affected geographical work locations when performing weekly work scheduling.

NIMO employed a strong, centralized contractor management organization. Management used a subscription service (IS Networld) to pre-screen and monitor contractor performance. All NIMO contractors had to subscribe to this service. Management undertook and documented an evaluation on every contractor for every job. These evaluations used a letter grade rating (A - B - C). Weekly reports from the system showed ratings of performance at National Grid companies, as well as any other utilities for which subscription service information was available. An automated ACIS (Automated Contractor Invoicing System), integrated with SAP, processed contractor invoices, except for civil work less of than $100,000.

Contractors had to report all accident types and near misses. Ratings of contractor performance used four main metrics: delivery (actuals vs bids), safety, quality (measured through third party QA/QC audits) and ethics. Management used data on number of incidents and hours worked to generate an incident rate. All the factors were entered and normalize to a score for each vendor, with performance ratings affecting consideration for future work.

b. <u>Gas Operations</u>

The National Grid Companies contracted between approximately 25 percent and 40 percent of capital construction, with NIMO at the low end at about 25 percent and KEDLI at the high of 40 percent. Within the category of capital construction, the Companies contracted 75 percent to 80 percent of that work.

All three companies contracted line locating and mark-outs and leak surveys, and performed all emergency response work in-house. KEDLI and KEDNY performed all inspections in-house. NIMO used a mix of internal and contractor labor. KEDNY and NIMO performed all leak repair work in-house, while KEDLI contracted about twenty percent. Engineering contracting ranged from 10 percent to 35 percent at KEDLI, and from 30 percent to 70 percent at KEDNY.

The Companies' blend of in-house and contractor labor reflected consideration of factors including seasonality of work load, timeliness, specialized skill sets, nature of the work, and cost. The blend at each company represented an evolved process that considered the attributes and characteristics of each.

None of the National Grid operations had performed studies comparing the costs of in-house versus contractor labor. KEDNY (and to a lesser extent NIMO) was engaged at the time of our field work in what it termed a "Managed Competition" initiative. An agreement with two bargaining units (and approximately 200 in-house union employees) put in-house employees and contractors on a level playing field to bid on specific work activities. The work types involved included certain surveillance activities, mark-outs, and public works projects. Bargaining unit worker flexibility with respect to shift work sometimes gave its employees a cost advantage, as compared with overtime rates paid to contractors.

Management cited the existence of a field of ten to twelve firms available for construction overall, with five in New York City. Of those, about three generally worked at NIMO, two at KEDLI (with another available for small amounts of specialty work, and one for KEDNY (with a second for small amounts of specialty work). Most contractor work came under "blanket" or unit rate approaches. Management did not segregate contracting of pipe replacement and other capital work; bundling all into work packages on which contractors bid. The Grid Companies employed one firm to perform locating and mark-outs and leak surveys for all companies and inspections for Niagara Mohawk. Master Services Agreements existed with 12 engineering firms. Management selected from among them to perform specific work scopes.

The Companies recognized the tightening of the capital contracting markets and the difficulty in bringing new contractors in and attracting national firms. One factor limiting the latter was their relatively higher prices. While recognizing the issue, management had not taken specific, significant action to address it yet. The National Grid companies, however, were moving to longer term contracts. Historically, contracts with contractors were for three years, but recently they began moving to five year terms. Management was, at the time of our field work, also engaged in the very early stages of a comprehensive work force analysis that would give it the ability to identify supply/demand trends, potential gaps, and accordingly, resource availability risks. The work at the time of our field work consisted of initial data analysis to define critical families of jobs in operations. Overall, the National Grid gas operations envisioned a stable employee/contractor percentage mix for the next one to two years. Beyond that, a new Network strategies organization was undertaking efforts to examine longer-term conditions and needs.

Following assignment of work, the Gas Construction contractor oversight team assigned an inspector, who performed day-to-day inspections. During project execution, inspectors filled out forms for each crew to which they were assigned. These forms reported progress and address safety issues. Separately, a corporate safety team made unannounced visits, as did QA personnel. Reviews included some re-digs, which allowed for inspection of already-completed jobs.

Management at all three gas operations held regular, formal meetings with primary contractors, reviewed their training facilities and Operator Qualification records regularly, and conducted informal meetings. At the time of our field work, management reported the recent establishment of quarterly meetings with senior management of the contractors.

None of the three gas operations was using a comprehensive scorecard for contractor performance. They had their own such evaluations in the past, and management was redeveloping them at the time of our fieldwork.

3. *Conclusions*

Liberty based these conclusions on our evaluation of Company practices and processes against specific Contractor Use criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The level of contractor use and the types of contractors retained should be supported by a contractor strategy that considers work volume, quality, timeliness, costs, and other relevant considerations.
2. There should exist a data-driven understanding of the comparative costs of using contractor versus internal resources, and apply a good qualitative rationale for choosing between contractor and internal resources.
3. Management should retain a sufficiently broad base of firms should remain under contract, pre-screened or pre-qualified for activities and tasks for which contractors are regularly used or anticipated to be used.
4. (Gas only) Where contractor resources are limited in terms of numbers of crews available or skill sets to meet anticipated future needs, the utility should be working to promote development of a skilled pool of resources.
5. Contractor strategy should be supported by appropriate contractor management processes.

1. National Grid's gas operations made appropriate use of contracted services on an historical basis; we found practices generally consistent with industry practice.

The National Grid Companies contracted 30 percent to 60 percent of capital construction, and in particular, 75 percent to 80 percent of pipe replacement work. On the O&M side, line locating and mark-outs and leak surveys, and emergency response work were performed exclusively in-house, while inspections used in-house employees at the two downstate companies and a mix of internal and contractor labor at NIMO. KEDNY and NIMO performed all leak repair work in-house, while KEDLI contracted about 20 percent. Engineering contracting at KEDLI and KEDNY grew historically at rates similar to the Reference Utility values, and were forecasted to drop to reasonably comparable ranges and remain flat. NIMO engineering contracting well exceeded Reference Utility values historically, and forecasts showed it continuing to do so.

We did not, however, find regular, structured uses of comparisons between internal and contractor resources.

2. The great increase that gas operations, particularly KEDNY and KEDLI face, calls for significant changes in historical practice.

Gas operations relied during our field work on a comparatively small number of contractors. Gas operations has had access to a larger field of available construction contractors (estimated at twelve overall and five in New York City), but NIMO was essentially using three capital contractors, KEDLI two and KEDNY one. Continuing that approach under greatly expanded work forecasts would create undue risk. The very large increase in required contractor FTEs alone would appear to make it difficult to meet work requirements using a minimum number of contractors. When considering the increasing demand for such resources in New York and across the region, the value of a wider pool of firms under contract and actively working becomes clear.

Gas operations also traditionally used shorter-term construction contracts. Many companies have moved to longer term contracts, using terms such as three or five years, in order to develop a long-term partnership with key contractors. This approach gives contractors a better basis for their resource planning, which is a matter of much greater importance given the large forecasted need for gas contract resources. Management was moving in this direction, but needed to move forward under an approach combining a reasonably broad base of contractors operating under such arrangements.

3. The massive pipe replacement program that the National Grid gas operations face requires planning not yet in place at the time of our field work.

In additional to the general tightening of the market for construction contractors, which is expected to worsen as many companies in New York and the Northeast step up their pipe replacement programs, KEDLI and KEDNY will also be substantially increasing their programs at a rate of increase higher than most. Management has recognized the current and increasing scarcity, but had not yet addressed its needs with a specific plan.

4. National Grid's gas operations structure for managing contractor operations did not include a number of activities that support performance optimization.

Management was applying active QA and safety programs, which included site visits, regular meetings with contractors, and meetings with contractors' senior management. Procurement, invoicing and payment processes followed the normal Grid procurement process and cycle.

However, management was not preparing formal performance evaluations of its construction contractors, and had abandoned its former practice of using contractor scorecards. The gas operations also did not provide contractor compensation incentives related to performance. Financial penalties did exist in some cases; (*e.g.*, for damage to National Grid facilities; contractor responsibility for defects discovered through a Quality Inspection Re-Dig program). Ultimately, if a contractor met minimally acceptable performance, the firm remained on the approved vendor list in good standing. Compensation was at contract price, with no incentives or disincentives related to performance. Contractor's future work depended, absent some unusual conditions, on bid price.

Management did not consider its internal structure for contractor management at a stage that would support effective use of incentive mechanisms.

5. NIMO applied an overall sound strategy for determining where to use electric contractors, but contracting of some low-value contracting work remained to be executed.

NIMO was making comparatively low use of contractors for capital work. The existence of requirements and targets for maintaining minimum levels of internal line workers were a principal cause. We found, within that resource framework, that management contracted appropriate types of work in a consistent manner

Except for overhead line inspections, NIMO was contracting most low value work at the time of our field work, but was moving toward contracting such inspection work. We found this direction sound and we found the use of unit rates for distribution contracts consistent and appropriate.

NIMO was contracting O&M distribution work at a higher level than that of the Reference Utility. The variance was logical, given the rural nature of the service area and the bundling of the line patrol O&M items for contracting out. Similarly, we found NIMO's comparatively high transmission/substation O&M contracting to be an understandable consequence of the existence of its sub-transmission system.

Buffalo-area replacements and upgrades were driving comparatively high transmission/substation engineering contracting levels. We found management sensitivity to the need to control engineering contractor use, managing effectively and controlling the types of design work being contracted out.

We did not find structured, regular comparisons of the costs of contractors versus internal resources. Considering general experience and the characteristics of its service territory, however, we found no reason to question the general types of work being contracted. We found NIMO's use of contractors offering both underground and overhead crews a strength.

Engineering management regularly conducted cost comparisons between internal and external design groups. The results of these analyses led to a conclusion to bring more design work in-house.

6. NIMO retained access to a sufficient number of electric contractors.

Management appropriately considered availability for emergency work in doing so.

7. NIMO employed a sound organization and effective methods for overseeing electrical contractors.

NIMO employed a strong contractor oversight organization, supported by sufficient procedures and processes. Management placed all contractors under a Master Service Agreements process. Management made use of a provider of automated contractor management services, ISNetworld (ISN). This service, used commonly in the utility industry provides streamlined methods for maintaining safety, insurance, quality and regulatory information on contractors and suppliers. ISN facilitates data collection and retention in a central database, provides verification of contractor information provided, supports the creation of relationships between contractors and customers, and provides centralized work performance and compliance data.

NIMO used a sound system of contractor evaluation as well.

4. Recommendations

1. National Grid should promptly develop and implement plans for increasing the massive added resources required to meet the needs of its pipe replacement program.

All three Companies ramped up their pipe replacement programs somewhat in the last few years, with plans to increase them substantially in the coming years. In the meantime, many of the other companies in New York State and the Northeast are also ramping up their programs over the next several years, which will tend to drive up contractor costs and limit their availability. Management should place a high priority on developing contractor use and contracting (*e.g.*, term and incentives) strategies and coordinated internal staffing plans designed to support forecasted work levels in markets where competition for resources is already strong, and threatens to grow.

Diversifying the current array of construction and O&M contractors should form part of the strategy and be reflected in the plans that management needs to develop. Dependence on a small number of contractors does not offer an optimum strategy for dealing with the very large needs, particularly for KEDNY and KEDLI, and the increasing competition for contractor resources for pipe replacement.

2. National Grid should return to the use of a formal contractor review and evaluation process, and evaluate the use of contractor incentive provisions.

Performance evaluation should form a central element of construction management. Management performed quality and safety reviews, but needed to include formal performance evaluations of its construction contractors. It should resume its former practice of using contractor scorecards. Although the specifics vary, this is a common practice among several of the other New York State gas utilities.

We recognize that management was engaged in a number of other efforts to strengthen management of gas operations. Adding incentives may not prove a priority, depending on where those efforts have progressed since our field work for this study.

Nevertheless, management needs to undertake in the not too distant future a review of its contracting strategies, in order to consider and to develop an appropriate incentive/disincentive structure that will link contractor compensation to performance.

The concept of providing incentives for good performance and disincentives for poor performance is well established. We observed at two other state operations model approaches to consider: (a) a direct link to compensation, and (b) a direct link to ratings when considering future bids.

3. NIMO should continue to move towards contracting out overhead line inspections.

At the time of our field work, NIMO was examining the contracting out of overhead line inspections in the near term. The industry recognizes this type of work as comparatively low in value, and thus is a candidate for contracting. Management appeared at the time to believe that contracting inspections could produce benefits by freeing up internal line resources for higher value work. We understand that management had ceased filling internal positions assigned to this work, and was using attrition to transition the work to contractors.

4. Electric and gas operations both should begin to compare contractor versus internal costs on a more rigorous, regular basis.

Neither was doing so at the time of our field work. Such analyses are important to ensuring that resource decisions are optimized.

Operations Audit of Staffing Levels at the Major New York State Energy Utilities

Final Report: Central Hudson
Case 13-M-0449

Presented to:

Public Service Commission
State of New York

Presented by:

The
Liberty Consulting Group

February 21, 2017

279 North Zinns Mill Road
Suite H
Lebanon, PA 17042

admin@libertyconsultinggroup.com

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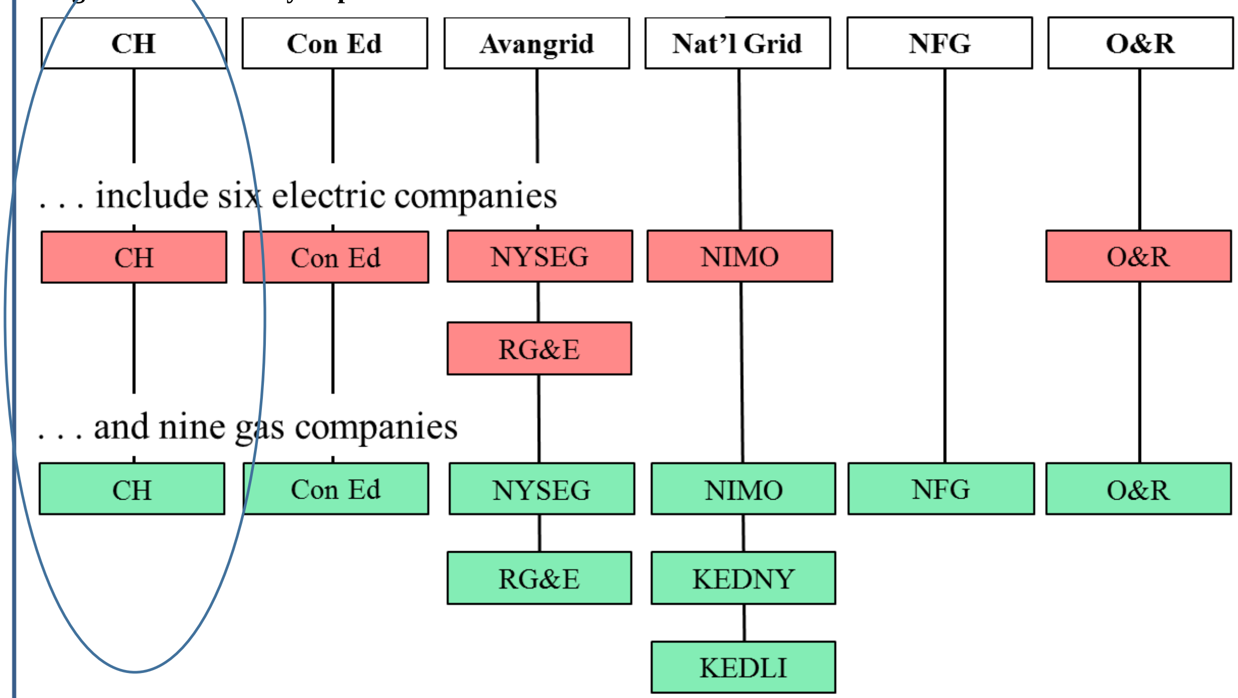
Chapter I: Background

The Liberty Consulting Group completed an extensive study of a prescribed set of staffing patterns and practices (the scope of which the Statewide section of this report addresses) at fifteen utility operations operating within six enterprises in New York State. The first part of this report addresses the results of our study from a statewide perspective. This part describes our study and presents its results as they relate directly to the Central Hudson utility operations (electric and gas) we examined.

Figure I.1: The Utility Reports



Central Hudson has electric and gas operations in the Mid-Hudson River Valley. It operates as a wholly-owned subsidiary of Fortis, Inc. ("Fortis"), a Canadian based holding company that controls a number of Canadian and Caribbean regulated gas and electric utilities, along with power generation assets and other business interests. Fortis has approximately $28 billion in total assets, and reported over $5.4 billion in revenue for its 2014 fiscal year. Its regulated utilities serve more than three million customers. Central Hudson and UNS Energy Corporation comprise the two US-based utilities now operating as part of the Fortis portfolio. Central Hudson has approximately 300,000 electric and 78,000 natural gas customers. Revenues for Central Hudson in 2014 totaled $719 million with just over $575 million from electric operations and just over $144 million from gas operations. Tucson-based UNS serves a657,000 electricity and gas customers.[1]

[1] The acquisition of ITC Holdings Corp. by Fortis was pending closure at the time of this report. ITC is the country's largest independent electricity transmission company, operating in Michigan, Iowa, Minnesota, Illinois, Missouri, Kansas and Oklahoma. ITC operates 26,000 megawatts of peak load and over 15,000 miles of transmission lines. Fortis announced the completion of the ITC acquisition in October 2016.

Central Hudson is the smallest of the New York natural gas utilities that Liberty evaluated and the second smallest electric utility. Orange & Rockland is the smallest electric utility in terms of operating revenues and customer base. In terms of relative size, Central Hudson's electric and gas operating revenues in 2014 represented less than four percent and three percent, respectively, of total state-wide electric and natural gas revenues. Staffing at Central Hudson was similarly proportional in 2014, with a reported total staff complement of 939 (555 classified and 384 supervisory and professional). Somewhat more than half of them (approximately 500) engaged in the electric and gas activities that we studied. Those 500 Central Hudson staff (union and salaried) comprised about three percent of the state-wide total of close to 16,000 union and salaried staff that our study included.

Certainly, Fortis exercised some level of influence on Central Hudson's planning, operations, and budgeting functions. General oversight and control from the holding company level have an indirect impact on a subsidiary's staffing. Nevertheless, we came to understand that Central Hudson operated on an essentially self-sufficient basis in the areas that we examined. We did not encounter significant reference to Fortis systems, tools, processes, procedures, or support groups in our examination.

A. Distinct Features of the Central Hudson Examination

A key objective of our study was to perform quantitative analysis of the adequacy of staffing for electric distribution, electric transmission and substation, and gas operations functions. Meeting this objective required each company to extract and provide large amounts of data from their accounting, budgeting, and operational systems addressing costs, labor hours, and system attributes for the key functions that comprised the subject areas we were studying. To that end, we structured the study to promote significant participation by management from each company. We intended this approach to ensure that the detailed data requirements needed to perform our analyses were effectively communicated to the companies.

We performed a number of quantitative analyses of staffing and its drivers at the other state electric and gas operations we studied. We founded those analyses on a very broad and comprehensive database, developed through extensive interaction with management at each of the operations listed above. The development of that database, expected to be quite challenging initially, proved far more difficult as our work proceeded. It eventually took many iterations and much more time than expected to produce a reasonably accurate, complete, and consistently structured statewide database. Liberty's work with the study participants included weekly phone calls, the provision of templates detailing the content and structure of data sought, on-site reviews, workshops to review model runs, and roundtable meetings to discuss data completeness and accuracy.

Those efforts eventually succeeded at the level required to support comparative analysis among most of the state's operations. They also succeeded in providing a basis for comparing trends within given companies. We could examine trended company staffing across an historical period (2009-2013). We also collected data for 2014, but, having to do so mid-year produced a mixture of actual and forecast data that we could not amalgamate on a basis that would support comparisons among the state's operations. Our extensive work with management at operations across the state also produced reasonably extensive and comparable forecast data for 2015 through 2019.

The data gave us the ability to break staffing down into a wide range of functions for detailed examination and to aggregate it for overall analysis. We related levels of work performed using internal straight time, internal overtime, and contractor resources to each other by creating an ability to express each in terms of number of equivalent full-time employees (FTEs). We quantitatively examined what proportions of capital, O&M, and engineering were performed by each group. We separated resources in each by distribution, transmission and substations, and engineering. For special purposes (*e.g.*, pipe replacement or new customer additions) we could pull the detailed information from the database.

We looked at how equivalent numbers of FTEs in a variety of categories trended across the historical period and how management forecasted them to change for the future, as we sought out indications of key staff drivers. We created what we termed a Reference Utility (a composite, generally using the median of the attribute(s) involved), which permitted us to compare each company with the others. We combined resource data with production units to produce composite measures of productivity expressed in both dollars and hours required to produce equivalent units of production. We constructed a model using the data provided by management of the state's utilities. It correlates actual staffing levels (the dependent variable) to key infrastructure attributes (the independent variables). This model produces staffing level estimates, broken down by capital, O&M and engineering for each utility. The estimates consider how the utility's unique combination of attributes vary with staffing levels compared to how the other state utilities' staffing levels vary for the same combination of attributes. The model provides a more sophisticated way to consider each utility's staffing levels normalized for each utility's unique mix of infrastructure. The model provides an objective yardstick for identifying large variances in staffing levels when compared to underlying infrastructure. Variances with model estimates provide one of the bases used to question issues and perform analyses of staffing.

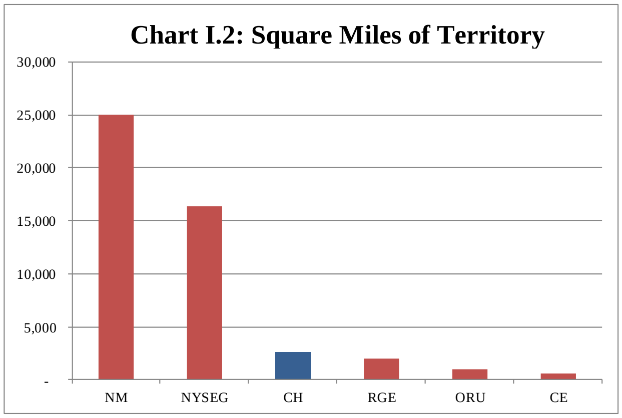
Such uses of the database proved useful in our study. However, we did not prove successful in developing the ability to apply them in the case of Central Hudson. While it was complex and difficult to secure the amounts, breadth, and structure of data for all the operations we studied, we concluded that it was impossible to do so for Central Hudson, within reasonable schedule and resource bounds. As with its peers, we had many continuing interactions with Central Hudson, designed to address a wide variety of gaps, inconsistencies, and errors in the data management provided.

Those efforts proved successful in narrowing and ultimately reducing such issues to a manageable level with other companies, but the same result did not occur with Central Hudson. We continued to find new issues as we proceeded to address existing ones. We eventually determined that we could not reach an acceptable level of data quality and completeness. It simply proved impracticable for Central Hudson, in contrast to the others we studied, to provide data under structures suitable to our work.

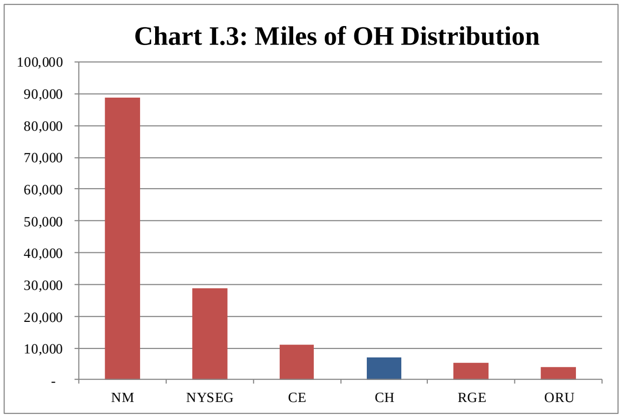
We decided not to attempt use of the database to compare Central Hudson with the other operations we studied, or to examine internal Central Hudson changes and trends according to the data structures we established. The other main part of our study, however, continued. That portion consisted of an examination of the key processes driving utility staffing in the areas we studied. This report describes the results of that examination. It does include data that frames basic Central Hudson system and operational attributes. That data came from more directly usable data. It does not support any analytical use, but does serve to place Central Hudson into size context with the other state utility operations we studied.

B. Electric System and Operational Attributes

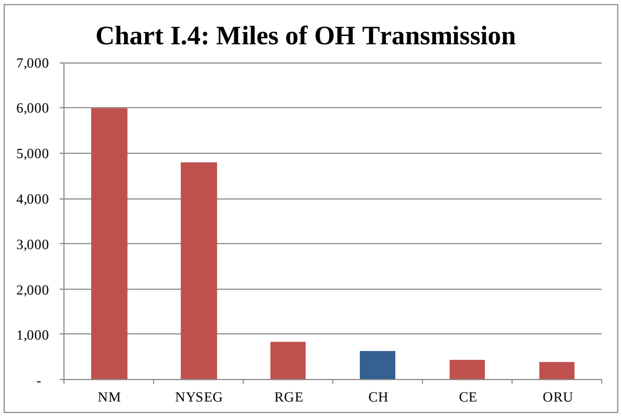
This section describes what we determined to be system attributes comprising hard drivers of staffing. The size of a utility's service territory and quantities derived from it (such as customer density) should have some impact on staffing. Sparse service territories likely experience higher costs as employees require greater travel times, with resources spread over a greater area. A larger service territory can also require more distribution facilities, in turn producing higher maintenance demands. The state's utilities split into two clear groups, with Niagara Mohawk and NYSEG, the two outliers, far above all others in service territory expanse. Central Hudson's territory, while larger than those of the remaining electric operations, is not very significantly so, particularly when considering how dispersed Niagara Mohawk and NYSEG are.

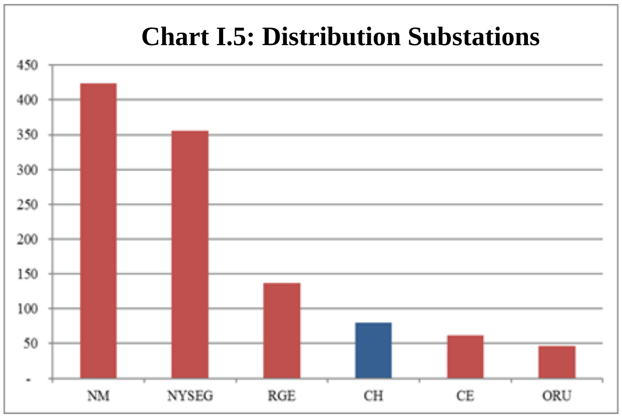


Note, however, that Central Hudson's ranking by overhead distribution line miles, like those of Niagara Mohawk and NYSEG, corresponds to its service territory ranking. Distance and number of overhead miles influence distribution staffing needs.



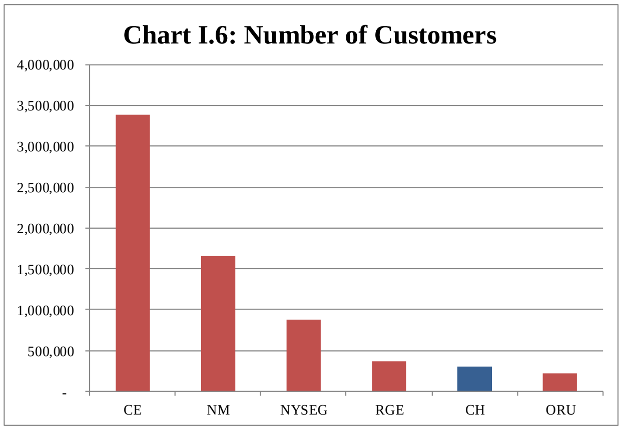
Central Hudson's numbers of transmission miles and distribution substations place it among the four operations that cluster in a reasonably close range. While similar on the surface, to this group of four, however, CECONY's overhead line miles are heavily influenced by the comparatively far more extensive use it makes of underground systems in serving customers.

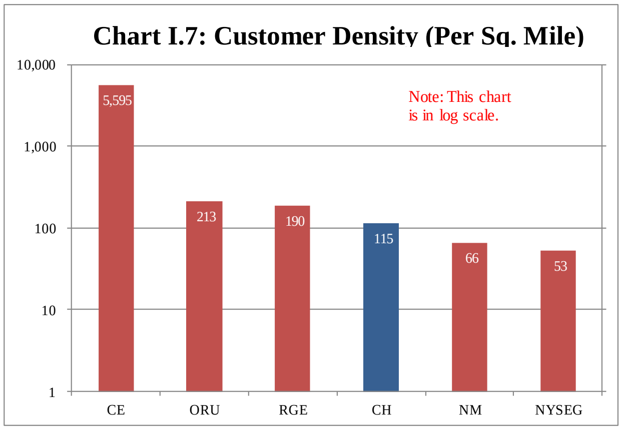




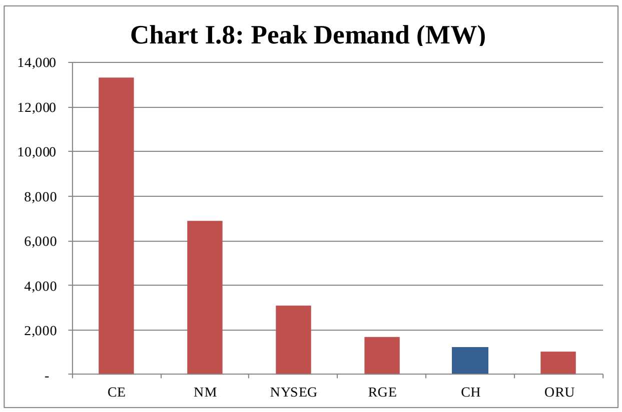
These first four parameters discussed define the geographically related attributes. They show significant commonality among Central Hudson, RG&E, and ORU, which share the features of being much less territorially dispersed than the two outlying companies. CECONY's commonality in values cannot be considered meaningful, given the fundamentally different nature of its infrastructure.

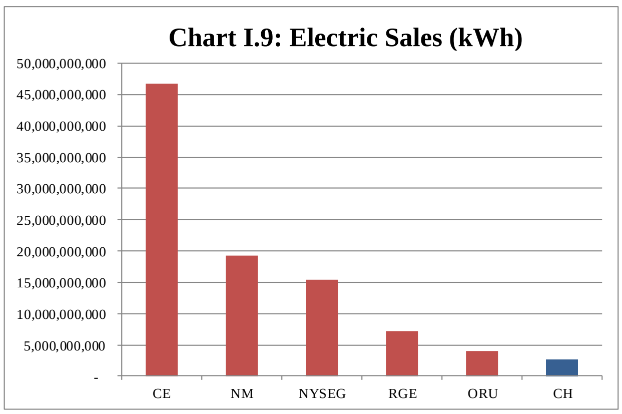
The customer and demand and sales data shown in the next two charts also show CECONY as the clear outlier. Unlike their size-based rankings, Niagara Mohawk and NYSEG move more into the range of the other state electric operations, including Central Hudson. Even with comparatively low customer numbers, Central Hudson becomes the median (after excluding CECONY) in customer density. The movement of the utilities in ranking as the measurement basis changes illustrates the complexity in using any single attribute in trying compare an electric operation to a peer group.



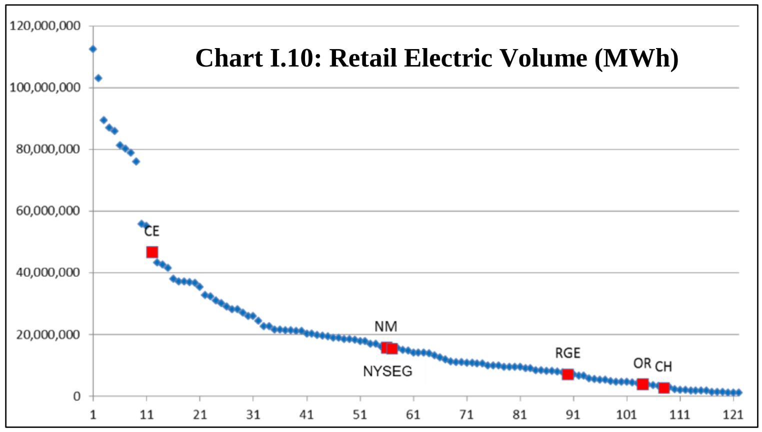


Peak system demand offers a typical indicator of utility size. Sales also provide a similar illustration of size. These attributes also show the dominance of CECONY among the state's electric operations, and, as contrasted with the other attributes, push Central Hudson away from the middle and toward the lowest end of the scale. The closeness of the pattern among the companies when measured by demand or sales is as one would expect, if the operations share similar load factors. In any event, like peak demand, sales likely have at best an indirect influence on staffing.



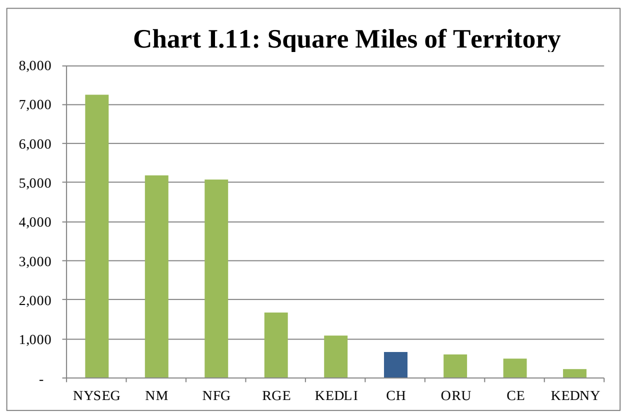


The Retail Electric Volume chart shows where the New York utilities rank among those across the country. From a sales perspective, the state's utilities are not particularly large on a national scale, again with the obvious exception of CECONY. Five of the six lie at the national median or lower and three fall into the bottom quartile.



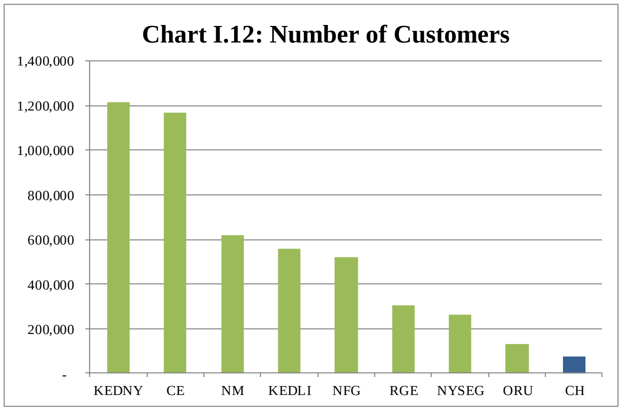
C. Gas System and Operational Attributes

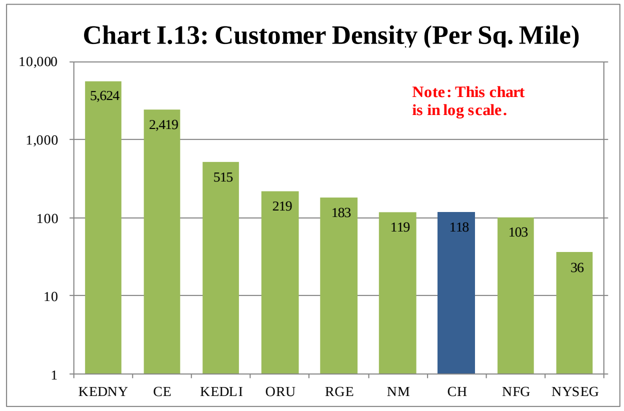
The size of a gas utility's service territory and its customer density can also be expected to influence its staffing. Travel times, the level of distribution facilities, and the number of service centers and crew support locations present examples of such impact. Additionally, the gas delivery business exhibits other variables (not present in the electric business) that affect staffing directly and indirectly. Virtually every occupied structure in an electric utility's service territory has electric service. This is not the case for gas distribution. Competition from oil, propane, electricity, and other fuels affects penetration rates for gas utilities. Moreover, many customers in the state do not have access to gas service, residing too far from transmission and distribution pipes to be served economically. Many electric customers do not have gas, because it is unavailable, or because they choose not to take it. However, virtually every gas customer is an electric customer. For those reasons, there are many more electric customers in the state than gas customers.



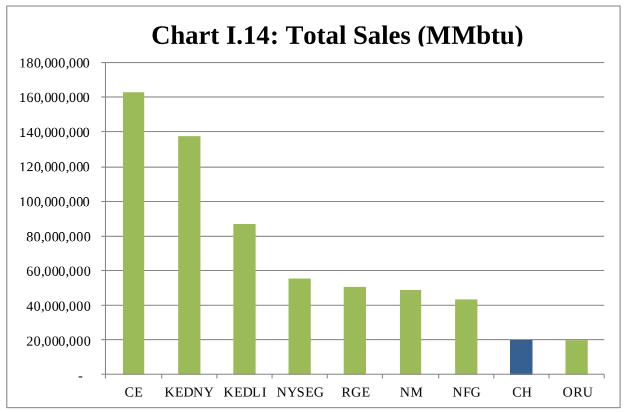
Central Hudson ranks differently in natural gas than it did in electric operations in terms of service territory size. The accompanying chart shows that it serves the sixth largest footprint among the nine New York gas distribution operations we studied. As with state electric operations, several outliers far outrank all others. That number increases to three in gas operations with the addition of NFG to the gas group. The other two outliers remain Niagara Mohawk and NYSEG, but their positions reversed relative to each other.

The next two charts compare customer numbers and densities.

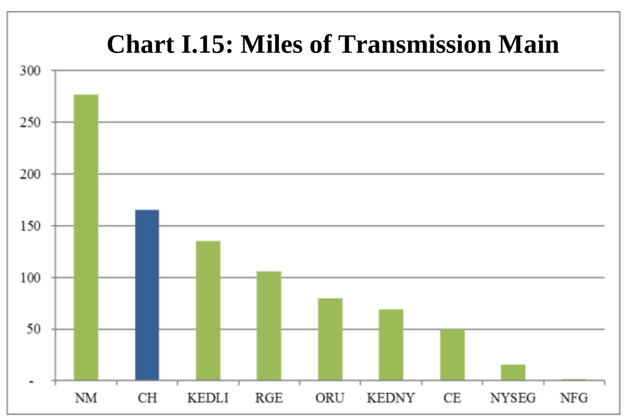




The state's gas operations include two very large companies, each with over one million customers. Three other mid-size companies cluster around the Reference Utility value of just under 600,000 customers. The next three smaller companies have two hundred thousand or fewer customers. Central Hudson is much smaller still in customer numbers (for example, only about half when compared even with the second smallest). Central Hudson's customer density is in line with the smaller natural gas operations we studied.

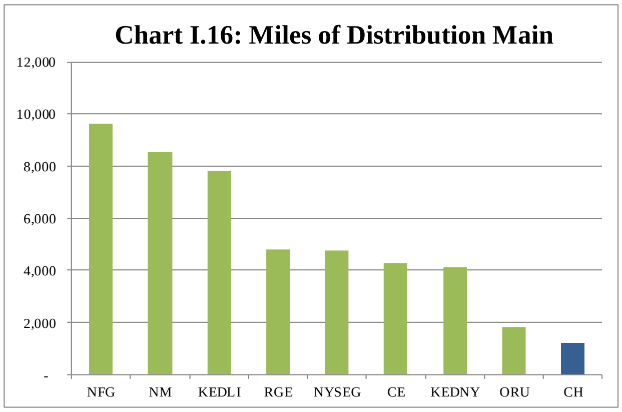


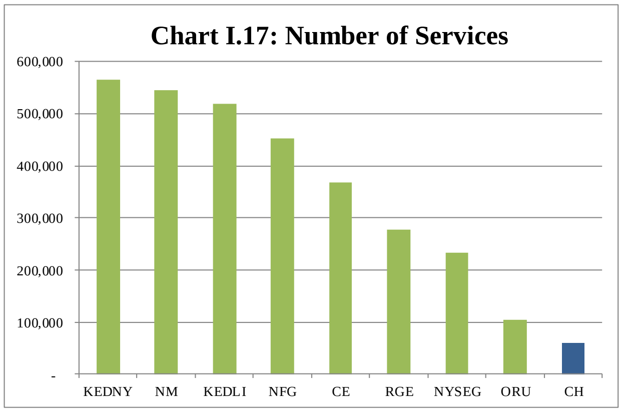
We next examined total sales on a comparative basis. The accompanying chart summarizes the results. Customer mix explains why the companies with the largest numbers of customers lie at the left of the chart, but for the others, the ranking by number of customers does not necessarily match the ranking by level of sales. Companies with large commercial and industrial loads tend to have the highest levels of usage per customer. These large customers tend to concentrate in the major metropolitan areas today, but that has not always been the case. In decades past, Upstate regions housed many major industrial customers who are now long gone. Losing these large loads often allows Upstate gas companies to add new customers now without significant requiring capacity additions, thus, all else equal, reducing resources needed for capital work.



Transmission in the gas business more generally falls to pipeline rather than distribution companies. Most gas utilities, however, have some facilities classified as transmission under certain technical and operating characteristics of the facility (typically around 200 psi when measured by operating pressure). Transmission facilities in a distribution utility move large volumes of gas over relatively longer distances within service territory locations where transmission pipeline companies do not have facilities. The accompanying chart shows that Central Hudson has a comparatively high number of transmission miles, particularly given its size.

The next two graphs display Central Hudson's number of distribution main miles and of customer services. Its numbers under these two attributes generally conform to its other size-based characteristics.





Chapter II: Process Analysis

A. Resource Planning

1. Summary

Central Hudson conducted resource planning processes on a highly-decentralized basis. Managers throughout the organization prepared annual budgets and work plans that helped drive plans for staffing resources. Operating managers received support from staff analysts in the Finance Department during development of budgets. Most of the operations we studied used a more formal, structured (often centralized) approach, methods, and processes for resource planning. Central Hudson's approach placed a high degree of reliance on the knowledge, understanding, and experience of its management team in developing annual work plans and budgets for each functional area of the organization. Other small utilities used a decentralized approach, which we found appropriate for Central Hudson.

Management had access to a wide array of information about historical workloads (person-hour amounts) for employees and contractor resources, but this information did not necessarily translate into quantitative, data-driven resource plans. The decentralized nature of the budgeting process did not require rigorous analysis and bottom-up development of work plan based staffing budgets. Management did not regularly quantitatively examine the cost-effectiveness of the tradeoffs between each staffing resources (straight time, overtime, and contracts) at the functional work group level. It largely followed past practice with smaller, incremental changes.

Central Hudson has an opportunity to improve the resource planning process by using evaluations of the trade-offs for straight time, overtime, and contractors at the functional/work group level, during the annual resource planning and budgeting process. Resourcing decisions, based on developing resource plans that compare all forecasted work for straight time, overtime, and contractors in person-hours and FTEs, would improve management's understanding of overall workload requirements and allocation of staffing resources. It could then develop ongoing data-driven methods for comparing the equivalent cost of each of these resources in annual resource plans.

2. Findings

a. <u>Overview</u>

Central Hudson employed a mature and highly decentralized resource planning process. Managers throughout the organization prepared annual budgets and work plans, with central staff support from the Finance Department. Formal resource planning processes were less developed than those used by the larger state utilities. Development of annual work plans and budgets for each functional area relied on the knowledge, understanding, and experience of its management team. This organizational approach and process were adequate in the past, given the size of the organization, the relatively stable nature of the business, and managers' depth of experience in the functional areas.

Capital and O&M forecasts identified and prioritized work using rigorous analytical frameworks and risk analyses. Forecasts considered overall guidance, past spending levels, identified future capital projects (on a risk-prioritized basis), and incremental O&M spending requests. Engineering had primary responsibility for the capital budget. The operating organizations had primary responsibility for the O&M budget. Management had access to some staff support for building bottom-up workload plans, tied to capital and O&M forecasts. For the most part, however, individual managers had to develop annual work plans, analyze workload requirements, and develop budget requests to resource their work. The culture promoted identification of staffing resources largely through top-down guidance constrained by the rate setting process. We observed an approach considering use of straight time as a labor resource constrained by headcounts driven by rates. Use of overtime and contractors, as a staffing resource pool, appeared to be similarly constrained by past practice. This construct produced a more incremental approach to resource planning, rather than the preferred, quantitative and data driven approach called for by our evaluation criteria.

b. Assessment of Key Resource Planning Elements

i. Organization

Management and staff throughout the engineering and operating units performed resource planning during the annual budget development cycle. Budget preparers (staff) within the electric and gas engineering groups prepared capital budgets. Staff and managers within the operating organizations prepared expense budgets, with input from operations. Analysts from the central Finance Group provided staff support and guidance to budget preparers and responsible managers and staff who prepared budgets.

Budget preparers (engineering managers and staff) implemented top-down guidance (from senior executives) during the annual budget preparation cycle, using a variety of information and tools. Managers responsible for planning and budgeting had broad and deep familiarity with the work occurring throughout the operating organizations.

Central Hudson's systems had the capability to provide extensive historical data and capital budget information. Extensive capabilities existed for analyzing historical expenditures and workloads. The Cognos Business Intelligence tools underpinned those capabilities. This IBM, web-based suite provides performance management tools with capabilities for extracting data, performing measurement, analyzing results, and reporting work performance. Managers and staff participating in plan and budget development used a variety of tools to analyze system requirements and to determine capital and expense work priorities.

This approach had been used for many years, making it very mature.

ii. Information

A range of information tools and processes captured data relating to workloads and future budget requirements. Such information came from tools including:

- Historical expenditure and person hour data was available from Central Hudson's FAS (Financial Accounting System), using COGNOS Business Intelligence.
- Clarity corporate budgeting system was used for O&M.
- Power Plan was used for capital budgeting and expenditure tracking.

- Headcount information was available from the personnel system and attrition; forecasted by business (electric or gas) and organizational unit.
- Historical dollar data available for internal, overtime, and contractors could be extracted from financial and operational systems using the Cognos BI tool. All work was tracked by dollars. Historical person hours information was available for internal hours, overtime, and contractors.

The information that managers developed to support preparing budget requests included:

- Work for historical periods tracked and forecasted for future periods on a dollar and person hour basis.
- Units of work available for many types of internally assigned work and contractor work units is available.
- Planning information that could be developed for each organization unit and that included breakdowns for hours and costs for internal resources (straight time and overtime) and contractors.
- Staffing levels for internal resources projected based on past headcount levels.
- Accounting for attrition in determining planned staffing levels.

iii. Processes and Tools

The people involved in the annual budgeting and resource planning process understood the annual budgeting cycle (and associated reviews of underlying workloads), whose long use made it settled and mature. The cycle began early in the year with the development and issuance of guidance from senior management about financial constraints (rate case targets) and key issues or initiatives. Development of initial budgets occurred in the spring. Then, submissions of budget requests included a series of presentations, reviews, and challenges, first at the Department level, then at the Group level. Central Hudson's size contributed to effective O&M budget development by permitting and encouraging communication throughout the Group and Department level discussions. This communication allowed for a robust budget process. More detailed requests formed at lower levels were rolled-up for review on a more consolidated basis. At various points throughout this process, line and engineering managers had an opportunity to make cases for funding changes and increases. The annual budgeting cycle culminated with a mid-year presentation of the budget to the Board of Directors for approval.

Planning for staffing resources was largely driven by top-down guidance, constrained by the rate setting process. We observed a cultural belief that use of straight time, as a labor resource, was constrained by headcounts driven in turn by rates. Use of overtime and contractors, as a staffing resource pool, appeared to be similarly constrained by past practice

This culture produced a resource planning approach focusing on contractors and overtime to meet incremental work requirements. A quantitative and data-driven approach that regularly analyzes all three resource types together would better support optimization. Nevertheless, management supported its incremental approach by capital and O&M work budgeting and resource planning processes that did recognize and rely on assessments of key underlying workload drivers to determine where to apply staffing resources.

Reasonably sophisticated analysis of system requirements drove capital budgets; for example:

- Capital spending frameworks and risk analyses (*e.g.*, mandatory work, customer work) operated consistently across all organizations and functions.
- Plans incorporated risk-based identification and prioritization of capital needs for gas work, including:
  - Robust processes driving the identification and prioritization of five-year capital spending requirements.
  - Use of sophisticated software to identify and set priorities for main replacement on a risk-weighted basis.
- Forecasts for capital projects were assembled and reviewed using PowerPlan, which also tracked capital expenditures as work progressed.
- Management used a monthly tracking mechanism (the "CARE" process) and dashboards to track current capital execution and adjusting plans, as required.
- This process also informed the next cycle of plans in the ensuing annual planning cycle.

O&M spending forecast development activities also included rigorous analysis of underlying work activities. Spending forecasts were based on work plans. Emergent work was based on historical hours adjusted for known changes and initiatives. Forecasts for some key activities, such as leak response and storm response work resulted from the use of historical hour requirements. The ability to use overtime effectively on a scheduled basis was considered in the planning process. After setting plans, the use of overtime for emergent work and storms became predicated on the available resources, both internal and contractors.

Management used these types of analyses to determine incremental spending levels, allocated between capital and O&M work. Incremental here means future spending requests compared to historical spending levels and work plans. As explained earlier, management had access to historical dollar and person hour expenditures for internal, overtime, and contractors for the development of work plans during budget preparation. A systematic, formal process to build workload-based (person-hours and units of work) plans tied to budget requests, however, did not form a required part of the process. Managers could (and often did) use this information during development of budgets, but the decentralized nature of the process did not require rigorous, quantitative analysis and bottom-up development of work plan based staffing budgets (for example, plans that analyze tradeoffs between straight time overtime, and contractors). Rather, operating managers reviewed past spending levels and work plans, identify emerging requirements being experienced by the operating units to develop estimated budget dollars and associated workload levels for future years.

iv. Resource Planning for Overtime and Contractors

Resource planning for overtime relied heavily upon historical use patterns for certain functions, with the result that plans reflected past overtime levels. Management recognized that different work groups and work types should have different levels of planned overtime, driven by differences in work natures. We found, however, that all Central Hudson work groups used relatively low amounts of overtime, compared to the other companies we studied. The resource planning processes had not made use of quantitative studies of the trade-offs (advantages versus disadvantages) and cost effectiveness of increased use of overtime. We also did not observe any one-time examinations of the cost-effectiveness of overtime as a staffing resource.

Use of contractors varied by work function, recognizing constraints in maintaining a qualified contractor workforce under its circumstances. Contractors work on unit rate and fixed bid bases, and are available to perform most types of capital work.

Planning processes explicitly took into account historical contractor assignments for different work functions and person hour estimates for future planned work. These considerations relied on estimates used to determine how many hours would be required for an internal crew to perform the work. Management developed annual work plans for work assigned to contractors, as part of the budget development process. Planned contractor levels resulted more from patterns of past use (*e.g.*, skills, work types) than from structured analyses of whether contractor use was economically more advantageous.

As we discussed earlier, we observed a cultural belief that use of straight time, as a labor resource, was constrained, and largely determined by headcounts driven in turn by rates. Use of overtime and contractors as a staffing resource pool appeared similarly constrained by past practice. This produced in a more incremental approach to resource planning for overtime and contractors. A more quantitative and data-driven approach, for example would regularly examine quantitatively the cost-effectiveness of the tradeoffs among staffing resource types (straight time, overtime, and contracts) at the functional work group level. The results of such analyses, rather than reliance on past practice, would then drive determinations of how to balance the three resource types. Beyond the lack of regular analyses of this type, we did not see even one-time studies or quantitative analyses of specific O&M functions or types of capital projects to determine what types of work to assign to which resource types in plans and budgets.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Resource Planning criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The organization for coordinating and supporting manpower Resource Planning should be treated as a specialized activity, with dedicated resources.
2. Complete and accurate information about units of work performed and costs by work function, by region, and by staff resource type should be available.
3. Processes should be integrated with annual budgeting and budget-control-related activities (including establishing complement levels and filling positions), and provide analytically derived identification of resource requirements.
4. Overtime should form a clear part of the process of identifying required resources, and should rely on an analytically supportable method for determining optimum levels for each work function.
5. Contractor use should form a clear part of the process of identifying required resources, and should use a data-driven understanding of the comparative costs of using contractors versus internal resources for each work function.

1. Central Hudson's decentralized approach and robust planning information and tools produced an appropriate overall approach to resource planning.

Management conducted mature budgeting processes that considered staffing resource requirements for the future. Budgeting and planning for staffing resources was decentralized. Managers throughout the organization had responsibility for preparing annual budgets and work plans, with central staff support from the Finance Group. Formal staffing resource planning processes were less structured and standardized, compared to those we observed at the larger state utilities, but were based upon a wide array of detailed information to support the development of work plans and budgets. Development of annual work plans and budgets for each functional area relied on the knowledge, understanding, and experience of its management team. This organizational approach and process was appropriate, given the size of the organization, the relatively stable nature of the business, and the depth of experience for managers in the functional areas.

2. Central Hudson was not making use of its extensive information on internal and contractor hour and expenditure data to perform ongoing, structured analyses of the effectiveness of overtime and contractor use at the functional level.

Effective plans for use of overtime and contractors at the functional/work group level cannot be accomplished without ongoing, data-driven analysis of how the results of using overtime and contractors compare to the use of internal staff, and to each other as well. Resourcing decisions, based on formal, consistent development of staffing resource plans linked to budget requests would improve management's understanding of overall workload requirements and allocation of staffing resources.

For each organizational unit budget request, these resource plans would quantitatively define all forecasted work for straight time, overtime, and contractors stated in person-hours and FTEs of underlying workload. Management could then develop ongoing data-driven methods for comparing the equivalent cost of each of these resources for accomplishing different types of work in this resource plan. Management has an opportunity to incorporate its extensive quantitative workload and expenditure data into an analytical approach forming part of an ongoing, data driven resource-planning process.

4. Recommendations

1. Central Hudson should conduct regular, data driven evaluations of trade-offs among overtime, contractors, and internal staff at the functional/work group level, as part of the resource planning process.

As part of the annual resource planning process, management should develop resource plans that quantify all forecasted work for straight time, overtime, and contractors in person-hours and FTEs. The annual process should be formalized to require each organizational unit to develop bottom-up workload forecasts, which are linked to the budget expenditure requests. The plan should evaluate the trade-offs for overtime, contractors, and internal staff at the functional/work group level.

Management should develop methods for comparing the equivalent cost of each of these three resource types in accomplishing the different types of work for these functional work groups. Meaningful comparisons of the equivalent cost of each of these three types (on a work type by work type basis) will enable a more informed resource plan for optimizing straight time, overtime, contractor mixes for each organization. Such comparisons can also be used to evaluate requests for changes to internal staffing levels.

B. Work Force Management and Performance Measurement

1. Summary

a. Work Force Management

Central Hudson did not have a comprehensive, integrated Work Management System, but applied processes that accomplish a number of the objectives of Work Management. Largely manual (supported by some automated components), these processes supported scheduling, monitoring, and reporting by project teams using standard templates and forms. Central Hudson's small size and scope kept its management close to the work, which provided advantages in communications, work planning and scheduling. Nevertheless, management should undertake a comprehensive examination of its processes in order to determine how and where to integrate and automate them more completely.

b. Performance Measurement

Management collected data and had the capability to report on a number of broad work types on an hours basis. It also maintained some data on contractor costs per broad unit of work performed. Management did not, however, do so on a comprehensive basis or in a manner that promotes efficient assembly and use of data to identify and balance resource needs. Broadening the breadth and depth of the units measured on an hourly basis and development of a system to ease data assembly, reporting, and analysis would be required to support the use of work unit information to identify and balance staffing needs. Recognizing the small scope of the Company's operations, Liberty acknowledges that care needs to be taken to ensure that the costs of improvements undertaken are commensurate with reasonable estimates of the benefits to be obtained. As noted in the discussion of work management, the Company's small size and the closeness of its managers to work performance already provide significant knowledge about the details of work processes and results.

2. Findings

a. Work Management Systems

Management used an IBM-provided COGNOS software platform to collect and retrieve performance data in a number of areas. COGNOS provides a network of more than 20 applications that span a wide range of management information needs. Survey information shows that IBM has a two percent share of the global ERP (Enterprise Resource Planning) marketplace. It ranks 8th of the 10 largest providers, compared to SAP's 24 percent and Oracle's 12 percent. The others who ranked above it range from shares of three to six percent. Interestingly, about a third of the market consists of participants with smaller shares than IBM's. That fact has significance given the size of Central Hudson. As the smallest of the utilities encompassed by this study, it certainly does not alone have the scope or scale that typifies the entities that have migrated to the two dominant providers. We undertook our review with recognition of the Company's stand-alone size.

However, it must also be observed that Central Hudson is part of a large utility family, owned by parent Fortis.

Fortis bills itself as "a leader in the North American electric and gas utility business," citing assets of $29 billion, annual revenue of $6.7 billion, and more than three million North American customers. These measures exclude the acquisition of the large Midwestern U.S. electricity transmission provider, ITC. Fortis has observed that this acquisition would make it one of the top 15 North American public utilities ranked by enterprise value. Taking a very literal view, our work encompasses what could be fairly described as a "tiny" part of the Fortis enterprise, whether measured before or after the ITC acquisition.

However, as Avangrid has shown, adoption of an enterprise approach (in its case SAP) across its New York utilities and its other operations stretching across country and continent divides can bring substantial leverage and support investments that would "bust" cost benefit analyses undertaken at the level of its stand-alone companies. Our work disclosed no Fortis-level initiatives bearing on this study. We have therefore evaluated Central Hudson in terms of what it has done historically, and what it intends internally to accomplish in the near future. This approach produces a "small company" context for our evaluation and for any recommendations intended to address observed improvement opportunities.

Nevertheless, we observe that it will remain appropriate for Staff to address Central Hudson's future circumstances and capabilities to meet them in a context that make it appropriate to inquire how Fortis plans to address issues of concern to Central Hudson that are common to the parent's extensive and growing footprint. In particular, Iberdrola SA's experience in advancing systems and tools at its two New York utilities show that individual operating company size need not be determinative in identifying effective ways to optimize performance for a family of operating companies. In a substantial way, Orange & Rockland's use of advancements initially undertaken at CECONY also demonstrate this additional means for gaining leverage.

b. WMS Documentation and Training

Written documentation described the Work Management processes used. The Project Management Manual, Procedures and Best Practices, Version 1.0.0, dated August 2012 fully documented the Project Management processes. Personnel gained access to the manual and all forms and templates it describes on-line. We found, , however, no formal training in project management processes. Engineers with experience as project managers provide guidance to neophytes, using the manual as both a teaching guide and resource. Management did does not employ a separate, dedicated project management function, instead embedding it in the day-to-day responsibilities of engineering personnel. Management did use three persons regularly as project managers on its larger, more complex projects. Documentation does describe the duties of a project manager.

c. Program and Project Management

While Central Hudson lacks a comprehensive Work Management System, its approach to and methods of project management nevertheless provided for much of the capability that Work Management processes seek. Both electric and gas operations used the same procedures. The Project Management program, however, did not address maintenance activities.

The central elements of the project management program relied largely on manual activities. Management did use MS Project to assist in the creation of Gantt charts for scheduling. Templates and standard forms existed to support monitoring, reporting, and analyses of performance during all phases of capital projects. Employees gained access to these forms and templates on-line. Management employed no robust computer-based tools to support project management.

Documentation for the project management process, roles and responsibilities exists in the form of a Project Management Manual, bearing an update identification of August 2012. The processes formally began to apply with initial proposals to conduct a capital project. The process covered projects meeting defined cost thresholds: $50,000 for gas, $100,000 for electric, and $250,000 for work associated with a new customer.

Management assembled a project team to develop a specific project proposal, which included a schedule and budget. Upon authorization to proceed with the project, this project team created detailed schedules, budgets, cash flows, engineering, design and construction resource needs. The team determined whether contract resources were needed, and identified material requirements and costs. Project managers worked with each other to resolve potential resource conflicts, in order to ensure completion of capital work.

Maintenance programs were not subject to the project management process. Field managers scheduled maintenance work, prioritizing it against capital and revenue work using a 60 – 90-day look-ahead.

Decisions regarding contractor use occurred during the project planning phase by the Project Team and Project Manager. Overtime was not discussed as part of the planning phase, but comprised a topic during the short-term scheduling process.

d. Program and Project Monitoring

Monthly meetings established short-term schedules, coordinated outages, and ensured that project progress supported required in-service dates. Gas Project Managers coordinated with government authorities to synchronize excavation and other road work.

Upon project inception, management generally assigned an engineer as Project Manager, who assumed responsibility for monitoring and reporting on progress, identifying problems that could result in schedule or cost over-runs, inspecting the work for quality during construction, holding meetings as required, and monitoring any contractors used. Project management operated as one of the multiple duties assigned to engineers. A single engineer could be assigned as Project Manager to multiple projects simultaneously, while remaining responsible for other job functions at the same time.

At completion, the Project Manager had to conduct a close-out session including a lessons-learned session to evaluate performance of both internal and contractor crews. The Project Manager operated under explicit instruction to recognize individual contributors to project success, and to "celebrate" (per the Manual) the end of the project.

There was no structured process for capturing performance data for internal and contract forces, or, in turn, for storing them for retrieval to support future planning. At project inception, Project Managers had to state which Key Performance Indicators (KPIs) would be measured against during each project. At the close-out meeting, the Project Manager had responsibility for reviewing KPIs of internal forces (actual vs. planned or budgeted) and contractors. There was no structured process for retaining or using the data that these measures provided.

e. Program and Project Scheduling

Management applied clear procedures to long-term and short-term project scheduling. Long-term schedule development occurred on a project's first proposal or identification by a Project Team. Short-term schedules were developed monthly through meetings of the Project Managers to ensure that capital projects met required in-service dates, and that work was prioritized accordingly. Monthly meetings reviewed project progress. Interim meetings or other communications occurred as needed.

Project Management used tools having some support from data systems, but generally relied on manual processes. Those processes did use clear, standard templates and forms. Liberty did not observe any reason to question the sufficiency of communication among Project Managers, managers and field personnel.

f. Quality Assurance and Control

Project Managers had responsibility for monitoring quality during all phases of the project. They also oversaw the work of any contractors used. At the end of a project, the Project Manager was obliged to provide a report on lessons learned about how quality could be improved and on best practices observed during the project.

g. Performance Measurement

i. Electric

Relying substantially on the IBM COGNOS platform that Central Hudson had been using for two years at the time of our fieldwork, management was measuring crew travel, direct work ("wrench"), and non-productive time. Management established (for its electric system work) baselines for constant time, travel time, and wrench time in 2014, for all its work areas. COGNOS enabled retrieval of information from legacy data housing systems. Most processes for gathering data, however, required manual intervention, limiting the scope and depth of information readily obtainable enough to support use for identifying and balancing staffing needs on a structured and comprehensive basis. We found the closeness of managers to the details of work performance important in providing knowledge of how work was performed and with what results, but not in a way that provided quantified hours data per unit of work achieved across the full spectrum of activities covered by our study.

Management identified twenty separate work activities, for which it collected historical data. Management employed system job estimates encompassing both hours and costs. These estimates, however, did not go to the individual work unit level, nor did management collect and routinely report such data as actual performance proceeded. Examining performance of specific work tasks took place under manual processes. At the time of our study, no specific work unit measures existed for tracking distribution engineering activities. Work had begun to develop measurement of labor hours versus dollars.

ii. Gas

Gas metrics existed at a more general level. The KPIs tracked included PSC-mandated measures for third-party damages, mismarks, gas leak backlogs, projected costs per leak, and similar activities. At a higher level, management tracked expenditures and hours, primarily by functional area. Management also employed some "unofficial" KPIs developed by the Gas Department to monitor performance, such as leak repair cost by contractors. Management was (at the end of our field work) examining additional gas metrics (*e.g.*, pipe replacement data including cost per mile of pipe) for implementation in 2016. One of the then-current metrics tracked cost per leak repair. This metric divided total leak repair cost by number of leaks repaired. Management also calculated a carrying cost per leak, which consisted of dividing total costs of surveying known leaks by number of leaks.

Some manual records existed, but were not formally circulated or analyzed widely. For example, management maintained statistics for hours expended, production levels, and costs in different information systems or subsystems. The data resided in a variety of individual systems or locations, without extraction or relation to each other as part of regular analysis. For example, available data would permit fairly ready determination of hours expended on a particular task (*e.g.*, pipe replacement) in a given month. The same was true for the number of miles of pipe installed in that month. The lack of combination and correlation, however, meant that resulting productivity measures (*e.g.*, hours expended per mile of pipe by size) were not calculated, analyzed, or used to assess staffing performance and needs.

The data available appeared sufficient (at least theoretically) to support useful performance measures at a granular level across a variety of work units. However, the need to employ manual processes to do so made the process unduly time consuming. Moreover, it appears that development of an electronic means to do so, using software, would take considerable effort.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Work Management and Performance Measurement criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These seven criteria are:

1. The systems and tools used to support Work Force Management should be sufficient to support current and forecasted work natures, scopes, and magnitudes.
2. Comprehensive, adequate documentation of the Work Management processes, systems and tools should exist and be supported by appropriate training.
3. Management should have and regularly employ well defined processes for the short- and long-term planning and scheduling of capital and O&M work that requires staffing resources.
4. Management should apply an appropriate approach, resources, and methods to program and project management.

5. Systems and tools should capture and enable the analysis of data respecting use of all types of staffing resources.
6. There should exist an appropriate approach to and organization for Quality Assurance and Control.
7. Sufficient measures of performance should exist to support analysis and assessment of efficiency and effectiveness resource use and balancing.

1. Central Hudson's approach to work force management, which depended largely on manual processes and the closeness of its management to work in the field, served generally well in supporting staffing needs.

Central Hudson's small size and geographic range, combined with its flat management structure made its approach to and processes generally effective. The Project Management Manual provided a source of training and documentation for employees. Its availability on-line, its extensive use of graphics to illustrate process steps and on-line availability of forms and supporting templates made the documentation complete and usable. We observed processes to develop long- and short-term schedules, finding them appropriate. Strong communication between Project Managers and project teams, and, in turn, among Project Managers provided a source for assessing resource needs and limitations.

Looking at Central Hudson in isolation makes it difficult to identify investments in systems and tools whose installation and ongoing costs it could expect to justify resulting improvements. Only the leverage that membership in the large Fortis family provides has the potential for reversing the imbalance between costs and benefits. Some of the other holding companies with state utilities have shown the ability to do so (CEI and Avangrid). Our study did not have a scope sufficient to examine operating and structural philosophies and approaches set by Fortis. It would take such a review to assess substantially the degrees of autonomy and commonality that result for Central Hudson. Such issues are more appropriately addressed in a full-scale management audit, which provides the overall perspective and access to holding and service company personnel appropriate for forming relevant judgments.

2. Central Hudson's scheduling similarly lacked the formality and structure seen in larger New York utilities, but Liberty did not find gaps justifying significantly enhanced systems and tools.

Project management received some support from data systems, but relied primarily on manual processes that use standard templates and forms. Strong communication and closeness to the work, hallmarks of a "small-company" approach existed, and supported effective scheduling.

3. Central Hudson's approaches to program and project performance monitoring were generally appropriate to the scale and nature of its operations as a small utility, but lacked a clear means for ensuring effective use of performance data.

Feedback among Project Managers, corporate managers, and field forces provided a sufficient means for assessing project status and needs. Monthly, weekly and *ad hoc* project meetings encouraged communication and corporate awareness of the status of individual projects and overall budget status. Moreover, the use of standard templates and forms ensured consistency across projects. This standardization helped managers communicate project plans and statuses in a uniform manner.

Some performance data capture existed, but did not appear to be used in a structured way for future resource planning. Project Managers had responsibility for documenting performance statistics using their identified Key Performance Indicators at the closing of a project. It is not clear how, once the reports were submitted, these were used going forward to improve planning, assess internal performance, or evaluate contractor performance.

4. Central Hudson's size made its methods of program and project management suitable.

As discussed above, much of what Central Hudson lacked in formal and structured approaches and automated tools for work management, it embedded in the processes that its project managers used. We generally consider dedicated project management and formal training appropriate to ensuring effective performance. Management compensated appropriately for its less comprehensive approach, in major part due to its small size and scope. The role of Project Manager was embedded in the position description of an engineer. The Project Management Manual provided adequate descriptions of the processes. It served adequately, given its application by an experienced staff.

The lack of a more structured approach to Project Management for maintenance programs also did not conform to normal expectations. However, we found that management appropriately considered short-term needs common to capital and maintenance work. The use of immediate-term (60-90 day) horizons for considering capital and maintenance scheduling needs together balanced resource needs and priorities.

The Project Management process addressed the use of contractors on the system. The scheduling process required Project Managers to identify early on the contractor resources required during the project, either specific to specialized skills needs or to meeting peak workload.

Liberty observed two particular strengths in the Project Management process. The first concerns recognition of the importance of communicating to all affected groups and individuals the status of projects in all phases. The Project Management Manual emphasized this need and the processes used ensured that this communication took place.

The second strength lies in the emphasis on communicating individual successes in project performance. The Manual required Project Managers to "celebrate" the end of a project with the Project Team, including recognition of individuals who contributed to the success of the project.

5. With respect to quality assurance and quality control, Central Hudson's small size may not call for a separate organization, but the lack of an independent source of examination did not comport with needs.

The QA/QC process as used in the Project Management process did not reflect best practice. As described in the Manual and through interviews, quality checks were done by the Project Manager. Best practice recognizes the value of independent examinations. While a separate organization may not prove necessary, management could at least provide for some level of independent review by having Project Managers or Supervisors undertake examinations involving projects assigned to others.

6. Central Hudson captured data in a number of categories relevant to developing measures of work units performed in relation to resource inputs, but not in a manner that supported the ability to identify and balance staffing requirements.

Manual extraction was necessary for the preparation of many of the reports that were available, and it appeared that combining data elements to derive productivity information useful for staffing analysis and optimization was impracticable. Management, at the end of our field work, was looking into the expansion of the metrics it could reasonably produce (and that it considered to be of value), but we did not observe efforts to streamline the effort through elimination of the many manual activities required to do so.

Management did not have access to a robust work-based monitoring system in place for electric and gas operations. The lack of comprehensive and readily executable means for capturing unit costs and unit hours impaired the ability to develop productivity reports. Management's closeness to the work, given the comparatively small scope and size of Company operations mitigated the impacts of the gaps in data and analysis, but did not obviate the need to examine means for improvement.

Until this measurement gap is closed, it will not be practicable to apply performance measures to work load projections and performance, comprehensively incorporate performance measures into staffing decision-making, or to maintain on a routine, continuing basis performance measures to determine production and productivity levels comprehensively.

Limitations of legacy data system hardware and software contributed, but management's perception that the end result did not clearly justify the effort to develop such a system was a factor as well. Management saw more value in focusing on productivity measurement on a global basis rather than on a more granular basis. Management responded to its scope and size constraints by training crews for numerous jobs and by assigning them to work at many different functions. This approach mixed maintenance, repairs and capital work. One result was a lack of task-based orientation among those logging job functions and time.

Small company size was a mitigating factor; managers were very close to the work and demonstrated a good sense of production and productivity. They were able to factor that knowledge into their decisions and decision-making process qualitatively.

Liberty observed that, for the data and metrics management did maintain, it was collected timely, at an appropriate level, and communicated to the appropriate individuals in the organization.

7. Over time, the way that Fortis does and can support Central Hudson operations with centrally developed approaches, systems, and tools bears scrutiny.

We have not provided a specific recommendation, given that determining where and how Fortis can develop cross-company approaches, systems, resources, and tools should spring from a Fortis system-wide perspective. It may in fact be that early priorities for producing such commonalities may lie outside the areas we have studied. A full-scale management and operations audit, such as those that occur periodically in New York, presents the best opportunity to address this matter more robustly.

We simply observe here that one of the candidates for examination should include the staffing issues we have identified, given the value that size leverage offers a New York operation that, while small in its individual right, may actually have much larger dimensions when combined with other operations facing similar needs.

4. Recommendations

1. Central Hudson's Quality Inspection process should produce independence in the performance of work inspections.

Independent review of physical work by another employee who has no relation to the project would better ensure identification of errors and poor practices.

2. Central Hudson should develop and use work measurements to identify and plan for future resource needs.

A sophisticated, enterprise-level approach is likely not necessary given the Company's size, but a more comprehensive set of metrics and a structured means for using them to guide resource decisions is in order. While operation as part of a large and growing Fortis enterprise may allow consideration of options that involve large up-front costs, looking at Central Hudson on a stand-alone basis does not provide a basis for concluding that sophisticated, enterprise-wide solutions make economic sense.

3. As a first priority, Central Hudson should develop performance measures for replacement and installation of pipe.

Pipe replacement and installation is a dominant contributor to capital cost. These costs are expected to increase, on an installed unit basis, by about 50 percent over the period ending 2018. They are likely to continue at high levels thereafter, given the forecast that Central Hudson's overall program will take 10 to 15 years to complete.

Costs will run to very large amounts. Already the market for skilled engineering, management and labor to perform those activities has changed as other utilities in New York and across the country face the same issues and problems associated with replacement of leak-prone pipe. Thus, market conditions affecting labor availability, skills, and experience will remain challenging in the future. Therefore, as a first priority, Central Hudson needs to develop and employ comprehensive performance measures for replacement and installation of pipe and use the information they provide to plan for the levels and balance of resources required to complete replacement timely and efficiently.

4. Central Hudson should institute a broad program of performance measures, and routinely apply them.

While Central Hudson's managers were close to the business, and displayed a fairly broad and deep knowledge of its operations, those attributes did not fully substitute for good data collection and analysis. Rather, the combination of broad and deep knowledge and solid analytics would form the basis for a highly effective management process.

Management should first develop a plan for capturing work unit measurements using the data capabilities of its existing data systems. Work-unit measurements should include both the number of units, cost per unit and hours per unit. A comprehensive work unit measurement system will track and inform productivity levels, inform current staffing level needs and allow for better forecasts of future staffing needs. However, the realities of being a small company with a legacy data system might not allow this for many years. The Company's vision of focusing on a global productivity measure might be a reasonable solution for it in the near term.

Beyond this immediate and overriding priority, management needs to ensure that an effort is made to improve performance measurement across the electric and gas functions this study addresses. This effort should first include a comprehensive plan for capturing work unit measurements using existing data capabilities. Work-unit measurements should include both the number of units, cost per unit and hours per unit. A comprehensive work unit measurement system will track and inform productivity levels, inform current staffing level needs and allow for better forecasts of future staffing needs.

The following list typifies the types of measures that should be subject to regular reporting and that should be used not only to assess the effectiveness and efficiency of staffing resources, but also to help in driving forecasts of resources required to meet forecasted requirements in a manner that optimizes the balance among straight internal time, overtime and contractor use.

Monthly Overall Staffing Monitoring – Actual versus Planned (FTE):
(a) Straight Time
(b) Overtime
(c) Contractors
(d) Total Company – ST, OT, Contractors displayed as stacked bars

Internal / Contractor Mix – Actual versus Planned (Functions with major contractors), as appropriate:
- Construction – Main Renewals, Replacements and Upgrades
- Construction – Services Renewals, Replacements and Upgrades
- Construction – New Customer Additions – Services
- Construction - System Additions - Mains

Internal Resource Replenishment (Headcounts) – Actual versus Planned:
(a) Total Workforce
(b) Attritions (based on historical data, adjusted for anticipated future conditions)
(c) Retirement (based on potential retirees, adjusted for anticipated future conditions)
(d) New Hires (based on qualifications and training duration required to become fully qualified)

High-level Performance Indicators on Productivity:
- Hours per Mile of Main Replaced
- Hours per Service Replaced
- Hours per Meter Replaced
- Hour per Mile of Main Installed
- Hours per Leak Repaired

- Hours per Trouble Job Ticket Responded.

C. Internal Staffing

1. *Summary*

Central Hudson performed effectively in planning for internal staff needs based on long-standing and well understood practices and procedures. Processes and procedures were not strong, but management maintained sufficient experience, given its small size, to execute internal staffing-related activities sufficiently. Management used no central source of data and analysis of attrition and retirement, but depended on line managers to monitor critical skill set requirements. Management did not believe it has been or will be affected by shortages in critical skill sets.

2. *Findings*

a. General

Management reported a 2014 total staff complement of 939 (555 classified and 384 supervisory and professional) of which approximately 500 performed the electric and gas operations we studied. Central Hudson, although part of the Fortis family of companies, performed its planning and management of internal resources with internally developed organizations, resources, approaches, systems, and tools.

b. Process

Internal staffing planning occurred as part of the Company's annual Business Plan preparation. Each department reviewed its own current staff levels, vacancies, transfers, potential retirements, and known and anticipated business requirements. Business requirements, as defined by the Company, included core operating functions, new regulatory and compliance requirements, and forecasted capital expenditures. In terms of capital related work, management indicated that, where appropriate and relevant, it analyzed similar historical capital projects to identify a basis for determining associated staffing needs. After identifying those staffing requirements, management assigned internal resources to base level, recurring work it considered "core" to utility functions. It then added contractors for the balance of the work, both core and non-core, as necessary.

As part of the annual planning cycle, management prepared five-year staffing projections. Responsible Managers in both electric and gas operations used spreadsheets and Clarity (now IBM Cognos C7), a corporate performance management system, to develop those forecasts. Clarity (versions 6 and 7) has been replaced by Cognos C7. IBM acquired Canadian-based, privately-held Clarity Systems, a provider of financial governance software, a number of years ago. The Clarity performance management suite of applications provides modules for web-based budgeting, planning, and forecasting, for financial consolidation, reporting and analysis, for modeling financial alternatives, for enterprise-wide analysis and reporting.

Managers prepared their forecasts largely independently of each other, and Human Resources aggregated the results. Staff forecasting did not take place under standardized approaches and processes. Management of each department approached such forecasting as it deemed appropriate to its current, past, and anticipated situation and circumstances. For example, capital projects (*e.g.*, infrastructure work, regulatory mandates) formed the principal driver for electric engineering services staff projections. Historical data drove productivity assessments (output per employee). By contrast electric operations used historical trends, reflecting the implicit assumption that the past provides a foundation for determining future needs. Similarly, management indicated that gas operations work load, barring factors such as safety code changes or strategic initiatives, tended to remain static in nature. Management typically forecasted this work (and the resulting staff needs) by using the most recent actual data and any trends exhibited.

Management had access to 10 years of historical data, but only used data from the most recent four years to develop staffing projections. Management considered the more recent data a better reflection of improvements in productivity and efficiency, and a better indicator of operational and regulatory driven initiatives that may have impacted staff productivity. Managers in each area, however, developed staffing projections, however, under their uniquely determined productivity assumptions.

Managers described these processes as standard, reasonably long-standing, and applied to both electric and gas operations. They reported no recent changes and no anticipation or intention to change organizational responsibilities, processes, or procedures underlying the planning or execution of internal staffing strategies. Management had identified the need for replacement of its then-current Human Resources information system (HRIS) within the next several years. These systems have become much more sophisticated and available at economic cost to ever smaller enterprises, as technology has advanced. The three key elements of an HRIS, employee information, payroll and benefits, encompass the core business functions of a human resources department.

Automating and streamlining these processes, a modern HRIS also provides data storage and query capabilities (*e.g.*, compensation, benefits, age, tenure, training, certifications) that provide a powerful source of information for analyzing staff numbers, gaps, costs, and other factors important in examining staff effectiveness and planning in a sophisticated manner. Management had identified improvements in its ability to generate reports and support analysis of the data that then-current systems possessed, but which was not readily retrievable. Consolidation of training and demographic information were among the retrieval capabilities management cited in connection with HRIS replacement. Other improvements included better support for succession planning and performance management processes, and providing line managers with electronic access to functions handled manually.

The process for examining, and iterating, short- and long-term internal staff projections included reviews by Group Heads, the Vice President of Human Resources, the Strategic Planning Committee and the Company President. The Human Resources ("HR") department maintained headcount information and control (the latter by coordinating the acquisition of approved, new hires). Current systems could provide actual head count information by area and by job title. Human Resources did not, however, provide information on staff demographics. That department also did not maintain or monitor information about where losses in numbers or skill sets in key job functions might affect the Company. That responsibility resided with the individuals and managers who developed forecasts in each budget area.

Management did not believe it had, or will have, constraints or limits to finding and training qualified electric and gas craft resources. This view extended to resources needed to address technological, regulatory or market developments, such as REV. In contrast to management's view, we observed that challenges did exist in ensuring recruitment of needed management staff.

Ultimately, management's approach in resource needs identification and fulfillment relied on three key ingredients: (a) line organization development of long term staffing plans, (b) Human Resources responsibility for acquiring the identified talent, and (c) a company small enough and populated with sufficiently experienced managers to be able to work closely together in assessing staffing needs. Management used no specific metrics or KPIs to measure success in meeting resource and skills addition needs associated with projected staffing needs.

Management identified a number of systems and tools that support analysis of staffing and development of projections. They included Clarity (noted above), PowerPlant, and Cognos Business Intelligence. Clarity provided an operations and maintenance budgeting tool. PowerPlant did the same for capital work. The two tools were not linked, which required manual processing to combine their outputs. Management recently began using Cognos to create the ability to run queries across a number of related databases to support staffing analysis (*e.g.*, to answer questions such as the amount of emergent work experienced over the last "x" number of years). Management recognized that its tool set was not optimum. Consideration was being given to investigating the introduction of improved tools, but no firm plans to do so existed at the time of our field work.

Management did not use a comprehensive, system-driven approach to identifying work levels and costs associated with internal resources, overtime and contractors. Doing so would lay a foundation for relating work levels and costs to staffing numbers in a structured, reliable manner. Line management conducted such examinations in what would better be described as an ad hoc basis at the discretion of management in each operations area.

Management used a comparatively flexible approach to applying resources. It had developed many internal personnel into multi-skilled resources. This approach gave management the ability to assign the same worker to electric or gas activities in many cases. Within either electric or gas operations, many could also perform activities crossing traditional job boundaries. This capability was particularly beneficial for a smaller company, where more job categories simply did not require the raw numbers that make narrowly "slotting" workers an optimal approach. On the other hand, workers who "jump" across job codes with frequency complicate the process of designing and using systems that efficiently support the time recording needed to keep information appropriately sortable by activity type.

Management reported an absence of user guidance and documentation "for tools, systems and reports related to the information that Central Hudson has provided Liberty because Liberty requested a unique set of information not tracked by Central Hudson's systems or prepared in the format requested by Liberty." Liberty interpreted that response to mean that management did not maintain system documentation or user guidelines at all, or at least in a form easily accessible to users.

c. Demographics

Concern about the rate at which the utility workforces is "graying," or getting, on average, uniformly older, has been an industry-wide issue for many years now. The phenomenon threatens the loss of skill sets earned over many years, if not decades that become increasingly difficult to replace as retirements pick up steam. Utilities not only face the loss of resources with traditional core competencies, but must address the dual challenge of replacing core competencies and attracting additional, younger staff with new skill sets in areas such as data analytics, advanced digital technologies, cyber security, and business development. A simultaneous, slow drain of critical skills and need to attract new skills cannot be easily or fully addressed by the use of contractors.

The accompanying chart shows the number of electric operations employees becoming retirement eligible through 2019. The percentage of staff employed as of January 1, 2015 in electric operations showed very low levels of retirement eligibility. On an absolute basis, the percentage of retirement eligible staff appeared very low. The age and tenure of electric operations staff, shown in the following two charts, confirmed the appearance that retirement eligibility numbers appeared too low.

Chart II.1: Electric - Percent of Current Staff Retirement Eligible as of Year End

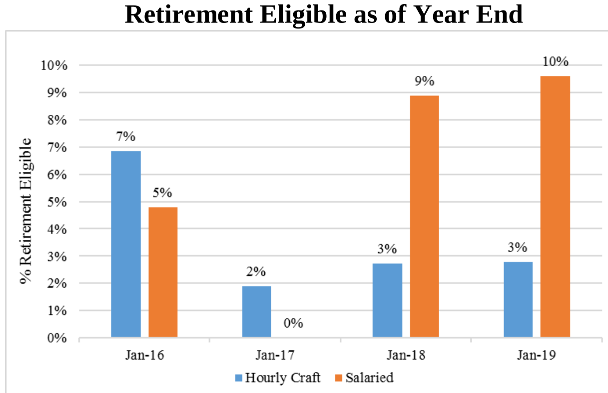
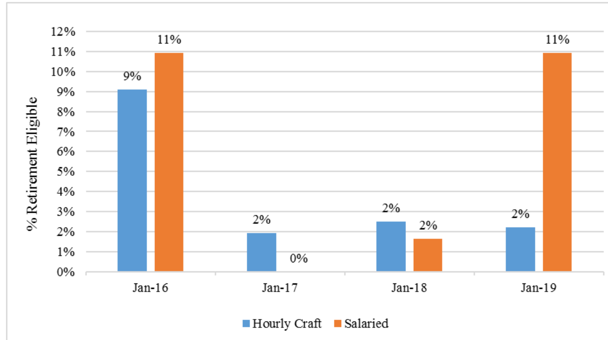


Table II.2: 2014 Average Age and Tenure - Electric

	Hourly Craft	Salaried
Average Age	45	50
Average Tenure	14	27

We sought information about historical (2009 – 2014) percentages of actual retirements from among those eligible. Management could not make that information available. Management did provide the data for 2014, but only for craft personnel. The data provided showed that 6 percent of those eligible to retire in 2014 actually did so. Management stated that its "systems and records were not designed to provide the unique information requested by Liberty." The retirement eligibility numbers and the inability to provide the historical data indicated that maintenance, retrieval, and analysis of such data did not form a recurring management activity. The implication that the nature of our request, rather than inherent limitations in systems caused the inability to respond was surprising.

Chart II.3: Gas - Percent of Current Staff Retirement Eligible as of Year End



The accompanying chart shows the retirement eligibility profile of gas operations staff. It exhibits the same apparently contradictory information. The temporary drop in craft and salaried staff retirement eligibility in 2017 and 2018 was also curious. As for electric operations, the eligibility numbers appeared inconsistent with the average age and management provided, as the next two charts illustrate.

Management could also not provide the historical information about how many employees eligible to retire actually did so. Again, as for electric operations, management did provide data limited to 2014 and to craft employees. That data showed a retirement rate of three percent in 2014. Using a common rationale for not providing requested data, management again advised that did not have the capability "to provide the unique information requested by Liberty."

Table II.4: 2014 Average Age and Tenure - Gas

	Hourly Craft	Salaried
Average Age	44	44
Average Tenure	18	15

d. <u>Monitoring, Training, and Development of Critical Skills</u>

Management believed that it had no current, significant gaps in resource numbers and further noted in a response to a data request regarding skills and experience gaps that "to the extent there are resource gaps they are due to the unique set of information requested by Liberty..."

Management provided the majority of training in electric operations through internal employees. It placed heavy reliance on peers and supervisors, with assistance, as needed, from subject matter experts from other departments. Training in gas operations came through internal resources or outside instructors, as needed. Departmental leads identified training needs, based on established intervals associated with specific position progression requirements. More general training existed for safety, ethics, physical and cyber security and regulatory compliance.

Management indicated that it communicated with other utilities and industry organizations, such as EEI, AGA, and IEEE, along with the New York State Public Service Commission. Nevertheless, management stated that it, "…cannot speculate regarding the development capabilities of outside resources." These communication efforts comprised what management says it is doing with respect to planning joint efforts for outside training and development, including with efforts bargaining units. Management did not identify any educational institution (*e.g.*, junior college, university, vocational school) with which it is affiliated or has a relationship in terms of training or curriculum.

Management shared best practices for recruiting veterans for craft positions through the New York State Troops for Energy Jobs program, working with other New York utilities and the Center for Energy Workforce Development ("CEWD") as well. Management was aware of the CEWD's national template for veteran recruitment and retention, reporting that it was assessing how CEWD's work could be used in determining future employment needs. At the time of our field work, management was completing the CEWD Gaps in the Energy Workforce Survey.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Internal Staffing criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These six criteria are:

1. There should exist a comprehensive, detailed forecast of medium- and longer-term capital and O&M work requirements; it should be sufficient to identify corresponding resource needs.
2. Capital and O&M work forecasts should have a factual and analytical foundation sufficient to support staffing projections.
3. There should exist sufficient sources of complete, accurate staffing information by region and by function
4. Forecasts should project losses through attrition and retirement by function, region, and work type, and reflect historical trends, recent experience, and expected conditions.
5. Management should have a sound understanding of areas where personnel losses have had and are likely to have significant work performance consequences.
6. Training and development programs should be sufficiently robust to provide adequate support for long term staff requirements.

1. Central Hudson had sufficiently detailed forecasts of medium and longer-term capital and O&M work requirements; they were comprehensive enough to identify likely resource requirements over those time frames.

Management used a decentralized, relatively unsophisticated but well-understood work plan development process. That development included identification of work to be performed using historical trends and known or anticipated project and program requirements. Projections extended over a five-year time horizon. The engagement of line and management personnel in the forecasting processes was sufficiently broad and active.

The identification of work requirements resulted from a multi-step process driven by significant line organization input and subject to multiple layers of review and examination. Conversion of those work requirements into resource needs occurred through a structured, straight-forward process that proceeded directly from the work forecasts. Management had a clear sense of staffing needs for base business requirements.

2. Central Hudson had sources of information providing complete and accurate data information about staffing by region and by function.

Central Hudson is a small company with a relatively small geographic footprint that allowed its informal but well-known and well-understood planning process to provide accurate information on internal staffing by area and function.

3. Central Hudson was not able to report information that would demonstrate a comprehensive approach to and understanding of areas where it may face critical resource shortages.

Basic workforce retirement information that all the other operations we studied provided was not available at Central Hudson. Management tied its inability to respond to the nature of our questions, which we did not find convincing. These questions were the same that we asked others, who were able to respond without undue difficulty. Those questions, moreover, sought information in forms that other North American utilities have been able to provide readily as well.

The decentralized nature of the internal staffing processes appeared to depend too heavily on individual managers (as opposed to systems and tools administered by Human Resources personnel) to be sensitive to and aware of the demographic trends affecting their areas of responsibility. Responsibility for preparing attrition and retirement forecasts rested at the operating department level. Consequently, broader-level forecasts existed only as an aggregate of individual manager forecasts, whose accuracy and consistency depended on efforts defined and executed by each manager.

Management described the desire to replace its HRIS within the next several years. Fairly sophisticated systems have become commonplace in the industry even for smaller utilities. They provide an important source for housing and for promoting the ability to analyze a wide range of data directly associated with traditional Human Relations functions. More important for our purposes, they provide a basis for supporting resource planning and use in the operations areas we studied.

Our work scope did not encompass a full-scale review of Human Resources functions. However, an examination of those that did relate more directly to staffing adequacy give impetus to the conclusion that the desire to add capabilities through a new HRIS will materially enhance staffing planning and analyses capabilities. Particularly with the development of increased capabilities that such a system can bring, Human Resources will become better equipped to perform an enhanced role in analyzing data important in dealing with resource needs identification, skills assessment, and training and development

4. Central Hudson's decentralized approach to training and development reflected the small size of the Company; however, management was not sufficiently active in promoting alliances to meet staffing needs, and lacked some elements that would promote better measurement of training, development, and recruitment effectiveness.

The internal training programs were oriented toward support of the line organizations. They operated primarily through internal staff in both electric and gas operations. Central Hudson had limited involvement with external training organizations, and only recently became involved (and to a very modest degree) with the CEWD. Management identified no local or regional education institutions with which it worked actively in terms of vocational training or development of energy-oriented curricula. Management also applied no metrics designed to measure the effectiveness of training or the acquisition of new resources.

4. Recommendations

1. Central Hudson's Human Resources department should standardize the development of attrition and retirement forecasts throughout the Company.

This approach would ensure consistent application of approach, assumptions, and analysis. In addition, those forecasts should be prepared at least twice per year. This frequency would eliminate their dependence on the annual planning cycle for the only Company wide retirement and attrition assessment.

2. Central Hudson should aggressively seek out and establish outside training and recruiting alliances, and use clear, objective measures for regularly assessing effectiveness in meeting clear, firm training and recruitment goals.

Management should investigate the development of training programs with external organizations that focus on the development of new skill sets that are likely to be required by changing market conditions. Such skill sets might include data analytics, communications and control technologies, and cyber security. Central Hudson should also establish and monitor metrics or KPIs that measure success in meeting specific targets for resource acquisition, training, and development.

Devolution of much of the responsibility for training to electric and gas operations remains appropriate because Central Hudson's size limits its ability to make economic use of the more centralized training departments that larger utilities employ. However, management needs to ensure that decentralization remains accompanied by a central and empowered group that ensures appropriate documentation and reporting of all elements of training and development participation.

3. Central Hudson should formalize and execute plans to enhance HRIS capabilities.

Management had a clear sense of where HRIS capabilities should be enhanced and of the inability of its current system to support improvement. What now appear to be plans of a more conceptual nature should become firm; management should commit to a firm schedule for securing and rolling out the required capabilities. We understand that the focus will concern needs that may not transparently involve staffing adequacy. However, a new-generation HRIS brings automation to issues such as payroll, benefits administration, employee record handling, recruitment, training, performance management (*e.g.*, appraisals), time recording, and grievance handling. Some of these areas can make a material contribution to staffing adequacy through the wealth of sortable, searchable information they enable.

The latest systems can support the ability to provide central tracking and management of aspects of training, and development. The ability of such systems to support recruiting efforts is also important to staffing. One of the more significant uses here lies in the power that current systems offer to capture data that support the use of a variety of metrics useful in gauging the current status of the workforce and assessing trends likely to affect it in the future.

D. Overtime

1. Summary

Central Hudson had adequate analytical capabilities, and was attentive to balancing overtime against the need to add required resources. It appears however that such balancing centered on a 25 percent overtime target level, which was somewhat high for New York utilities. We found Central Hudson's approaches and methods reasonably sound, but there are opportunities for improvement.

2. Findings

Liberty has found in prior work that overtime among the utilities does not generally receive a degree of organizational attention commensurate with its importance in the cost and staffing equation. The magnitude of overtime costs, negative impacts on personnel from high overtime, reduced productivity associated with overtime, and issues of control, especially with emergency requirements, argue that overtime planning and management should get more attention in most organizations.

Central Hudson's processes underlying its management of overtime appeared sound. Liberty saw opportunities for process improvement that are moderate at best. We found no process areas here that reflect significant weaknesses, either on an absolute basis or relative to the other New York utilities.

Management was attentive to overtime, and employed a strategy to limit overtime to 25 percent. Overtime was projected in the annual manpower plan based on historical usage. Each business area reviewed overtime usage on an ongoing basis. Overtime was typically utilized for trouble work or reliability issues requiring immediate response.

Management did not have a documented user guideline to address whether and how overtime should be used in lieu of other resources. Budget documents did provide specific overtime instructions for both gas and electric utilities. Different approaches applied to gas capital and expense functions. Likewise, different considerations applied to the capital and expense functions of distribution, transmission, and substation operations. Overtime plans relied on historical levels of response to after-hour emergent work activities, covering shift vacancies, meeting customers' commitments, and scheduled outage requirements. Management left decisions about overtime use to first-line supervisors' discretion, determining on a case-by-case basis whether it made sense to extend a normal work day to improve overall production and productivity.

Management had not performed detailed analysis and quantification of costs of straight time versus overtime hours. The tools, systems and reports were not designed to enable such reports. Management relied on monthly variance analysis to identify overtime cost issues. Management emphasized that, when overtime is used for emergency situations, safety, not productivity, comprised the major consideration.

A company with an effective integrated process can balance internal and external resources with the optimal levels of overtime. Central Hudson compared the cost of overtime to the cost of contract labor. Management used contractors to provide specialized work, respond to peak service demands, and supplement internal resources. In most instances, management found it less expensive to use internal resources at overtime rates than to obtain external resources.

During the annual budgeting process, historical overtime formed a budget assumption. Management took high overtime into consideration in evaluating resource requirements, hiring more electric and gas workers, as appropriate. We verified that management did make a small increase in electricians and gas mechanics.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Overtime criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. There should exist an analytically supportable method for determining optimum levels of overtime.
2. Planning should appropriately consider the relationship between amounts of overtime use and productivity and costs developed separately for the different work functions and types.
3. Overtime use should comprise a formal part of the process of identifying required resources.
4. Overtime use should conform as closely as practicable to well-founded assumptions used for determining resource requirements.
5. Overtime use should comprise part of an integrated process for balancing internal, overtime, and contractor resources across all functions at issue.

1. Central Hudson provided a significant level of planning, monitoring, and oversight to the management of overtime, and demonstrated good analytical capabilities.

The degree of attention to overtime as a management parameter varies among the utilities; Central Hudson was attentive to the issue. Budget targets and caps existed. Tradeoffs in staffing decisions received an appropriate level of analysis and management consideration. The skills and capabilities applied to analysis and decision-making were sound.

2. Central Hudson did not employ an analytically supportable method for determining optimum levels of overtime.

Management essentially used historical overtime rates as a budget target. Management did not use an analytically driven model to determine optimum overtime levels.

Central Hudson's overtime was marginally high at 25 percent both in gas and electric operations. These levels raise the question of whether overtime should be subjected to a more sophisticated, analytically-based method to determine optimum levels. In some utilities, overtime levels are so constrained or the expenditures are so small, that the question is less important. Each utility needs to answer this question based on its individual circumstances. Central Hudson's overtime levels were sufficiently high to merit consideration of improved approaches to its optimization.

3. Central Hudson did not routinely consider the interrelationships among overtime, cost, and productivity in its decision-making related to overtime.

We observed no analyses of how overtime use impacts productivity and costs. Management did not see the need, and views such quantitative analysis as unnecessary. The tools, systems, and reports were not set up to provide detailed productivity analysis of straight time versus overtime. Management viewed productivity improvement as a matter of maximizing wrench time by reducing travel time and constant time (daily dispatch and return time from base station). Management contended that there was no significant variation in productivity between straight time versus overtime during the day, but some decline during the night shift due to limited visibility and the work rule restrictions in place regarding gloving high voltage in the dark.

High overtime levels tend to be more understandable for the comparatively smaller workforce that Central Hudson had. To the extent that a large fraction of overtime in a company is on "no choice" situations, the productivity issue is not relevant. On the other hand, large amounts of overtime present a diminishing-returns issue. Management needs to understand its exposure here and overtime penalties should be better understood and considered in decision-making.

4. Central Hudson did not apply overtime planning and analysis at the functional level.

Management recognized that different work groups or work types should and do have different levels of overtime, based on the nature of their particular work. Planning of this type did not go down to the functional level. Most utilities see the functional level as the ultimate basis for effective planning and control of costs in general, although abilities to implement such a strategy vary widely. We therefore recommend more, not less attention at the functional level. The degree to which such functional attention is desirable for overtime needs to be evaluated and determined at the individual utility level. For example, the Distribution - Overhead Maintenance function was a major Central Hudson overtime driver, with a consistently high rate for the past five years. This function comprises planned work, allowing for identification of any recurring issues that may have been driving overtime there. This example points to the benefits of timely cost analysis.

5. Central Hudson adequately considered overtime in its resource planning and budgeting functions.

Management did consider historical overtime levels in long-term resource planning strategy and trending. Overtime parameters were adequately considered and integrated into budgets and plans. Management described examples of identifying required resources. We validated that consideration of overtime did result in additional full time hires.

6. Central Hudson was able to hold overtime to planned and budgeted levels.

Management sought to maintain the overtime rate in the 23 to 27 percent range. The target established for both gas and electric was set at 25 percent. Even though this target was essentially being met, Central Hudson's overtime levels were somewhat high even for a small utility. Moreover, management understated the overtime percentage. It considered time charges for training, meetings, inclement weather, and other non-working time. Such inclusions comprise a deviation from our overtime definition of direct work functions. Including such components produced a lower calculated rate, because overtime charges in these indirect accounts are minimal.

7. Central Hudson appropriately considered overtime as an element of the resource mix, and appropriately planned its use on an integrated basis with the other resource elements.

The annual workforce planning process occurred during the budgeting process. Managers took into consideration current productivity, training requirements, amount of unproductive time, and workload demands to establish baseload internal resource levels. Management did evaluate historical overtime use versus the external resource option. The analytically supportable method we recommend that management institute will give support to a more quantitative analysis for a more effective integrated process of balancing internal and external resources.

4. Recommendations

1. Central Hudson should develop a more analytical process to determine the optimum level of overtime.

Each utility's circumstances will dictate its needs for an analytically optimized solution for overtime. Such sophisticated approaches will be more appropriate in cases where: (a) overtime expenditures are large, both absolutely and relative to other staffing related costs, (b) planned levels of overtime are relatively high, (c) productivity issues exists, (d) non-economic issues exist, or (e) control issues exist.

A number of these circumstances existed at Central Hudson. Management should undertake more robust analytical determination of an optimized level and strategy for overtime.

Liberty believes that a study of overtime within the framework of a "control zone" approach (please see the Statewide report) can be beneficial. Nevertheless, Central Hudson's circumstances and needs may be more basic, given its relatively high overtime in gas and electric distribution. Any determination of an optimum level should be accompanied by an ability to control to that target (or range).

The Company's circumstances, most notably the absence of 24-hour coverage, led directly to balancing higher overtime against the option of staffing a new off-hours shift. With overtime in the 25 percent range, that balance is likely to favor overtime. Re-analysis is appropriate, given high levels of overtime.

2. Central Hudson should include all relevant factors in its decision-making regarding overtime planning and use.

We have stressed that each utility's circumstances will dictate the level of effort appropriate for managing various elements of its work. Central Hudson, on balance, is a small utility in both the electric and gas businesses. Accordingly, Liberty is not recommending that the Company undertake expensive analytical exercises that may offer no real return. Rather, Central Hudson needs to ensure that it has a strong understanding of the negative impacts of overtime, and considers those impacts as practical in its decision-making processes.

3. Central Hudson should expand the use of functional planning, budgeting, and monitoring regarding overtime.

Utilities generally accept the appropriateness of a functional approach to cost management, but fewer carry that concept very far. The question for functional cost management is not whether to do it, but rather how far to go in its application.

Overtime is a lower level cost element and Central Hudson is a small utility. We recognize that detailed, functional analysis of overtime at Central Hudson would be non-productive. On the other hand, the overtime level was high in both gas and electric operations. It is reasonable to expect that the bulk of overtime came in comparatively few key functions. If overtime is not planned, budgeted, and monitored in at least those particular functions, then solutions are not likely to be forthcoming very soon.

Liberty therefore recommends that management evaluate the merits of expanding the role for functional management of overtime, if not for all functions, then for at least those functions likely to be the most fruitful.

4. Central Hudson should develop and employ a program for managing overtime within a reasonable control zone.

We have stressed the historical overtime rate of 25 percent is on the high side. Management should evaluate the merits of a lower target, and adopt the control zone concept. Monitoring of overtime in problem functions, analysis of deviations, and implementation of corrective measures should be considered minimum requirements.

E. Contractor Use

1. Summary

Central Hudson employed an appropriate strategy for the use of electric and gas contractors. Management contracted low-value and specialty electrical work, and made use of lump-sum contracts to manage costs. Gas operations contracted services conformed to general industry practice. Central Hudson did not use a central contract management organization, but, given its size, made use of sufficient measures to supervise contractor work in electric and gas operations.

Management used a sufficiently broad number of contractor firms in electric operations, and undertook reasonable efforts to have contractor resources available to support storm response efforts. Management had access to a sufficiently broad base of contractors for gas construction, but generally limited contracts for construction to short terms.

However, the Company, like others, faces increasing competition for outside resources even as its own needs are forecasted to increase. Management had taken steps to increase the number of resources required to support its construction program in the coming years. It is important that it continue to act to ensure access to needed resources. We therefore encourage management to pursue (as it has been considering) construction contracts with longer durations, which we believe will better suit tightening market conditions. Promoting a “relationship” approach to contractors is also appropriate in ensuring continuing access to resources. Central Hudson took appropriate efforts to promote relationship building with contractors.

We found several noteworthy elements of Central Hudson's gas contracting efforts. First was the use of hybrid crews, which showed promise in increasing the numbers of Operator Qualified gas mechanics. Second was the direct link its contracts made between contractor performance and compensation.

2. *Findings*

a. Contracting Levels & Types of Contracts

i. *Electric*

Management used contractors in the expected and usual ways in the industry; *i.e.*, for specialized work, work peaks, and supplementing internal resources. Management also contracted low-value civil work, inspections and line maintenance. Internal employees performed substation steel erection and wiring work. Distribution engineering made use of five or so contract estimators, but they worked mostly on CATV projects, and management billed their time directly to the CATV companies where applicable.

Bargaining agreements affected Central Hudson's contracting ability. Minimum required internal staffing levels included 150 linemen and 16 union estimators. Such agreements resulted from negotiation that typically involves compromises across a wide range of variables that affect work. Judging them in isolation, from the perspective of staffing, is thus not appropriate. For example, Central Hudson also had work rules (*e.g.*, job-site reporting) that increased the flexibility of work by its crews.

Management made primary use of lump sum contracting often on a multiple-project basis, to gain mobilization and demobilization efficiencies. Management limited time and equipment rates where possible. Central Hudson had no contractors working on a unit price basis. Multi-project bids permitted packaging of smaller jobs in a way that extended the work made available for lump sum pricing. Central Hudson was the only one of the state electric operations we studied that considered lump sum bidding the preferred means for electric distribution contracting.

Management applied a number of measures to compare contractor effectiveness to other resource alternatives. Management compared each lump-sum bid case with its internal costs. Where contractor bids displayed high costs for low-value work, such as flagging and rock holes, management used labor under existing contracts having lower prices. Overtime was generally considered the best option for jobs of less than 100 hours. Contractors were considered prime candidates for jobs requiring more than 1,000 hours. Central Hudson generally contracted more line work in remote locations, which allowed contractors to set up and stage the work.

At the time of our field work, three contractor overhead line crews were present (two on transmission projects and one on distribution). In order to promote the availability of overhead contractors for storm needs, management scheduled contract overhead line work in the main storm season.

Central Hudson did not employ a central contractor management organization for electric operations. Operations managed the bidding process. After a lump-sum award, a line foreman, to whom the contractor was assigned, provided the same direction to contractor crews as existed for internal crews. Management made use of a comparatively small number of contractor FTEs in 2013 (less than 40). The small amount of contractor use made this approach appropriate, in lieu of the more formal contractor management organization and systems seen in larger operations.

Clear approaches and processes applied to contractor payments. At job-start, an invoice approval level was established. Contractors provided weekly timesheet reporting. Central Hudson made lump sum progress payments to contractors on a monthly basis, based on work complete. Invoices were scanned, approved electronically, and forwarded to Accounts Payable. Management considered contractor job and safety performance factors in awarding future work.

ii. Gas

Central Hudson contracted about two-thirds of its pipe replacement work. Management considered this mix optimum for maintaining its expertise in the field and promoting employee engagement. An increased pace of replacement led, in the past several years, to an increase in internal gas mechanics from 40 to 55 to maintain the desired ratio. Management increased its number of contactor FTEs from thirty to approximately fifty in the last few years, and expected to add two to three additional contractor crews in the near future.

Management scheduled its pipe replacement work to ramp up by 50 percent between 2013 and 2018 (from 10 to 15 miles).[2] At 2013 rates of production, this increase would require an additional 2 to 3 FTEs**.** The Company had 231 miles of leak-prone pipe at year-end 2013. Its 2013 rate of production would lead to replacement of all such pipe in 23 years. The 2018 rate of production would reduce that duration to 15 years.

Management offered a similar rationale to what others apply in making contractor decisions. For capital construction, it sought to balance a number of competing constraints. One goal was to limit the number of internal construction resources to those it could keep busy during the off-season, when weather conditions prohibit construction. Another important goal was to retain a sufficient number of contract firms and crews to promote availability when emergencies produce work spikes. This goal recognized that contractors give preference to their regular client companies under tight conditions.

Gas contracting for O&M work included low-skill, high-volume repetitive work, such as locating and mark-outs and leak surveys. For system expansion purposes, Central Hudson typically used lump sum bids for projects in the range of 15,000 to 20,000 feet or pipe or more. Approximately sixty percent of leak-prone pipe replacement and about forty percent of new construction used unit rates. Management sought to migrate to unit pricing for leak-prone pipe replacement, but reported that its contractor base was uncomfortable bidding on that basis. Management returned to lump-sum pricing, which it reported as more economical.

Management believed that the costs of contractors and internal resources were roughly comparable, but had not performed any formal cost comparison studies. Management used five major construction contractors, who provided approximately 31 to 38 FTEs. They complemented

[2] Approved in Case 14-G-0319 by Order Dated 17, 2015

the 8 to 14 internal FTEs performing construction activities. Management was also using "hybrid" crews. These crews consisted of employee supervisors who were Operator Qualified and contractor utility workers, who were generally not Operator Qualified. This approach maximized use of the Qualified employees, because only the supervisor was Qualified. Contractor utility workers also could then move on to be Qualified, with later hiring by the Company

Gas engineering administered construction contracts. Their inspectors visited all construction sites. Management also met with internal foremen and supervisors monthly. The QA/QC program, administered by engineering, also included monthly meetings with contractors.

Contractors were eligible for compensation incentives and penalties based upon performance, which used an evaluation system with levels from A to D. The ratings affected up to 10 percent (five percent plus or minus) of total compensation.

3. Conclusions

Liberty based these conclusions on our evaluation of Company practices and processes against specific Contractor Use criteria. The statewide report discusses in more detail these criteria and the reasons why they are important. These five criteria are:

1. The types and levels of contractor use should be supported by a contractor strategy that considers work volume, quality, timeliness, costs, and other relevant considerations.
2. Management should operate with a data-driven understanding of the comparative costs of using contractor versus internal resources, and apply a sound rationale for choosing between contractor and internal resources.
3. A reasonably-broad base of firms should remain under contract or pre-qualification to provide flexibility and diversity in activities involving significant contractor use, current and anticipated.
4. Recognizing gas contracting market conditions, management should have clear, comprehensive plans for ensuring access to and retention of resources needed to support major, long-term needs (*e.g.*, main replacement).
5. Management should apply a sound contractor oversight program that includes appropriate central program monitoring and field oversight, payment control, performance evaluation, and adequate linkages between performance and corresponding matters of compensation and continuing work eligibility.

1. Central Hudson's level of electric operations contractor use and the types of contractors were supported by consistent strategy and execution.

The contracting levels were comparatively low, but Central Hudson was contracting out the appropriate low-value and specialized work. Management used a quarterly lump sum bid process effectively to manage contractor costs.

2. Central Hudson had a data-driven understanding and a good qualitative rationale supporting the use of contractors in lieu of internal resources.

The lump sum bid process enabled management to compare the contractor bid costs with internal crews. Central Hudson regularly compared work for both high- and low-value jobs.

3. Central Hudson's approach to managing its fairly limited number of contractors was effective.

Management did not have a central contractor management organization in place. The costs of a central organization did not appear warranted, given the small number of crews employed. Management used Line Supervisors directly to manage contractor crews.

4. Central Hudson used a sufficiently broad number of contract firms in electric operations.

The number used was consistent with the small level of contracting, and designed to have contractor resources available to support storm response efforts.

5. Central Hudson's use in gas operations of contracted services was generally consistent with industry practice.

Management contracted approximately two-thirds of its construction, all line locating, leak surveying, and inspections. Formerly, it contracted a great deal of construction (particularly pipe replacement), but moved about one-third in-house in recent years, in conjunction with an increase from 40 to 55 gas mechanics. It also contracted Quality Assurance and a small portion of engineering.

6. Central Hudson used appropriate qualitative rationales for identifying what gas services to contract.

While there were no quantitative studies, management demonstrated a broad and deep understanding of all aspects of operations, and had logical, considered rationales for the functions it performs internally and externally.

7. Central Hudson used a sufficiently broad base of contractors for gas construction, but generally limited contracts to short terms.

Management used local contractors with whom it had strong and, for the most part, continuing relationships. This approach provided a continuing and diversified field of contractors providing services currently and available for emergencies.

Most construction contracts had a term of one year, but dealings with gas contractors reflected a long-term, "relationship"-based approach. Management recently began to consider entering contracts with durations of two- to-five years. It had also taken additional steps to strengthen relationships with existing contractors. Efforts included earlier design preparation to aid contractors in mobilization and demobilization decisions. Other contracts, (O&M and Engineering) typically had three- to five-year terms.

8. Central Hudson had taken steps to increase the number of resources which will be required to support its construction program.

Central Hudson's trial of hybrid crews showed promise in increasing the numbers of Operator Qualified gas mechanics. A training path and trajectory was particularly necessary for gas mechanics and welders at Central Hudson, which required a progression taking three and one-half to four years, even though the actual training requirements might be satisfied in a year and a half.

9. Central Hudson had an effective support structure for its gas contract operations.

Central Hudson used its standard company contractor processing for payment processing and control. Quality assurance was administered by Gas Engineering, and included a regular presence at all construction sites, along with monthly meetings with each contractor and a contractor rating system.

10. Central Hudson's incentive/penalty mechanism for construction contracts was notable.

Providing a direct link between compensation and performance over and above the basic requirement of meeting minimally acceptable performance criteria distinguished Central Hudson.

4. Recommendations

1. Central Hudson should extend the term of construction contracts with contractors.

All New York gas utilities need to address the impending shortage of in-house employees and contractors to perform pipe replacement work. Central Hudson has increased its resources, both contractor and internal, and has plans to add more. Increasing competition for resources across New York and the region, however, needs to be recognized as a threat, both to adding resources and to maintaining those now being used.

One mechanism to address the need is to provide longer term commitments to contractors, which provides them with a basis to attract, train, and retain sufficient numbers of skilled resources. Management does work well to maintain close relationships with local contractors, but nevertheless needs to remain vigilant as the market gets substantially tighter and the potential for bidding wars for employees increases.

Contracts with construction firms are generally short term (generally for one year), although the relationships tend to be much longer term. Recently, management began to consider: (a) entering longer term contracts, in the two- to five-year range, and (b) taking additional steps to improve relationships. Steps taken included earlier design preparation to aid contractors in mobilization and demobilization decisions. Other contracts (O&M and Engineering) were typically negotiated for three- to five-year periods.