# Appendix 2

Washington Savings Verification

Pacific Power

# 2012-2013 Final Report

# Washington Savings Verification and Reporting Process Review

Submitted to

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**May 28, 2014**

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## Introduction

PacifiCorp contracted with SBW Consulting, Inc., in conjunction with DNV GL, to perform an independent portfolio-level review of their reported 2012-2013 biennial electric conservation energy savings in the State of Washington. The primary objective of this review was to develop a summary report that will be submitted as an appendix to PacifiCorp's 2012-2013 Biennial Conservation Report (BCR). This review was not meant to duplicate already-completed impact evaluations of the individual energy efficiency programs, but rather to assess field verification practices and tracking, and the reporting processes helping to validate the accuracy of the savings being reported. It also examined PacifiCorp's evaluation, measurement, and verification (EM&V) procedures and third-party evaluation methodologies to assess whether they met reasonable industry best practice standards.

## Methodology

The review team accomplished the objectives by carefully examining selected overarching documents, databases, and calculations underpinning the PacifiCorp 2012-13 portfolio claims, as well as interviewing key PacifiCorp program staff. Specifically, the review team performed the four tasks laid out in the work plan, namely: 1) Portfolio Electric Savings Review, 2) Savings Verification Systems Review, 3) Validate Tracking and Reporting, and 4) Review EM&V and Cost-Effectiveness. The approaches for each task are summarized below:

### Portfolio Electric Savings Review

This task had a major focus on three programs, Home Energy Savings (HES), Energy FinAnswer, and FinAnswer Express, which collectively account for over two-thirds of the projected biennial savings. Smaller programs, namely Low Income Weatherization (LIW) and Appliance Recycling (a.k.a., See Ya Later, Refrigerator, or SYLR) were also included in the review.

The following documentation and data informed this review:

- Portfolio- and Program-level documents such as WUTC reporting requirements, PacifiCorp annual reports, program manuals, and evaluation reports
- Program tracking data
- Staff interviews
- Source documents underlying electric energy savings such as deemed savings tables
- Project documents for 90 sampled projects: 17 HES, 33 Energy FinAnswer, 34 FinAnswer Express and 7 Low Income Weatherization

### Savings Verification Systems Review

The review team analyzed the PacifiCorp verification procedures for the five key programs highlighted in the electric savings review described in Section 2, namely: Energy FinAnswer,

FinAnswer Express, Home Energy Savings, Appliance Recycling, and Low Income Weatherization. To develop a sense of how programs verify that measures were implemented properly and are yielding energy savings, the review team interviewed program managers and examined relevant procedural documents and example project files. This included collection and review of the verification documentation, such as template inspection forms, completed inspection forms, training manuals, and program manuals to assess existing verification practices. As a part of this review, the team also leveraged findings from the review of portfolio electric savings discussed in Section 2. The review team also compared PacifiCorp's measure installation practices to industry best practices.

### Tracking and Reporting Review

The review included the following steps:

1. **Database Variance.** Compared reported savings in the annual reports to summaries of the tracking data, reviewed processes for data reconciliation and examined how data is used to track program goals.
2. **Minimum Data Quality.** Checked that the tracking database is fully utilized, including managing quality control of the data.
3. **Conformance to Industry Practices.** Examined the tracking database against industry practices in regards to program management, as well as whether it supports quality control and evaluations.

### Impact and Process Evaluation Review

To understand how PacifiCorp has planned and implemented M&V practices relevant to the 2012-2013 program year, the review team examined both past evaluation work that informs the current programs, as well as current evaluation plans and activities that will affect programs in the next program cycle. The team reviewed each report and compared PacifiCorp's evaluation practices to industry best practices. Specifically, the team used the Model Energy Efficiency Program Impact Evaluation Guide from the National Action Plan for Energy Efficiency to assess the best practices of the PacifiCorp impact evaluations.[1] Furthermore, the review team leveraged the National Energy Efficiency Best Practices Study[2] to assess whether the process evaluations addressed areas such as program design, administration and implementation as well as participant response, noting where there were gaps in topics covered in the evaluations across the portfolio.

### Cost-Effectiveness Calculation Review

The review team examined PacifiCorp's cost-effectiveness calculations that were reported in Appendix 2 of the 2012 and 2013 Annual Report. It also conducted the following assessments to

[1] http://www.epa.gov/cleanenergy/energy-programs/suca/resources.html

[2] National Energy Efficiency Best Practices Study, Volume S—Crosscutting Best practices and Project Summary, Quantum Consulting. December 2004. This study was managed by Pacific Gas and Electric Company under the auspices of the California Public Utility Commission in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company.

confirm if PacifiCorp's calculation approach, inputs, and assumptions were properly documented and transparent.

1. Review for correct methodology in evaluation reports and 2012 and 2013 Annual Report
2. Conduct due diligence review of calculation methodology
3. Assess validity of calculation inputs

# Conclusions

Overall, based on the material available for this review, the team found that PacifiCorp has in place solid practices for tracking, verifying, reporting, and evaluating savings achievements and cost-effectiveness across their Residential and Commercial & Industrial programs. Below are conclusions by the various review approaches along with areas identified as having room for improvement.

## Portfolio Electric Savings Review

The review team found no issues with the program reported savings for 2012, and a couple small issues with reported savings in 2013 amounting to less than 250 kWh overstatement in 2013 savings. The issues concerned selecting incorrect deemed savings values for a couple of insulation measures based on the cooling source indicated in the project documents. Specifically, the reported savings for two floor insulation measures installed in a total of 3,434 sq ft were based on the incorrect cooling source such that the deemed savings value selected was 3.98 kWh/sq ft instead of 3.94 kWh/sq. ft. Similarly, the reported savings for one attic insulation measure installed in 912 sq ft were also based on the incorrect cooling source such that the deemed savings value selected was 0.92 kWh/sq ft instead of 0.8 kWh/sq ft. The following issues made verifying the savings challenging but did not necessarily lead to reporting inaccurate savings:

- The Low Income Weatherization program inadequately tracked the quantities of various measures installed; however, this was not critical to reporting the correct savings value since it is a deemed, whole-home savings value regardless of what measures were installed.
- The sample projects reviewed for FinAnswer Express revealed instances in which the program inadequately tracked the quantities of various measures installed, for example, deemed savings for some measures are based on horsepower but quantity of motors was tracked.
- In nearly one-quarter of the Energy FinAnswer projects reviewed (8 of 33), it was exceedingly challenging, if not impossible, to track the final reported savings to the detailed engineering calculations in the appendices of the Final Inspection Reports, such as the final baseline and installed condition consumption values, the difference of which establishes the savings.

## Savings Verification Systems Review

The review team concluded that all five programs conduct site verification of installed measures or program activity, except for a subset of Home Energy Savings measures (e.g.,

appliances, ceiling fans, water heaters, etc.) that constitute less than 10% of program savings. Most inspections are contracted out, and generally conducted by program implementers. This facilitates correcting reporting problems prior to closing out projects. The three programs with largest savings inspect all of their largest projects. All Energy FinAnswer projects are inspected. For the most part, forms and processes for conducting the site inspections are clear and consistent.

As part of the Savings Verification Systems Review, the review team also compared PacifiCorp's methodologies to industry best practices, which revealed the following findings:

- *Overarching verification guidelines.* While portfolio-level guidelines for implementing risk-based verification procedures are not formally documented, PacifiCorp's program-level verification practices are generally consistent with targeting verification efforts at high risk, high impact energy efficiency measures.
- *Varied inspection strategies*. Verification practices reflect the diverse customer sectors, project types and attributes, and savings.
- *Actual Documentation of Savings or Verification*. Procedures for reviewing key documents are in place. However the review team found some invoices that were illegible or insufficiently detailed to verify the measure cost or measure being installed.

### Tracking and Reporting Review

The review team concluded that PacifiCorp is following best practices in the way they have designed the Nexant iEnergy platform, which should enable them to accurately track their programs on a project and measure level. The iEnergy platform provides documentation and system flow checks and balances to properly track, verify, and report program and project progress. Once iEnergy is in full implementation mode, PacifiCorp should consider doing another review at least once (and then follow up periodically) of the tracking and reporting systems to ensure they align with best practices, are used according to design, and properly incorporate quality control checks.

### Impact and Process Evaluation Review

The review team found that recent process evaluations were fairly comprehensive in addressing the program implementation and participant response, and all included interviews with program staff and participants. Assessment of program design and administration was included less frequently, particularly for residential programs. Recent impact evaluations generally covered essential components. Commercial/industrial evaluations, however, lacked detail about data collection and analysis methods. The overall evaluation strategy is comprehensive, and if implemented as planned, demonstrates best practices. PacifiCorp is improving how evaluations results inform future programs, though there is not currently a mechanism for confirming that the recommendations were implemented.

### Cost-Effectiveness Calculation Review

This review was challenging because (1) third-party-generated calculations were unavailable for review; however, the review team did observe the software's abilities via the user manual and a webinar demonstration and (2) embedded avoided energy costs and impact load shapes were

not fully described. Furthermore, the review team found that selection of load shapes and measure lives occurred at the program or measure category level, rather than at the measure level for the commercial and industrial programs as is done by the Council, however, it is an acceptable practice. The review team found the measure lives used in cost-effectiveness calculations to be inconsistent with the TRL except for the FinAnswer Express program. Disaggregation of administration costs was detailed and informative. Home Energy Savings and FinAnswer programs' measure costs were somewhat inconsistent or unclear about whether they were incremental or full measure costs.

# Recommendations

Moving forward, PacifiCorp can continue to improve their practices for tracking, verifying, reporting, and evaluating savings achievements and cost-effectiveness by fulfilling the following recommendations.

### Portfolio Electric Savings Review

1. Improve tracking quantities installed, particularly in Low Income Weatherization and FinAnswer Express programs.
2. Make complex custom savings calculations more transparent by requiring a brief description of methodology and final values in the main body of the report traceable to the calculations in the appendices in the Energy FinAnswer Program.
3. Ensure correct deemed savings values are selected, particularly in HES.

### Savings Verification Systems Review

1. Continue to monitor the periodic evaluation results for all programs and consider implementing a low cost verification approach for Home Energy Savings (e.g., telephone verification) if any issues arise in the future.
2. Conduct an appropriate sample of random site inspections, while balancing the costs of site inspection across all programs.
3. Ensure that a percentage of inspections are prioritized for projects completed by new contractors, including the Home Energy Savings program.
4. Document site inspection and verification procedures, particularly the commercial component of the FinAnswer Express program and the Low Income Weatherization program.

### Tracking and Reporting Review

1. Once iEnergy is fully implemented, perform periodic reviews of the tracking and reporting systems to make sure they align with best practices, are used as designed, and properly incorporate quality control checks.

## Impact and Process Evaluation Review

1. For future process evaluations consider addressing the gaps identified in Table 10 in Section 5.2. such as timing of HES program implementation.
2. Provide better explanation of data collection and analysis methods used for specific sites and overall, especially for the C&I program evaluations.

## Cost-Effectiveness Calculation Review

1. Consider making cost-effectiveness calculations more transparent by documenting methodologies and providing avoided costs derivations or, alternatively, via a sample calculation in replicable manner.
2. Include additional load shapes from other sources that are “transferable” to PacifiCorp service territory, especially if the end use contributes a high percentage of savings.
3. Consider performing cost-effectiveness analysis on a measure level similar to the Council’s approach, however, existing methodology is acceptable.
4. Document the method for determining measure costs recorded for the cost-effectiveness calculations.

# 1. INTRODUCTION

PacifiCorp currently operates residential, commercial, and industrial energy efficiency programs in Washington, under the name Pacific Power. They contracted with SBW Consulting, Inc., in conjunction with DNV GL (referred to in this report as the *review team*), to perform an independent portfolio-level review of their reported 2012-2013 biennial electric conservation energy savings in the State of Washington.

The primary objective of this review is to develop a summary report that will be submitted as an appendix to PacifiCorp's 2012-2013 Biennial Conservation Report (BCR), which will be filed by June 1, 2014. This review is not meant to duplicate already-completed impact evaluations of the individual energy efficiency programs, but rather to assess field verification practices and tracking, and the reporting processes helping validate the accuracy of the savings being reported. It also provides an assessment of PacifiCorp's evaluation, measurement, and verification (EM&V) procedures and third-party evaluation methodologies, and whether they meet reasonable industry best practice standards.

This review relied on multiple approaches. The review team carefully examined selected overarching documents, databases, and calculations underpinning the PacifiCorp 2012-13 portfolio claims. Interviews with key PacifiCorp managers regarding these aforementioned records of programmatic activity shed additional light on how they were developed. In addition, the review team selected random samples of project-level documentation for each program, and subjected these samples to careful scrutiny and analysis. Examining the portfolio claims at both summary and detail levels helped identify problems and potential improvements that can strengthen PacifiCorp's future claims.

This Report provides results from the review of the *Washington Annual Report on Conservation Acquisition for January 1, 2012 – December 31, 2012*, issued April 1, 2013 (referred to in this report as the *2012 Annual Report*) and the *Washington Annual Report on Conservation Acquisition for January 1, 2013 – December 31, 2013*, issued March 31, 2014 (referred to in this report as the *2013 Annual Report*). The subsequent four sections correspond to the following areas of investigation:

- Section 2 Portfolio Electric Savings Review
- Section 3 Savings Verification Systems Review
- Section 4 Tracking And Reporting
- Section 5 Impact and Process Evaluation Review
- Section 6 Cost-Effectiveness Calculation Review

Each section presents methodology, findings, recommendations, and next steps. The Conclusions and Recommendations section (Section 7) at the end of the report brings together results from each section.

# 2. PORTFOLIO ELECTRIC SAVINGS REVIEW

The overarching verification approach for each PacifiCorp program is shown in Table 1. The three programs of major focus, which collectively account for over two-thirds of the projected biennial savings, are Home Energy Savings (HES), Energy FinAnswer, and FinAnswer Express. Smaller programs, namely Low Income Weatherization (LIW), and Appliance Recycling, are also included in the review.

The review team examined 91 randomly-selected project files from the 2012 and 2013 program years but did not perform any field verifications. The review team also reviewed the methodology and findings of past evaluation reports, particularly pertaining to site visits and file reviews performed as part of these evaluations. This served as an additional source of validating information.

**Table 1: Summary of Verification Approaches**

| Tariff Schedule | Program | % of portolio savings goal[1] | Verification approach |
|---|---|---|---|
| 114 | Low Income Weatherization | 1% | Minor program that received minimal file reviews to validate. |
| 107 | Appliance Recycling | 3% | Spot checked independent inspector's phone/on-site survey documentation. No follow-up phone surveys were necessary. |
| **118** | Home Energy Savings | **15%** | **Major program - reviewed a sample of current files and past impact evaluations to validate.** |
| | Home Energy Reports | 3% | Evaluation not completed in time to be included as part of this review. |
| **125** | Energy FinAnswer | **29%** | **Major program - reviewed a sample of current files and past impact evaluations to validate.** |
| **115** | FinAnswer Express | **25%** | **Major program - reviewed a sample of current files and past impact evaluations to validate.** |
| | Energy Education in Schools | 0% | Not included, since no savings were reported. |
| | Northwest Energy Efficiency Alliance | 22% | Not included, since WUTC ordered statewide review and savings claim approach be developed by WA investor-owned utilities by end of 2012. |
| | Distribution efficiency | 3% | Not included, since not customer-based program. |
| | Production efficiency | 0.1% | Not included, since not customer-based program. |

[1] As determined from the 2012-13 biennial plan.

Further details of the approach for accomplishing the reviews associated with this task are provided below.

# 2.1. Methodology

### Aquisition of documentation and data

The information acquired includes, but is not limited to, the following:

- **Overall requirements:** Documents enumerating the WUTC's reporting requirements and the PacifiCorp reports written to meet those requirements.
- **Program materials:** Handbooks that fully define program procedures, such as those for reviewing custom projects or for conducting an inspection. Documents with program cost-effectiveness calculations. Sources of values used to estimate electric savings, incremental cost, and effective useful life for deemed measures. Simplified calculators used to estimate electrical savings for non-deemed, non-custom measures. RTF, PacifiCorp and NEEA deemed savings values agreed upon for the 2012-13 programs.
- **EM&V documentation:** Recent process or impact evaluations germane to the 2012 and 2013 reported savings.
- **Program tracking data:** Database extracts that contain all data behind the 2012 and 2013 savings claim. No data dictionaries were received; however, the field names were generally self-explanatory.

### Interview staff

The review team interviewed program staff associated with the key programs identified in Table 1, specifically:

- Residential program manager (Appliance Recycling and HES)
- Program Manager (Low Income Weatherization, via e-mail)
- C&I program manager (Energy FinAnswer)
- C&I program manager (FinAnswer Express)

After reviewing program documentation and data, the review team prepared for the interviews by developing a script and checklist of important issues to discuss. The latter included determining if there was other relevant documentation that could be helpful to the savings review, and specifics about other aspects of the overall review, such as savings verification procedures, tracking and reporting, EM&V, and cost-effectiveness. Detailed notes were taken during the interviews which inform this verification report.

### Review documentation underlying electric energy savings

After reviewing initial documentation, and during the process of following up on the information uncovered in those steps, the review team studied the numbers and calculations underlying the 2012 and 2013 reported electric savings in detail. This effort was focused on four areas:

- **Deemed savings:** Reviewed the deemed savings values used for the 2012 and 2013 programs, and assessed how those values migrated to the project files and tracking database.
- **Simplified calculations:** Reviewed calculations that account for significant amounts of reported savings to find any systemic and/or localized problems.
- **General:** Compared the 2012 and 2013 annual report claimed savings to the program tracking database to identify and investigate variances. Also compared descriptions of the programs in the report to the other reviewed documents and information obtained from the interviews to find any discrepancies.

## Sample file reviews

The review team performed an initial review of tracking data to understand the number of projects in each key program, as well as the types of measures, amount of reported savings, and the distribution of these attributes across the program. Based on this, a sampling and review approach for each key program was developed and is shown in Table 2. This table shows the allocation of the 91 file review sample points, and describes briefly how projects were selected and reviewed. For the selected projects, the review team either obtained project files from PacifiCorp, or confirmed that the program tracking database contained the relevant information.

**Table 2: Sampling and Review Approach by Program**

| Program | Sampling / review approach | % of kWh** | Sample size | | |
|---|---|---|---|---|---|
| | | | 2012 | 2013 | Total |
| Low Income Weatherization | Performed a few file reviews per the project review matrix (see Table 3), and checked the UES value and applicability carefully. | 1% | 4 | 3 | 7 |
| Appliance Recycling | Program verifies appliance removal through phone surveys. Reviewed several sets of phone verification data. | 3% | See approach description on left | | |
| Home Energy Savings | Reviewed 8 lighting and 9 non-lighting project files per the project review matrix. | 19% | 10 | 7 | 17 |
| FinAnswer | Applied stratified random sampling. Reviewed each project file per the project review matrix. | 39% | 20 | 13 | 33 |

| Program | Sampling / review approach | % of kWh** | Sample size 2012 | 2013 | Total |
|---|---|---|---|---|---|
| FinAnswer Express | Used stratified random sampling for two domains--one each for lighting and non-lighting to ensure diversity. Reviewed 17 lighting and 17 non-lighting project files per the project review matrix. | 38% | 20 | 14 | 34 |
| **Total** | | **100%** | **54** | **37** | **91** |

** As determined from the 2012 annual report and supporting data.

The review team developed and implemented a standardized review process for the sampled project files. This process included comparing file values for the number of units and savings to those in the program tracking database, checking for correct algorithms and key parameters in simplified calculations, and making sure proper procedures and/or good practices were applied for custom projects. Where applicable, the review team attempted to track down the inputs to the cost-effectiveness calculations, such as effective useful life or measure cost, for each sampled project. The project review matrix is shown in Table 3.

The review team also examined the methodology and findings of past evaluation reports, particularly pertaining to site visits and file reviews performed as part of these evaluations. This served as an additional source of validating information.

**Table 3: Preliminary Project Review Matrix**

| Data class | Category | Subcategory | Parameter | Third-party review questions |
|---|---|---|---|---|
| PacifiCorp Tracking Data | | Identifiers | Program Number | |
| | | | Project ID | |
| | | | Description of Project ID | |
| | | | Program | |
| | | | Sampling domain | |
| | | | Type of savings calculation | |
| | | Measure | Measure description | |
| | | | Quantity | |
| | | Savings | kWh savings | |
| | | | Hours of operation | |
| | | Costs | Measure cost | |

| Data class | Category | Subcategory | Parameter | Third-party review questions |
|---|---|---|---|---|
| | | | Incentive payment amount | |
| | | | Incentive payment date | |
| Unit energy savings data | | | Measure type | |
| | | | Unit savings | |
| | | | Measure cost | |
| | | | Measure life | |
| 3rd party review | General | | Date requested | |
| | | | Date received | |
| | | | Reviewer | |
| | | | | Was complete project file readily available from PacifiCorp? If not, why not? |
| | | | | Is info complete, well-organized, and understandable? |
| | File comparison w/tracking data | Identifiers | Program number | Match? (Y/N) |
| | | | PacifiCorp project number | Match? (Y/N) |
| | | | Facility type | No more than a few words to provide a general sense of types of facilities |
| | | Measure | Measure description | Described accurately enough to match appropriate savings value (if deemed)? |
| | | | Measure type | Match? (Y/N) |
| | | | Quantity | Match? (Y/N) |
| | | | | Source of quantity info--invoices, other documents, inspections? |
| | | Savings | Type of savings calculation | Note ONLY if different than expected |
| | | | kWh savings | Match? (Y/N) |
| | | | KWh ≠ reason | Note reason why savings values do not match |
| | | | Unit savings | If deemed, is UES correct for given measure? |
| | | | Hours of operation | Recorded value(s) |
| | | | | Are values reasonable? |
| | | | Measure life | Consistent across measure types? |
| | | Costs | Measure cost | Match? (Y/N) |
| | | | | If No, input documentation cost |
| | | | | Is it incremental, if appropriate? |
| | | | Incentive payment amount | Match? (Y/N) |

| Data class | Category | Subcategory | Parameter | Third-party review questions |
|---|---|---|---|---|
| | | | | Payment amount <= measure cost? Reasonable amount? |
| | | | Incentive payment date | Date |
| | | | | Was incentive paid / project claimed in appropriate year? (Y/N) |
| | | | | Contains appropriate, detailed invoicing? |
| | Verification/ inspection | | | Evidence of pre and/or post inspection? |
| | | | | Is location of business and measure(s) clearly described, so someone else could find them? |
| | Savings detail | | Deemed | Right value chosen? |
| | | | | Deemed value up to date? |
| | | | | Does UES * Qty. = Tracking savings? |
| | | | Standard | Appropriate calculator? |
| | | | | Reasonable input(s)? |
| | | | Custom | Briefly describe data collection, calculation methods. |
| | | | | Reasonable input(s)? |
| | | | | Rely on measured data for baseline (where applicable)? |
| | | | | Rely on measured data for as-built? |

## 2.2. Findings

Overall, the portfolio savings review revealed no issues with the savings reported in 2012 and a couple small issues with reported savings in 2013 amounting to less than 250 kWh overstatement in savings. The HES Program-specific Findings subsection-section below elaborates on the issues. The review team found some issues not directly related to reported savings both across programs and specific to certain programs. The issues are discussed below, along with some germane observations.

### General findings

For the most part, adequate facility descriptions were available in project documentation. The review team observed that, among the sampled projects, just over 50% were industrial in nature, primarily production, processing and/or storage of food; just over 20% were residential; and 12% were educational facilities. The remaining 16% were a mix of commercial and municipal facilities.

For Commercial and Industrial programs which rely on simplified calculations for savings determination, the review team observed that while hours of operation were not tracked, sufficient data on this parameter was generally available in project documentation for applicable projects.

During the review of 2012 projects, the review team had difficulty determining the savings claim date to verify that the savings were reported in the appropriate program year. PacifiCorp cleared up this issue for the 2013 review period by providing the Cost Recovery Date field with the tracking data. However, project documents for the residential programs contained insufficient information to verify the date recorded in the tracking data.

Two issues that will be further elaborated upon in Section ? are tracking and documentation of measure life and measure cost. Across all programs reviewed, with few exceptions, neither project documentation nor tracking data report measure-specific effective useful life (EUL). Consequently, insufficient information about measure life was available to judge the consistent application of EULs across measure types. Regarding measure cost, with the exception of the Energy FinAnswer program, invoices frequently lacked sufficient detail to associate customer cost with tracked measure cost. This is particularly problematic when reported cost does not match the invoiced amount, e.g., because the project involved more than installation of energy efficiency measures (EEM). Furthermore, it was difficult to discern whether tracked measure cost was incremental or full.

Additionally, the review team examined past evaluation reports to understand the methodology and findings of site visits and file reviews performed as part of these efforts to see if they could shed light on current program processes, controls, and procedures, and inform the savings validation process. Generally, these reports and their appendices did not provide enough detail about their methodology and findings to improve the review team's understanding of savings. For instance, the review team obtained several evaluation site reports developed as part of the FinAnswer program evaluation, and found that they lacked sufficient detail about data collection and analysis methods to draw any useful conclusions about current practices.

## Program-specific findings

### Low Income Weatherization

While the Homeowner Agreement and Invoice form has a space to record estimated energy savings for each installed weatherization measure, frequently this was not filled in. Even though the savings claimed is based on a deemed whole home value, having a quantity and/or estimated savings for each measure would provide a better sense of savings relative to cost and improve evaluability.

### Home Energy Savings

Across the 2012-2013 review period, the review team uncovered a couple small issues with reported savings within one sampled project[3]. There were two instances in which incorrect deemed savings values were selected. Based on the Current Primary Cooling Source provided in the customer application, the unit savings applied to two floor insulation measures should have been 3.94 kWh, instead of 3.98 kWh, an overstatement of 138 kWh. Furthermore, another tracking record under the same sampled project appears to have used the incorrect deemed savings for attic insulation based on the Current Primary Cooling Source, using 0.92 kWh instead of 0.8 kWh, which resulted in additional overstatement of 109 kWh. These issues occurred in one sampled project out of 17 projects reviewed. The review team found the incorrect assignment of deemed savings was likely an isolated event and does not necessarily indicate systemic issues, and therefore, concluded that the total overstatement of savings for this program was 247 kWh.

### Appliance Recycling

The review team found no unresolved issues for this program in our review of the 2012-2013 data and documentation.

### FinAnswer Express

For 2012 deemed non-lighting measures, the units tracked were frequently not the units required for the deemed savings calculation, e.g., one motor was reported, but the unit energy savings value is based on kWh/HP. For 2013 deemed non-lighting measures, no units were provided in the tracking data; however, tracked savings matched savings presented in project documentation.

### Energy FinAnswer

The review team observed that the majority of savings calculations were performed in sophisticated spreadsheet models developed by the engineering consultant, and were based on pre- and post- measured data and other site inspection observations. These generally provide more accurate estimates of savings than simple calculators, but can make following the savings calculation less transparent. In this review, there were eight instances (projects done by Cascade Energy), out of thirty-three sampled projects, where the savings calculations were either not provided at all (two projects) or required going back and forth between the Final Inspection Report and the Energy Analysis report to put all the pieces of the calculation together. These projects are peer-reviewed and thus, generally, the calculations are assumed to be sound. It is beyond the scope of this review to verify the accuracy of the model inputs or the calculations in the intricate spreadsheet models (provided as PDFs).

[3] For this review of this program, customer name and invoice date combined to for unique sampling units (projects) and may have comprised multiple measures and/or properties.

## 2.3. Recommendations

The following are recommendations to improve documentation and tracking of project-specific data.

- For Low Income Weatherization projects, it would be beneficial to evaluators if the quantity installed of the various measures were tracked and recorded in project documentation, e.g., square feet of attic insulation, linear feet of pipe insulation, etc.
- For Home Energy Savings, ensure that the correct deemed savings are selected.
- For Home Energy Savings projects, consider collecting the type of residence (single family, multifamily, or manufactured) from the applicant, as is done with the other residential programs.
- For FinAnswer Express, ensure that the units tracked are the units required for savings calculations.
- For Energy FinAnswer, the Final Inspection Report should provide a brief description of the calculation methodology, e.g., used temperature bins, etc., and final numbers in the body of the report that can be tracked to the calculations in the appendices.

# 3. SAVINGS VERIFICATION SYSTEMS REVIEW

## 3.1. Methodology

The review team analyzed the PacifiCorp verification procedures for the five key programs highlighted in the electric savings review described in Section 2, namely: Energy FinAnswer, FinAnswer Express, Home Energy Savings, Appliance Recycling, and Low Income Weatherization.

Measure installation verification for the purposes of this report is defined as the process of identifying that the applicant-claimed measures are properly installed and delivering the reported savings. The steps necessary for this can include:

- Developing a transparent and explicit verification and inspection process by program and by measure, as necessary.
- Checking for applicant, project, and measure eligibility.
- Conducting pre- and post-inspections.
- Documenting verification results appropriately.

To understand PacifiCorp's measure installation verification practices, the review team used interviews of program managers, and reviews of relevant procedural documents and example project files to develop a sense of how programs are verifying that measures were implemented properly and are yielding energy savings. We collected and reviewed the quality of the verification documentation, which included template inspection forms, completed inspection forms, training manuals, and program manuals to assess existing verification practices. As a part of this review, the team also leveraged findings from the review of portfolio electric savings discussed in Section 2. PacifiCorp's measure installation practices were then compared to industry best practices to develop recommendations.

## 3.2. Findings

### 3.2.1. Current Verification Practices

The review team found that all five programs conducted site verification of installed measures or program activity (i.e., Appliance Recycling) as part of program implementation, with the exception of Home Energy Savings, which does not conduct any field or phone verification for a subset of measures (less than 10% of the program savings). These measures include refrigerators, dishwashers, ceiling fans, light fixtures, clothes washers, water heaters, evaporative coolers, and air conditioners. Although no independent verification is conducted for these measures, this was not found to be an issue at this time, as recent program evaluation activities have found 100% installation of these measures

Table 4 provides an overview of the entities who conduct site inspections for each program. In general, site inspections are conducted by the implementation entities responsible for the day-

to-day operations of the program. Therefore, site inspections (and phone inspections) described below are conducted prior to incentive payment, which enables any corrections to energy savings or project attributes to be revised in the tracking database prior to closing out the project. With the exception of the Low Income Weatherization program, no inspections are conducted after the close-out of projects.

**Table 4: Summary of Who Conducts Verification Visits for PacifiCorp Programs**

| | | | Site Verifications Managed By? | |
|---|---|---|---|---|
| Program Name | Implementer | Program Component | 3rd Party Implementer | PacifiCorp |
| Energy FinAnswer | PacifiCorp | Projects | | √ |
| FinAnswer Express | Nexant, Cascade and PacifiCorp | Trade ally lighting > incentive threshold | | √ |
| | | Trade ally lighting < incentive threshold | √ | |
| | | Trade ally non-lighting measures | √ | |
| | | Company delivered projects | | √ |
| Home Energy Savings | PECI | New home measures | √ | |
| | | Insulation, windows, HVAC and duct measures | √ | |
| | | All other retrofit measures (e.g., appliances, fans) | N/A | |
| Appliance Recycling | JACO | Home pick-ups | | √ |
| Low Income Weatherization | Three regional non-profits | Homes treated | √ | √ |

While the third party program implementers (e.g., Nexant, Cascade, PECI, and the Low Income Weatherization agencies) generally conduct inspections using their own staff, all of PacifiCorp's inspections are contracted out thusly:

- Energy FinAnswer projects are inspected by assigned engineering firms who are assisting with the program on a project-by-project basis.
- FinAnswer Express projects delivered by PacifiCorp are inspected by an assigned engineering firm from the same approved list as Energy FinAnswer. PacifiCorp also contracts with

another firm (3rd party consultant) to inspect the large lighting projects delivered by trade allies.[4]

- Appliance Recycling and Low Income Weatherization site inspections are conducted by a former employee of PacifiCorp.

The three largest programs in terms of energy savings all conduct inspections for all of their largest projects, including all Energy FinAnswer projects and 100% of the largest FinAnswer Express projects (thresholds are based on incentives over a specified dollar amount, which varies depending on the measure type), as well as 100% of new homes in the Home Energy Savings program.

Although the Home Energy Savings program does not site inspect a large number of measure types (e.g., appliances, ceiling fans, water heaters, etc.), these measures together constitute less than 10% of program savings, and paper reviews of application materials (e.g., receipts, model number/eligible equipment review and serial numbers) are conducted. While it is best practice to conduct some type of verification (either by phone or site) across all measure types, the two most recent Home Energy Savings program evaluations found 100% of measures in this category to be installed.[5] The upstream CFL component does comprise, however, the majority of Home Energy Savings program savings. Table 5 summarizes the percent inspected by program component for each of the five programs reviewed.

**Table 5: Verification Approach and Percent Inspected**

| | | | Sampling Approach | |
|---|---|---|---|---|
| Program Name | Implementer | Program Component | Percent Inspected | Sample selected by |
| Energy FinAnswer | PacifiCorp | Projects | 100% | |
| FinAnswer Express | Nexant, Cascade and PacifiCorp | Trade ally lighting > incentive threshold | 100% | |
| | | Trade ally lighting < incentive threshold | 5% | Nexant** |
| | | Trade ally dairy/compressed air > incentive threshold | 100% | |
| | | Trade ally other measures >incentive threshold | 100% | |
| | | Trade ally all other measures | 5%* | Nexant and Cascade** |

[4] Note that Nexant does utilize the same 3rd party consultant as PacifiCorp to spot inspect the other FinAnswer Express lighting projects. However, Nexant is contracted directly with the 3rd party consultant in this case, selects the projects and assigns the inspections. The results are not directly reported to PacifiCorp, but they are part of the project file.

[5] Cadmus. Final Report: 2011-2012. Washington Residential Home Energy Savings Evaluation (January 20, 2014); and Cadmus. Pacific Power Washington 2009-2010 Residential Home Energy Savings Evaluation (January 13, 2012)

| Program Name | Implementer | Program Component | Sampling Approach: Percent Inspected | Sampling Approach: Sample selected by |
|---|---|---|---|---|
| | | Company delivered projects | 100% | |
| Home Energy Savings | PECI | New home measures | 100% | |
| | | Insulation, windows, HVAC and duct measures | >5% | PECI |
| | | All other retrofit measures (e.g., appliances, fans) | Paper review | |
| Appliance Recycling | JACO | Home pick-ups | ≥5% | Inspector |
| Low Income Weatherization | Three regional non-profits | Homes treated | 100%<br>5-10% | Non-profit agency<br>PacifiCorp |

* May be site inspection or telephone interview

**Not completely random

While the site inspections are selected randomly for the residential programs, the FinAnswer Express projects include a non-random component that is triggered by new trade allies, lack of clarity on application forms, or proximity to other projects scheduled for site inspection. Furthermore, some FinAnswer Express industrial/agricultural projects may be phone verified.

For the programs that conduct a smaller percent of inspections, the program implementer generally selects the sample, with the exception of Appliance Recycling and Low Income Weatherization. For the Appliance Recycling Program, the inspector (contracted directly with PacifiCorp) determines when he would like to follow the JACO crew and follows along for whatever appointments had been scheduled for that day. The Low Income Weatherization inspections conducted by PacifiCorp are selected randomly by the PacifiCorp program manager.

For the most part, there appear to be clear and consistent forms and processes for conducting the site inspections. The review team found field forms were used by many programs to ensure that the proper items were being tracked and verified in the field. No field forms were provided to the review team for components of the FinAnswer Express and Home Energy Savings programs. A FinAnswer Express chiller inspection form was provided to the review team. Otherwise, it was unclear what forms or processes are being used for verification of the FinAnswer Express non-lighting measures and the Home Energy Savings new home measures.

### Table 6: Verification Field Forms and Results Reporting

| Program Name | Implementer | Program Component | Documentation: Field Form? | Documentation: Results Provided to |
|---|---|---|---|---|
| Energy FinAnswer | PacifiCorp | Projects | Yes | PacifiCorp |

| Program Name | Implementer | Program Component | Documentation: Field Form? | Documentation: Results Provided to |
|---|---|---|---|---|
| FinAnswer Express | Nexant, Cascade and PacifiCorp | Trade ally lighting > incentive threshold | Yes | Nexant |
| | | Trade ally lighting < incentive threshold | Yes | Nexant |
| | | Trade ally dairy/compressed air > incentive threshold | Unknown | Cascade |
| | | Trade ally other measures > incentive threshold | Unknown | Nexant and Cascade |
| | | Trade ally all other measures | Unknown* | Nexant and Cascade |
| | | Company delivered projects | Yes, chiller inspection form | PacifiCorp |
| Home Energy Savings | PECI | New home measures | Unknown | |
| | | Insulation, windows, HVAC and duct measures | Yes | PECI |
| Appliance Recycling | JACO | Home pick-ups | Yes | JACO and PacifiCorp |
| Low Income Weatherization | Three regional non-profits | Homes treated | Yes | PacifiCorp |

* May be site inspection or telephone interview

In particular, the Energy FinAnswer verification procedures include a comprehensive post-installation inspection report, due to the nature of the projects. Furthermore, the report is a final deliverable related to the measurement and verification (M&V) responsibilities of the assigned engineering firm. The post-installation inspection reports assessed by the review team were found to be consistently complete across different contractors with the following key sections: Executive Summary including project background, incentive summary and final inspection results; Inspection Details by EEM and Supplemental Information including measure life, non-energy benefits and other notes.

The FinAnswer Express program uses a Trade Ally Coordination (TAC) QC Checklist to ensure that applications for the industrial and agricultural component are complete and follow required program processes. According to the program manual,[6] every application is reviewed by a minimum of three TAC employees before it is approved. The checklist is well-organized, clear and ensures that each application packet includes all necessary supporting documentation.

[6] Cascade FE Program Manual

For desk verification of lighting applications, the program utilizes a "Lighting Quality Assurance Checklist"[7] which checks that the program applicant utilizes the correct version of the Lighting Tool software and forms, and tracks consistency in energy savings and unit quantity between the Lighting Tool and invoices. The checklist is found to be comprehensive to ensure proper payment of program incentives.

The program also provided the review team with a "Chiller Inspection Checklist," which is not formatted as a checklist, but includes data entry fields to be completed by the inspector related to overall chiller attributes (e.g., whether primary or back-up unit, and whether installed and operating) and specific attributes to be collected in the field, including type of chiller, chilled water set points and condenser set points. Some parameters such as "type of chiller" and "facility use type" may benefit from multiple choice options or further instructions on the type of information being requested.

The Home Energy Savings program provided template field forms for four measures: duct insulation, insulation dispatch, HVAC tune-up and windows. The forms are pre-populated with links to other program application documents. Overall, the review team finds that the forms are well-organized, clear data-entry fields and collect the required information to verify performance of the program measure.

The Appliance Recycling program report consists of an Excel spreadsheet listing the customer accounts inspected each day. The field inspector lists whether the unit is verified to be working, the correct size requirement (over 10 cubic feet) and whether the old unit was removed. This appears to be sufficient documentation for the program.

The Low Income Weatherization program uses an inspection template for homes treated. Each measure on the template includes a Pass/Fail field but no other information is required to be collected. Therefore, it is unclear what the Pass/Fail rating is based on and whether the site inspection includes assessing proper installation of measures to achieve energy savings. Furthermore, the form asks whether "services meet local, state and federal building codes" (Yes/No) but provides no information or details on how this should be assessed. The inspection template should be revised to include additional fields to assist the inspector to justify the Pass/Fail rating and Yes/No answers.

## 3.2.2. Comparison with Best Practices

The review team outlines below the relevant best practices for quality control and verification, as drawn from the National Energy Efficiency Best Practices study[8]. Following each of the three

[7] Lighting Quality Assurance Checklist (Rev 6)

[8] The Energy Efficiency Best Practices Project sought to build off industry experience and knowledge by establishing a structure for analyzing and communicating best practices to help meets today's complex energy challenges. The project uses a benchmarking methodology to identify best practices for a wide variety of program types. This study was managed by Pacific Gas and Electric Company under the auspices of the California Public Utility Commission in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company (eebestpractices.com). Most of the study's work was published in 2004.

best practices, the review team provides a brief assessment of PacifiCorp verification processes observed to date.

### Best Practice #1: Generally, program portfolios should have overarching guidelines for verification needs.

The National Energy Efficiency Best Practices 2004 study (subsequently updated in 2008) acknowledges that while good M&V and quality control practices are necessary for a successful portfolio of programs, it must also be affordable.[9] While the review found no formal documentation of verification priorities across the PacifiCorp portfolio of programs, the best practices principles were found to be generally followed by emphasizing verification activities on programs with the largest savings impact. Table 7 outlines elements related to best practices for balancing the need for robust quality control with financial constraints, and an initial summary of review team observations related to PacifiCorp verification practices.

**Table 7: Specific Elements Related to Program Portfolio Level Quality Control**

| Best Practices | Findings related to PacifiCorp |
|---|---|
| Consider administrative cost in designing the verification strategy. | The largest programs and the largest projects have been prioritized for site verification. Additionally, administrative costs are clearly considered at the program level (e.g., grouping FinAnswer Express projects together for inspection, although it is not strictly random). |
| Build in statistical features to the sampling protocol to allow a reduction in the number of required inspections based on observed performance and demonstrated quality of work. | Both the FinAnswer Express and Home Energy Savings programs allow a reduction in the number of required inspections by prioritizing larger projects for inspection. However, the FinAnswer Express inspections are not strictly random, which limits the statistical rigor of the results. |
| Tailor measurement rigor, including the use of sampling, to each project's contribution to the cumulative uncertainty in estimated savings for the program overall. | The FinAnswer Express program includes different inspection requirements according to project size thresholds. All new homes are inspected in the Home Energy Savings program. Other programs have high inspection rates (e.g., 100%). |
| Use a verification method capable of confirming measure and installation quality. | For the most part, programs utilize site inspections, with some industrial/agricultural projects verified by phone. Some Home Energy Savings projects are only verified through application review, however. |

[9] National Energy Efficiency Best Practices Study. Volume P1 – Portfolio Best Practices Report. July 2008. Last accessed 5/24/2013: http://www.eebestpractices.com/pdf/Portfolio_BP_Report.pdf

## Best Practice #2: Inspection Strategy May Vary by Measure and/or Program.

In order to cost-effectively allocate resources, inspection strategy may vary based on both contribution to overall savings and uncertainty related to measure or program savings. PacifiCorp's verification practices do reflect the varying nature of different customer sectors, project types and attributes, and savings. Table 8 outlines elements related to best practices for effective inspection strategies by measure or program, and an initial summary of review team observations related to PacifiCorp verification practices.

### Table 8: Specific Elements Related to Inspection Strategy

| Best Practices | Findings related to PacifiCorp |
|---|---|
| Obtain a good random sample of vendor and measure types. | The FinAnswer Express program conducts both random and non-random inspections. It is unclear what percent of inspections are random, however. This information was not provided to the review team. |
| Always inspect the first job submitted by a new vendor, depending on program type. | The FinAnswer Express program inspects projects completed by new trade allies. However, it's not clear if it is 100% of new allies. The Home Energy Savings program may benefit from prioritizing inspections of projects completed by new contractors. |
| Pre-inspections for large or uncertain impact projects, such as those with highly uncertain baseline conditions that significantly affect project or program savings. | 100% pre-inspection is conducted for Energy FinAnswer projects that represent larger and more uncertain (custom) projects. 100% pre-inspection is also conducted by the FinAnswer Express program for large lighting projects. |
| Clearly define post-inspection rigor and quantity by cost-effectiveness considerations. | The Energy FinAnswer program includes a robust M&V process for post-inspections. |
| Require post-project inspections and commissioning for all large projects and projects with highly uncertain savings, which may include performance verification, especially for projects involving controls. | 100% post-project inspections are conducted for Energy FinAnswer projects, which represent larger and more uncertain (customer projects). Customers may opt-out of commissioning for a 20% reduction in savings and incentive payment. 100% pre-inspection is also conducted by the FinAnswer Express program for large lighting projects. |
| Ensure inspectors have plenty of hands-on experience. | The residential third party inspector was found to be quite experienced. Post-inspections of large Energy FinAnswer projects are conducted by engineering firms. The qualifications for the engineering firms were specified in the original request for proposals. |

| Best Practices | Findings related to PacifiCorp |
|---|---|
| Ensure that inspectors have adequate training in identifying and explaining reasons for failure. | Trainings are found to be conducted for Home Energy Savings inspectors. It is assumed that the engineering firms ensure their employees are properly trained, though, this should be verified in regards to the RFQ/RFP process that PacifiCorp uses. |

## Best Practice #3: Actual Documentation of Savings or Verification, Should Employ Best Practice.

The National Energy Efficiency Best Practices study outlines several recommended best practices related to documentation of savings and verification results. Table 9 presents the recommended best practices, and our initial observations related to PacifiCorp verification practices.

### Table 9: Specific Elements Related to Documentation of Savings or Verification

| Best Practices | Findings related to PacifiCorp |
|---|---|
| Verify accuracy of rebates, coupons, and invoices to ensure the reporting system is recording actual product installations by target market, such as lighting. | The PacifiCorp programs appear to have procedures in place to review applicable invoices, equipment specification documents, manufacturer agreements and retail sales records. Some invoices provided with sampled project files for Home Energy Savings, FinAnswer Express and Energy FinAnswer were illegible or did not provide enough detail to verify measure cost. Therefore, it is unclear how well the procedures are working, although the evaluation reports did not highlight any issues associated with program realization rates. |
| Conduct in-program measurement/impact evaluation for the very largest projects or those with uncertain impacts. | 100% inspection is conducted for Energy FinAnswer projects that represent larger and more uncertain (custom) projects. 100% pre-inspection is also conducted by the FinAnswer Express program for large lighting projects. These occur in-program and prior to payment of incentives. |
| For residential new construction, recognize the different inspection needs of experienced builders and builders who are new to the program. | All new home measures are inspected. When setting inspection priorities, the program does not differentiate between experienced builders and builders new to the program. |
| Monitor evaluation report results across all programs to ensure that verification activities continue to target high risk measures. | PacifiCorp conducts regular evaluations of its largest energy efficiency measures and/or programs. |

## 3.3. Recommendations

Overall, our assessment of PacifiCorp's practices for verification found them to be in line with best practices. The utility does a good job in documenting verification practices for each individual program via the use of inspection forms, clear guidelines of when an inspection is required, and checklists. Based on initial assessment and tasks completed to date, the following are the review team's recommendations for PacifiCorp to consider related to quality control and verification procedures for its portfolio of programs.

- **Continue to monitor the periodic evaluation results and consider implementing a low cost verification approach (e.g., telephone verification) if any issues arise in the future.**
  - The Home Energy Savings program follows industry best practices by prioritizing the site inspection of measures with the greatest impact and need. Although no independent verification is conducted for a large number of measures (e.g., appliances, ceiling fans, water heaters, etc.), this was not found to be an issue at this time, as recent program evaluation activities have found 100% installation of these measures
- **Conduct an appropriate sample of random site inspections, while balancing the costs of site inspection.**
  - The FinAnswer Express program strives to conduct 5% spot inspections on a random basis, but non-random inspections are triggered by new trade allies, lack of clarity on application forms, or proximity to other projects already scheduled for site inspection. These are found to be appropriate triggers for prioritized inspections given limited program resources and the need to inspect higher risk projects. At this time, it is not clear what percent of projects in the FinAnswer Express are randomly inspected compared to the percent selected due to the triggers.
- **Ensure that inspections are conducted for projects completed by new contractors.**
  - While the FinAnswer Express program explicitly inspects projects completed by new trade allies, it appears that the Home Energy Savings program does not prioritize new contractors for site inspection. The review team recommends that the Home Energy Savings program incorporate a procedure to ensure that a higher percent of new contractors are selected for site inspection.
- **Document site inspection and verification procedures.**
  - For the FinAnswer Express program, a program manual for the industrial and agricultural component includes information about inspection procedures and requirements. However, it does not appear that this exists for the commercial component of the program. Due to the diversity of project types, it is difficult to outline guidelines for how post-inspections should be conducted. However, this effort would be valuable to ensuring consistency of inspection quality and results.
  - The Low Income Weatherization program should modify the inspection template to provide more guidance and data fields to be used in determining how measures "pass"

or “fail” the site inspection. The existing template simply lists the measure name next to the “pass” or “fail” checkboxes.

# 4. TRACKING AND REPORTING REVIEW

## 4.1. Methodology

As part of the Portfolio Gross Savings and Cost-Effectiveness Reviews, the review team obtained relevant project tracking database extracts and reports as well as internal studies of these systems in a webinar on the iEnergy Nexant web-based tracking system and assessed whether the information currently collected by programs is adequate to confirm measures were implemented properly. The team conducted an overall assessment of database fields, their use, and accuracy of the data. This went beyond the portfolio savings and cost-effectiveness reviews described in Sections 2 and 6, which focused on verifying the overall portfolio savings numbers, costs, and measure life using the tracking data, to a more broad-based assessment of the various ways the tracking information is used. Our team reviewed the flat files and iEnergy webinar information. PacifiCorp recognized the need to upgrade and standardize their systems. This was in process in 2012 and the TRL and specific programs were completed in 2013.

The steps considered and implemented in this review include:

1. Database Variance. Building on the savings verification and cost-effectiveness review effort, as part of this subtask we checked that the reported savings in the annual reports can be duplicated from the tracking database. In addition to reviewing the validity of measure-level information within the database, we reviewed PacifiCorp's processes for data reconciliation (e.g., accounting for changes to deemed savings values for measure level data), as well as how data is used to track program goals.
2. Minimum data quality. We reviewed that the database is fully utilized and sufficiently tracks all the relevant fields, including managing the quality control of the data. This may include checking for fields with significant missing data, and appropriate data quality (e.g., account number fields populated with actual account numbers, and not placeholder data).
3. Conformance to industry practices. Reviewed data quality control checks that PacifiCorp includes in their program process and database. Our experience in program implementation has confirmed the value of developing a comprehensive set of data ranging from project milestones (dates of application received, project installation, incentive payment, etc.), contact logs, inspection results, etc. We checked the PacifiCorp database against good industry practices in regard to program management. Similarly, we know from evaluation experience the critical role the tracking database can play in process and impact evaluations. We examined the database to see how well it supports EM&V activities.
4. Suggested Improvements. Finally, after review of the tracking system, we identified areas in need of improvement.

The team commends PacifiCorp for moving to one system for all its programs and meeting their needs, as discussed further below.

# 4.2. Findings

The flat file tracking from one program year to the next (2012 to 2013) did not vary since the new system was still being developed. Therefore, we note findings from the 2013 flat files, with some caveat in understanding that iEnergy will replace most of what was previously used.

### Flat File Review

Each program's flat file is based on what the program collected. In the existing system subjected to this review, the flat files did not include details on which projects received site verification, but the new system does track site inspection date. The details may have been captured elsewhere, but was not further investigated due to the iEnergy upgrade. These details also include date application received, review completed, and then submitted for payment. However, there are some critical pieces that are universally captured such as incentive amount, savings, participant information, measure name, critical dates, and more. Generally, most fields are completed if applicable. In our review of the flat files, there are some non-critical blanks (null fields) for some project entries. Since there was a transition to the iEnergy platform, we did not investigate this further. Based on this cursory evaluation coupled with savings portfolio and cost-effectiveness reviews, the findings indicate that the PacifiCorp systems were doing well even before the upgrade in iEnergy. One area to note is that the tie-in to the deemed measures tracking was not in place until the TRL (implemented in 2013) and hence it is not clear, nor fully validated in this review, that the match-up to these values were properly done, unless noted in the savings portfolio and cost-effectiveness reviews.

### iEnergy Review

Based on the PacifiCorp webinar presentation of their database tracking and reporting system to the review team, we have come to the following assessment. The discussion mostly focused on the tracking and validation side and less on the reporting. However, as shown in the following figure, there is a library of reports, as well as some standard dashboard reports to indicate portfolio and program progress towards goals in different configurations and variables.

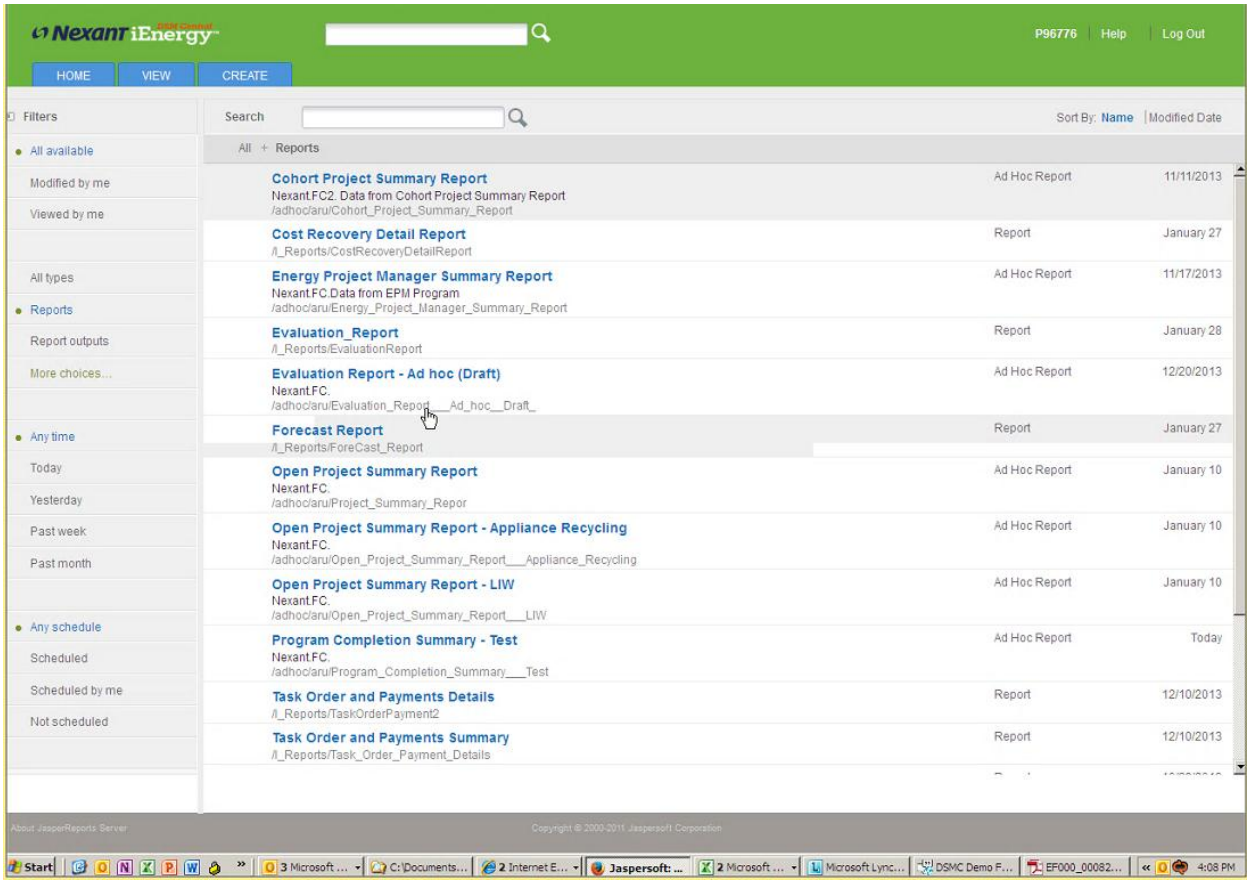


**Figure 1: Sample Reports**

iEnergy has different fields by program. Each program has its own unique element that was designed into this platform. Some programs require more details than others. For example, the Appliance Recycling needs bulk uploads, which is being configured. Individual project entries can be accomplished in some of the screen shots shown below. Some elements that can be observed in these screens are:

1. Tie-in to the TRL where the TRL values are used based on the cost-recovery dates, measure, efficiency level, and any other parameter that is critical for the look-up.
2. Project status cannot be advanced unless required pieces of the current form are complete. Some program process flows are simpler or more complex than others.
3. Certain fields are required and others are grayed out if they are based on look-ups or other calculations. Some featured customization of the programs are:
   a. Differentiating between capped and non-capped measures with auto-calculation, but need reviewer validation
   b. Number of TRL units and quantity fields – however, there is concern that not enough is provided or required (e.g. Low Income Weatherization does not require specific sq ft of insulation for example).
4. Validation needs are clearly documented (and some may require engineering review).

5. If on-site verification is part of the program process flow, then these fields are included and required entry fields.

The following figures present sample data entry screen shots.

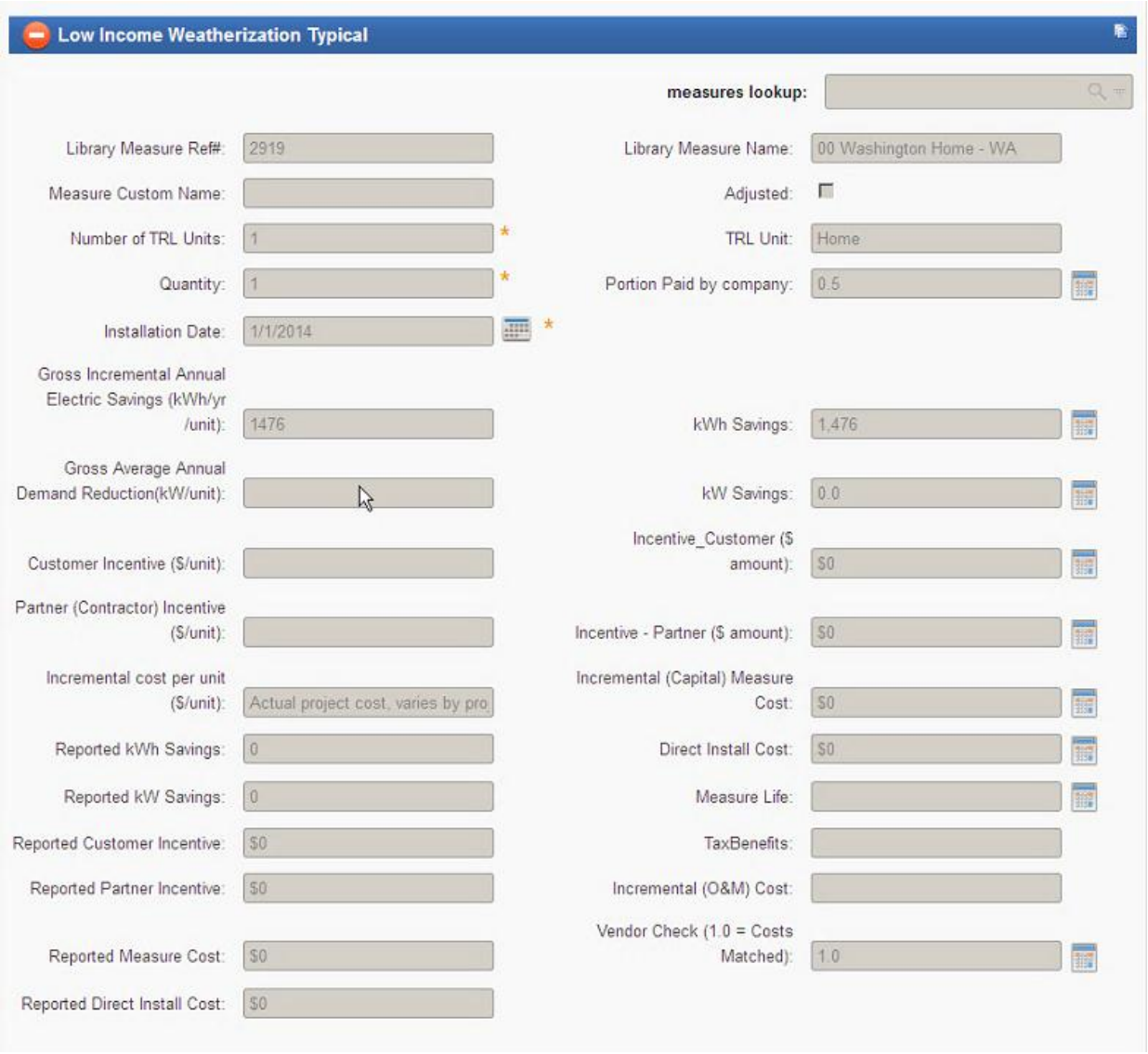


**Figure 2. Sample data entry screen shot for Low Income Weatherization**

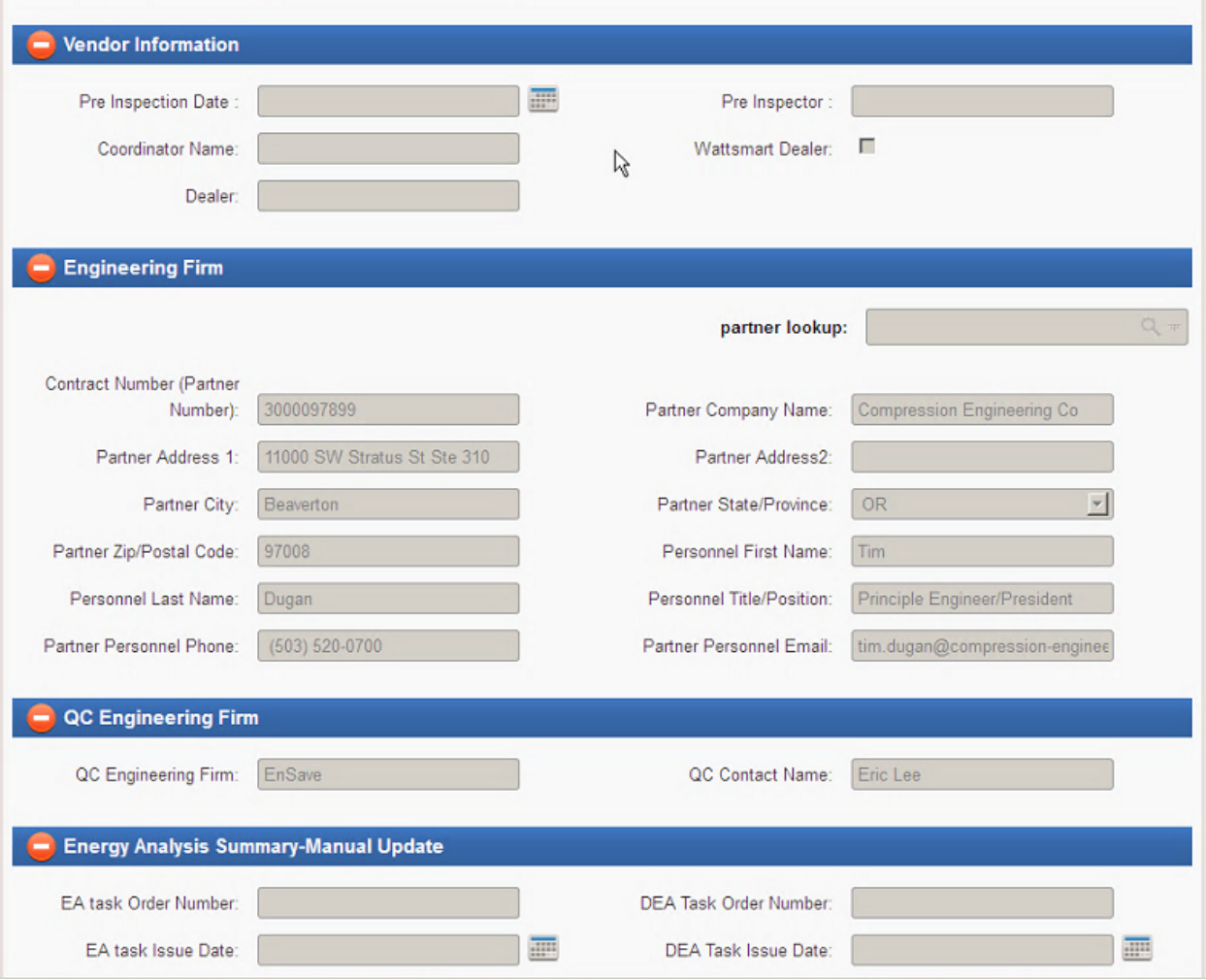


**Figure 3: Sample data entry screen shot for Watt Smart Business**

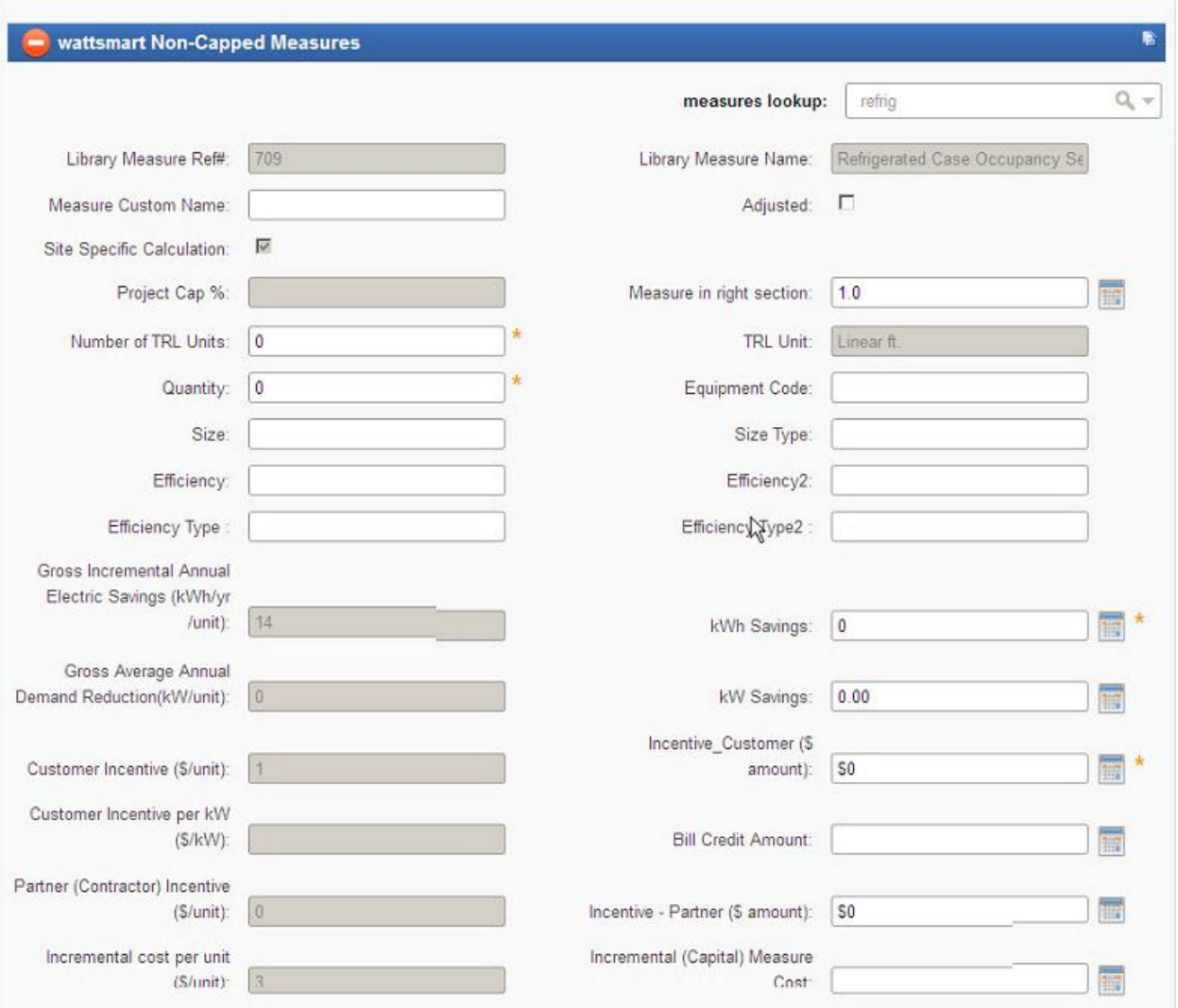


**Figure 4: Sample data entry screen shot for Watt Smart Business**

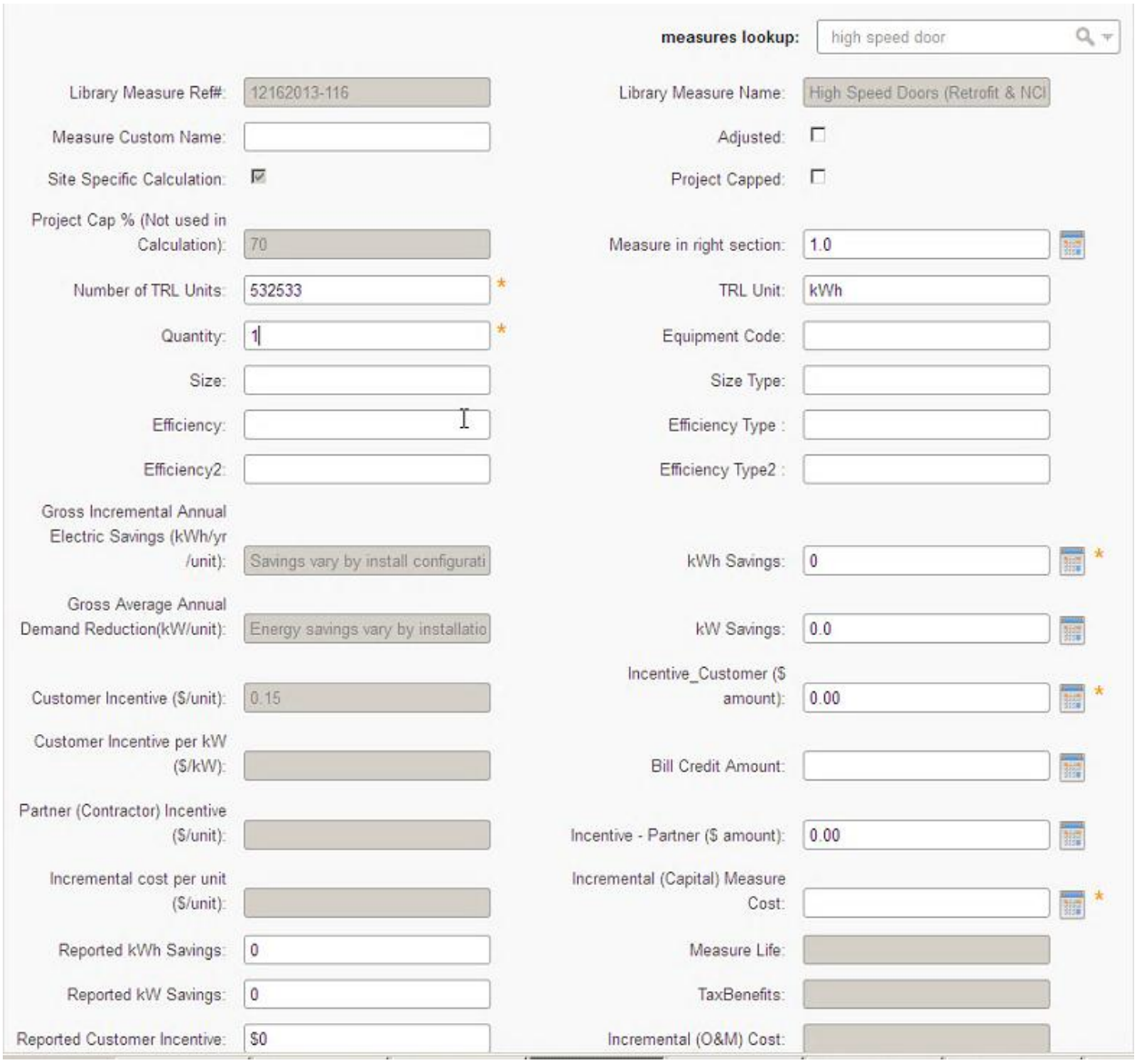


**Figure 5: Sample data entry screen shot for Watt Smart Business**

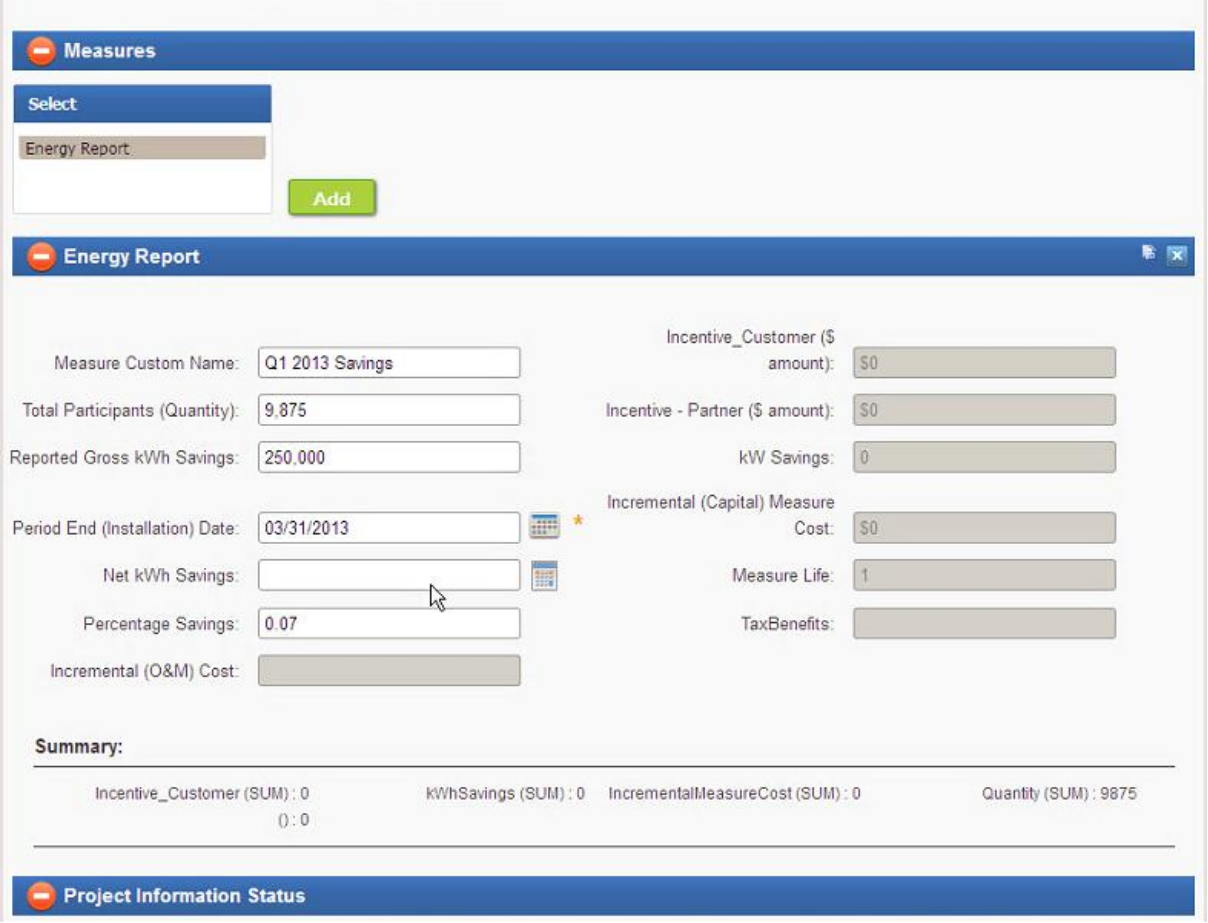


**Figure 6: Sample data entry screen shot for Home Energy Reports**

## 4.2.1. Comparison with Best Practices

The review team outlines below the relevant best practices for tracking and reporting, as drawn from the National Energy Efficiency Best Practices study[10]. Following each of the three best practices, the review team provides a brief assessment of PacifiCorp systems observed to date.

### Best Practice #1: Defining and documenting data requirements.

This practice incorporates the need to clearly define and identify the key information needed to track and report early in the program development process to measure success. As part of the iEnergy solution, these elements must be clearly defined. For example, it is understood the Appliance Recycling and FinAnswer Express need bulk upload features. It is also clear that

[10] The Energy Efficiency Best Practices Project sought to build off industry experience and knowledge by establishing a structure for analyzing and communicating best practices to help meets today's complex energy challenges. The project uses a benchmarking methodology to identify best practices for a wide variety of program types. This study was managed by Pacific Gas and Electric Company under the auspices of the California Public Utility Commission in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company (eebestpractices.com). Most of the study's work was published in 2004.

certain parameters define if the measure values are looked up in the TRL or not. All, these features help align the PacifiCorp system with best practices.

The following identified best practices are noted within the iEnergy platform.

- Integrate all program data, including measure-level data, into a single database
- Develop accurate algorithms and assumptions on which to base estimates of savings
- Carefully document the tracking system and provide trainings (and or manuals) for all users; use detailed process flow diagrams
- Assure that tracking systems are intuitive, straightforward, integrated and comprehensive
- Design databases for long-term strategy and use to be scalable to accommodate changes in program scope

The following are areas that were not identified or reviewed during the iEnergy webinar. However, they are best practices PacifiCorp should consider incorporating, if not available at this time.

- Integrate marketing, customer billing, audit, and impact data
- Design the program tracking system to support the requirements of evaluators as well as program staff
- Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress

### Best Practice #2: Use of database and tracking systems.

Having a database and tracking system does not necessarily mean it is used to its potential or use appropriately. Since the upgrade of iEnergy was not ready for the 2012-13 portfolio review, the following details of best practice elements are provided for consideration for the next portfolio review, if conducted. However, there are elements below that are known features of iEnergy (indicated by the asterisk).

- Establish system to collect and track these data over time*
- Conduct regular checks of tracking reports to assess program progress and make corrections to ensure success*
- Build in real-time data validation systems that perform routine data quality functions* (currently available with such links as with the TRL)
- Automate routine functions such as monthly reports
- Track vendor activity and measure volume where relevant*
- Track market transformation program qualitative benefits and measures related to spillover effects, along with direct savings impacts
- Use electronic application processes, workflow management and Web-based communications*
- Allow program managers to generate or automate standardized reports*

- Use databases that fully integrate with cross-program energy-efficiency program information systems*
- Track and utilize contractor and equipment information that aids in analyzing and reporting actual installed efficiency
- For programs with proactive marketing efforts, track program prospects early including audit recommendations, and drive program intervention around major equipment-related events

### Best Practice #3: Integrate all program data.

For a utility portfolio, having program data integrated and available in a routine manner helps with cross-cutting efforts, as well as, cost-effectively reporting in an accurate manner. Having all program data in iEnergy and the measure-level data, specifically for the deemed measures in the TRL, represents PacifiCorp's implementation of this best practice element.

### Best Practice #4: Data quality.

Data integrity and data quality are key at all levels from paying out incentives to portfolio savings claims. This step was not fully reviewed for the PacifiCorp data systems. However, there are some validation steps built into the iEnergy platform which includes asterisked fields that are required, capping calculations, and links to the TRL.

- Conduct regular checks of the tracking reports to assess how the program is working and make program corrections to ensure success
- Minimize duplicative data entry by linking databases to exchange information dynamically
- Build in real-time data validation systems that perform routine data quality functions
- Build in rigorous quality control screens for data entry such as minimizing duplicative entry (was not verified)

## 4.3. Recommendations

Overall, our assessment of PacifiCorp's practices for tracking and reporting found that they are in line with best practices. The utility made a decision to use iEnergy which should enable them to accurately track their programs on a project and measure level. The iEnergy platform provides documentation and system flow checks and balances to properly track, verify, and report program progress.

Based on initial assessment and tasks completed to date, the review team recommends PacifiCorp consider all listed best practices and ensure on a regular basis that they are assessed and properly implemented as related to tracking and reporting for its portfolio of programs. Additionally, once iEnergy is in full implementation mode, PacifiCorp should consider doing another review at least once (and then follow up periodically) of the tracking and reporting systems to ensure they align with best practices, are used according to design, and properly incorporate quality control checks.

# 5. IMPACT AND PROCESS EVALUATION REVIEW

## 5.1. Methodology

To understand how PacifiCorp has planned and implemented M&V practices relevant to the 2012-2013 program year, the review team examined both past evaluation work that informs the current programs, as well as current evaluation plans and activities that will affect programs in the next program cycle. First, the team obtained relevant M&V documentation from PacifiCorp. This included a total of seven M&V reports, as well as overarching planning and procedural documents, such as the following:

- Evaluation, Measurement & Verification Framework for Washington (Updated October 12, 2012)
- Washington Annual Report on Conservation Acquisition, Appendix 4 (2012 and 2013 Reports)

The review team reviewed each report as described below. In addition to the document reviews, the review team also assessed the evaluations compared to industry best practices. The term "Best Practice" refers to practices that result in a higher level of performance when compared to other practices that could have been used. Each of the evaluations was classified as an impact, process or market study and assessed along the appropriate best practices for that type of study.

The goal of impact evaluations is to assess the direct and indirect benefits of the program. An impact evaluation typically quantifies the extent of the changes in energy usage or demand that are attributable to the program activities. The team used the Model Energy Efficiency Program Impact Evaluation Guide from the National Action Plan for Energy Efficiency to assess the best practices of the PacifiCorp impact evaluations.[11]

The objective of process evaluations is to assess how well the program is operating, from both the administrative and participant perspectives. The process evaluations usually cover areas such as program design, program administration, program implementation and participant response. Process evaluations often contain recommendations for changing the program processes along those dimensions to improve the efficiency, effectiveness, and/or participant satisfaction. Process evaluations can vary widely in the content addressed and methodologies employed depending on the intent of the evaluation and the type of program being evaluated. To accommodate the variation across evaluations, the team leveraged the National Energy Efficiency Best Practices Study[12] cross-cutting recommended best practices for the review of PacifiCorp's program evaluations. The National Best Practices Study provides a list of best

[11] http://www.epa.gov/cleanenergy/energy-programs/suca/resources.html

[12] National Energy Efficiency Best Practices Study, Volume S—Crosscutting Best practices and Project Summary, Quantum Consulting. December 2004. This study was managed by Pacific Gas and Electric Company under the auspices of the California Public Utility Commission in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company.

practices developed from analysis of programs across the country. The team used this framework to assess whether the process evaluations addressed the areas, noting where there were gaps in topics covered in the evaluations across the portfolio.

# 5.2. Findings

## 5.2.1. Past Evaluation Efforts

Figure 7 summarizes the evaluations conducted to date. The Home Energy Reports evaluation was not complete in time for this review. Each evaluation addressed a single program.

| Program | Evaluated program year | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 |
| Low-Income Weatherization | | | | | Evaluation complete | | | |
| Appliance Recycling | | Evaluation complete | | | Evaluation complete | | Evaluation complete | |
| Home Energy Savings | | Evaluation complete | | | Evaluation complete | | Evaluation complete | |
| FinAnswer | Evaluation complete | | | | Evaluation complete | | | |
| FinAnswer Express | Evaluation complete | | | | Evaluation complete | | | |

**Figure 7: Program Evaluation Summary**

## 5.2.2. Current Evaluation Efforts

The Evaluation, Measurement & Verification Framework for Washington established guidelines for evaluation activities for PacifiCorp's energy efficiency programs. The Framework was updated in October 2012 in response to additional requirements in WUTC Docket UE-111880 Order No. 01.

PacifiCorp is also improving the process by which the results of evaluations inform future programs. PacifiCorp formally engages the evaluation result by addressing each recommendation in an action plan for each program. Periodically throughout the year, program managers provide updates on the status of the action plans. This process helps build the institutional memory of evaluation practices and results. Appendix 4 of the 2012 and 2013 Washington Annual Reports on Conservation Acquisition identified PacifiCorp action plans for each program.

## 5.2.3. Comparison with Best Practices

The review team assessed the evaluation strategy for the portfolio of programs as documented in the Framework according to Crosscutting Best Practices for Program Evaluation identified in the Best Practices Study[13]. The Study provides a list of best practices that can be used as a benchmark to measure evaluation strategies, but notes that rarely is an organization or program "best-in-class" in every area. These ten best practices (stated first in bold), and our assessment of how PacifiCorp's current evaluation practices compare, are listed below:

1. **Engage the implementation team in the evaluation process.** The Evaluation, Measurement & Verification Framework for Washington clearly outlines roles and responsibilities of PacifiCorp staff, outside consultants, and the Advisory Group. PacifiCorp staff is engaged during the pre-implementation design, post-implementation assessment, and implementation of program stages. PacifiCorp is in compliance with Docket UE-111880 Order 01 (3) (c), which states the Advisory Group should meet quarterly at a minimum.
2. **Create a culture in which evaluation findings are valued and integrated into program management.** The process of reviewing recommendations and developing changes to the program are described in the Framework, indicating that processing the findings of evaluations has been formalized into the PacifiCorp culture. Appendix 4 of the 2012 and 2013 Washington Annual Reports on Conservation Acquisition presents the evaluation recommendations and the corresponding Pacific Power Action Plan to address the recommendations.
3. **Present actionable findings to program staff both in real time and at the end of study.** The Framework describes the opportunity for interim results to be delivered to implementation staff, and provides guidance as to how to identify when interim results may be most useful.
4. **Stagger the timing of process and ex post impact tasks so that process evaluations can be conducted and results communicated on a relatively real-time basis.** The review team's understanding is that the process evaluations for established programs are scheduled to coincide with the timing of the impact study for a program, which may lead to findings that are outdated or no longer relevant to the program. However, review of and response to the recommendations from the evaluation can help to facilitate developing relevant action items on a timely basis for the existing program instead of waiting until the next planning period.
5. **Conduct detailed ex post, impact evaluations routinely, though not necessarily annually.** The Framework outlines an evaluation schedule that indicates all programs will be evaluated every two years.

[13] National Energy Efficiency Best Practices Study, Volume S—Crosscutting Best practices and Project Summary, Quantum Consulting. December 2004. This study was managed by Pacific Gas and Electric Company under the auspices of the California Public Utility Commission in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company.

6. **Include periodic estimation of free-ridership and spillover.** The Framework states that PacifiCorp will examine program spillover and free ridership when it is feasible to do so, for program design purposes.
7. **Use regular process evaluation activities to provide timely and fresh data.** The Framework establishes a multi-year evaluation rotation schedule. Process evaluations are scheduled to be conducted for each program every two years, but it is the review team's understanding that the implementation of evaluations will be tied in to the budget and prioritization processes as determined in the Biennial Conservation Plan.
8. **Periodically review & update market level information about construction practices, market share and measure adoption.** The Framework discusses planning and design studies, such as potential studies and market characterization studies, that may be conducted based on the relative need across all states served.
9. **Perform market assessments for those programs that have a market transformation (MT) component.** It is the review team's understanding that the implementation of market studies will be subject to the budget and prioritization processes as determined in the Biennial Conservation Plan.
10. **Support program review and assessment at the most comprehensive level possible.** The Sample of Multi-Year Evaluation Rotation Schedule in the Framework indicates each program will undergo a process and impact evaluation every two years.

The overall evaluation strategy of PacifiCorp appears to be comprehensive in scope and if implemented as planned, demonstrates many of the best practices for evaluation across the portfolio.

The evaluation reports shown in the above table were considered part of the current evaluation plan and were reviewed in more detail against evaluation best practices. The overall PacifiCorp evaluation strategy aims to include process and impact evaluations for each program, and all seven of the evaluations reviewed included both types of evaluations.

By implementing process evaluations on a regular schedule, PacifiCorp has the potential to identify opportunities for updating, streamlining, and generally improving program implementation procedures. As shown in Table 10, the activities described in the seven evaluation reports were reviewed and found to cover many elements of process evaluations, as outlined by the National Action Plan for Energy Efficiency. The table presents the characterization of whether or not the evaluation reports addressed "best practice" elements of process evaluations, but does not indicate whether the evaluation concluded that the program implementation adhered to best practices.

Overall, the process evaluations were fairly comprehensive in addressing the program implementation and participant response, and all included interviews with program staff and participants. The evaluations included assessing program design and administration less frequently. The two evaluations for the commercial and industrial programs developed logic models to assist in assessing the program design. The evaluation reports completed in 2012 for the three residential programs did not include a discussion of assessing program logic, but the

subsequent evaluations for Appliance Recycling and HES included assessments of the respective logic models and indicators. Even with established programs, logic models can help to develop specific metrics for outcomes and to identify areas to be monitored. Areas of program administration such as staffing or management and staff training were also covered less frequently in the evaluations of the residential programs in the earlier set of evaluations, but the evaluations of the PY 2011-2012 covered these areas. Overall, the evaluations showed improvement by incorporating additional best practices that had been missing in earlier evaluations.

### Table 10: Review of Process Evaluation Elements

| | Elements of Process Evaluation | | | | | | |
|---|---|---|---|---|---|---|---|
| **Process Evaluation** | **Low Income Weatherization** | **Appliance Recycling** | | **HES** | | **Energy FinAnswer** | **FinAnswer Express** |
| **Program Years** | **2009-2011** | **2009-2010** | **2011-2012** | **2009-2010** | **2011-2012** | **2009-2011** | **2009-2011** |
| **1. Program Design** | | | | | | | |
| 1.1 The program mission | X | X | X | X | X | X | X |
| 1.2 Assessment of program logic | | | X | | X | X | X |
| 1.3 Use of new practices or best practices | | X | X | X | X | X | X |
| **2. Program Administration** | | | | | | | |
| 2.1 Program oversight | X | X | X | X | X | X | X |
| 2.2 Program staffing | X | | X | | X | X | X |
| 2.3 Management and staff training | X | | X | | X | X | X |
| 2.4 Program information and reporting | X | X | X | X | X | X | X |
| **3. Program Implementation** | | | | | | | |
| 3.1 Quality control | X | X | X | X | X | X | X |
| 3.2 Operation practice -- how program is implemented | X | X | X | X | X | X | X |
| 3.3 Program targeting, marketing and outreach efforts | X | X | X | X | X | X | X |
| 3.4 Program timing | X | X | X | | | X | X |

| | Elements of Process Evaluation | | | | | | |
|---|---|---|---|---|---|---|---|
| Process Evaluation | Low Income Weatherization | Appliance Recycling | | HES | | Energy FinAnswer | FinAnswer Express |
| Program Years | 2009-2011 | 2009-2010 | 2011-2012 | 2009-2010 | 2011-2012 | 2009-2011 | 2009-2011 |
| **4. Participant Response** | | | | | | | |
| 4.1 Participant interaction and satisfaction | X | X | X | X | X | X | X |
| 4.2 Market and government allies interaction and satisfaction | X | | | X | X | X | X |
| **5. Overall Assessment** | | | | | | | |
| 5.1 External or internal evaluators | External | External | External | External | External | External | External |
| 5.2 Number of data collection methods | 4 | 5 | 5 | 7 | 6 | 6 | 6 |

The current evaluation reports were also assessed for best practices along the impact evaluation components described in the Model Energy Efficiency Program Impact Evaluation Guide from the National Action Plan for Energy Efficiency. The results of these assessments are shown Table 11. In general, the current impact evaluations appear to cover the components essential for an impact study.

One of the items identified from the review of the C&I impact evaluations was that neither the evaluation reports nor the specific site analyses provided for FinAnswer Express and Energy FinAnswer included enough detail about data collection and analysis methods. For the FinAnswer Express program, the evaluator provided details in some areas but not enough in others, e.g., equations for calculation of sample size and realization rate; no report on number of strata or engineering analysis techniques; and brief mention of data collection techniques.

### Table 11: Review of Impact Evaluation Components

| Component | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Low Income Weatheri-zation | Appliance Recycling | | HES | | Energy FinAnswer | FinAnswer Express |
| | | 2009-2011 | 2009-2011 | 2011-2012 | 2009-2010 | 2011-2012 | 2009-2011 | 2009-2011 |
| **Overall Assessment** | | | | | | | | |
| Evaluators | Ex –External<br>In – Internal | Ex | Ex | Ex | Ex | Ex | Ex | Ex |

| Component | | Low Income Weatheri-zation | Appliance Recycling | | HES | | Energy FinAnswer | FinAnswer Express |
|---|---|---|---|---|---|---|---|---|
| | | 2009-2011 | 2009-2011 | 2011-2012 | 2009-2010 | 2011-2012 | 2009-2011 | 2009-2011 |
| Status | P - Proposal<br>E - Evaluation Plan<br>C – Completed | C | C | C | C | C | C | C |
| Portfolio vs. program | S– Single program<br>M– Multiple programs, but not portfolio<br>P– Portfolio | S | S | S | S | S | S | S |
| Persistence | E – EULs from other sources<br>P – Primary data collection<br>NP – Not provided. Insufficient documentation to score this criterion | E | E | E | E | E | E | E |
| Documentation within evaluation | 1 – Insufficient documentation provided<br>2 – Partial documentation provided<br>3 – Documentation appears sufficient | 3 | 3 | 3 | 2 | 3 | 2 | 2 |
| Recommendations | 1 – Report does not include recommendations for program improvements.<br>2 – Report provides some recommendations, but appears incomplete based on analysis completed.<br>3 – Report provides relatively comprehensive set of recommendations | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Component | | Low Income Weatheri-zation | Appliance Recycling | | HES | | Energy FinAnswer | FinAnswer Express |
|---|---|---|---|---|---|---|---|---|
| | | 2009-2011 | 2009-2011 | 2011-2012 | 2009-2010 | 2011-2012 | 2009-2011 | 2009-2011 |
| **Gross Savings** | | | | | | | | |
| Verification | 1 – Paper verification.<br>2 – Phone or mail verification.<br>3 – Physical (on-site) verification.<br>NP – Not provided. Insufficient documentation to score this criterion | 1 | 1&2 | 1&2 | 2&3 | 2&3 | 1&3 | 1&3 |
| Approach | | Large-Scale Data Analysis Approach | Large-Scale Data Analysis Approach | Large-Scale Data Analysis Approach | Large-Scale Data Analysis Approach | Large-Scale Data Analysis Approach | M&V Approach - IPMVP Options | M&V Approach - IPMVP Options |
| Baseline | Proj – Project-Specific baseline.<br>Perf – Performance Standard baseline.<br>NP – Not provided. Insufficient documentation to score this criterion | Proj | Modeled energy consump-tion of early-retired appliance | Modeled energy consump-tion of early-retired appliance | Perf | Market Baseline | Proj & Perf | Proj & Perf |
| Sampling | 1 – Sampling mentioned, but no description provided.<br>2 – Sampling partially described.<br>3 – Sampling approach fully described, or census.<br>NP – Not provided. Insufficient documentation to score this criterion. | 3 | 3 | 3 | 2 | 3 | 2 | 2 |

| Component | | Low Income Weatheri-zation | Appliance Recycling | | HES | | Energy FinAnswer | FinAnswer Express |
|---|---|---|---|---|---|---|---|---|
| | | 2009-2011 | 2009-2011 | 2011-2012 | 2009-2010 | 2011-2012 | 2009-2011 | 2009-2011 |
| Precision | 1 – No sampling precision reported or discussed.<br>2 –Sampling precision was discussed in some manner but not completely.<br>3 – Target and achieved precision (or error bounds) were reported.<br>NP – Not provided. Insufficient documentation to score this criterion. | 3 | 3 | 3 | 3 | 2 | 2 | 2 |
| **Net Savings** | | | | | | | | |
| Approach | SRS – Self-reporting surveys<br>ESRS - Enhanced self-reporting surveys<br>EM- Econometric methods<br>NTGR - Stipulated net-to-gross ratios<br>NP – Not provided. Insufficient documentation to score this criterion | Analyzed bills of a non-participant sample | SRS | SRS | SRS | NA | SRS | SRS |
| Free-ridership | PFR-Partial Free ridership addressed<br>FR - Free ridership addressed, but not Partial free ridership<br>NA - None included | NA | FR | FR | PFR | NA | PFR | PFR |
| Spillover effects | PS-Participant<br>NPS - Non-Participant<br>NA - None included | NA | PS | NA | PS | NA | PS but no savings quantified | PS&NPS |

[1] The dataset analyzed, and used for gross savings determination, was a secondary source, not from PacifiCorp's Appliance Recycling participant population.

## 5.3. Recommendations

The review team investigated PacifiCorp's current evaluation efforts and compared the evaluation activities with industry best practices. PacifiCorp has significantly formalized their planned EM&V activities through the development of the EM&V Framework for Washington. The review team's findings have resulted in the following recommendations:

- Consider for future process evaluations to address the gaps identified in Table 10, such as timing of HES program implementation
- Provide better explanation of data collection and analysis methods used for specific sites and overall, especially for the C&I program evaluations
- Consider improving how evaluation results inform future programs. There is an action plan per evaluation report, but there is not currently a mechanism for confirming that the recommendations were implemented.

# 6. COST-EFFECTIVENESS CALCULATION REVIEW

## 6.1. Methodology

The review team analyzed the PacifiCorp cost-effectiveness calculations presented in the 2012 and 2013 Annual Reports and the evaluation reports completed in 2011, 2012, and 2013. Generally, system avoided costs, discount rates, and escalation rates are fixed by the utility planning and forecasting analysis. Cost-effectiveness calculator inputs that are more likely to be variable include the program administration costs, customer costs (including incremental measure costs), first-year savings, non-energy benefits (or other resource savings), incentives, and measure life. They can be interpreted in different ways, or may rely on a variety of primary and secondary sources.

The objective of the cost-effectiveness calculation review was to examine the methodology, inputs, and assumptions used to determine portfolio and program cost-effectiveness, and assess whether they are appropriate and consistent with best practices. This section describes how the review team carried out this effort, and presents the corresponding findings. PacifiCorp includes cost-effectiveness calculations in the following two types of reports: annual report and evaluation studies. The review team did a due diligence review of the 2012 and 2013 Annual Reports. The evaluation studies were only reviewed in regards to the methodology used and not the actual inputs and reported results.

The review team examined PacifiCorp's cost-effectiveness calculations that were reported in Appendix 2 of the 2012 and 2013 Annual Report. It also conducted the following assessments to confirm if PacifiCorp's calculation approach, inputs, and assumptions were properly documented and transparent.

1. Review for correct methodology in evaluation reports and 2012 and 2013 Annual Reports
2. Conduct due diligence review of calculation methodology:
   - Did PacifiCorp properly summarize the individual programs in calculation sheets?
   - Were the proper load shapes used?
3. Assess validity of calculation inputs, including:
   - Avoided costs
   - Administrative costs
   - Incremental measure costs
   - Measure life
   - Savings and incentives
   - Discount rate

The review team is familiar with the results from the Washington State Conservation Work Group (WSCWG) efforts, published under docket number UE-110001[14], in which they examined and found that utility methodologies for determining avoided costs and total resource cost (TRC) tests were consistent with Northwest Pacific Power and Conservation Council (Council) guidelines. Our team assumed that there were no substantial revisions to PacifiCorp's approach to avoided costs and the TRC test since these WSCWG results were issued. PacifiCorp and Cadmus (the consultant for the annual cost-effectiveness calculations) presented to the review team in Q4 2013 their cost-effectiveness calculation methodology which is conducted on a web platform via a SQL-server. The review team was able to validate that the PacifiCorp approach is consistent with the Council. Therefore, the review team focused on documentation, transparency, and the ability for a reviewer to follow the methodology and results.

## Calculating Cost-Effectiveness—Definitions and Methodology

This section discusses the tests currently calculated by PacifiCorp and as interpreted by National Action Plan for Energy Efficiency (NAPEE)[15]. The methodologies used by PacifiCorp were consistent with the guidelines established by NAPEE, as reported by the independent program evaluators--Navigant Consulting for the commercial and industrial programs, and Cadmus for the residential programs. Navigant used the California Standard Practice Manual (CA SPM) algorithms and Cadmus used its software tool, DSMPortfolio Pro[16] (which also utilizes the CA SPM algorithms). Actual review of calculation algorithms was outside of the scope of this effort, but observed in a webinar at a high-level.

The basic approach to calculating cost-effectiveness is on a net present value (NPV) basis. The cost-effectiveness test results are typically reported as net benefits in dollars (NPV of the sum of the benefits minus the NPV of the sum of the costs) or as a benefit to cost ratio (NPV of the sum of the benefits divided by the NPV of the sum of the costs). The NAPEE guidance document does not elaborate further on calculation details.

Levelized cost is often used as a convenient and comparable summary metric of the overall competiveness of different utility supply side resources, including DSM programs. Levelized cost represents the present value of the total cost of a program or measure(s) over the life of the measure(s) or program (ideally, the weighted average life of all measures in the program) and converted to equal annual payments. While all of the costs calculated are incurred in year one, levelized cost can be used to express all variable costs over the life of a measure.[17] Similar to NPV, details of the calculation of levelized cost are not documented either by NAPEE or PacifiCorp. However, PacifiCorp does calculate NPV of the cost of the program and the value of

[14] http://www.utc.wa.gov/docs/Pages/DocketLookup.aspx?FilingID=WSCWG

[15] NAPEE's document "Understanding Cost-Effectiveness of Energy Efficiency Programs: Best Practices, Technical Methods, and Emerging Issues for Policy-Makers", November 2008, refers to the California "Standard Practice Manual: Economic Analysis of Demand-Side Programs and Projects" as the source of the principal approaches used for evaluating energy efficiency programs across the Unites States.

[16] DSM Portfolio Pro has been independently reviewed by various utilities, their consultants, and a number of regulatory bodies, including the Iowa Utility Board, the Public Service Commission of New York, the Colorado Public Utilities Commission, and the Nevada Public Utilities Commission.

[17] http://www.eia.doe.gov/oiaf/aeo/electricity_generation.html

the kWh savings to yield a value that can be compared to the $/kWh of a new generation source.

PacifiCorp is required to report on five different cost-effectiveness tests at the program and portfolio level:

- **Program Administrator Cost or Utility Cost Test (PAC or UC).** This test from the utility's perspective compares the program costs to the effect of the program/measures to reduce supply side resource costs. The program costs to implement energy efficiency measures includes direct installation costs incurred by the utility (as opposed to the participant), conservation acquisition payments (through rebates or incentives), administration, overhead, evaluation, and marketing expenses. These costs combined make up the program administrator costs. Benefits included in this cost test are the utility's avoided energy and capacity costs, including transmission and distribution. This test does not consider the effect on utility revenues and the customer retail rates.
- **Total Resource Cost Test (TRC).** This test considers the cost and benefits (same benefits as the UC test) of an efficiency measure as a resource option based on its total cost, including both the participant and the utility. Participant costs include the cost to purchase a measure, install it, and maintain the more efficient equipment (total measure costs)[18] as if there was no incentive. Utility costs include marketing, program administration, evaluation, and any direct installation costs incurred by the utility. Incentives are used to offset measure costs and are not included in TRC calculations as they represent a transfer from utility to participant and are not an additional resource cost.
- **PacifiCorp Total Resource Cost Test (PTRC).** This test is the TRC but includes a 10% adder to the benefits to include environmental and non-energy benefits.
- **Participant Cost Test (PCT).** This test considers the costs and benefits from the participant perspective. The cost is the measures' incremental costs above what the participant would have paid for a non-qualifying product. The benefits are the cost savings on the utility bill plus the incentives received.
- **Ratepayer Impact (RIM).** This is the perspective of all participating and non-participating ratepayers which represents how the energy savings may affect potential retail rates. The utility may observe lost revenues due to reduced energy usage from the energy savings accrued from the programs, leading to increased retail rates per kWh. This test includes all utility costs, as well as lost revenues. The benefits are the avoided costs.

[18] In some cases, the incremental measure cost is used instead.

# 6.2. Findings

This section discusses the review team's findings from analyzing the cost-effectiveness calculations for 2012 and 2013 program years, based on all information received to date. Gaps in the review are noted below. Some gaps were addressed in between the 2012 and 2013 reviews. The new information and 2013 findings, if different, are included here.

## Calculation Metholodgy

The review team was able to review the calculation methodologies from a high level for reasonableness and consistency to industry-accepted methodologies. The Cadmus software used for the residential evaluation reports and the annual reports is not open for public review; however, Cadmus did a demonstration of their software. It appears to include all necessary elements and algorithms. The Navigant calculations and associated data inputs for the commercial and industrial evaluation reports were also not provided. Both methodologies do, however, reference a common source, the California Standard Practice Manual (which is also the NAPEE-referenced source).

## Avoided Costs and Load Shapes

The review team did a high-level assessment of the derivation of average annual avoided costs used in Appendix 2 of the 2012 and 2013 Annual Reports. These avoided costs values were used to calculate the benefits related to the energy savings from the utility perspective. The review team did not verify the inputs used to calculate the average annual avoided costs,[19] which are typically the levelized cost ($/kWh) and the benefits columns in the program cost effectiveness summaries provided for each program. The embedded avoided energy costs and impact load shape data are not fully described in the evaluation or annual reports. From the evaluation reports and a review of the Cadmus presentation on their cost-effectiveness calculator, the present value of avoided energy and capacity costs includes avoided line losses occurring from end user energy savings. It also includes a transmission and distribution investment deferral benefit, a stochastic risk reduction benefit, and the medium CO2 tax scenario benefit. Additionally, the Cadmus presentation showed that the avoided costs are annualized from hourly values based on the hourly load shapes. The approach is acceptable based on the presentation. A detailed review of the underlying calculations and assumptions to replicate results was not part of this review. If access to the calculator or a step-by-step description is provided, then the calculation methodology review by third parties can include the excluded details.

The inputs provided in the 2012 and 2013 Annual Reports are shown below:

| Variable | 2012 | 2013 |
|---|---|---|
| IRP Year | 2011 | 2013 |
| Commercial Line Loss | 9.53% | 9.53% |

[19] This task was considered out of scope.

| Variable | 2012 | 2013 |
|---|---|---|
| IRP Year | 2011 | 2013 |
| Industrial Line Loss | 8.16% | 8.16% |
| Residential Line Losses | 9.67% | 9.67% |
| Discount Rate | 7.17% | 6.88% |
| Inflation Rate | 1.8% | 1.9% |

For 2012, the 2011 IRP West system load shape decrements at Med Carbon Stream and, for 2013, the 2013 IRP West load shape factor decrements (listed below in Table 12) were used to calculate the average annual avoided costs. This list is not comprehensive, but the most appropriate one is chosen based on the measure category load shape. For example, the residential whole house decrement was selected for refrigerators since they cycle on and off throughout the day.

The avoided capacity and energy costs are individually assessed based on a program or measure category's annual kWh saved. PacifiCorp uses a percent load factor decrement by load shape end use category to consider the effects of avoided capacity costs. The methodology to calculate the avoided capacity costs ($/kW) to energy costs ($/kWh) was not part of this review. If the algorithms can be provided, then a third party review team can further analyze this approach. The actual impact load shapes used by PacifiCorp are summarized in Table 12.

**Table 12: Measure Life, Load Factor Decrement, and Impact Load Shapes**

| Program Name | Measure Category | EUL[1] | Load Factor Decrement[2] | Impact Load Shape[3] |
|---|---|---|---|---|
| Home Energy Savings[20] | Lighting | 5 | Res Lighting | WA_Single_Family_lighting |
| | Appliance | 14 | Res Whole House | WA_Single_Family_Whole_House |
| | Home Improvement/Weatherization | 45 | Res Cooling/Res Whole House | WA_Single_Family_cooling |
| | HVAC | 18 | Res Cooling/Res Whole House | WA_Single_Family_cooling |
| | New Construction | 41 | Res Cooling/Res Whole House | WA_Single_Family_cooling |
| Appliance Recycling | Refrigerators | 6 | Res Whole House | WA_Single_Family_Whole_House |
| | Freezers | 9 | Res Whole House | WA_Single_Family_Whole_House |
| | Kits | 5 | Res Whole House | WA_Single_Family_Whole_House |
| Low Income Weatherization | | 30 | Res Whole House | WA_Single_Family_Whole_House |

[20] The 2012 cost-effectiveness review found that the EUL's were mismatched for this program. PacifiCorp made the appropriate changes in the updated June annual report.

| Program Name | Measure Category | EUL[1] | Load Factor Decrement[2] | Impact Load Shape[3] |
|---|---|---|---|---|
| FinAnswer Express | Appliance | 9 | System Load | WA_Large_Office_Plug_Load |
| | Envelope | 20 | System Load | WA_Large_Office_HVAC_Aux |
| | Food Service | 12 | System Load | WA_Large_Retail_Cooking |
| | HVAC | 15 | System Load | WA_Large_Office_HVAC_Aux |
| | Lighting | 14 | System Load | WA_Large_Office_Lighting |
| | Motor | 15 | System Load | WA_Industrial_Machinery_General |
| | Office | 5 | System Load | WA_Commercial_2012 |
| | Compressed Air | 9 | System Load | WA_Large_Office_HVAC_Aux |
| | Farm & Dairy | 10 | System Load | WA_Irrigation_General |
| | Irrigation | 5 | System Load | WA_Irrigation_General |
| Energy FinAnswer | Additional Measures | 14 | System Load | WA_Large_Office_Plug_Load/WA_Industrial Machinery_General |
| | Building Shell | 14 | System Load | WA_Large_Office_HVAC_Aux |
| | Compressed Air | 14 | System Load | WA_Industrial_Machinery_General |
| | Controls | 14 | System Load | WA_Industrial_Machinery_General |
| | HVAC | 14 | System Load | WA_Large_Office_HVAC_Aux |
| | Irrigation | 14 | System Load | WA_Irrigation_General |
| | Lighting | 14 | System Load | WA_Large_Office_Lighting |
| | Motors | 14 | System Load | WA_Industrial_Machinery_General |
| | Refrigeration | 14 | System Load | WA_Large_Office_Refrigeration/WA_Industrial_Machinery_General |

[1] Effective Useful Life

[2] The % LF Decrement used by the program/measure category is defined in Appendix 2 of the 2012 and 2013 annual report. If two load shapes were provided, then the second is per the 2013 annual report.

[3] Provided by PacifiCorp, May 2013. A repeat was not request for the 2013 review.[21]

For most programs, the predominant measure end-use type at an aggregate program or measure category level is used. Ideally, mapping is done at the measure level, instead of at the aggregate program level), as this is more consistent with the Council's Pro Cost calculator and California methods. The selection of a measure level load shape can have significant effects on the cost-effectiveness calculations. Therefore, the review team recommends adding more end use load shapes to the PacifiCorp library, such as residential heat pump and residential plug load. A report prepared for Northwest Power and Conservation Council and Northeast Energy Efficiency Partnerships,[22] identifies a big gap in updated and regional data for end use load shapes. The report noted that both Northeast and Northwest energy efficiency stakeholder groups rely on different data sets, creating additional concerns about the proper development,

[21] It is unclear how the impact load shape is used.

[22] "End-Use Load Data Update Project Final Report", DNV KEMA, prepared for Prepared for Northwest Power and Conservation Council and Northeast Energy Efficiency Partnerships, September 2009. (http://rtf.nwcouncil.org/subcommittees/enduseload/KEMA%20End%20Use%20Catalog%20Report%20FINAL.pdf)

source, and application of load shapes. However, the report did indicate that many load shapes are transferable across geographic regions and that PacifiCorp's library of load shapes could be enhanced by carefully borrowing from sources identified in the aforementioned report, as well as other regional entities.

### Measure Life

The measure life stipulates how many years of savings are expected from a measure. For cost-effectiveness calculations, this value is the basis for the present value and levelized costs and benefits.

The review team planned to verify the measure life values used at the measure and program levels for cost-effectiveness calculations. Since the review of the tracking systems extracts for 2012 had not yet been completed at the original review, the review team did not verify that proper measure lives were used. The measure category or weighted average (by kWh savings) by program was used to calculate cost-effectiveness by the measure category or program level assessment. The Low Income Weatherization program uses a value of 30 years and it is unclear if this is a weighted average value or a default value. The FinAnswer Express program did not provide a similar reference for measure life for its measure as the Home Energy Savings program, but measure life by measure category was provided. Table 12 summarizes the measure life (or EUL, effective useful life) used by program or measure category.

It would behoove PacifiCorp to develop a measure life look-up table for non-deemed measures. Currently, the Energy FinAnswer program uses a fixed value of 14 years; however, a more precise measure life provided by PacifiCorp is captured in the Energy Analysis Reports developed for each project. For example, the California DEER and the Pennsylvania ACT 129 technical resource manual (Appendix A) have such tables.

The following are the 2013 review team findings for FinAnswer Express in reference to the TRL which has active dates in 2013; hence all differences and the TRL values should be the referenced values for the cost-effectiveness calculations. However, at a high level review, these variances should not have a big impact on overall program cost-effectiveness. For some measure categories, the cost-effectiveness may now exceed 1.0. All other programs were consistent with the TRL.

**Table 13: Fin Answer Express Measure Life, Annual Report Exhibit 2 versus TRL**

| Measure Category | Annual Report | TRL |
|---|---|---|
| Building Shell[1] | 20 | 15 |
| Compressed Air | 9 | 14 |
| Dairy Farm Equipment | 10 | 14 |
| Food Service[2] | 12 | 6 |
| Irrigation | 5 | 14 |
| Lighting[3] | 14 | 12 |
| Motors | 15 | 9 |

| Measure Category | Annual Report | TRL |
|---|---|---|
| Refrigeration[4] | 14 | 12 |

[1] Savings are mostly from cool roof.

[2] Savings are mostly from refrigerated case lighting.

[3] Most savings came from "general package lighting," which is assumed to be mostly linear fluorescent fixtures, which the TRL has at 12 years.

[4] Most savings came from new refrigerators.

For 2012, it was suggested that the calculations and source of inputs be transparent so third-party reviewers can verify proper use of inputs, such as weighted average measure life and deemed costs. For 2013, the TRL provided deemed cost and measure life, where the measure life weighted averages can be verified. Most programs, except for FinAnswer Express, improved on the transparency in 2013.

## Cost Inputs

The two cost inputs are as follows:

- Administrative (utility and program)
- Measure costs

**Administrator Costs**

PacifiCorp considers administrative costs to be all costs attributable to a program except for incentives. This would include all marketing costs, labor, materials, office supplies, and outside services that it takes to run a given program. The costs claimed are a key variable for determining total program cost-effectiveness.

Under administrative costs, PacifiCorp includes:

- Portfolio level costs (see Table 2, Appendix 2 of the 2012 and 2013 annual report)
  - School energy education
  - Outreach and communication
  - Portfolio level expenditures
    - Company initiatives
    - New programs
    - Evaluation, potential study, and technical reference library
- Program costs
  - Marketing
  - Utility administration
  - Engineering

PacifiCorp considers all costs attributable to a program, except incentives, to be administrative costs. This would include all marketing costs, labor, materials, office supplies, and outside

services that it takes to run a given program. The review team found PacifiCorp's disaggregation of costs within programs and across the portfolio to be detailed and providing good insights on the cost allocation.

**Incremental Measure Costs**

The incremental measure cost (IMC) can be either the incremental cost or the full cost of a measure. The appropriate value is dependent on the measure application, i.e., retrofit or early replacement, replace-on-burnout (ROB) or natural replacement, or new construction. The 2013 Regional Technical Forum document "Guidelines for the Estimation of Incremental Measure Costs and Benefits," provides definitions of the proper cost basis for measures. The source of this value may vary by program delivery method, market sector, measure type, or other variables. This report is a good reference for defining the best practices that address measure costs. Each program's tracking system should include a field for measure costs and whether deemed, actual invoice, or a calculated incremental measure cost was used. The TRL provides the source of the deemed measure cost, if applicable.

Generally, PacifiCorp prefers to use actual costs for applications where actual costs are available. Actual costs are more valuable for planning purposes. Actual costs are not available in all cases, so deemed values are used when actuals are not available. For lighting retrofits, the measure costs are actual. For lighting new construction and major renovation, the measure costs are usually deemed. For non-lighting, measure costs may be actual or deemed depending on the project. For non-lighting measures where the assumed baseline is energy code, the costs are deemed since incremental costs are not usually reflected on customer invoices.

The review team summarizes PacifiCorp's IMC practices by program as follows:

<u>Residential</u>

- Home Energy Savings – This program tracks actual full measure costs, but for cost-effectiveness calculations, the deemed costs are used.
- Appliance Recycling – The program uses deemed costs since it equals the incentives and program administration costs.
- Low Income Weatherization – The program uses actual costs.

<u>Commercial and Industrial</u>

- Energy FinAnswer – The program uses actual costs for retrofits and incremental measure cost for projects where the participant would have installed new equipment in the absence of the program (e.g., ROB).
- FinAnswer Express – The program uses actual invoice values in most cases. However, deemed costs are intended to be used with commercial/industrial rebates where the choice is high-efficiency versus code or industry standard. This may not always be the case, however. The program has begun tracking whether a deemed or actual value is used for the agricultural and industrial measures since PacifiCorp intention is to use deemed costs with commercial/industrial rebates where the choice is high-efficiency

versus code or industry standard. This practice was expanded to the rest of the program's measures for 2013[23] but, the database tracking extract does not note it.

## Benefit Inputs

The only benefits tracked by PacifiCorp are energy savings. No demand savings are reported as part of the cost-effectiveness calculations or accounted for in the cost-effective analysis, though capacity avoided costs are rolled into the energy savings' avoided costs. Most of the savings claimed are deemed and those that are not were spot-verified as part of the portfolio electric savings review discussed in Section 2. The energy savings are translated into avoided costs. These costs include transmission and distribution losses. A ten percent additional benefit is used only for the PTRC test to account for the environmental and non-energy benefits.

Two programs capture non-energy benefits from water savings on clothes washers and dishwashers for the Home Energy Savings and Low Income Weatherization program. Additionally in 2013, the Low Income Weatherization cost effectiveness calculations included non-energy benefits associated with a rate reduction, capital cost savings, economic impact, and repair costs per the 2009-10 evaluation.

## Discount Rates

The weighted average (or actual) after-tax cost of capital by sector per the Council is dependent on the sector and perspective of the stakeholder's view. These values have decreased from the previous years. Per the Council, values in regional investor-owned utilities' recent Integrated Resource Plans (IRPs) ranged between about 7.0 - 8.3 percent in nominal terms, or 5.1 - 5.6 percent in real terms, using the inflation rates assumed in the various IRPs. They represent the tax-adjusted weighted average cost of capital (WACC) for the utilities. The RTF ProCost Calculator varies the discount rate based on the stakeholder addressed in the calculation. If the benefit is for the utility, then the WACC is acceptable. If it is the participant, their discount rate should be used.

## Incentives and Energy Savings

Energy savings and incentive payments were examined as part of the portfolio electric savings review discussed in Section 2.2 of this report. The review team assumed the database tracking reports used in Appendix 2 of the 2012 and 2013 Annual Reports captured the incentive payments correctly. Their correct assignment or calculation was completed under the cost-effectiveness review. All program incentive costs and savings are traceable back to a sum of individual measures for each project within the tracking workbooks provided except for the motors end use in Energy FinAnswer for 2013 where the tracking incentives value is lower than that reported in Appendix 2 since it includes the trade ally bonus. With this bonus, the numbers do match.

[23] Implementers have the "measure cost type" column in their bulk upload file.

## 6.3. Recommendations

The following are the review team's recommendations for PacifiCorp to consider when reporting cost-effectiveness metrics.

- Consider providing third party reviewers step-by-step process (or an Excel-based example) for deriving the cost-effectiveness values to increase transparency.[24] PacifiCorp provided the Cadmus DSM Portfolio Pro User Manual for reference which provided a background and all available inputs and parameters that are used in the calculation, but not the calculation steps (which were reviewed via a webinar).[25]
- Include additional load shapes from other sources that are "transferable" to PacifiCorp service territory.
- Consider performing cost-effectiveness analysis on a measure level, instead of using aggregate values or weighted average avoided costs, measure life, etc. However, the existing method is sufficient to meet the reporting requirements.
- Document the method for determining measure costs recorded for the cost-effectiveness calculations. The review team has found that most programs that use deemed savings also use deemed incremental measure costs for reporting purposes. PacifiCorp should consider the potential impacts of changing its practice of assessing measure costs per the above recommendations, such as when to use full versus incremental or deemed versus actual costs. For non-deemed measures, actual costs (incremental if appropriate) should be recorded and used for cost-effectiveness analysis. Other aspects of this recommendation include:
  - Default costs to the incremental cost for deemed (replace on burnout or natural replacement measures) instead of invoiced costs for calculating cost-effectiveness, as appropriate
  - Document a methodology for measure or measure category level cost assumptions throughout portfolio
  - Ensure documentation describes what may or may not be included as a measure cost
  - Specify when to use incremental versus full cost
  - Specify when to default to deemed value
  - Require itemized invoices, as program designers deem appropriate.

[24] Even though the review of the actual algorithms are out of scope for this work, it is recommended to make them available to ensure the inputs provided results in the outputs as was conducted for the energy savings due diligence review.

[25] For example, consider providing avoided cost derivations, as it is levelized for each end use category, either by documenting calculation methodology and algorithms, or by providing Excel-based calculations that are accessible for third-party review. One example of needed clarification is how the IRP decrement value is used versus the impact load shapes. The review team's interpretation is that the identified load factor decrement defines the impact of the capacity costs (based on end use) into the hourly avoided energy costs. The impact load shape is used to annualize the avoided costs based on the measure load shape.

# 7. CONCLUSIONS AND RECOMMENDATIONS

Below are summarizations of review team findings, recommendations, and next steps presented in the preceding sections. Refer to the corresponding section for more details.

## 7.1. Conclusions

The **Portfolio Electric Savings Review** found no issues with the program reported savings for 2012 and a couple small issues with reported savings in 2013 amounting to less than 250 kWh overstatement in savings. Important parameters, such as savings claim date and measure unit quantity, however, were often insufficiently documented and tracked. Particularly, the Low Income Weatherization and FinAnswer Express programs inadequately recorded or tracked the quantities of various measures installed. Additionally, Energy FinAnswer savings calculation documentation was inadequate or opaque in several instances.

The **Review of Savings Verification Systems** concluded that all five programs conduct site verification of installed measures or program activity, except for a subset of Home Energy Savings measures that constitute a small percentage of program savings. All inspections are contracted out, and generally conducted by program implementers. This facilitates correcting reporting problems prior to closing out projects. The three programs with largest savings inspect all of their largest projects. All Energy FinAnswer projects are inspected. For the most part, forms and processes for conducting the site inspections are clear and consistent.

Another aspect of the Savings Verification Systems Review, comparison of best practices to PacifiCorp's methodologies, revealed the following:

- *Overarching verification guidelines.* While portfolio-level guidelines for implementing risk-based verification procedures are not formally documented, PacifiCorp's program-level verification practices are generally consistent with targeting verification efforts at high risk, high impact energy efficiency measures.
- *Varied inspection strategies*. Verification practices reflect the diverse customer sectors, project types and attributes, and savings.
- *Actual Documentation of Savings or Verification*. Procedures for reviewing key documents are in place. However the review team found some invoices that were illegible or insufficiently detailed to verify the measure cost or measure being installed.

The **Review of Tracking and Reporting Systems** concluded that PacifiCorp is following best practices in the way they have designed the Nexant iEnergy platform which should enable them to accurately track their programs on a project and measure level. The iEnergy platform provides documentation and system flow checks and balances to properly track, verify, and report program progress. Future assessment should include review of the actual implementation of the system.

In the **Impact and Process Evaluation Review**, the review team found that recent process evaluations were fairly comprehensive in addressing the program implementation and

participant response, and all included interviews with program staff and participants. Assessment of program design and administration was included less frequently, particularly for residential programs. Recent impact evaluations generally covered essential components. Commercial/industrial evaluations, however, lacked detail about data collection and analysis methods. The overall evaluation strategy is comprehensive, and if implemented as planned, demonstrates best practices. PacifiCorp is improving how evaluations results inform future programs, though there is not currently a mechanism for confirming that the recommendations were implemented.

The **Cost-Effectiveness Calculation Review** was challenging because (1) third-party-generated calculations were unavailable for review; however, the review team did observe the software's abilities via the user manual and a webinar demonstration and (2) embedded avoided energy costs and impact load shapes were not fully described. Furthermore, the review team found that selection of load shapes and measure lives occurred at the program or measure category level, rather than at the measure level for the commercial and industrial programs as is done by the Council, however, it is an acceptable practice. The measure lives used in cost-effectiveness calculations were found to be inconsistent with the TRL except for the FinAnswer Express program. Disaggregation of administration costs was detailed and informative. Home Energy Savings and FinAnswer programs' measure costs were somewhat inconsistent or unclear about whether they were incremental or full measure costs.

## 7.2. Recommendations

Moving forward, PacifiCorp can continue to improve their practices for tracking, verifying, reporting, and evaluating savings achievements and cost-effectiveness by fulfilling the following recommendations.

### Portfolio Electric Savings Review

1. Improve tracking quantities installed, particularly in Low Income Weatherization and FinAnswer Express programs.
2. Make complex custom savings calculations more transparent by requiring a brief description of methodology and final numbers in the main body of the report traceable to the calculations in the appendices in the Energy FinAnswer Program.
3. Ensure correct deemed savings values are selected, particularly in HES.

### Savings Verification Systems Review

1. Continue to monitor the periodic evaluation results for all programs and consider implementing a low cost verification approach for Home Energy Savings (e.g., telephone verification) if any issues arise in the future.
2. Conduct an appropriate sample of random site inspections, while balancing the costs of site inspection across all programs.
3. Ensure that a percentage of inspections are prioritized for projects completed by new contractors, including the Home Energy Savings program.

4. Document site inspection and verification procedures, particularly the commercial component of the FinAnswer Express program and the Low Income Weatherization program.

### Tracking and Reporting Review

1. Once iEnergy is in full implementation mode, it is recommended to perform periodic reviews of the tracking and reporting systems to make sure they align with best practices, are used according to design, and properly incorporate quality control checks.

### Impact and Process Evaluation Review

1. For future process evaluations consider addressing the gaps identified in Table 10 in Section 5.2. such as timing of HES program implementation.
2. Provide better explanation of data collection and analysis methods used for specific sites and overall, especially for the C&I program evaluations.

### Cost-Effectiveness Calculation Review

1. Consider making cost-effectiveness calculations more transparent by documenting methodologies and providing avoided costs derivations or, alternatively, via a sample calculation in a replicable manner.
2. Include additional load shapes from other sources that are “transferable” to PacifiCorp service territory, especially if the end use contributes a high percentage of savings.
3. Consider performing cost-effectiveness analysis on a measure level similar to the Council’s approach.
4. Document the method for determining measure costs recorded for the cost-effectiveness calculations.