WASHINGTON SAVINGS VERIFICATION AND REPORTING PROCESS 2014-2015 REVIEW

Submitted to

PACIFICORP DBA PACIFIC POWER
Portland, OR

Submitted by

SBW CONSULTING, INC.
2820 Northup Way, Suite 230
Bellevue, WA 98004

In association with

DNV GL
Oakland, CA

April 29, 2016

sbw

ENERGY + WATER + EFFICIENCY

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Introduction

PacifiCorp dba Pacific Power (Pacific Power) contracted with SBW Consulting, Inc., in conjunction with DNV GL, to perform an independent portfolio-level review of their reported 2014-2015 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 Pacific Power's 2014-2015 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 Pacific Power'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 Pacific Power 2014-2015 portfolio claims, focusing on changes made since the 2012-2013 biennium[1]. Specifically, the review team performed the four tasks laid out in the work plan, namely: 1) Portfolio Electric Savings Review, 2) Savings Verification Process 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 two key programs, Home Energy Savings (HES) and wattsmart Business (WSB), which collectively account for over two-thirds of the projected biennial savings. Smaller programs, namely Low Income Weatherization (LIW), Appliance Recycling (a.k.a., See Ya Later, Refrigerator, or SYLR), and Home Energy Reports (HER) were also included in the review.

The following documentation and data informed this review:

- Portfolio- and Program-level documents such as Washington Utility & Transportation Commission (WUTC) reporting requirements, Pacific Power annual reports, program manuals, and evaluation reports
- Program tracking data
- Source documents underlying electric energy savings contained in the Technical Reference Library (TRL)

[1] The SBW team conducted the 2012-2013 verification of Washington savings study which concluded in May 2014 with a report included in the appendix of Pacific Power's 2012-2013 Biennial Conservation Report.

- Project documents for 90 sampled projects: 21 HES, 65 WSB and 4 LIW Savings Verification Process Review

Savings Verification Process Review

The review team analyzed the Pacific Power verification procedures for the four programs highlighted in the electric savings review described in Section 3, namely: WSB, HES, SYLR, and LIW. To develop a sense of how programs verify that measures were implemented properly and are yielding energy savings, the review team examined relevant procedural documents and sample project documentation. 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 3. Lastly, the review team compared Pacific Power's measure installation practices to industry best practices.

Tracking and Reporting System Review

The tracking and reporting system review included the following steps:

1. **Database Variance.** Compared reported savings in the 2014 annual report to tracking data report, reviewed 2015 tracking data report, reviewed processes for data reconciliation and examined how data is used to track program goals.
2. **Minimum Data Quality.** Received a demonstration of the functionality of Pacific Power's new tracking and reporting system, DSM Central (DSMC). 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 best practices for program management, data collection, and reporting. Assessed whether DMSC supports quality control and program evaluations.

Impact and Process Evaluation Review

To understand how Pacific Power has planned and implemented M&V practices relevant to the 2014-2015 program years, the review team examined five evaluation reports completed since the 2012-2013 verification study. The team reviewed each report and compared Pacific Power'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 Pacific Power impact evaluations.[2] Furthermore, the review team leveraged the National Energy Efficiency Best Practices Study[3] to assess whether the process evaluations addressed areas such as program design, administration and

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

[3] 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.

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 Pacific Power's cost-effectiveness calculations that were reported in Appendix 2 of the 2014 Annual Report and prepared for the 2015 annual report[4]. The team also conducted the following assessments to confirm if Pacific Power's cost-effectiveness calculation approach, inputs, and assumptions were properly documented and transparent.

1. Review for correct methodology in evaluation reports and 2014 and 2015 Annual Report summary tables
2. Conduct due diligence review of calculation methodology
   - Assess validity of calculation inputs

Conclusions

Overall, based on the material available for this review, the team found that Pacific Power 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 2014, and one issue with a sampled project's savings in 2015. The issue was revealed during onsite inspection in which the SBW engineer observed that operating hours on a WSB lighting measure were incorrect. The program had applied an always-on hours value (8,064 hours) but the site contact stated the affected light fixtures were in use 10 hours per day 5 days per week, as was the case in the baseline condition. The correction to operating hours for this measure resulted in reducing savings for this project by 21,858 kWh from 35,497 kWh to 13,639 kWh. Since the sample size was too small to generalize this finding to the broader population of lighting measures, the review team concluded that this savings adjustment should only be applied to the measure in which it was observed.

The following issues made verifying the savings challenging but did not necessarily lead to reporting inaccurate savings:

- The review team encountered difficulties associating the various dates provided in the project documentation with the dates in the tracking data report, particularly for verifying the cost recovery date. While the review team understands that Pacific Power has chosen to not show the cost recovery date of a project until after the program manager has signed

[4] The 2015 annual report was not complete in time for its review to be included; however, Pacific Power provided the summary tables being prepared for the annual report.

off on it and that the cost recovery date may be a different date than the program administrator's date, other applicable milestone dates were challenging to confidently identify in the project documentation to verify that the cost recovery date occurred within an acceptable timeframe relative to the customer's participation.

- It was frequently challenging to confidently associate the tracked measure with its TRL counterpart, even for deemed measures, because the tracking data reports provided did not include the Measure Reference Number with the Measure Name assigned to each unique measure in the TRL. This is particularly important for deemed measures since their savings, costs, and/or incentive information is typically not in the project documentation, making the TRL the only independent source for verification.
- The sample projects reviewed for WSB revealed instances in which the program used incorrect measure names or 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.

Savings Verification Process Review

The review team once again found Pacific Power's verification practices to be in line with best practices. Pacific Power has strengthened its verification practices since the last assessment of the 2012-2013 programs by implementing appropriate solutions to all of the review team's previous recommendations. As noted in the prior Verification of Savings report, all of Pacific Power's programs conducted site verification of installed measures with the exception of HES, which does not conduct any verification for a subset of measures (appliances, water heaters, evaporative coolers, and air conditioners) that represent a small fraction of program savings (less than 10%). Most inspections are contracted out, and generally conducted by program implementers or a third party consulting engineering firm. The programs with largest savings inspect 100% of their largest projects and the incentive trigger for inspection varies by measure type.

As part of the Savings Verification Process Review, the review team also compared Pacific Power's verification strategies 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, Pacific Power'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 and projects with large savings claims and incentives are in place.

Tracking and Reporting Review

The review team's assessment of Pacific Power's practices for tracking and reporting found that they are in line with best practices. Pacific Power has fully implemented the DSMC tracking system which enables them to accurately track their programs on a project and measure level.

The DSMC platform provides documentation, project flow checks, and controls on incentive payments and measure details to properly track, verify, report, and evaluate program achievements.

Impact and Process Evaluation Review

The review team investigated Pacific Power's 2014 and 2015 evaluation efforts and compared the evaluation activities with industry best practices. Pacific Power has addressed the review team's prior evaluation recommendations from the 2012-2013 Verification of Savings Report and has formalized a process to address program evaluation results and recommendations. The overall evaluation strategy is comprehensive, and if implemented as planned, demonstrates best practices.

Cost-Effectiveness Calculation Review

The review team did not review the calculation methodologies again as they were unchanged from the previous review conducted for the 2012-2013 Verification of Savings study and previously found to be reasonable and consistent with industry-accepted methodologies. The cost-effectiveness methodologies utilized by third party consultants hired to evaluate specific programs as well as portfolio cost-effectiveness reference a common source, the California Standard Practice Manual (which is also the NAPEE-referenced source). The review team found that Pacific Power continues to assign load shapes and measure lives at broad measure category levels which could be improved upon to support more accurate cost-effectiveness calculations. Otherwise, the cost-effectiveness calculations appear to follow best practices.

Recommendations

Moving forward, Pacific Power 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

- Key dates should be labeled in project documentation for all measures to assist with verifying cost recovery dates
- Clearly define a policy for establishing the cost recovery dates for projects being claimed at the beginning or end of the year, e.g., purchase date, installation date, invoice date, or incentive payment date, and ensure it is followed consistently
- Include the TRL Measure Reference Number and Effective Date in the tracking data report, particularly for deemed measures
- Ensure measure descriptions and quantities of appropriate units are tracked and updated accurately in DSMC and consistent with TRL measures, particularly for WSB projects

Savings Verification Process Review

- Continue to monitor the periodic evaluation results and consider implementing a new and appropriate verification approach if any issues arise in the future.

Tracking and Reporting Review

- Reiterating a recommendation from above, the review team again recommends Pacific Power continues to review all listed best practices and ensures on a regular basis that they are assessed and properly implemented as related to tracking and reporting for its portfolio of programs.
- While not critical to confirming proper measure implementation or assessing program cost-effectiveness, the review team recommends that Pacific Power consider assigning a measure life to all active measures (including a default or weighted average measure life for different types of custom projects) in the TRL. Should Pacific Power wish to evaluate the measure life assumptions currently assigned to measure categories (used for cost-effectiveness analysis), having a measure life for every energy saving measure or project in a measure category is necessary to calculate a weighted average measure life.

Impact and Process Evaluation Review

The review team does not have any evaluation related recommendations.

Cost-Effectiveness Calculation Review

- As previously stated, the review team recommends that Pacific Power start tracking and recording the measure life for all measures and projects (weighted average measure life or default measure lives based on the most common measures can be applied to complex custom projects) even if the utility continues to use measure category values for reporting cost-effectiveness metrics. Documenting the measure life for every measure recorded in the DSMC tracking system would allow for easier validation of the measure category assumptions used in cost-effectiveness calculations. This information could also help Pacific Power better assess measure level cost-effectiveness.

1. INTRODUCTION

Pacific Power currently operates residential, commercial, and industrial energy efficiency programs in Washington State, under the name Pacific Power. They have 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 2014-2015 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 Pacific Power's 2014-2015 Biennial Conservation Report (BCR), which will be filed by June 1, 2016. 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 Pacific Power's evaluation, measurement, and verification (EM&V) procedures and third-party evaluation methodologies, and whether they meet reasonable industry best practice standards.

This review relies on multiple approaches. The review team is carefully examining selected overarching documents, databases, and calculations underpinning the Pacific Power 2014-2015 portfolio claims. In addition, the review team is selecting random samples of project-level documentation for each program, and subjecting these samples to careful scrutiny and analysis, including field verification. Examining the portfolio claims at both summary and detail levels helps identify problems and potential improvements that can strengthen Pacific Power's future claims.

This report provides results from the review of the *Washington Annual Report on Conservation Acquisition for January 1, 2014 – December 31, 2014*, issued April 1, 2014 (referred to in this report as the *2014 Annual Report*) as well as review of the information being compiled for the *Washington Annual Report on Conservation Acquisition for January 1, 2015 – December 31, 2015* (referred to in this report as the *2015 Annual Report*)[5]. The subsequent five sections correspond to the following areas of investigation:

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

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

[5] The 2015 Annual Report was not complete in time for its review to be included in this report.

2. PORTFOLIO ELECTRIC SAVINGS REVIEW

The overarching verification approach for each Pacific Power program is shown in Table 1. The two programs of major focus, which collectively account for over two-thirds of the projected biennial savings, are Home Energy Savings (HES) and wattsmart Business (WSB). Smaller programs, namely Low Income Weatherization (LIW), Appliance Recycling (a.k.a., See Ya Later, Refrigerator, or SYLR), and Home Energy Reports (HER), are also included in the review.

For the 2014 and 2015 reviews, the review team examined documentation from 90 randomly-selected projects and selected a total of 15 projects for field verification. The review team also reviewed a sample of JACO workbooks from 2014 and 2015 to verify the SYLR savings claim as well as reviewed the HER activity.

Table 1: Summary of Verification Approaches

Tariff Schedule	Program	% of portolio savings goal*	Verification approach
114	Low Income Weatherization	<1%	Minor program, so we will do minimal file reviews to validate.
107	Appliance Recycling	2%	Spot checks of independent inspector's phone/on-site survey documentation. We will do follow-up phone surveys only if necessary.
118	**Home Energy Savings**	**25%**	**Major program - we will do file reviews and on-site visits to validate.**
	Home Energy Reports	16%	Review of third-party ex post verification.
140	**wattsmart Business**	**50%**	**Major program - we will do file reviews and on-site visits to validate.**
	Northwest Energy Efficiency Alliance (NEEA)	6%	Not included, since Washington Utilities and Transportation Commission (WUTC) ordered statewide review and savings claim approach be developed by WA investor-owned utilities by end of 2014.

* As determined from the 2014-2015 biennial plan.

Further details of the approach for accomplishing the 2014 and 2015 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 Pacific Power 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. Regional Technical Forum (RTF), Pacific Power and NEEA deemed savings values agreed upon for the 2014-15 programs.
- **EM&V documentation:** Recent process and impact evaluations germane to the 2014 and 2015 claimed savings.
- **Program tracking data:** Database extracts that contain all data behind the 2014 and 2015 savings claim. The extracts included the Technical Reference Library (TRL).

Interview staff

After reviewing program documentation and data, the review team and senior planning staff at Pacific Power determined that interviews were not necessary for this round of review. The information provided was sufficient to carry out the evaluation.

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 2014 and 2015 claimed electric savings in detail. This effort was focused on three areas:

- **Deemed savings:** Reviewed the deemed savings values used for the 2014 and 2015 programs, with emphasis on measures contributing to a large portion of the program savings, and assessed how those values migrated to the project documentation and tracking database.
- **Simplified calculations:** Reviewed calculations that account for significant amounts of claimed savings, particularly new or revised methods since 2013, to search for any systemic and/or localized problems.
- **General:** Compared the 2014 Annual Report claimed savings and tables prepared for the 2015 Annual report to the program tracking data reports to identify and investigate variances. Also compared descriptions of the programs in the 2014 annual report to the other reviewed documents to look for any discrepancies.

Sample file reviews

The review team performed an initial review of the tracking data reports to understand the number of projects in each key program, as well as the types of measures, amount of claimed savings, and the distribution of these attributes across the program. Based on this, a sampling and review approach for each key program, shown in Table 2, was developed. This table shows the allocation of the 90 file review sample points, and describes briefly how the projects were selected and reviewed. Pacific Power provided 2015 tracking data in two reports, one constituting the first three-quarters of the year and a second release constituting the final quarter. The number of sample points corresponded to the fraction of the program year covered by each release with three quarters of the points drawn from the first 2015 release and one quarter drawn from the final release. The tracking data report from the final quarter included a new WSB delivery channel called Midstream Lighting. Four sample points from the final quarter were reallocated to this delivery channel in order to ensure a sufficient level of review. For all of the selected projects, the team either obtained project documentation from Pacific Power, or confirmed that the program tracking database contained the relevant information.

Table 2: Sampling and Review Approach by Program

			Sample size		
Program	**Sampling / review approach**	**% of kWh***	**2014**	**2015**	**Total**
Low Income Weatherization	Each customer has, on average, about 11 measures of widely varying costs and scopes. All projects get one UES of 1,476 kWh/yr. Since this is a small program, we performed a few file reviews per the project review matrix (see Table 3), and checked the UES value and applicability carefully.	<1%	2	2	4
Appliance Recycling	Several randomly-selected sets of data provided by the implementer were reviewed. Also verified appropriate application of UESs for every savings claim in 2014 and 2015.	2%	See approach description on left		
Home Energy Savings	Split sample ~1/3 Upstream, ~1/3 Kits, ~1/3 Appliance/HVAC/Weatherization. Reviewed documentation of each project per the project review matrix. In 2015, this distribution was maintained but three sample points were reallocated to review the new WSB lighting program.	25%	12	9	21
Home Energy Reports	Reviewed evaluation and tracking data report. No sampling.	16%			
wattsmart Business	For the 2014 review, the sample was split evenly between Lighting, Non-Lighting – Trade Ally, and Non-lighting-In-House. For 2015, the	50%	31	34	65

Program	Sampling / review approach	% of kWh*	Sample size 2014	2015	Total
	distributions were skewed towards programs that showed some variability in an initial review and four sample counts were reallocated to the review the new Midstream Lighting delivery channel.				
NEEA	Not part of this verification	6%			
Total		**100%**	**45**	**45**	**90**

* As determined from the supporting data for the 2015 Annual Report.

The review team followed a standardized documentation review process for the sampled projects. This process was very similar to the previous biennium review which included reviewing deemed values, comparing file values for the number of units and savings to those in the program tracking data report, 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: Project Review Matrix

Data class	Category	Subcategory	Parameter	Third-party review questions
Pacific Power Tracking Data		Identifiers	Program Number	
			Project ID	
			Description of Project ID	
			Program	
			Subprogram	
			Sampling domain	
			Type of savings calculation	
		Measure	Measure description	
			Quantity	
		Savings	kWh savings	
		Costs	Measure cost	
			Incentive payment amount	

Data class	Category	Subcategory	Parameter	Third-party review questions
			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 Pacific Power? If not, why not?
				Is info complete, well-organized, and understandable?
	File comparison w/tracking data	Identifiers	Program number	Match? (Y/N)
			Pacific Power 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?
			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)
				Payment amount <= measure cost? Reasonable amount?
			Incentive payment date	Date
				Was incentive paid / project claimed in appropriate year? (Y/N)

Data class	Category	Subcategory	Parameter	Third-party review questions
				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?

Field verification

To supplement the file review process, the review team contacted 15 of the file reviewed projects to verify them through observations and tailored, project-specific customer interviews. This small sample is not statistically significant in any traditional sense but helped round out the comprehensive portfolio assessment, particularly taken in conjunction with other verification activities, including the detailed review of verification practices.

One or more of the following factors was used in deciding how to allocate on-site inspections among programs and program elements: (1) program saving size, (2) third-party administration, (3) measure complexity, (4) rigor of existing inspections, and (5) presence of file review discrepancies.

The evaluation team and Pacific Power worked together to develop a recruitment letter. Pacific Power supplied the letterhead. The evaluation team provided Pacific Power a list of sites which had been selected for on-site inspection. Pacific Power then shared the list of field verification sites with its utility customer representatives and call center.

The site visits provided opportunities to confirm as much as possible, through interviews and inspection, that measures associated with the project were fully installed and operational.

After all of the sampled projects were inspected, the review team aggregated the results by program, examined the data, and developed overall findings.

2.2. Findings

Overall, our review verified the savings claimed in 2014 and makes an adjustment based on one project to the 2015 savings claim as described below. In the process of the review, we found

some minor, though nontrivial, issues both across programs and specific to certain programs; however, we do not believe these issues directly affected the savings claimed. Details of our findings are discussed below.

General findings

The following findings correspond to issues found across programs and delivery channels. In the tracking data report provided for our 2014 review, it was frequently challenging to confidently associate the tracked measure with its TRL counterpart, even for deemed measures, because the tracking data report did not include the Measure Reference Number and its Effective Date. Pacific Power subsequently included the measure effective date for the 2015 portion of this review but there continued to be misalignment between the unique measure identifiers in the tracking data report and those found in the TRL. This is particularly important for deemed measures since their savings, costs, and/or incentive information is typically not in the project documentation. The TRL then serves as the only independent source for verification.

Additionally, as with the 2012-2013 verification study, the review team initially encountered difficulties associating the various dates provided in the project documentation with the dates in the tracking data report, particularly for verifying the cost recovery date, during the review of the sampled projects from 2014. However, for the review of the sampled projects from 2015, Pacific Power satisfactorily addressed the cost recovery date issue by providing check copies or final payment screenshots for each of the sampled projects.

Program-specific findings

Low Income Weatherization

The sampled low income projects had clear documentation for the incentives paid, types of measures implemented, and post-installation inspections.

Appliance Recycling

Savings for most of these measures matched the corresponding TRL deemed values for 2014, however, 13 of the measures applied the Unit Energy Savings (UES) values from the previous year. This was due to a combination of a couple of factors. One, the measures had a measure effective date (date units were picked up) in December 2013 because the contractors who administer the program have a cut off each month so they can process the information, particularly at year end. And two, historically, the next year's UES values would have been used, but since the implementation of DSMC (see Section 4.1 for description), the UES values are assumed for a specific measure effective date. The cost recovery date assigned is a result of the transition to DSMC in early 2014. The review team concluded that the correct UES was selected based on when the measure was picked up. A review of the Appliance Recycling measures in 2015 demonstrated correct use of TRL values.

Home Energy Savings

<u>Upstream Lighting</u>

We reviewed invoices for three retailers from three manufacturers. The invoices matched the count and model of lamps listed in the tracking data report, though one proved challenging

because the invoice covered two stores and our originally selected sample of tracking records was only for one of the two stores.

We also reviewed the source of the savings values claimed. For the CFLs, we found that the sunset date of the RTF workbook upon which the savings were based expired at the end of 2013. The following comment is from the "Sunset Criteria" section of the "RTF Summary" tab of the Pacific Power workbook:

> Measure shall not remain in effect after Dec 31, 2013.

The next version of the RTF CFL workbook was approved at the October 2013 meeting. A major change in the October 2013 version was that it did not contain a fixture or average lamp replacement measure. Furthermore, savings were significantly reduced compared with the previous version of the workbook due to the inclusion of CFLs in the average baseline lamp. However, Pacific Power noted that its savings values were locked down in the summer of 2013, and that the values used in its claim are consistent with those used in setting the Conservation target. The review team concluded that the appropriate savings values were applied for the 2014 and 2015 savings claim.

Kits and Rebates

No issues were found in the review of the sampled measures for energy saving kits or the sampled rebates measures.

wattsmart Business

This program was split into four domains for careful examination: Lighting (non-Midstream), Non-Lighting by Trade Ally, Non-Lighting In-House, and Midstream Lighting. Fifteen of the sampled projects were selected for field verification and customer interviews.

Lighting

Approximately half of the 21 sampled lighting projects received post-installation inspections. The review team conducted on-site verification at seven of the sites which had not received post-installation inspections. Site visits for six of the projects verified that all lighting measures were installed and operating as documented. The site visit of one 2015 lighting project revealed significantly lower operation hours for a key measure than assumed by the program. Specifically, the site contact indicated that a set of fixtures for which 8,064 hours (always on) was used in the program savings estimate are actually only in use 10 hours per day, five days per week, as was the case in the baseline condition as well. This resulted in reducing the savings claim for the project by 21,858 kWh from 35,497 kWh to 13,639 kWh. Since the sample size was too small to generalize this finding to the broader population of lighting measures, the review team concluded that this savings adjustment should only be applied to the measure in which it was observed.

The review team examined documentation of four Midstream Lighting projects and found no issues.

Non-Lighting

All seventeen sampled in-house non-lighting projects involved custom calculations to estimate savings[6]. There was a thorough level of documentation which allowed reviewers to find most necessary information with only a couple exceptions. Two of the sampled projects from 2014 did not have associated incentive payment invoices available. Further, two of the sampled projects had an incorrect project type in the tracking data report. Neither of these situations warranted site visits. Due to discrepancies in project documentation, one project from 2015 was selected for field verification which confirmed the correct savings were claimed.

About half of the sampled Trade Ally non-lighting projects from 2014 appeared to have quantity mismatches between tracking data report and documentation. One customer refused the site visit request. At another site, the incented rewound motor was in storage as backup which is acceptable and no savings adjustment is recommended. The remaining four sites had the measures installed and operating as documented. Due to uncertainty about the baseline condition, one of the eleven sampled Trade Ally projects from 2015 received onsite verification which confirmed the correct baseline condition was used. There were no other issues with the sampled 2015 projects.

2.2.1. Pacific Power Response to Prior Verification Recommendations

As part of the portfolio electric savings review, the review team revisited the recommendations made in the prior report to see if and how Pacific Power has responded. Table 4 summarizes prior verification recommendations as well as Pacific Power's response. As shown in the table, Pacific Power has proactively addressed all of the verification recommendations.

Table 4: Prior Savings Review Recommendations and Pacific Power Response

Prior Recommendation	Pacific Power Response
Home Energy Savings (HES)	
Consider collecting the type of residence (single family, multifamily, or manufactured) from the applicant, as is done with the other residential programs.	Pacific Power collects housing type when unit energy savings are different for different housing types such as MF attic insulation, MF duct sealing/duct insulation, MF ductless heat pumps, etc. Where appropriate housing type fields will be added to the paper and online incentive applications. Incentive applications for measures with different savings, incentives or requirements for different housing type are in place.
Ensure that the correct deemed savings are selected. (Page 17 of the report states "Across the 2012-	All savings values are now managed in the TRL and reconciled as part of the year end process.

[6] One of the sampled projects included a lighting measure whose savings was determined with the standard lighting calculator.

Prior Recommendation	Pacific Power Response
2013 review period, the review team uncovered a couple small issues with reported savings within one sampled project. There were two instances in which incorrect deemed savings values were selected.")	
FinAnswer Express (now wattsmart Business – Trade Ally)	
Ensure that the units tracked are the units required for savings calculations. (Page 17 states: 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.)	Unit counts and what the unit is, and size and size units are provided for the Nexant and Cascade measures/projects. In some cases such as the motor example cited on page 5 of the report, both the unit count and the size (e.g. horsepower) are needed for the incentive calculation. Both are tracked. Going forward, units will all be "TRL units". No further action is required given the improvements already made with the TRL and incorporation of the TRL into the data tracked for measures.
Energy FinAnswer (now wattsmart Business – In House)	
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. Page 5 of the report states: 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.	The Final Inspection Report template will be reviewed and updated to provide better guidance around the calculation approach description and where the savings values are coming from. The review and template changes will be provided for contractors to use in the first quarter of 2015.

Prior Recommendation	Pacific Power Response
Low Income Weatherization	
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.	On page 5 of the report, the following is stated regarding this recommendation, "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." We are able to collect number of measures such as showerheads, refrigerators and CFLs in DSMC. The sq. ft. of insulation installed, etc. is not tracked as it would create additional work for our partnering agencies which is not warranted as it is not critical. Additional reporting requirements would increase the administrative costs of the agencies and decrease program cost effectiveness. Current reporting requirements imposed on the low income weatherization agencies will remain in place.

2.3. Recommendations

To facilitate third party evaluation and review of claimed savings, we recommend the following:

- Key dates should be labeled in project documentation for all measures to assist with verifying tracked cost recovery dates
- Clearly define a policy for establishing the cost recovery dates for projects being claimed at the beginning or end of the year, e.g., purchase date, installation date, invoice date, or incentive payment date, and ensure it is followed consistently
- Include the TRL Measure Reference Number and Effective Date in the tracking data report, particularly for deemed measures
- Ensure measure descriptions and quantities of appropriate units are tracked and updated accurately in DSMC and consistent with TRL measures, particularly for WSB projects

It should be noted that Pacific Power completed steps to implement standard reporting summaries in 2014 which came into full effect for 2015.

3. SAVINGS VERIFICATION PROCESS REVIEW

3.1. Methodology

The review team analyzed the Pacific Power verification procedures for four of the five key programs highlighted in the electric savings review described in Section 2, namely: WSB, HES, SYLR, and LIW. The HER program was excluded from the verification review due to the nature and delivery of the program. The review team focused on changes to Pacific Power's verification procedures since the previous assessment of the 2012-2013 programs and Pacific Power's response to verification procedure recommendations.

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 any changes to the measure installation verification practices, the review team compared the verification documentation and findings from the 2012-2013 report with the verification procedures outlined in Appendix 3 of Pacific Power's 2014 Annual Report. The review team also assessed the verification procedures of the WSB program in more detail to see if there were any changes implemented after the Energy FinAnswer and FinAnswer Express programs merged to form the WSB program after the 2012-2013 verification report. The review team reviewed program verification documentation, template inspection forms, and completed inspection forms. Lastly, the review team investigated Pacific Power's response to prior verification recommendations. As a part of this review, the team also leveraged findings from the review of portfolio electric savings discussed in Section 2. Pacific Power's measure installation practices were then compared to industry best practices to develop recommendations.

3.2. Findings

The review team did not find any significant changes to Pacific Power's measure installation verification strategies from the 2012-2013 Verification of Savings report. Pacific Power has implemented some minor modifications to their verification strategies to address issues and recommendations from that report which will be detailed further in this section. As noted in the prior Verification of Savings report, all of Pacific Power's programs conducted site verification of installed measures with the exception of HES, which does not conduct any verification for a subset of measures (appliances, water heaters, evaporative coolers, and air

conditioners) that represent a small fraction of program savings (less than 10%). Additionally, the most recent evaluation of the HES program (2011-2012) found 100% installation rate of these measures.

Table 5 provides an overview of the different project types included in the WSB verification protocol and the percent of each project inspected. As shown in the table, projects can originate from Pacific Power, third party implementers, and retailers and the verification protocol is different for each project type. The incentive threshold that triggers an inspection for the largest projects varies by measure type. All projects implemented by a Pacific Power account manager have the post-installation inspection completed by a third party consulting engineering firm and the final invoice is reconciled to reflect the results of the inspection. In general, the WSB installation verification protocol is very similar to the protocols that were in place for the Energy FinAnswer and FinAnswer Express Programs.

Table 5: wattsmart Business Program Verification by Project Type

Project Type	Implementer	Project Details	Percent Inspected	
			Pre-Installation	Post Installation
Lighting	3rd Party	Retrofits > incentive threshold	100%	100%
Lighting	3rd Party	New Construction > incentive threshold	N/A	100%
Lighting	3rd Party	Retrofits and new construction < incentive threshold	0%	5%
Lighting	Retailers (mid-stream)	Retrofits > incentive threshold	0%	5%
Non-lighting	3rd Party	Retrofits > incentive threshold	100%	100%
Non-lighting	3rd Party	Retrofits and new construction < incentive threshold	0%	5%
ALL	Pacific Power	Retrofit	100%	100%
ALL	Pacific Power	New Construction	N/A	100%

3.2.1. Pacific Power Response to Prior Verification Recommendations

As part of the savings verification process review, the review team revisited the recommendations made in the prior report to see if and how Pacific Power has responded. Table 6 summarizes prior verification recommendations as well as Pacific Power's response. As

shown in the table, Pacific Power has proactively addressed all of the verification recommendations.

Table 6: Prior Vefication Recommendations and Pacific Power Response

Prior Recommendation	Pacific Power Response
Home Energy Savings (HES)	
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.	Not currently an issue as recent program evaluations found 100% installation rate of measures (appliances, water heaters, etc.) that are not inspected. Pacific Power will re-evaluate the issue after the next HES evaluation.
Ensure that inspections are conducted for projects completed by new contractors. The review team recommended that the HES program incorporate a procedure to ensure that a higher percent of new contractors are selected for site inspection.	The HES program has adjusted the inspection process to ensure a greater number of projects submitted by new trade allies are inspected. The first two projects of new trade allies are inspected as part of the onboarding process. Mandatory inspections also are applied to the first two projects of any existing trade ally for newly added measures.
FinAnswer Express (now wattsmart Business - Trade Ally)	
Conduct an appropriate sample of random site inspections, while balancing the costs of site inspection. The program conducted 5% spot inspections on a random basis but non-random inspections were triggered by new trade allies, lack of clarity on inspection forms, and proximity to other site inspections. At the time of review, it was not clear what percent of projects were randomly inspected compared to the percent selected due to the triggers.	Previously, Pacific Power indicated that the contractors were in the process of adding a field to their tracking system to identify the number of projects selected for inspection at random versus triggered; however, their contractor has since indicated they are unable to add a new field at this time. Company continues to look at alternatives based on contractors' system limitations.
Document site inspection and verification procedures. The review team found that documentation did not exist for the commercial component of the program.	Pacific Power prepared a new manual for the WSB program that includes a savings verification and reporting framework that applies to all sectors and projects covered by the program.
Low Income Weatherization (LIW)	
Document site inspection and verification procedures. The review team recommended that the LIW	Pacific Power has created a new inspection form to address this issue which includes a comment line under the pass/fail checkbox for each measure that states "reason for fail

Prior Recommendation	Pacific Power Response
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.	and/or comments."

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[7]. Following each of the three best practices, the review team provides a brief assessment of Pacific Power 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.[8] While the review found no formal documentation of verification priorities across the Pacific Power 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 Pacific Power verification practices.

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

Best Practices	Findings related to Pacific Power
Consider administrative cost in designing the verification strategy.	The largest programs and the largest projects have been prioritized for site verification with specific incentive levels (dependent on the measure) triggering an automatic inspection for the WSB program. Additionally, administrative costs are clearly considered at the program level (e.g., grouping WSB projects together for inspection,

[7] 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.

[8] National Energy Efficiency Best Practices Study. Volume P1 – Portfolio Best Practices Report. July 2008. Last accessed 7/14/2015: http://www.eebestpractices.com/pdf/Portfolio_BP_Report.pdf

Best Practices	Findings related to Pacific Power
	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 WSB and HES programs allow a reduction in the number of required inspections by prioritizing larger projects for inspection. Pacific Power is in the process of addressing this issue by working with their 3rd party implementers to add this information to their data tracking system.
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 WSB program includes different inspection requirements according to project size thresholds. All new homes are inspected in the HES program.
Use a verification method capable of confirming measure and installation quality.	For the most part, programs utilize site inspections which verify both measure quantities and installation quality. There are some projects that are only verified through phone or application review which does not confirm installation quality.

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. Pacific Power'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 Pacific Power verification practices.

Table 8: Specific Elements Related to Inspection Strategy

Best Practices	Findings related to Pacific Power
Obtain a good random sample of vendor and measure types.	The WSB program conducts both random and non-random inspections. Currently, it is unclear what percent of inspections are random; however, Pacific Power is in the process of addressing this issue by working with their 3rd party implementers to add this information to their data tracking system.
Always inspect the first job submitted by a new vendor, depending on program type.	The WSB program inspects projects completed by new trade allies. Additionally, the HES program inspects the first two projects of new trade allies as part of the onboarding process.
Pre-inspections for large or uncertain impact projects, such as	100% pre-inspection is conducted for WSB projects that represent larger and more uncertain (custom) projects. The

Best Practices	Findings related to Pacific Power
those with highly uncertain baseline conditions that significantly affect project or program savings.	program also inspects all projects that exceed an incentive threshold (different by measure).
Clearly define post-inspection rigor and quantity by cost-effectiveness considerations.	The WSB 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 and commissioning are conducted for WSB projects, which represent larger and more uncertain (custom projects) savings.
Ensure inspectors have plenty of hands-on experience.	The residential third party inspector was found to be quite experienced. Post-inspections of large WSB projects are conducted by engineering firms. The qualifications for the engineering firms were specified in the original request for proposals.
Ensure that inspectors have adequate training in identifying and explaining reasons for failure.	Trainings are found to be conducted for HES inspectors. It is assumed that the engineering firms ensure their employees are properly trained.

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 Pacific Power verification practices.

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

Best Practices	Findings related to Pacific Power
Verify accuracy of rebates, coupons, and invoices to ensure the reporting system is recording actual product installations by target market, such as lighting.	The Pacific Power programs appear to have procedures in place to review applicable invoices, equipment specification documents, manufacturer agreements and retail sales records.
Conduct in-program measurement/impact evaluation for the very largest projects or those with uncertain impacts.	100% inspection is conducted for WSB projects that represent larger and more uncertain (custom) projects. 100% pre-inspection is also conducted by the WSB program for large lighting projects. These occur in-program and prior

Best Practices	Findings related to Pacific Power
	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.	Pacific Power conducts regular evaluations of its largest energy efficiency measures and/or programs.

3.3. Recommendations

The review team once again found Pacific Power's verification practices to be in line with best practices. Pacific Power has strengthened its verification practices since the last assessment of the 2012-2013 programs by implementing appropriate solutions to all of the review team's previous recommendations. The review team only has one long term and on-going recommendation for Pacific Power 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 new and appropriate verification approach if any issues arise in the future.
  - As Pacific Power programs continue to evolve, promote new measures and target different market segments, new verification strategies may need to be considered.

4. TRACKING AND REPORTING SYSTEMS REVIEW

The following section describes the review team's assessment of Pacific Power's tracking and reporting system.

4.1. Methodology

As part of the Portfolio Savings and Cost-Effectiveness reviews, the review team obtained relevant project tracking database extracts (flat files) and reports as well as internal studies of these systems in a webinar on the Demand Side Management Central (DSMC) tracking system and assessed whether the information currently collected by programs is adequate to confirm measures were implemented properly. The DSMC tracking system is an upgrade to the prior program tracking system(s) and was in the process of being implemented during the prior verification study. The review 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, respectively, which focused on verifying the overall portfolio savings numbers, costs, and measure life using the tracking data report, to a more broad-based assessment of the various ways the tracking information is used.

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 Pacific Power'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 examined whether 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. We reviewed data quality control checks that Pacific Power 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 Pacific Power 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 review team once again commends Pacific Power for moving to one system for all its programs with the implementation of the DSMC tracking system and was especially impressed

with the checks and QC elements that were programmed into the system, as discussed further below.

4.2. Findings

The review team's findings are largely based on the completeness and accuracy of the 2014 and 2015 program flat files from DSMC as well as the functionality of the DMSC tracking system that was demonstrated during a 2015 webinar conducted by Pacific Power staff.

Flat File Review

Each program's flat file is based on what the program collected as well as the measure details from the TRL. The flat files provided by Pacific Power for review included only completed projects or measures with energy savings recognized in the 2014 and 2015 program years (i.e. cost recovery date in 2014 or 2015). Similar to the flat files provided during the previous verification review, the critical information including incentive amount, energy savings, participant information, measure name, measure category, measure cost and cost recovery date were universally captured across programs. The review team also found that customer account numbers were also present for all projects or measures that received an incentive. While the DSMC tracking system captures crucial project milestones like whether or not a site inspection was completed (required for incentive payment on WSB programs over certain incentive thresholds), inspection date, date application received and approved, this information was not present in the flat file. During the DSMC webinar, Pacific Power explained that all of that information was contained at the project level in DSMC and reports would be updated to include the dates relevant for project management.

In general, all of the fields were completed that are necessary to confirm measures were implemented properly. The review team did find some non-critical blanks (null fields) for some project entries. Additionally, while not critical to confirming proper measure implementation, the review team did notice that the measure life was missing for many measures across programs. This does not impact Pacific Power's ability to assess program cost-effectiveness as that's done at the measure category level (i.e. lighting), however, the review team recommends that Pacific Power consider tracking measure life at the measure level for all projects.

DMSC Review

Based on the Pacific Power webinar presentation of the DSMC database tracking and reporting system, the review team was impressed with the overall functionality as well as key features such as the direct link to the TRL. The presentation and discussion mostly focused on the tracking and validation side and less on the reporting. Pacific Power demonstrated the quality control features that have been programmed into the DSMC tracking system which help mitigate the human error inherent to data entry. For example, many projects in the WSB program have incentive caps based on the measure cost and simple payback. The DSMC has all of the measure specific rules programmed in to prevent overpaying or violating one of the rules. Additionally, all of the required inspection and verification processes are built in and projects cannot move forward until each step is satisfied.

While most of the webinar was spent displaying the data process, QC features, and complex process flow, Pacific Power did show the review team their library of reports, including standard dashboard reports to indicate portfolio and program progress towards goals in different configurations and variables.

Like most tracking databases, DSMC has different required fields by program and measure. Each program has its own unique element that was designed into the system. Some programs require more details than others. For example, the SYLR and HES programs both require bulk uploads into the system, which was demonstrated by Pacific Power. Some individual project elements that were demonstrated to the review team 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 more complex than others.
3. Certain fields are required and others are grayed out if they are based on look-ups or other calculations.
4. Differentiating between capped and non-capped measures with auto-calculation.
5. Number of TRL units and quantity fields.
6. Validation needs are clearly documented (and some may require engineering review).
7. If on-site verification is part of the program process flow, then these fields are included and required entry fields.

4.2.1. Pacific Power Response to Prior Tracking and Reporting Recommendations

As part of the tracking and reporting systems review, the review team revisited the recommendations made in the 2012-2013 report to see if and how Pacific Power has responded. Table 10 summarizes prior tracking and reporting recommendations as well as Pacific Power's response. As shown in the table, Pacific Power has adequately addressed all of the prior recommendations.

Table 10: Prior Tracking and Reporting Recommendations and Pacific Power Response

Prior Recommendation	Pacific Power Response
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.	Pacific Power has shared this recommendation with all Program Managers.
Once DSMC is in full	Pacific Power gave a demo of DSMC to the review team as

Prior Recommendation	Pacific Power Response
implementation mode, Pacific Power 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.	part of this verification study to show the system's various layers of controls and its ability to align with appropriate best practices.

4.2.2. 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. Following each of the four best practices, the review team provides a brief assessment of Pacific Power 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 implementation of the DSMC solution, these elements were clearly defined. For example, it was understood that the SYLR and HES programs needed bulk upload features which were built into DSMC. It is also clear that certain parameters define if the measure values are looked up in the TRL or not. These features have helped to align the Pacific Power system with best practices.

We identified the following best practices within the DSMC 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
- Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress
- Design the program tracking system to support the requirements of evaluators as well as program staff
- Integrate audit data

The following areas were not identified or reviewed during the DSMC webinar. However, they are best practices Pacific Power should consider incorporating in the future if they are not currently in place.

- Integrate marketing, customer billing (account numbers were present), and impact data

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 used appropriately. That being said, we found that Pacific Power was maximizing the capabilities of the DSMC platform and observed the following details of best practice elements:
.

- Establish system to collect and track 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 links such as with the TRL)
- 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

The following are areas that were not identified or reviewed during the DSMC webinar. However, they are best practices Pacific Power should consider incorporating in the future.

- Track market transformation program qualitative benefits and measures related to spillover effects, along with direct savings impacts
- Track vendor activity, such as equipment providers and installation contractors, and measure volume where relevant
- Automate routine functions such as monthly reports

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 DSMC and the measure-level data, specifically for the deemed measures in the TRL, represents Pacific Power'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 Pacific Power data systems. However, there are some validation steps built into the DSMC 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
  - The review team observed this functionality during Pacific Power's demonstration of DMSC
- Build in rigorous quality control screens for data entry such as minimizing duplicative entry

4.3. Recommendations

Overall, our assessment of Pacific Power's practices for tracking and reporting found that they are in line with best practices. Pacific Power has fully implemented the DSMC tracking system which enables them to accurately track their programs on a project and measure level. The DSMC platform provides documentation, project flow checks, and controls on incentive payments and measure details to properly track, verify, report, and evaluate program achievements.

Reiterating a prior recommendation, the review team again recommends Pacific Power reviews all listed best practices and ensures on a regular basis that they are assessed and properly implemented as related to tracking and reporting for its portfolio of programs. Additionally, while not critical to confirming proper measure implementation or assessing program cost-effectiveness, the review team recommends that Pacific Power consider assigning a measure life to all active measures (including a default or weighted average measure life for different types of custom projects) in the TRL. Should Pacific Power wish to evaluate the measure life assumptions currently assigned to measure categories (used for cost-effectiveness analysis), having a measure life for every energy saving measure or project in a measure category is necessary to calculate a weighted average measure life.

5. IMPACT AND PROCESS EVALUATIONS REVIEW

The following section describes the review team's assessment of Pacific Power's recent impact and process evaluations.

5.1. Methodology

To build on the understanding of how Pacific Power plans and implements M&V practices established during the 2012-2013 verification study, the review team focused on five program evaluations that were recently completed and not previously available for review. The review team obtained relevant M&V documentation from Pacific Power as well as the Washington Annual Report on Conservation Acquisition (2014) which includes Pacific Power's response to evaluation recommendations (Appendix 4).

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 Pacific Power impact evaluations.[9]

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[10] cross-cutting recommended best practices for the review of Pacific Power's program evaluations. The National Best Practices Study provides a list of best practices developed from analysis of programs across the country. The team used this

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

[10] 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.

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

As previously mentioned, the review team focused its assessment on the five program evaluations that were completed since the previous verification study. These were:

- Energy FinAnswer, 2012-2013 (now wattsmart Business - In House)
- FinAnswer Express, 2012-2013 (now wattsmart Business - Trade Ally)
- HES, 2012-2014
- Low-Income Weatherization, 2011-2012
- See ya later, refrigerator, 2013-2014

5.2.1. Pacific Power Response to Evaluation Recommendations

As part of the evaluation review, the review team revisited the recommendations made in the 2012-2013 report to see if and how Pacific Power has responded. Table 11 summarizes prior evaluation recommendations as well as Pacific Power's response. As shown in the table, Pacific Power has successfully addressed all of the prior recommendations.

Table 11: Prior Evaluation Review Recommendations and Pacific Power Response

Prior Recommendation	Pacific Power Response
All Programs - Consider for future process evaluations to address the gaps identified in Table 10 from that report, such as timing of HES program implementation	Future evaluations will take these recommendations into account.
Energy FinAnswer and Finanswer Express - Provide better explanation of data collection and analysis methods used for specific sites and overall, especially for the C&I program evaluations. Page 45 states "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	C&I evaluation for Washington now has a specific SSMVP (site specific measurement & verification plan) plan and detailed analysis for every project sampled/visited by Navigant.

Prior Recommendation	Pacific Power Response
mention of data collection techniques."	
All Programs - 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.	Pacific Power established a formal documentation process in 2014 for all evaluation. recommendations. The process includes more details on follow-up activities and documentation for what was completed or why the recommendation was not implemented. The Annual Report for 2014 is capturing the status of recommendations and when completed.

5.2.2. 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. 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 Pacific Power’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 Pacific Power staff, outside consultants, and the Advisory Group. Pacific Power staff is engaged during the pre-implementation design, post-implementation assessment, and implementation of program stages. Pacific Power 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 Pacific Power culture. Appendix 4 of the 2014 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.
6. **Include periodic estimation of free-ridership and spillover.** The Framework states that Pacific Power 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. Pacific Power is also able to leverage regional measure and market studies conducted by the Northwest Energy Efficiency Alliance (NEEA) and the Regional Technical Forum (RTF).
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 Pacific Power did not change from the last assessment completed in 2014 and once again appears to be comprehensive in scope and if implemented as planned, demonstrates many of the best practices for evaluation across the portfolio.

The three evaluation reports listed above were considered part of the current evaluation plan and were reviewed in more detail against evaluation best practices. The overall Pacific Power evaluation strategy aims to include process and impact evaluations for each program, and all of the evaluations reviewed included elements of both types of evaluations. The HER evaluation did not include all of the traditional elements of a process evaluation but when reviewed against other similar program evaluations, the review team found Pacific Power's evaluation approach to be in-line with best practices.

By implementing process evaluations on a regular schedule, Pacific Power has the potential to identify opportunities for updating, streamlining, and generally improving program implementation procedures. As shown in Table 12, the activities described in the five 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 of the evaluations included interviews with participants. The Energy FinAnswer and FinAnswer Express evaluations included interviews with program management staff, an assessment of program design, logic model, and administration. Given the unique nature of the HER Program, these process evaluation elements were found to be not applicable for evaluating the program and Pacific Power's approach was consistent with other similar evaluations around the country reviewed by the review team. As previously mentioned, Pacific Power addressed all of the prior evaluation recommendations and the evaluation reports completed in 2014, 2015, and early 2016 were found to be in-line with best practices.

Table 12: Review of Process Evaluation Elements

Process Evaluation	Home Energy Reports	Energy FinAnswer	FinAnswer Express	Low-Income Weatherization	See ya later, refrigerator
Program Years	2012-2014	2012-2013	2012-2013	2011-2012	2013-2014
1. Program Design					
1.1 The program mission	X	X	X	X	X
1.2 Assessment of program logic	N/A	X	X	X	X
1.3 Use of new practices or best practices	X	X	X	X	X
2. Program Administration					
2.1 Program oversight	N/A	X	X	X	X
2.2 Program staffing	N/A	X	X	X	X
2.3 Management and staff training	N/A	X	X	X	X
2.4 Program information and reporting	X	X	X	X	X
3. Program Implementation					
3.1 Quality control	X	X	X	X	X
3.2 Operation practice -- how program is implemented	X	X	X	X	X
3.3 Program targeting, marketing and outreach efforts	X	X	X	X	X
3.4 Program timing	X	X	X	X	X
4. Participant Response					
4.1 Participant interaction and satisfaction	X	X	X	X	X
4.2 Market and government allies interaction and satisfaction	N/A	X	X	X	X

Process Evaluation	Home Energy Reports	Energy FinAnswer	FinAnswer Express	Low-Income Weatherization	See ya later, refrigerator
Program Years	2012-2014	2012-2013	2012-2013	2011-2012	2013-2014
5. Overall Assessment					
5.1 External or internal evaluators	External	External	External	External	External
5.2 Number of data collection methods	1	4	4	2	2

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 in Table 13. Overall, the current impact evaluations contain all of the components essential for an impact study.

While the review of the HER evaluation found certain elements such as gross savings or persistence to be "not present" in the evaluation, this is largely a result of the program design and not reflective of a deficiency in the evaluation strategy.

Table 13: Review of Impact Evaluation Components

		Home Energy Reports	Energy FinAnswer	FinAnswer Express	Low-Income Weaterization	See ya later, refrigerator
		2012-2014	2012-13	2012-13	2011-2012	2013-2014
Overall Assessment						
Evaluators	Ex –External In – Internal	Ex	Ex	Ex	Ex	Ex
Status	P - Proposal E - Evaluation Plan C – Completed	C	C	C	C	C
Portfolio vs. program	S– Single program M– Multiple programs, but not portfolio P– Portfolio	S	S	S	S	S
Persistence	E – EULs from other sources P – Primary data collection NP – Not provided. Insufficient documentation to score this criterion	NP	E	E	NP	NP

		Home Energy Reports	Energy FinAnswer	FinAnswer Express	Low-Income Weaterization	See ya later, refrigerator
		2012-2014	2012-13	2012-13	2011-2012	2013-2014
Documentation within evaluation	1 – Insufficient documentation provided 2 – Partial documentation provided 3 – Documentation appears sufficient	2	2	2	2	2
Recommendations	1 – Report does not include recommendations for program improvements. 2 – Report provides some recommendations, but appears incomplete based on analysis completed. 3 – Report provides relatively comprehensive set of recommendations	3	3	3	3	3
Gross Savings						
Verification	1 – Paper verification. 2 – Phone or mail verification. 3 – Physical (on-site) verification. NP – Not provided. Insufficient documentation to score this criterion	NP	1,2,&3	1,2,&3	NP	2
Approach		Billing Analysis	M&V Approach - IPMVP Options	M&V Approach - IPMVP Options	Large-Scale Data Analysis Approach	Large-Scale Data Analysis Approach
Baseline	Proj – Project-Specific baseline. Perf – Performance Standard baseline. NP – Not provided. Insufficient documentation to score this criterion	Proj	Proj	Proj & Perf	NP	Perf
Sampling	1 – Sampling mentioned, but no description provided.	3	2	2	2	2

		Home Energy Reports	Energy FinAnswer	FinAnswer Express	Low-Income Weaterization	See ya later, refrigerator
		2012-2014	2012-13	2012-13	2011-2012	2013-2014
	2 – Sampling partially described. 3 – Sampling approach fully described, or census. NP – Not provided. Insufficient documentation to score this criterion.					
Precision	1 – No sampling precision reported or discussed. 2 –Sampling precision was discussed in some manner but not completely. 3 – Target and achieved precision (or error bounds) were reported. NP – Not provided. Insufficient documentation to score this criterion.	NP	2	2	2	2
Net Savings						
Approach	SRS – Self-reporting surveys ESRS - Enhanced self-reporting surveys EM- Econometric methods NTGR - Stipulated net-to-gross ratios NP – Not provided. Insufficient documentation to score this criterion	EM	SRS	SRS	EM	ERSR
Free-ridership	PFR-Partial Free ridership addressed FR - Free ridership addressed, but not Partial free ridership NA - None included	NA	FR	FR	NA	FR
Spillover effects	PS-Participant NPS - Non-Participant NA - None included	PS	PS	PS	NA	NA

5.3. Recommendations

The review team investigated Pacific Power's 2014 and 2015 evaluation efforts and compared the evaluation activities with industry best practices. Pacific Power has addressed the review team's prior evaluation recommendations and has formalized a process to address program evaluation results and recommendations. The review team does not have any evaluation related recommendations at this time.

6. COST-EFFECTIVENESS CALCULATIONS REVIEW

The following section describes the review team's assessment of Pacific Power's cost-effectiveness calculations.

6.1. Methodology

The review team analyzed the 2014 and 2015 Pacific Power cost-effectiveness inputs, results presented in the 2014 Annual Report, and the evaluation reports completed in 2014, 2015 and early 2016. As found during the previous assessment, 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. Pacific Power 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 2014 Annual Report as well as the inputs used to produce the 2015 Annual Report. The evaluation studies were only reviewed in regards to the methodology used and not the actual inputs and reported results.

The review team examined Pacific Power's cost-effectiveness calculations that were reported in Appendix 2 of the 2014 Annual Report as well as the inputs that will be used for the 2015 Annual Report which was not complete at the time of this assessment. The 2012-2013 Verification study included a review of the load shapes used in Pacific Power's cost-effectiveness calculations, however, for this study the review team did not review the load shapes as Pacific Power indicated that there were no changes to the load shapes to promote consistency and allow for comparative analysis in the IRP process. The review team conducted the following assessments to confirm if Pacific Power's calculation approach, inputs, and assumptions were properly documented and transparent.

1. Review for correct methodology in evaluation reports, 2014 Annual Report, and inputs to the 2015 Annual Report
2. Conduct due diligence review of calculation methodology:
   - Did Pacific Power properly summarize the individual programs in calculation sheets?
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[11], 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 Pacific Power's approach to avoided costs and the TRC test since these WSCWG results were issued. Previously, Pacific Power and Cadmus (the consultant for the annual cost-effectiveness calculations) presented to the review team their cost-effectiveness calculation methodology. The review team did not seek an additional presentation for this verification as the methodology did not change and Pacific Power continues to employ third party consultants that use DSM Portfolio Pro to calculate cost-effectiveness which reduces manual input errors and has been reviewed by various state commissions.

Calculating Cost-Effectiveness—Definitions and Methodology

This section discusses the tests currently calculated by Pacific Power and as interpreted by National Action Plan for Energy Efficiency (NAPEE)[12]. As previously found, the methodologies used by Pacific Power were consistent with the guidelines established by NAPEE, as reported by the independent program evaluators, Navigant Consulting. Navigant used the California Standard Practice Manual (CA SPM) algorithms. Actual review of calculation algorithms was outside of the scope of this effort, but observed in a webinar during the previous verification study.

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,

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

[12] 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.

levelized cost can be used to express all variable costs over the life of a measure.[13] Similar to NPV, details of the calculation of levelized cost are not documented either by NAPEE or Pacific Power. However, Pacific Power does calculate NPV of the cost of the program and the value of the kWh savings to yield a value that can be compared to the $/kWh of a new generation source.

Pacific Power 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 UCT).** 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 UCT 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)[14] 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.
- **Pacific Power 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.

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

[14] 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 the 2014 and 2015 program years, based on all information received to date. Gaps in the review are noted below.

Calculation Metholodgy

The review team did not review the calculation methodologies again as they were unchanged from the previous review and previously found to be reasonable and consistent with industry-accepted methodologies. The cost-effectiveness methodologies utilized by third party consultants hired to evaluate specific programs as well as portfolio cost-effectiveness 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 2014 Annual Reports. These avoided costs values were used to calculate the benefits related to the energy savings from the utility perspective. The scope of this study did not include verification of the inputs used to calculate the average annual avoided costs, 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 evaluations or annual report. From the evaluation reports 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. A detailed review of the underlying calculations and assumptions to replicate results was not part of this review.

The inputs provided in the 2014 Annual Report and confirmed to be the same in the 2015 report are shown below:

Variable	
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Residential Line Losses	9.67%
Discount Rate	6.88%
Inflation Rate	1.9%

For 2014 and 2015, the 2013 IRP West load shape factor decrements (listed below in Table 14) were used to calculate the average annual avoided costs. The most appropriate load factor decrement was 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. Pacific Power 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. The actual impact load shapes used by Pacific Power are summarized in Table 14.

Table 14: Measure Life, Load Factor Decrement, and Impact Load Shapes

Program Name	Measure Category	EUL[1] (2014/2015)	Load Factor Decrement[2]
Home Energy Savings	Appliance	15	Res Whole House
	Building Shell	45	Res Whole House
	Energy Kits	9	Res Whole House
	HVAC	19	Res Whole House
	Lighting	7/9	Res Lighting
	Water Heating	15	Res Whole House
	Whole Home	45	Res Whole House
Home Energy Reporting	HER Legacy/Expansion	1	Res Whole House
Appliance Recycling	Refrigerators	7	Res Whole House
	Freezers	5	Res Whole House
	Kits	6	Res Lighting
Low Income Weatherization	Low Income	37	Res Whole House
wattsmart Business	Additional Measures	14/NA	System Load
	Building Shell	20/16	System Load
	Compressed Air	15	System Load
	Dairy Farm Equipment	14	System Load
	Energy Management	3	System Load
	Fast Acting Doors	15/NA	System Load
	Food Services	12/9	System Load
	HVAC	15	System Load
	Irrigation	12/8	System Load
	Lighting	14	System Load
	Motors	15	System Load
	Office Equipment/Electronics	5	System Load
	Refrigeration	14	System Load

[1] Effective Useful Life

[2] The % LF Decrement used by the program/measure category is defined in Appendix 2 of the 2014 annual report.

Similar to previous findings, the predominant measure end-use type at an aggregate program or measure category level is used. Previously the review team recommended adding more end use load shapes to the Pacific Power library as the selection of a measure level load shape can have significant effects on cost-effectiveness calculations. As shown in more detail below,

Pacific Power indicated in their response that they elected to continue to utilize the existing load shapes so that comparative analysis of IRPs or program years can focus on changes to technology, saturation rates, costs, etc. and that they will continue to evaluate this recommendation as the planning process starts for the 2017 IRP.

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. Similar to previous findings, 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. As mentioned in the Tracking and Reporting Systems Review section, during the flat file review the review team found that the measure life was missing on a number of projects, making it challenging to evaluate the accuracy of the measure category lives used in the cost-effectiveness analysis. Table 14 summarizes the measure life (or EUL, effective useful life) used by program or measure category. For 2015, some of the measure categories changed or were consolidated into another category. For example, “fast acting doors” and “additional measures” were standalone categories in 2014 and the measures previously assigned to those categories were reassigned to other categories. Additionally, some of the measure category measure lives changed between 2014 and 2015. As shown in Table 14, the measure lives for the building shell, food services, and irrigation measure categories all decreased between 2014 and 2015.

Similar to a previous recommendation from the 2012-2013 report, the review team again recommends that Pacific Power consider developing a measure life look-up table for non-deemed measures that would allow for tracking and reporting measure life at the measure level. Currently, the WSB program uses default values for measure categories which may or may not reflect the actual measure life (or weighted average measure life) of a specific project. While the measure category lives appear reasonable to the review team, there is no way to properly evaluate their validity without doing a weighted average measure life calculation (measure savings x measure life) for each category and program.

Cost Inputs

The two cost inputs are as follows:

- Administrative (utility and program)
- Measure costs

Administrator Costs

Pacific Power 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, Pacific Power includes:

- Portfolio level costs (see Table 2, Appendix 2 of the 2014 annual report)
  - School energy education
  - Outreach and communication
  - Portfolio level expenditures
    - Company initiatives
    - New programs
    - Evaluation, potential study, and TRL
- Program costs
  - Marketing
  - Utility administration
  - Engineering

The review team found Pacific Power'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. The DSMC tracking system includes a field for measure costs and whether a deemed or actual invoice cost was used. The TRL provides the source of the deemed measure cost and whether it is a full or incremental cost, if applicable.

Similar to previous findings, Pacific Power 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 Pacific Power's IMC practices by program as follows:

1. Residential
   - HES – This program tracks actual full measure costs, but for cost-effectiveness calculations, the deemed incremental costs are used.
   - SYLR – The program uses deemed costs since it equals the incentives and program administration costs.
   - Home Energy Reporting - There are no participant costs in the HER program.
   - LIW – The program uses actual costs.
2. Commercial and Industrial
   - WSB - The program uses actual costs for custom retrofits and deemed incremental measure costs for deemed measures.

Benefit Inputs

The benefits tracked by Pacific Power include energy and demand savings as well as non-energy benefits for a subset of programs. While Pacific Power tracks demand savings associated with installed measures, they are not included in the cost-effectiveness calculations or accounted for in the cost-effective analysis; however, capacity avoided costs are rolled into the energy savings' avoided costs. Most of the energy 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: the HES program from water savings on clothes washers and dishwashers and the LIW program's cost-effectiveness calculations included non-energy benefits associated with a rate reduction, capital cost savings, economic impact, and repair costs.

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. For 2014 cost-effectiveness calculations, Pacific Power used a nominal discount rate of 6.88 percent which came from their 2013 IRP. This discount rate is very close to the range found by the Council for other regional investor-owned utilities. The discount rate was confirmed to be the same for 2015.

Incentives and Energy Savings

Energy savings and incentive payments were examined as part of the portfolio electric savings review discussed in Section 2 of this report. The review team assumed the database tracking reports used in Appendix 2 of the 2014 Annual Reports and the inputs for the 2015 Annual

Report provided by Pacific Power captured the incentive payments correctly. Their correct assignment or calculation was completed under the cost-effectiveness review.

6.2.1. Pacific Power Response to Cost-Effectiveness Recommendations

As part of the evaluation review, the review team revisited the recommendations made in the 2012-2013 report to see if and how Pacific Power has responded. Table 15 summarizes prior cost-effectiveness recommendations as well as Pacific Power's response. While the review team continues to recommend that Pacific Power consider additional load shapes and track the actual measure life for all measures and projects (not just at the measure category level), the review team also acknowledges the benefits of consistency across IRP and program years to provide for easier comparative analysis.

Table 15: Prior Cost-Effectiveness Recommendations and Pacific Power Response

Prior Recommendation	Pacific Power Response
Consider providing third party reviewers step-by-step process (or an Excel-based example) for deriving the cost-effectiveness values to increase transparency.	Cost effectiveness calculations are performed by third party consultants for annual reports and program evaluations. Cadmus utilizes DSM Portfolio Pro to calculate cost effectiveness. The software reduces input errors associated with manual input and has been reviewed by various state commissions. Pacific Power feels the benefits associated with the consultant's software are greater than the risks associated with manual input. The third party consultants are available to provide demos on the software and to answer any associated cost effectiveness questions. For 2014 Annual Report, Navigant provided the supporting spreadsheets for the cost effectiveness calculations.
Include additional load shapes from other sources that are "transferable" to Pacific Power service territory.	The company utilizes end use load shapes to time differentiate savings value(s) during planning and program delivery. The load shapes currently utilized for program cost effectiveness are the same as those utilized for decrement value development and the IRP inputs. The current information serves to identify larger differences in value (peak vs. flat, winter vs, summer, etc.). Information as described in the 2009 report prepared by DNV KEMA identifies additional data sources (and opines on the transferability), but estimates of costs and benefits on the company DSM

Prior Recommendation	Pacific Power Response
	planning and delivery process was not readily available. The company has considered updates to load shapes used throughout the DSM planning and delivery process, but has elected to continue utilizing the existing load shapes throughout the planning and delivery process so that IRP to IRP, or program year to program year, or biennial period to biennial period explanations can focus on changes in technology types, measure saturations, costs, ramp rates, etc. The company will continue to evaluate this recommendation as the DSM planning process (conservation potential assessment) starts again in preparation for the 2017 IRP.
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. Page 56 states "It would behoove Pacific Power to develop a measure life look-up table for non-deemed measures. A more precise measure life provided by Pacific Power 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 company is currently assessing cost effectiveness on a measure group. Measure groups generally align with end uses and includes multiple measures (equipment or configurations) associated with that end use (or measure group). Additionally, this aligns with the load shapes and LF decrements provided via the IRP process. The measure group/end use convention narrows the selections of load shapes and decrement values and minimizes the need for weighted load shapes or decrement values. However within a measure group, there may be extensive configurations of equipment types and some may have different measure life. The company has retained a third party consultant in conjunction with the program evaluation process to review the non-residential program measure life to ensure alignment and consistency. Information from this review will be included in the TRL and program documentation as appropriate and may minimize the need to aggregate or weight measure life within the business programs.
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. Pacific Power should	Market characterization reports identify and document the methodology for measure cost reporting (this is likely captured in the TRL). For outsourced delivery, "deemed or actual" is provided to identify if the costs are deemed values or project specific actuals.

Prior Recommendation	Pacific Power Response
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.	Documentation - There is guidance on eligible project costs in the program manuals that have been provided to the consultants and outsourced delivery. The baseline checklist provides guidance on determining the baseline and this then leads to whether an incremental cost would be appropriate or the invoiced cost. Specifying invoice requirements can be problematic and lead to "proforma" invoices submitted that meet program requirements but are not the actual invoice paid by the customer. Instead, the program gathers the actual invoice paid by the customer and documents additional details in the project file.

6.3. Recommendations

The review team recommends that Pacific Power start tracking and recording the measure life for all measures and projects (weighted average measure life or default measure lives based on the most common measures can be applied to complex custom projects) even if the utility continues to use measure category values for reporting cost-effectiveness metrics. Documenting the measure life for every measure recorded in the DSMC tracking system would allow for easier validation of the measure category assumptions used in cost-effectiveness calculations. This information could also help Pacific Power better assess measure level cost-effectiveness.

7. CONCLUSIONS AND RECOMMENDATIONS

Below are compilations and summaries of review team findings, recommendations and next steps for this study. Refer to the corresponding sections for more details.

7.1. Conclusions

Across all aspects of the review, we found that Pacific Power proactively addressed the recommendations from the previous round of review as covered in the sections above. Other results are summarized by task below.

Portfolio Electric Savings Review

The review team verified the savings claimed for 2014 and 2015 and does not recommend any adjustments to that claim. For 2015, the review team concluded that Pacific Power is satisfactorily estimating savings with one exception – the reported savings should be reduced by the 21,858 kWh for the lighting project with incorrect hours of operation. Beyond savings estimation, the review team encountered challenges around dates and matching to the TRL. Opportunities for improvements in these areas are listed in the recommendations below.

Savings Verification Process Review

The review team once again found Pacific Power's verification practices to be in line with best practices. Pacific Power has strengthened its verification practices since the last assessment of the 2012-2013 programs by implementing appropriate solutions to all of the review team's previous recommendations. As noted in the prior Verification of Savings report, all of Pacific Power's programs conducted site verification of installed measures with the exception of HES, which does not conduct any verification for a subset of measures (appliances, water heaters, evaporative coolers, and air conditioners) that represent a small fraction of program savings (less than 10%). Most inspections are contracted out, and generally conducted by program implementers or a third party consulting engineering firm. The programs with largest savings inspect 100% of their largest projects and the incentive trigger for inspection varies by measure type.

As part of the Savings Verification Process Review, the review team also compared Pacific Power's verification strategies to industry best practices, which revealed the following findings:

- *Overarching verification guidelines.* Pacific Power has established program-level guidelines for implementing risk-based verification procedures which 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 Verification.* Procedures for reviewing key documents and projects with large savings claims and incentives are in place.

Tracking and Reporting Systems Review

The review team's assessment of Pacific Power's practices for tracking and reporting found that they are in line with best practices. Pacific Power has fully implemented the DSMC tracking system which enables them to accurately track their programs on a project and measure level. The DSMC platform provides documentation, project flow checks, and controls on incentive payments and measure details to properly track, verify, report, and evaluate program achievements.

Impact and Process Evaluations Review

The review team investigated Pacific Power's 2014 and 2015 evaluation efforts and compared the evaluation activities with industry best practices. Pacific Power has addressed the review team's prior evaluation recommendations from the 2012-2013 Verification of Savings Report and has formalized a process to address program evaluation results and recommendations. The overall evaluation strategy is comprehensive, and if implemented as planned, demonstrates best practices.

Cost-Effectiveness Calculations Review

The review team did not review the calculation methodologies again as they were unchanged from the previous review conducted for the 2012-2013 Verification of Savings study and previously found to be reasonable and consistent with industry-accepted methodologies. The cost-effectiveness methodologies utilized by third party consultants hired to evaluate specific programs as well as portfolio cost-effectiveness reference a common source, the California Standard Practice Manual (which is also the NAPEE-referenced source). The review team found that Pacific Power continues to assign load shapes and measure lives at broad measure category levels which could be improved upon to support more accurate cost-effectiveness calculations. Otherwise, the cost-effectiveness calculations appear to follow best practices.

7.2. Recommendations

Portfolio Electric Savings Review

- Key dates should be labeled in project documentation for all measures to assist with verifying tracked cost recovery dates
- Clearly define a policy for establishing the cost recovery dates for projects being claimed at the beginning or end of the year, e.g., purchase date, installation date, invoice date, or incentive payment date, and ensure it is followed consistently
- Include the TRL Measure Reference Number and Effective Date in the tracking data report, particularly for deemed measures
- Ensure measure descriptions and quantities of appropriate units are tracked and updated accurately in DSMC and consistent with TRL entries

Savings Verification Process Review

- Continue to monitor the periodic evaluation results and consider implementing a new and appropriate verification approach if any issues arise in the future.

Tracking and Reporting Systems Review

- Reiterating a recommendation from above, the review team again recommends Pacific Power continues to review all listed best practices and ensures on a regular basis that they are assessed and properly implemented as related to tracking and reporting for its portfolio of programs.
- While not critical to confirming proper measure implementation or assessing program cost-effectiveness, the review team recommends that Pacific Power consider assigning a measure life to all active measures (including a default or weighted average measure life for different types of custom projects) in the TRL. Should Pacific Power wish to evaluate the measure life assumptions currently assigned to measure categories (used for cost-effectiveness analysis), having a measure life for every energy saving measure or project in a measure category is necessary to calculate a weighted average measure life.

Impact and Process Evaluations Review

The review team does not have any evaluation related recommendations at this time.

Cost-Effectiveness Calculations Review

- As previously stated, the review team recommends that Pacific Power start tracking and recording the measure life for all measures and projects (weighted average measure life or default measure lives based on the most common measures can be applied to complex custom projects) even if the utility continues to use measure category values for reporting cost-effectiveness metrics. Documenting the measure life for every measure recorded in the DSMC tracking system would allow for easier validation of the measure category assumptions used in cost-effectiveness calculations. This information could also help Pacific Power better assess measure level cost-effectiveness.