Appendix 1

2016-2017
Plan Condition Requirements and Compliance

Pacific Power

June 1, 2018

2016-2017 Plan Condition Requirements and Compliance

Docket UE-152072 Order 01 (3) (a)		
The Company shall continue to use its Demand-Side Management Advisory Group.	A list of 2016 and 2017 Advisory Group meetings, is provided in the Company's 2016 and 2017 Annual Reports on Conservation Acquisition.	✓
Docket UE-152072 Order 01 (3) (b)		
Pacific Power has a separate Washington low income advisory group ("Low Income Advisory Group") that includes members representing customers with limited income. Any issues related to conservation programs for customers with limited income will need to be considered and reviewed by the Low Income Advisory Group.	Low Income commitments from the Commission issued Order 12 in Docket UE-152253 were discussed with representatives from the organizations mentioned in the order as well as from our partnering weatherization agencies. Meetings took place on December 15, 2016 and February 2, 2017. Low income program revisions were mutually agreed upon with low income stakeholders and filed in Advice 17-03 on March 16, 2017. Additional information is provide dint eh 2017 Annual Report on Conservation Acquisition.	✓
Docket UE-152072 Order 01 (3) (c)		
Pacific Power will consult the DSM Advisory Group members on the scope and design of the conservation potential assessment that will inform the 2019 IRP and Washington 2020-2029 conservation forecast in advance of beginning the work i.e., prior to the vendor request for proposal, etc.	Scope of work provided to DSM Advisory Group on June 12, 2017. Comments received on June 28, 2017 and discussed at June 29, 2017 DSM Advisory Group meeting. Email follow-up to DSM Advisory Group provided on July 14, 2017. Conservation Potential Assessment RFP released in late July 2017.	✓
Docket UE-152072 Order 01 (3) (d)		
Pacific Power must consult with its DSM Advisory Group no later than July 1, 2017 to identify achievable conservation potential for 2018-2027 and to begin to set the annual and biennial targets for 2018-2019 biennium, including necessary revisions to program details.	Company began these discussions at the June 29, 2017 DSM Advisory Group meeting.	✓
Docket UE-152072 Order 01 (4) (5)		
Pacific Power must provide its proposed annual budgets in a detailed format with a summary page indicating the proposed budget and savings levels for each electric conservation program, and subsequent supporting spreadsheets providing further detail for each program and line item shown in the summary sheet. Pacific Power must maintain its conservation tariffs, with program descriptions, on file with the Commission. Program details about specific measures, incentives, and eligibility	Copies of the Company's annual budgets, conservation tariffs and/or program descriptions, including details on specific measures, incentives and eligibility are contained in Appendix 7, the Company's Demand-Side Management Business Plan for 2016–2017 filed in Docket UE-152072. This information was refreshed in the Company's 2017 Annual Conservation Plan filed on November 15, 2016. The last update to the 2017 Annual Conservation Plan was provided as draft to the DSM Advisory Group on December 29, 2017 to include impacts of program changes during 2017 and to indicate the possibility of conservation achievement shortfall relative to the WUTC approved target. This revision was filed on February 27, 2018 to complete the record in this docket	✓

requirements must be filed as tariff attachments or as revisions to Pacific Power's DSM Business Plan.		
Docket UE-152072 Order 01 (6) (a)		
Pacific Power has identified a number of potential conservation resource types as set forth on page 11 in Pacific Power's BCP. The Commission is not obligated to accept savings identified in the BCP for purposes of compliance with RCW 19.285. Pacific Power must demonstrate the cost effectiveness of its conservation programs to the Commission after the savings are achieved.	Cost effectiveness of programs and the portfolio is provided as an appendix to the Annual Report (s) on Conservation Acquisition for 2016 and 2017.	✓
Docket UE-152072 Order 01 (6) (b)		
When Pacific Power proposes a program, it must present the program to the DSM Advisory Group with program details fully defined. After consultation with the DSM Advisory Group in accordance with WAC 480-109-110(1)(h), Pacific Power must file a revision to its DSM Business Plan in this Docket. The revision may be acknowledged by placement on the Commission's No Action Open Meeting agenda.	Copies of the Company's annual budgets, conservation tariffs and/or program descriptions, including details on specific measures, incentives and eligibility are contained in Appendix 7, the Company's Demand-Side Management Business Plan for 2016–2017 filed in Docket UE-152072. This information was refreshed in the Company's 2017 Annual Conservation Plan filed on November 15, 2016. The last update to the 2017 Annual Conservation Plan was provided as draft to the DSM Advisory Group on December 29, 2017 to include impacts of program changes during 2017 and to indicate the possibility of conservation achievement shortfall relative to the WUTC approved target. This revision was filed on February 27, 208 to complete the record in this docket.	✓
Docket UE-152072 Order 01 (6) (c)		
Pacific Power must spend a reasonable amount of its conservation budget on evaluation, measurement, and verification ("EM&V"), including a reasonable proportion on independent, third-party EM&V. Pacific Power must perform EM&V annually on a two-year schedule of selected Programs such that, over the EM&V cycle, all major programs are covered. The EM&V function includes impact, process, market and cost test analyses. The results must verify the level at which claimed energy savings have occurred, evaluate the existing internal review processes, and suggest improvements to the program and ongoing EM&V processes. Evaluation reports involving analysis of both program impacts and process impacts of the programs evaluated in the prior year must be part of the Annual Report on Conservation Acquisition described in WAC 480-109-120(3)(v).	As documented in the Company's 2016-2017 Biennial Conservation Report, the Company spent $993,927 on third-party evaluation, measurement and verification (process and impact evaluations, verification of savings) of its conservation program results over the two year period. This represents 4.3% of the Company's $23,271,570 in conservation expenditures (excluding NEEA) over the same period. NEEA expenditures are excluded since the Company is not evaluating NEEA. Information on completed evaluations is provided in the annual reports. Completed evaluations are available on http://www.pacificorp.com/es/dsm/washington.html	✓

Docket UE-152072 Order 01 (6) (d) (i) (ii)		
An independent third-party review of portfolio-level electric energy savings reported by Pacific Power for the 2016-2017 biennial period, from existing conservation programs operated during that period, shall be conducted, per WAC 480-109-120(4)(b)(v).	Attached in the 2016-2017 Conservation Report as Appendix 2 is the Washington Savings Verification and Reporting Process 2016-2017 Review. SBW Consulting, Inc., the reviewer was selected through a proposal request process.	✓
Docket UE-152072 Order 01 (7) (a)		
Modifications to the programs must be filed with the Commission as revisions to tariffs, revisions to Pacific Power's DSM Business Plan, or revisions as summarized in the process described in the Company's DSM Business Plan.	Copies of the Company's annual budgets, conservation tariffs and/or program descriptions, including details on specific measures, incentives and eligibility are contained in Appendix 7, the Company's Demand-Side Management Business Plan for 2016–2017 filed in Docket UE-152072. This information was refreshed in the Company's 2017 Annual Conservation Plan filed on November 15, 2016. The last update to the 2017 Annual Conservation Plan was provided as draft to the DSM Advisory Group on December 29, 2017 to include impacts of program changes during 2017 and to indicate the possibility of conservation achievement shortfall relative to the WUTC approved target. This revision was filed on February 27, 2018 to complete the record in this docket	✓
Docket UE-152072 Order 01 (7) (c)		
Conservation Efforts without Approved EM&V Protocol — Pacific Power may spend up to ten (10) percent of its conservation budget on programs whose savings impact has not yet been measured, as long as the overall portfolio of conservation passes the Total Resource Cost (TRC) test as modified by the Council. These programs may include information-only, behavior change, and pilot projects. Pacific Power may ask the Commission to modify this spending limit following full DSM Advisory Group consultation.	PacifiCorp spent approximately 0.5% of its conservation budget (excluding NEEA) during the 2016-2017 biennial period on the Be wattsmart, Begin at Home (energy education in schools) program. The savings impact from this program was not measured or reported. .	✓
Docket UE-152072 Order 01 (8) (a) - (c)		
(a) The Commission uses the Total Resource Cost Test (TRC), as modified by the Council, as its primary cost-effectiveness test. The Council-modified TRC test includes quantifiable non-energy benefits, a risk adder, and a 10 percent conservation benefit adder. Pacific Power's portfolio must pass the TRC test. All cost-effectiveness calculations will assume a Net-to-Gross ratio of 1.0, consistent with the Council's methodology. (b) Pacific Power must also provide calculations of the Program Administrator Cost Test (also called the Utility Cost Test) as described in the National Action Plan for Energy	See Appendices 3 of the Ten-Year Conservation Potential and Biennial Conservation Target reports, "Comparison of Regional Methodologies" filed in Docket UE-152072. This information was also provided in prior dockets; UE-132047 and UE-111880. In addition to resource planning and avoided cost development methodology comparisons these appendices provide information on how the Company's Total Resource Cost calculation complies with the cost-effectiveness definition (RCW 80.52.030(8)), incorporating the 10 percent conservation benefit and a risk adder consistent with the Council's approach. Cost effectiveness assessments for the programs in the 2016-2017 business plan as well as portfolio cost effectiveness assessments are provided in Appendix 7 to the 2016-2025 report. Program and portfolio level cost effectiveness was provided in the 2016 and 2017 annual reports and also included quantifiable non-energy benefits. The 2015 potential study update was used to inform the IRP selections which forms the basis for the target in this biennial period. The 2015	✓

Efficiency's study "Understanding Cost- Effectiveness of Energy Efficiency Programs." (c) Conservation-related administrative costs must be included in portfolio level analysis.	potential study included the effects of non-energy benefits as a reduction to energy efficiency measure costs.	
WAC-480-109-100 (a) (iv) (c)		
Adaptively manage. Continuously review and update as appropriate the conservation portfolio to manage changing market conditions and developing technologies. A utility must research emerging conservation technologies and assess the potential of such technologies for implementation in its service territory. Pilots. A utility must implement pilot projects when appropriate and expected to produce cost-effective savings within the current or immediately subsequent biennium as long as the overall portfolio remains cost effective.	The steps to adaptively manage programs is included in the 2016 and 2017 Annual Report(s) on Conservation Acquisition. Information on emerging conservation technologies used to inform the 2016-2017 targets is available in Volume 2 of the 2015 conservation potential assessment available on the company web site. Research technology research undertaken during the 2016-2017 biennial period and used to inform the 2018-2019 is available in Volume 2 of the 2017 conservation potential assessment also available on the company web site. Annual reports on Conservation Acquisition also provide information on pilot efforts undertaken by the Company and their program administrators during the period.	✓
WAC-480-109-110 (1) (h)		
(1) Scope of issues. A utility must maintain and use external conservation advisory group of stakeholders to advise the utility on conservation issues including, but not limited to: (h) The need for tariff modifications or mid-biennium program corrections.	Program changes made during the biennial period are presented to the DSM Advisory Group, typically on email for review and comments prior to beginning the noticing period of the prescribed change process included in the program tariff(s). A description of changes and the effective date for each program are provided in the Annual Report(s) on Conservation Acquisition.	✓

Appendix 2

2016-2017
Verification of Savings

Pacific Power

June 1, 2018

FINAL REPORT
WASHINGTON SAVINGS VERIFICATION AND REPORTING PROCESS 2016-2017 REVIEW

Submitted to

PACIFICORP
825 NE MULTNOMAH STREET
PORTLAND, OR 97232

Submitted by

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

In association with

DNV GL
Oakland, CA

April 27, 2018

sbw

ENERGY + WATER + EFFICIENCY

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Introduction

PacifiCorp dba Pacific Power contracted with SBW Consulting, Inc., in conjunction with DNV GL, to perform an independent portfolio-level review of their reported 2016-2017 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 2016-2017 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 2016-2017 portfolio claims, focusing on changes made since the 2014-2015 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 three-quarters of the projected biennial savings. Smaller programs, namely Low Income Weatherization (LIW) 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)
- Project documents for 90 sampled projects: 16 HES, 68 WSB and 6 LIW Savings Verification Process Review

[1] The SBW team conducted the verification of Washington savings studies for the 2012-2013 and 2014-2015 biennia which concluded in reports included in the appendices of Pacific Power's Biennial Conservation Report for each biennium.

Savings Verification Process Review

The review team analyzed the Pacific Power verification procedures for the three programs highlighted in the electric savings review described in Section 3, namely: WSB, HES, 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 2016 annual report to tracking data report, reviewed 2017 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 2016-2017 program years, the review team examined five evaluation reports completed since the 2014-2015 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

implementation as well as participant response, noting where there were gaps in topics covered in the evaluations across the portfolio.

[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.

Cost-Effectiveness Calculation Review

The review team examined Pacific Power's cost-effectiveness calculations that were reported in Appendix 2 of the 2016 Annual Report and prepared for the 2017 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 2016 and 2017 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 2016-2017. Three minor documentation errors were found.

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. This cost recovery verification is still difficult to verify for HES rebate projects, but the WSB documentation has improved since the last biennium.
- Although TRL measure reference numbers are not tracked directly, the inclusion of version numbers gives enough unique information to find the corresponding measure and its program requirements. This is an improvement over the previous biennium.
- The sample projects reviewed for WSB revealed instances in which the program used incorrect tracking details, or the program implementer had made errors documenting project details. None of these findings have impacts on energy savings.

Savings Verification Process Review

The review team once again found PacifiCorp's verification practices to be in line with best practices. As noted in the 2014-2015 Verification of Savings report, all of Pacific Power's programs conducted site verification of installed measures with the exception of HES, which

[4] The 2017 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.

does not conduct any verification for a subset of measures that represent a small fraction of program savings. 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.

The review team did not find any significant changes to PacifiCorp's measure installation verification strategies from the prior Verification of Savings report. The biggest change noted by the review team was PacifiCorp's expansion of the detail included in the "savings verification and reporting framework" section of their wattsmart Business Program Guidelines for Contractors. The additional detail helped further define verification procedures, expectations and contractor responsibilities. This added detail helps strengthen contractor understanding of PacifiCorp's verification strategy for the program and the types of verification activities that are required for different types and sizes of projects.

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 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

Similar to past findings, the 2016-17 assessment of PacifiCorp's tracking and reporting systems highlighted that they continue to be in line with best practices. PacifiCorp's DSMC tracking system enables them to accurately track and report on their programs on a project and measure level basis. 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 2016 and 2017 evaluation efforts and compared the evaluation activities with industry best practices. Overall, PacifiCorp's evaluation practices continue to be in-line with best practices which is consistent with previous verification study findings.

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 2014-2015 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 implemented a key recommendation from 2014-2015 Verification of Savings study to assign appropriate measure lives to all measures in their TRL, including custom measures. Implementing this recommendation allowed PacifiCorp to calculate updated weighted average measure lives for each measure category and improve the accuracy of their 2016 and 2017 cost-effectiveness calculations. Overall, the cost-effectiveness calculations continue 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

- 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 unique Measure Name and TRL Version Number, in the DSMC Evaluation Report (tracking data) provided to evaluators and third party reviewers to facilitate matching tracked measures to the TRL.
- 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

Review 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.

Impact and Process Evaluation Review

The review team recommends that the next wattsmart Business evaluation should add interviews with market actors or trade allies such as contractors, distributors, manufacturers, and retailers about barriers and ways to improve the program to round out the perspective provided by participants, non-participants, and program staff.

Cost-Effectiveness Calculation Review

The review team does not have any cost-effectiveness related recommendations at this time.

1. INTRODUCTION

PacifiCorp currently operates residential, agricultural, 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 2016-2017 biennial electric conservation energy savings in the State of Washington.

The primary objective of this review was to develop a summary report to be submitted as an appendix to PacifiCorp's 2016-2017 Biennial Conservation Report (BCR), which will be filed by June 1, 2018. This review did not intend 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 provided an assessment of PacifiCorp's evaluation, measurement, and verification (EM&V) procedures and third-party evaluation methodologies, and whether they meet reasonable industry best practice standards.

This review relied on multiple approaches. The review team carefully examined select overarching documents, databases, and calculations underpinning the PacifiCorp 2016-2017 portfolio claims. In addition, the review team randomly sampled project-level documentation for each program, and subjected these sampled projects to careful scrutiny and analysis, including field verification. Examining the portfolio claims at both summary and detail levels helped identify problems and potential improvements that can strengthen PacifiCorp's future claims.

This report provides results from the review of the *Washington Annual Report on Conservation Acquisition for January 1, 2016 – December 31, 2016*, issued July 19, 2017 (referred to in this report as the *2016 Annual Report*) as well as review of the information being compiled for the *Washington Annual Report on Conservation Acquisition for January 1, 2017 – December 31, 2017* (referred to in this report as the *2017 Annual Report*)[5].The subsequent five sections correspond to the following areas of investigation:

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

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

[5] The 2017 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 PacifiCorp program is shown in Table 1. The two programs of major focus, which collectively account for over 80% of the projected biennial savings, are Home Energy Savings (HES), and wattsmart Business. Smaller programs, namely Low Income Weatherization (LIW) and Home Energy Reports (HER), are also included in the review.

For the 2016 and 2017 reviews, the review team examined 90 randomly-selected project files from the respective program years and selected a subset of those projects for field verification.

Table 1: Summary of Verification Approaches

Tariff Schedule	Program	% of portolio savings goal*	Verification approach
114	Low Income Weatherization	1%	Minor program, did minimal file reviews to validate.
118	**Home Energy Savings**	**29%**	**Major program - conducted file reviews and on-site visits to validate.**
	Home Energy Reports	10%	Reviewed third-party ex post verification.
140	**wattsmart Business**	**55%**	**Major program - conducted file reviews and on-site visits to validate.**
	Northwest Energy Efficiency Alliance (NEEA)	5%	Not included in scope.

* As determined from the 2016-2017 biennial plan.

Further details of the approach for accomplishing the 2016 and 2017 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 Washington Utilities and Transportation Commission's (WUTC) reporting requirements, and the PacifiCorp reports written to meet those requirements.
- **Program materials:** Handbooks that fully define program procedures, such as those for reviewing custom projects or for conducting an inspection. Documents with program cost-effectiveness calculations. Sources of values used to estimate electric savings, incremental cost, and effective useful life for deemed measures. Simplified calculators used to estimate

electrical savings for non-deemed, non-custom measures. Regional Technical Forum (RTF), PacifiCorp and NEEA deemed savings values agreed upon for the 2016-17 programs.

- **EM&V documentation:** Recent process and impact evaluations germane to the 2016 and 2017 claimed savings.
- **Program tracking data:** Database extracts that contain all data behind the 2016 and 2017 savings claim. The extracts included the Technical Reference Library (TRL).

Interview staff

We made inquiries and determined the critical PacifiCorp staff members for phone interviews were the program managers – namely, Nancy Goddard, Don Jones, and Becky Eberle. After a review of the initial documentation and data, we prepared for the interviews by updating our script and checklist of important issues to discuss, focusing on changes since the previous study. The checklist included:

- Determining if there were other relevant documents, such as handbooks, standard calculation procedures, or unpublished evaluations that we did not obtain in the prior step that could be helpful to our effort
- Probing for relevant documentation from other organizations, such as NEEA, RTF, regional utilities, or national sources
- Confirming with sector leads which programs have claimed savings
- Asking about others who might be useful to interview (not only for this task, but also to support the EM&V, cost-effectiveness, and detailed review tasks as well.

Additionally, we inquired explicitly about changes made to programs in response to recommendations from evaluations and the 2014-2015 Verification of Savings study and followed up with staff regarding any unaddressed concerns from the previous Verification study.

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 2016 claimed electric savings in detail. This effort was focused on three areas:

- **Deemed savings:** Reviewed the deemed savings values used for the 2016 programs, with emphasis on measures contributing to a large portion of the program savings, and assessed how those values migrated to the project files and tracking database.
- **Simplified calculations:** Reviewed calculations that account for significant amounts of claimed savings, particularly new or revised methods since 2015, to search for any systemic and/or localized problems.
- **General:** Compared the 2016 Annual Report claimed savings to the program tracking database to identify and investigate variances. Also compared descriptions of the programs in the report to the other reviewed documents to look for any discrepancies.

Sample file reviews

The review team performed an initial review of tracking data to understand the number of projects in each key program, as well as the types of measures, amount of claimed savings, and the distribution of these attributes across the program. Based on this, a preliminary 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. For all of the selected projects, the team either obtained project files from PacifiCorp, or confirmed that the program tracking database contained the relevant information.

Table 2: Sampling and Review Approach by Program

			Sample size*		
Program	**Sampling / review approach**	**% of kWh****	**2016**	**2017**	**Total**
Low Income Weatheri-zation	Each participant had, on average, about 11 measures of widely varying costs and scopes. These projects received UES values of either 1,476 or 2,214 kWh/yr based on version number. Since this is a small program, we performed a few file reviews per the project review matrix (see Table 3), and check the UES values and applicability carefully.	1%	3	3	6
Home Energy Savings	Split sample ~1/4 Upstream lighting, ~3/4 Rebate (Appliance/HVAC/Weatherization) in 2016. Reviewed each project file per the project review matrix. The 2017 sample added kits and reduced the number of rebate measures.	29%	8	8	16
wattsmart Business	Split sample ~1/3 Lighting, ~1/3 Non-Lighting Prescriptive, ~1/3 Non-lighting Calculator/Custom. Reviewed each project file per the project review matrix.	55%	34	34	68
Home Energy Reports	Review evaluation(s). No sampling.	10%			
NEEA	Not part of this verification	5%			
Total		**100%**	**45**	**45**	**90**

* The 2016-2017 file review target is 90, with 50% in 2016 and 50% in 2017.
** As determined from the 2016 Annual Report and supporting data.

The review team followed a standardized review process for the sampled project files. 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 database, checking for correct algorithms and key parameters in simplified calculations, and making sure proper procedures and/or good practices were applied for custom projects. Where applicable, the review team attempted to track down the inputs to the

cost-effectiveness calculations, such as effective useful life or measure cost, for each sampled project. The project review matrix is shown in Table 3.

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

Table 3: Project Review Matrix

Data class	Category	Subcategory	Parameter	Third-party review questions
PacifiCorp Tracking Data		Identifiers	Program Number	
			Project ID	
			Application Number	
			Description of Project ID	
			Program	
			Subprogram	
			Sampling domain	
			Type of savings calculation	
		Measure	Measure Category	
			Measure Type	
			Measure Sub-Type	
			Measure Name	
			Measure Custom Name	
			Quantity	
			Qty Units	
		Savings	kWh savings	
		Life	Measure Life	
		Costs	Measure cost	
			Incentive payment amount	
			Invoice Date	
			Cost Recovery Date	
			Partner Incentive	
			Customer Incentive	
Unit energy savings data			Measure type	
			Unit savings	
			Measure cost	
			Measure life	
3rd party review	General		Date requested	
			Date received	
			Reviewer	

Data class	Category	Subcategory	Parameter	Third-party review questions
				Was complete project file readily available from PacifiCorp? If not, why not?
				Is info complete, well-organized, and understandable?
				Notes
	File comparison w/tracking data	Identifiers	PacifiCorp project number	Match? (Y/N)
			Facility type	A few words to provide a general sense of types of facilities
			General Type	General Type
			Notes	
		Measure	Measure description	Described accurately enough to match documentation?
			Measure type	Match? (Y/N)
			Quantity	Match? (Y/N)
				Source of quantity info--invoices, other documents, inspections?
				Notes
		Savings	Type of savings calculation	Deemed, Calculated, Custom
			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	Measure Life
				Consistent across measure types?
			Notes	
		Costs	Measure cost	Match? (Y/N)
				If No, input documentation costMatch? (Y/N)
				Is it incremental, if appropriate?
			Incentive payment amount	Match? (Y/N)
				Payment amount <= measure cost? Reasonable amount?
			Invoice 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?	
			Notes	
	Verification/Inspection		Evidence of pre and/or post inspection?	
			Is location of business and measure(s) clearly described, so someone else could find them?	
			SBW Site Visit	Recommended? If So Why?
				Date Recruited
				Date Visited
				Describe any discrepancies from project documentation or other concerns
	Savings detail		Deemed	Deemed value up to date
				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 10 of the file reviewed project sites from Home Energy Savings and wattsmart Business programs. Customer interviews verified projects through observations and project-specific questions. This small sample is not statistically significant in any traditional sense, but did help 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 PacifiCorp worked together to develop recruitment letters specific to residential and non-residential participants. PacifiCorp supplied the letterhead. The evaluation team provided PacifiCorp a list of sites which had been selected for on-site inspection. PacifiCorp 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 2016-2017. In the process of the review, we found some minor issues both across programs and specific to certain programs; however, we do not believe these issues affected the savings claimed. Details of our findings are discussed below.

General findings

The following findings correspond to issues found across delivery channels. In the tracking data provided for our 2016-2017 review, PacifiCorp included measure names in the DSMC Evaluation Report which improved association with measures in the TRL. A unique measure and version number in the DSMC Evaluation Report would expedite matching tracked measures with 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 2014-2015 verification study, the review team continued to encounter difficulties associating the various dates provided in the project documentation with the dates in the tracking data, particularly for verifying the precise cost recovery date. For the 2015 review PacifiCorp was able to address this issue by providing check copies or final payment screenshots for each of the sampled projects. An exception is that the documents provided for the 2016-2017 wattsmart Business projects included either a copy of the check to the customer or an incentive approval form to verify the cost recovery within a smaller range of dates.

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.

Home Energy Savings

Upstream Lighting

We reviewed program contractor tracking data for four retailers. The data matched the count and model of lamps listed in the PacifiCorp tracking data. Copies of original receipts were available as backups to the database and were reviewed in the 2017 sample.

Kits and Rebates

No issues were found in the review of the sampled rebates measures. Of the 16 Home Energy Savings projects sampled, 6 were visited for verification (three attic insulation, one heat pump, one thermostat, and one clothes washer). Site visits showed no differences from documentation.

wattsmart Business

This program contains three main categories which were considered separately: wattsmart Business, wattsmart Small Business Lighting, and Midstream Lighting. Sixty-eight of these projects were sampled for review. Thirteen of the sampled projects were selected for field verification and customer interviews.

wattsmart Business contains three domains of interest: Prescriptive, Custom, and Lighting. wattsmart Business Lighting, and Midstream lighting both fall into the lighting domain. The Prescriptive and Custom measures were all non-lighting projects.

Seven of the twelve sampled lighting projects in 2016 had post-install inspections done by a third party. Site visits by SBW for two of the projects verified that all lighting measures were installed and operating as documented. The only exception was an area with a different description being upgraded instead of the one documented. This occurred in project WBWA_151491.

Eleven of the thirty-seven sampled non-lighting projects used custom calculations[6] to estimate savings. There was a thorough level of documentation which allowed reviewers to find most project details. Nine wattsmart Business non-lighting projects were selected for on-site visits and or phone interviews by SBW. Site visits verified that energy conservation measures were mostly installed exactly as documented. Two projects were incorrectly categorized as irrigation pumps. One due to a human error in entering information into the DSMC, and the other due to a misunderstanding of the intent to pump well water as coolant instead of for irrigation.

We concluded that the correct savings were claimed for all sampled projects.

[6] Custom calculators are not the same as the custom Domain. Custom calculators were deemed to have a high level of complexity and would typically involve a pre and post calculation adjusted by collected post install data. The count of custom projects in the 2016 interim report included some custom projects which used standardized calculators. The count in this report is revised to reflect only those sampled projects in 2016-17 which used custom calculators.

2.2.1. PacifiCorp 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 PacifiCorp has responded. Table 4 summarizes prior verification recommendations as well as PacifiCorp's response. As shown in the table, PacifiCorp has proactively addressed all of the verification recommendations.

Table 4: Prior Savings Review Recommendations and PacifiCorp Response

Prior Recommendation	PacifiCorp Response
All Channels	
Key dates should be labeled in project documentation for all measures to verify tracked cost recovery dates.	PacifiCorp now includes these dates in DSMC.
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	PacifiCorp updated the document DSMC Manual Upload and Cost Recovery Process to provide clarity on handling savings claims near the end of reporting cycles.
Assign the TRL Measure Reference Number and Effective Date to each tracked record, particularly for deemed measures	PacifiCorp now includes TRL Measure Reference Number and Effective Date in DSMC.
Ensure measure descriptions and quantities of appropriate units are tracked and updated accurately, particularly for *watt*smart Business projects	PacifiCorp updated the instruction document for measure data entry in DSMC to include guidance on entering proper number of units according to TRL specifications (e.g. 100 HP motor) as well as quantity of measure installed (e.g., 3 motors).

2.3. Recommendations

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

- Include the unique Measure Name and TRL Version Number, in the DSMC Evaluation Report (tracking data) provided to evaluators and third party reviewers to facilitate matching tracked measures to the TRL.
- A cross-reference document should be developed which describes how the various tracked date fields correspond to project files to facilitate verification of cost recovery dates

- Periodic comparison of TRL to information entered by program implementers will ensure continued accuracy in measure reporting.

3. SAVINGS VERIFICATION SYSTEMS REVIEW

3.1. Methodology

The review team assessed the PacifiCorp verification procedures for three of the five programs highlighted in the electric savings review described in Section 2, namely: wattsmart Business, Home Energy Savings, and Low Income Weatherization. The Home Energy Reports program was excluded from the verification review due to the nature and delivery of the program and NEEA was excluded as it is out of scope for this study. The review team focused on changes to PacifiCorp's verification procedures since the previous assessment of the 2014-2015 programs and PacifiCorp'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 included:

- 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 2014-2015 report with the verification procedures outlined in Appendix 2 of PacifiCorp's 2016 Annual Report and in individual program handbooks. The review team focused on the changes to verification procedures of the wattsmart Business program and the Home Energy Savings program as they account for the vast majority of portfolio energy savings. The review team reviewed program verification documentation, template inspection forms, and completed inspection forms. Lastly, the review team investigated PacifiCorp'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. PacifiCorp'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 PacifiCorp's measure installation verification strategies from the 2014-2015 Verification of Savings report. The biggest change noted by the review team was PacifiCorp's expansion of the detail included in the "savings verification and reporting framework" section of their wattsmart Business Program Guidelines for Contractors. The additional detail helped further define verification procedures, expectations and contractor responsibilities. This added detail helps strengthen contractor

understanding of PacifiCorp's verification strategy for the program and the types of verification activities that are required for different types and sizes of projects.

As noted in the prior Verification of Savings report, all of PacifiCorp's programs conducted site verification of a sample of installed measures. There are different triggers (e.g. specific measure types, housing types, energy savings or incentive thresholds) for each program and measure category which drive the number and types of verification activities. In the Home Energy Savings program there are certain measures, primarily delivered through retail channels, that are not subject to site verification but do go through a quality assurance review before incentives are issued.

Table 5 provides an overview of the different project types included in the wattsmart Business verification protocol and the percent of each project inspected. The wattsmart Business Program's verification protocol is highlighted as the program has both typical and custom projects with the largest savings and incentives which require a closer level of inspection. As shown in the table, projects can originate from both PacifiCorp and third party implementers and the verification protocol is different for each project. The savings or incentive threshold that triggers an inspection for the largest projects varies by measure type. All retrofit projects that go through the custom track require both pre-installation and post installation inspections. Additionally, all projects implemented by a PacifiCorp project 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.

Table 5: wattsmart Business Program Verification by Project Type

Project Type[7]	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%	sample
Non-lighting	3rd Party	Retrofits > incentive threshold	100%	100%
Non-lighting	3rd Party	Retrofits and new construction < incentive threshold	0%	sample
Custom	PacifiCorp/	Retrofit	100%	100%

[7] Standard lighting and non-lighting projects (I.e. not custom) include measures that have deemed savings or savings are calculated using a simplified analysis tool

Project Type[7]	Implementer	Project Details	Percent Inspected	
			Pre-Installation	Post Installation
	3rd party energy engineer			
Custom	PacifiCorp/ 3rd party energy engineer	New Construction	N/A	100%

3.2.1. PacifiCorp Response to Prior Verification Recommendations

As part of the savings verification review, the review team revisited the recommendations made in the 2014-15 report to see if and how PacifiCorp has responded. The review team only had one long term and on-going recommendation for PacifiCorp to consider related to quality control and verification procedures for its portfolio of programs, "continue to monitor the periodic evaluation results and consider implementing a new and appropriate verification approach if any issues arise in the future." Through conversations with program managers, and changes implemented through their adaptive management documented in the 2016 annual report, the review team feels that PacifiCorp is constantly monitoring their programs and associated evaluation results and will consider implementing new verification strategies if and when they're warranted.

3.2.2. Comparison with Best Practices

The review team outlines below the relevant best practices for quality control and verification, as drawn from the National Energy Efficiency Best Practices study[8]. Following each of the three best practices, the review team provides a brief assessment of PacifiCorp verification processes observed to date.

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

The National Energy Efficiency Best Practices 2004 study (subsequently updated in 2008) acknowledges that while good M&V and quality control practices are necessary for a successful portfolio of programs, it must also be affordable.[9] The review of verification documentation for

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

[9] National Energy Efficiency Best Practices Study. Volume P1 – Portfolio Best Practices Report. July 2008. Last accessed 8/1/2017: http://www.eebestpractices.com/pdf/Portfolio_BP_Report.pdf

the key programs in PacifiCorp's portfolio revealed that the best practices principles were generally followed by emphasizing verification activities on programs and measures with the largest savings impact and uncertainty. Best practices are listed below in bold followed by an initial summary of review team observations related to PacifiCorp verification practices.

1. **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 wattsmart Business program.
2. **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 wattsmart Business and Home Energy Savings programs allow a reduction in the number of required inspections by prioritizing larger projects for inspection. Additionally, administrative costs are clearly considered at the program level (e.g., grouping wattsmart Business projects together for inspection, although it is not strictly random).
3. **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 wattsmart Business program includes different inspection requirements according to project size thresholds. All new homes and multifamily projects are inspected in the Home Energy Savings program.
4. **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. PacifiCorp's verification practices do reflect the varying nature of different customer sectors, project types and attributes, and savings. Elements related to best practices for effective inspection strategies by measure or program are in bold below, followed by an initial summary of review team observations related to PacifiCorp verification practices.

1. **Obtain a good random sample of vendor and measure types**. The wattsmart Business program conducts both random and non-random inspections. Currently, it is unclear what percent of inspections are random as PacifiCorp does not track this.
2. **Always inspect the first job submitted by a new vendor, depending on program type.** The wattsmart Business program inspects projects completed by new trade allies. Additionally, the Home Energy Savings program inspects the first two projects of new trade allies as part of the onboarding process.

3. **Pre-inspect large or uncertain impact projects, such as those with highly uncertain baseline conditions that significantly affect project or program savings.** 100% pre-inspection is conducted for wattsmart Business projects that represent larger and more uncertain (custom) projects. The program also inspects all projects that exceed an incentive threshold (different by measure).
4. **Clearly define post-inspection rigor and quantity by cost-effectiveness considerations.** The wattsmart Business program includes a robust M&V process for post-inspections.
5. **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 wattsmart Business projects, which represent larger and more uncertain (custom projects) savings.
6. **Ensure inspectors have plenty of hands-on experience.** The residential third party inspector was found to be quite experienced. Post-inspections of large wattsmart Business projects are conducted by qualified engineering firms selected by PacifiCorp. The qualifications for the engineering firms were specified in the original request for proposals.
7. **Ensure that inspectors have adequate training in identifying and explaining reasons for failure.** Trainings are found to be conducted for Home Energy Savings inspectors. It is assumed that the engineering firms ensure their employees are properly trained.

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. The recommended best practices are in bold below followed by our initial observations related to PacifiCorp verification practices.

1. **Verify accuracy of rebates and invoices to ensure the reporting system is recording actual product installations by target market, such as lighting.** The PacifiCorp programs appear to have procedures in place to review applicable invoices, equipment specification documents, manufacturer agreements and retail sales records.
2. **Conduct in-program measurement/impact evaluation for the very largest projects or those with uncertain impacts.** 100% inspection is conducted for wattsmart Business projects that represent larger and more uncertain (custom) projects. 100% pre-inspection is also conducted by the wattsmart Business program for large lighting projects. These occur in-program and prior to payment of incentives.
3. **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.

4. **Monitor evaluation report results across all programs to ensure that verification activities continue to target high risk measures.** PacifiCorp conducts regular evaluations of its largest energy efficiency measures and/or programs.

3.3. Recommendations

The review team once again found PacifiCorp's verification practices to be in line with best practices. PacifiCorp has strengthened its verification practices since the last assessment of the 2014-2015 programs by further expanding the wattsmart Business verification guidelines for contractors. The review team continues to have only one long term and on-going recommendation for PacifiCorp to consider related to quality control and verification procedures for its portfolio of programs.

- Continue to monitor the periodic evaluation results and consider implementing a new and appropriate verification approach if any issues arise in the future.
  - As PacifiCorp 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 PacifiCorp'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 to assess whether the information currently collected by programs is adequate to confirm measures were implemented and tracked properly. The review team also checked the data from PacifiCorp's DSMC tracking system aligns with the program activity and savings claims made by PacifiCorp in their 2016 annual report. The review team conducted an overall assessment of database fields, their use, and accuracy of the data. This effort builds upon 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 claims against the tracking data, 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 PacifiCorp's processes for data reconciliation (e.g., accounting for changes to deemed savings values for measure level data), as well as how data is used to track program goals.
2. Minimum data quality. We 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 PacifiCorp includes in their program process and database. Our experience in program implementation has confirmed the value of developing a comprehensive set of data ranging from project milestones (dates of application received, project installation, incentive payment, etc.), contact logs, inspection results, etc. We checked the PacifiCorp database against good industry practices in regard to program management. Similarly, we know from evaluation experience the critical role the tracking database can play in process and impact evaluations. We examined the database to see how well it supports EM&V activities.
4. Suggested Improvements. Finally, after review of the tracking system, we identified areas in need of improvement.

4.2. Findings

The review team's findings are largely based on the completeness and accuracy of the 2016 program flat files from DSMC as well as the functionality of the DMSC tracking system that was demonstrated during a prior webinar conducted by PacifiCorp staff for the 2014-15 Verification study.

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 PacifiCorp for review included only completed projects or measures with energy savings recognized in the 2016 program year (i.e. cost recovery date in 2016). 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 continue to be present for all projects or measures that received an incentive. Additionally, the flat files now include crucial project milestones information that the DSMC tracking system has always captured but were not displayed in the flat files during the last review, such as whether or not a site inspection was completed (required for incentive payment on wattsmart Business programs over certain incentive thresholds), post inspection date, date application received and approved, this information was not present in the flat file. Previously, PacifiCorp explained that all of that information was contained at the project level in DSMC and the reports would be updated to include the dates relevant for project management which we observed during this review.

In general, PacifiCorp continues to make incremental improvements to their program tracking data collection and reporting. The review team confirmed 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 which is consistent with previous review findings. Additionally, the review team was pleased to see the adoption of a recommendation from the 2014-15 review that PacifiCorp consider tracking measure life at the measure level for all projects. Previously, measure life was assigned at the measure category level (e.g., lighting). This change allows for more accurate reporting of the weighted average measure life for a particular program in any given year.

DMSC Review

The review team did not request another demonstration of PacifiCorp's DSMC tracking system so the findings in this section are largely based on the PacifiCorp webinar presentation of the DSMC database tracking and reporting system delivered for the 2014-15 verification study. In general, the review team was impressed with the overall functionality of DSMC as well as key features such as the direct link to the TRL. PacifiCorp 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 wattsmart Business 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.

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 Home Energy Savings program requires bulk uploads into the system, which was demonstrated by PacifiCorp. Some individual project elements that were demonstrated to the review team were:

1. Tie-in to the TRL where the TRL values are used based on the measure, measure effective date, version number, 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. PacifiCorp 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 2014-2015 report to see if and how PacifiCorp has responded. Table 6 summarizes prior tracking and reporting recommendations as well as PacifiCorp's response. As shown in the table, PacifiCorp has adequately addressed all of the prior recommendations. The review team acknowledges that implementing the measure life recommendation was a complicated and time consuming effort and commends PacifiCorp for adopting the recommendation despite the acknowledged burden.

Table 6: Prior Tracking and Reporting Recommendations and PacifiCorp Response

Prior Recommendation	PacifiCorp 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.	PacifiCorp has shared this recommendation with all Program Managers.
The review team recommends that PacifiCorp 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.	PacifiCorp has implemented this recommended change and there are now measure lives associated with all applicable measures, including the vast majority of custom measures in the wattsmart Business program, in the TRL and in the flat file reports from DSMC. The review team acknowledges that a great deal of work went into implementing this recommended change including on-going data cleaning.

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 PacifiCorp systems observed to date.

Best Practice #1: Defining and documenting data requirements.

This practice incorporates the need to clearly define and identify the key information needed to track and report early in the program development process to measure success. As part of the implementation of the DSMC solution, these elements were clearly defined. For example, it was understood that the Home Energy Savings 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 PacifiCorp 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 PacifiCorp 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 PacifiCorp 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
- Automate routine functions such as monthly reports

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

- 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
  - While note reviewed during the webinar, the review team discussed this topic with PacifiCorp and this information is tracked

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 PacifiCorp's implementation of this best practice element.

Best Practice #4: Data quality.

Data integrity and data quality are key at all levels from paying out incentives to portfolio savings claims. This step was not fully reviewed for the PacifiCorp data systems. However, there are some validation steps built into the 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 PacifiCorp's demonstration of DMSC
- Build in rigorous quality control screens for data entry such as minimizing duplicative entry

4.3. Recommendations

Similar to past findings, the 2016-17 assessment of PacifiCorp's tracking and reporting systems highlighted that they continue to be in line with best practices. PacifiCorp's DSMC tracking system enables them to accurately track and report on 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.

The review team continues to recommend that PacifiCorp 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, especially as programs and data tracking requirements change over time.

5. IMPACT AND PROCESS EVALUATIONS REVIEW

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

5.1. Methodology

To build on the understanding of how PacifiCorp plans and implements M&V practices established during the 2014-2015 verification study, the review team focused on four program evaluations that were recently completed and not previously available for review. The review team obtained relevant M&V documentation from PacifiCorp as well as the Washington Annual Report on Conservation Acquisition (2016) which includes PacifiCorp's response to evaluation recommendations (Appendix 6).

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

The goal of impact evaluations is to assess the direct and indirect benefits of the program. An impact evaluation typically quantifies the extent of the changes in energy usage or demand that are attributable to the program activities. The team used the Model Energy Efficiency Program Impact Evaluation Guide from the National Action Plan for Energy Efficiency to assess the best practices of the PacifiCorp impact evaluations.[10]

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[11] cross-cutting recommended best practices for the review of PacifiCorp'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

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

[11] 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 four program evaluations that were completed since the previous verification study. These were:

- Home Energy Reports, 2014-2015
- wattsmart Business, 2014-2015
- Low Income Weatherization, 2013-2015
- Home Energy Savings, 2015-2016

Overall, the review team found the evaluations to be thorough, with sound methodologies, and well supported findings.

5.2.1. PacifiCorp Response to Evaluation Recommendations

As part of prior evaluation reviews, the review team revisited the recommendations made in the previous verification report to see if and how PacifiCorp has responded; however, the review team did not make any evaluation related recommendations in the 2014-15 report. The review team also looked at how PacifiCorp responded to recommendations made in the individual program evaluations by the evaluator (rather than from the review team) which are documented in Appendix 6 of the 2016 annual report. The review team found that PacifiCorp adequately responded to all of the recent evaluation recommendations. There are additional recommendations for the wattsmart Business program that the review team discussed with the program manager during the in-depth interview that will be formally addressed by PacifiCorp in their 2017 annual report.

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 PacifiCorp’s current evaluation practices compare, are listed below:

1. **Engage the implementation team in the evaluation process.** The Evaluation, Measurement & Verification Framework for Washington clearly outlines roles and responsibilities of PacifiCorp staff, outside consultants, and the Advisory Group. PacifiCorp staff is engaged during the pre-implementation design, post-implementation assessment, and implementation of program stages. PacifiCorp is in compliance with Docket UE-111880 Order 01 (3) (c), which states the Advisory Group should meet quarterly at a minimum.

2. **Create a culture in which evaluation findings are valued and integrated into program management.** The process of reviewing recommendations and developing changes to the program are described in the Framework, indicating that processing the findings of evaluations has been formalized into the PacifiCorp culture. Appendix 6 of the 2016 Washington Annual Reports on Conservation Acquisition presents recent 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 PacifiCorp will examine program spillover and free-ridership when it is feasible to do so, for program design purposes.
7. **Use regular process evaluation activities to provide timely and fresh data.** The Framework establishes a multi-year evaluation rotation schedule. Process evaluations are scheduled to be conducted for each program every two years, but it is the review team's understanding that the implementation of evaluations will be tied in to the budget and prioritization processes as determined in the Biennial Conservation Plan.
8. **Periodically review & update market level information about construction practices, market share and measure adoption.** The Framework discusses planning and design studies, such as potential studies and market characterization studies, that may be conducted based on the relative need across all states served. PacifiCorp is also able to leverage regional measure and market studies conducted by NEEA and the RTF.
9. **Perform market assessments for those programs that have a market transformation (MT) component.** Currently, PacifiCorp does not conduct independent studies for measures or programs in their service territory based solely on the MT component. However, PacifiCorp regularly provides program participation data to NEEA and the Northwest Power and Conservation Council (the Council) to assist in NEEA's reporting of market transformation impacts and the Council's reporting on regional conservation achievements.

10. **Support program review and assessment at the most comprehensive level possible.** The Sample of Multi-Year Evaluation Rotation Schedule in the Framework indicates each program will undergo a process and impact evaluation every two years.

The overall evaluation strategy of PacifiCorp did not change from the last assessment completed for the 2014-15 verification study 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 four evaluation reports listed above were considered part of the current evaluation plan and were reviewed in more detail against evaluation best practices. The overall PacifiCorp evaluation strategy aims to include process and impact evaluations for each program, and all of the evaluations reviewed included elements of both types of evaluations. The Home Energy Reports 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 PacifiCorp's evaluation approach to be in-line with best practices.

By implementing process evaluations on a regular schedule, PacifiCorp has the potential to identify opportunities for updating, streamlining, and generally improving program implementation procedures. As shown in Table 7, the activities described in the four 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 both of the evaluations included interviews with participants. The wattsmart Business evaluation included interviews with program management staff, a summary of program design, logic, and administration. The process component of the Home Energy Reports Program evaluation did not address program administration which the review team deemed to be not applicable and consistent with other similar evaluations reviewed by the review team. In addition to program staff interviews, participant and general population surveys, the Home Energy Savings Program process evaluation also included a benchmarking component to assess the program's performance against similar programs offered around the country. As previously mentioned, PacifiCorp addressed all of the prior evaluation recommendations and the evaluation reports completed in 2016 through early 2018 were found to be in-line with best practices.

Table 7: Review of Process Evaluation Elements

Process Evaluation	Home Energy Reports	wattsmart Business	Low-Income Weatherization	Home Energy Savings
Program Years	2014-15	2014-2015	2013-2015	2015-2016
1. Program Design				
1.1 The program mission	X	X	X	X
1.2 Assessment of program logic	X	X	X	X
1.3 Use of new practices or best practices	X	X	X	X
2. Program Administration				
2.1 Program oversight	N/A	X	X	X
2.2 Program staffing	N/A	X	X	X
2.3 Management and staff training	N/A	X	X	X
2.4 Program information and reporting	X	X	X	X
3. Program Implementation				
3.1 Quality control	X	X	X	X
3.2 Operation practice -- how program is implemented	X	X	X	X
3.3 Program targeting, marketing and outreach efforts	X	X	X	X
3.4 Program timing	X	X	X	X
4. Participant Response				
4.1 Participant interaction and satisfaction	X	X	X	X
4.2 Market and government allies interaction and satisfaction	N/A		X	X
5. Overall Assessment				
5.1 External or internal evaluators	External	External	External	External
5.2 Number of data collection methods	1	3	2	4

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 6. Overall, the current impact evaluations contain all of the components essential for an impact study.

While the review of the Home Energy Reports 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 6: Review of Impact Evaluation Components

		Home Energy Reports	wattsmart Business	Low-Income Weatherization	Home Energy Savings
		2014-15	2014-15	2013-15	2015-16
Overall Assessment					
Evaluators	Ex –External In – Internal	Ex	Ex	Ex	Ex
Status	P - Proposal E - Evaluation Plan C – Completed	C	C	C	C
Portfolio vs. program	S– Single program M– Multiple programs, but not portfolio P– Portfolio	S	S	S	S
Persistence	E – EULs from other sources P – Primary data collection NP – Not provided. Insufficient documentation to score this criterion	NP	P	NP	P
Documentation within evaluation	1 – Insufficient documentation provided 2 – Partial documentation provided 3 – Documentation appears sufficient	3	3	3	3
Recommendations	1 – Report does not include recommendations for program improvements. 2 – Report provides some recommendations, but appears incomplete based on analysis completed.	3	3	3	3

		Home Energy Reports	wattsmart Business	Low-Income Weatherization	Home Energy Savings
		2014-15	2014-15	2013-15	2015-16
	3 – Report provides relatively comprehensive set of recommendations				
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	N/A	1,2,&3	2	2
Approach		Billing Analysis (RCT)	M&V Approach - IPMVP Options	Large-Scale Data Analysis Approach	Deemed Savings Approach
Baseline	Proj – Project-Specific baseline. Perf – Performance Standard baseline. NP – Not provided. Insufficient documentation to score this criterion	Perf	Perf & Proj	Perf	Perf
Sampling	1 – Sampling mentioned, but no description provided. 2 – Sampling partially described. 3 – Sampling approach fully described, or census. NP – Not provided. Insufficient documentation to score this criterion.	3	2	3	3
Precision	1 – No sampling precision reported or discussed. 2 –Sampling precision was discussed in some manner but not completely.	3	3	3	3

		Home Energy Reports	wattsmart Business	Low-Income Weatherization	Home Energy Savings
		2014-15	2014-15	2013-15	2015-16
	3 – Target and achieved precision (or error bounds) were reported. NP – Not provided. Insufficient documentation to score this criterion.				
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	EM	NTGR
Free-ridership	PFR-Partial Free ridership addressed FR - Free ridership addressed, but not Partial free ridership NA - None included	NA	FR	NA	PFR
Spillover effects	PS-Participant NPS - Non-Participant NA - None included	PS	PS	NA	PS

5.3. Recommendations

The review team investigated PacifiCorp's current evaluation efforts and compared the evaluation activities with industry best practices. Overall, PacifiCorp's evaluation practices continue to be in-line with best practices which is consistent with previous verification study findings. The review team has one recommendation for PacifiCorp to consider for their next wattsmart Business evaluation. The review team recommends that the next wattsmart Business evaluation should add interviews with market actors or trade allies such as contractors, distributors, manufacturers, and retailers about barriers and ways to improve the program to round out the perspective provided by participants, non-participants, and program staff.

6. COST-EFFECTIVENESS CALCULATIONS REVIEW

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

6.1. Methodology

The review team analyzed the PacifiCorp cost-effectiveness inputs and results presented in the 2016 Annual Report and the underlying documentation provided by PacifiCorp. 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 lives. Those inputs rely on a variety of primary and secondary sources and are based on the annual program activity and tend to vary more on a year to year basis as program offerings, incentive levels, and market uptake shift.

The objective of the cost-effectiveness calculation review is to assess whether the methodology, inputs, and assumptions used to determine portfolio and program cost-effectiveness are appropriate and consistent with best practices. This section describes how the review team carried out this effort and presents the corresponding findings. PacifiCorp includes cost-effectiveness calculations in the following two types of reports: annual report and program specific evaluation studies. The review team did a due diligence review of the 2016 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 PacifiCorp's cost-effectiveness calculations that were reported in Appendix 1 of the 2016 Annual Report. Similar to the previous verification study, the review team notes the load shapes used in PacifiCorp's cost-effectiveness calculations but did not review the underlying assumptions and analyses used to derive the load shapes. Previously, PacifiCorp indicated that they do not regularly change 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 PacifiCorp's calculation approach, inputs, and assumptions were properly documented and transparent.

1. Review for correct methodology in evaluation reports and 2016 Annual Report
2. Conduct due diligence review of calculation methodology:
   - Did PacifiCorp 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[12], in which they examined and found that PacifiCorp's methodologies for determining avoided costs and total resource cost (TRC) tests were consistent with Northwest Pacific Power and Conservation Council (Council) guidelines. PacifiCorp has indicated that there will not be any substantial revisions to their approach to avoided costs and the TRC test since these WSCWG results were issued. The review team is familiar with PacifiCorp's cost-effectiveness calculation methodology and the methodology has not changed since the last verification study. PacifiCorp 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 PacifiCorp and as interpreted by National Action Plan for Energy Efficiency (NAPEE)[13]. As previously found, the methodologies used by PacifiCorp 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 previous verification efforts.

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

Levelized cost is often used as a convenient and comparable summary metric of the overall competiveness of different utility supply side resources, including DSM programs. Levelized cost represents the present value of the total cost of a program or measure(s) over the life of the measure(s) or program (ideally, the weighted average life of all measures in the program) and converted to equal annual payments. While all of the costs calculated are incurred in year one, levelized cost can be used to express all variable costs over the life of a measure.[14] Similar to NPV, details of the calculation of levelized cost are not documented either by NAPEE or PacifiCorp. However, PacifiCorp does calculate NPV of the cost of the program and the value of the kWh savings to yield a value that can be compared to the $/kWh of a new generation source.

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

[13] 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.

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

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

- **Program Administrator Cost or Utility Cost Test (PAC or 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)[15] as if there was no incentive. Utility costs include marketing, program administration, evaluation, and any direct installation costs incurred by the utility. Incentives are used to offset measure costs and are not included in TRC calculations as they represent a transfer from utility to participant and are not an additional resource cost.
- **PacifiCorp Total Resource Cost Test (PTRC).** This test is the TRC but includes a 10% adder to the benefits to include environmental and non-energy benefits.
- **Participant Cost Test (PCT).** This test considers the costs and benefits from the participant perspective. The cost is the measures' incremental costs above what the participant would have paid for a non-qualifying product. The benefits are the cost savings on the utility bill plus the incentives received.
- **Ratepayer Impact (RIM).** This is the perspective of all participating and non-participating ratepayers which represents how the energy savings may affect potential retail rates. The utility may observe lost revenues due to reduced energy usage from the energy savings accrued from the programs, leading to increased retail rates per kWh. This test includes all utility costs, as well as lost revenues. The benefits are the avoided costs.

6.2. Findings

This section discusses the review team's findings from analyzing the cost-effectiveness calculations for the 2016 program year, based on all information received to date. Gaps in the review are noted below.

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

Calculation Metholodgy

The review team did not review the calculation methodologies again as they were unchanged from the previous review efforts 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 program 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 1 of the 2016 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 2016 Annual Reports are shown in Table 9.

Table 9: 2016-2017 Utility inputs for cost-effectiveness calculations

Variable	2016
IRP Year	2015
Discount Rate	6.66%
Residential Line Losses	9.67%
Commercial Line Loss	9.53%
Industrial Line Loss	8.16%
Irrigation Line Losses	9.67%
Inflation Rate	1.9%

For 2016 and 2017, the most recent IRP West load shape factor decrements 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 water heating decrement was selected for the Home Energy Saving Program's water heating measure category and the residential heating load shape was selected for the program's building shell measure category. Similar to previous verification findings, the predominant measure end-use load shape at an aggregate program or measure category level was used for cost-effectiveness calculations.

The avoided capacity and energy costs are individually assessed based on a program or measure category's annual kWh saved. PacifiCorp uses a percent load factor decrement by load shape end use category to consider the effects of avoided capacity costs. The methodology to calculate the avoided capacity costs ($/kW) to energy costs ($/kWh) was not part of this review. The actual impact load shapes used by PacifiCorp are summarized in Table 7.

Table 7: Measure Life, Load Factor Decrement, and Impact Load Shapes

Program Name	Measure Category	EUL[16] (2016/2017)	Load Factor Decrement[17]
Home Energy Savings	Appliance	14	Res Water Heating
	Building Shell	45	Res Heating
	Electronics	5/NA	Plug Load
	Energy Kits	9/10	Res Water Heating
	HVAC	17	Res Heating
	Lighting	10/12	Res Lighting
	Water Heating	14/13	Res Water Heating
	Whole Home	27	Res Whole House
Home Energy Reporting	HER Legacy/Expansion	1	Res Whole House
Low Income Weatherization	Low Income	37/30	Res Whole House
wattsmart Business	Additional Measures	13	N/A[18]
	Building Shell	15/17	Commercial Cooling
	Compressed Air	15	Industrial
	Energy Management	11/3	Plug Load
	Farm & Dairy	14	Plug Load
	Food Service Equipment	9/10	Industrial
	HVAC	16/14	Industrial[19]
	Irrigation	11	Commercial Cooling[20]
	Lighting	13/14	Commercial Lighting
	Motors	11/14	Industrial
	Refrigeration	12/15	Industrial
	Wastewater	16	Industrial

[16] Effective Useful Life

[17] The % LF Decrement used by the program/measure category is defined in Appendix 1 of the 2016 annual report.

[18] New measure category in 2017, LF decrement was not available for this report

[19] HVAC load shape

[20] Irrigation load shape

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 verified the measure life values used at the measure, measure category and program levels for cost-effectiveness calculations. Similar to previous findings, the measure category life or weighted average (by kWh savings) measure life by program was used to calculate cost-effectiveness by the measure category or program level assessment. Table 7 summarizes the measure life (or EUL, effective useful life) used by program or measure category.

In both the 2012-13 and 2014-15 verification studies, the review team recommended that PacifiCorp 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. Previously, the wattsmart Business program used default values for measure categories which may or may not have reflected the actual measure life (or weighted average measure life) of a specific project. As mentioned in Section 4.2.1, PacifiCorp implemented this recommendation and added measure lives to custom measures that were previously deemed at the category level. This resulted in the weighted average measure life at the measure category level to shift both up and down (depending on the category). From the review team's perspective, this change has resulted in more accurate cost-effectiveness analysis as the measure lives used better reflect the program activity from 2016-17.

Cost Inputs

The two cost inputs are as follows:

- Administrative (utility and program)
- Measure costs

Administrator Costs

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

Under administrative costs, PacifiCorp includes:

- Portfolio level costs (see Table 2, Appendix 1 of the 2016 annual report)
  - School energy education
  - Outreach and communication
  - Portfolio level expenditures
- Program costs
  - Marketing

- Utility administration
- Energy engineering

The review team found PacifiCorp's disaggregation of costs within programs and across the portfolio to be detailed and providing good insights on the cost allocation.

Incremental Measure Costs

The incremental measure cost (IMC) can be either the incremental cost or the full cost of a measure. The appropriate value is dependent on the measure application, i.e., retrofit or early replacement, replace-on-burnout (ROB) or natural replacement, or new construction. The 2013 Regional Technical Forum document "Guidelines for the Estimation of Incremental Measure Costs and Benefits," provides definitions of the proper cost basis for measures. The source of this value may vary by program delivery method, market sector, measure type, or other variables. This report is a good reference for defining the best practices that address measure costs. 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, PacifiCorp prefers to use actual costs for applications where actual costs are available. Actual costs are more valuable for planning purposes. Actual costs are not available in all cases, so deemed values are used when actuals are not available. For lighting retrofits, the measure costs are actual costs. For lighting new construction and major renovation, the incremental measure costs are usually deemed based on site specific inputs. For non-lighting, measure costs may be actual or deemed depending on the project. For prescriptive non-lighting measures where the assumed baseline is energy code or a federal standard, the costs are deemed since incremental costs are not usually reflected on customer invoices.

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

1. Residential
   - Home Energy Savings – This program tracks actual full measure costs, but for cost-effectiveness calculations, the deemed incremental costs are used.
   - See Ya Later Refrigerator – 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.
   - Low Income Weatherization – The program uses actual costs.
2. Commercial and Industrial
   - wattsmart Business - The program uses actual costs for retrofits and incremental measure costs for projects where the participant would have installed new equipment in the absence of the program (e.g., ROB).

Benefit Inputs

The benefits tracked by PacifiCorp include energy and demand savings as well as non-energy benefits for a subset of programs. While PacifiCorp 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 or based on a simple analysis tool and those that are not were spot-verified as part of the portfolio electric savings review discussed in Section 2. The energy savings are multiplied by by avoided costs to calculate. 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 Home Energy Savings program from water savings on clothes washers, avoided lamp replacement for lighting and the Low Income Weatherization 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 2016 cost-effectiveness calculations, PacifiCorp used a nominal discount rate of 6.66 percent which came from their 2015 IRP. This discount rate is very close to the range found by the Council for other regional investor-owned utilities.

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 1 of the 2016 Annual Report captured the incentive payments correctly. Their correct assignment or calculation was completed under the cost-effectiveness review.

6.2.1. PacifiCorp Response to Cost-Effectiveness Recommendations

As mentioned in the findings section above, previously, the review team recommended that PacifiCorp 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. The review team argued that 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. PacifiCorp has implemented this recommendation and assigned appropriate measure lives to all measures in their TRL, including custom measures, which allowed the utility to calculate updated weighted average measure lives for each measure category for the 2016 and 2017 cost-effectiveness calculations.

6.3. Recommendations

The review team does not have any cost-effectiveness related recommendations at this time.

7. CONCLUSIONS AND RECOMMENDATIONS

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

7.1. Conclusions

Across all aspects of the review, we found that PacifiCorp 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 2016 and 2017 and does not recommend any adjustments to that claim. We were challenged with issues around dates and matching to the TRL in our review of the HES and wattsmart Business programs. Opportunities for improvements in these areas are listed in the recommendations below.

Savings Verification Systems Review

The review team continued to find PacifiCorp's verification practices to be in line with best practices. Furthermore, PacifiCorp has strengthened its verification practices since the last assessment in 2015 by implementing appropriate solutions to all of the review team's previous recommendations.

Tracking and Reporting Systems Review

Similarly, the review team observed PacifiCorp's tracking and reporting system to also be in line with best practices.

Impact and Process Evaluations Review

Overall, the review team found PacifiCorp's evaluation practices to be in line with best practices.

Cost-Effectiveness Calculations Review

As previously noted, PacifiCorp adopted a prior recommendation to assign measures lives to all measures, which allows for more accurate weighted average measure lives at the measure category level and improved cost-effectiveness reporting. This was evidenced by shifting measure category lives between 2016 and 2017, reflecting actual program activity. Overall, the review team found that the cost-effectiveness calculations appear to follow best practices.

7.2. Recommendations

Portfolio Electric Savings Review

- Include the unique Measure Name and TRL Version Number, in the DSMC Evaluation Report (tracking data) provided to evaluators and third party reviewers to facilitate matching tracked measures to the TRL.

- A cross-reference document should be developed which describes how the various tracked date fields correspond to project files to facilitate verification of cost recovery dates
- Periodic comparison of TRL to information entered by program implementers will ensure continued accuracy in measure reporting.

Savings Verification Systems 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

Review 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

Impact and Process Evaluations Review

The review team recommends that the next wattsmart Business evaluation should add interviews with market actors or trade allies such as contractors, distributors, manufacturers, and retailers about barriers and ways to improve the program to round out the perspective provided by participants, non-participants, and program staff.

Cost-Effectiveness Calculations Review

The review team does not have any cost-effectiveness related recommendations at this time.

Appendix 3

2016-2017
NEEA Final Savings Estimate

Pacific Power

June 1, 2018

Memorandum

March 30, 2018

TO: Don Jones, DSM Planning and Development Manager, Pacific Power; Eli Morris, Program Manager, PacifiCorp

FROM: Christina Steinhoff, Principal Planning Analyst
Kathryn Bae, Senior Planning Analyst

CC: Stephanie Rider, Senior Manager, NEEA Planning; Susan Hermenet, Director of Planning, Evaluation and Technology

SUBJECT: 2017 Annual Report (Final 2016-2017 Savings Estimate)

This memo tracks the performance of NEEA's programs against its original 2016-2017 forecast. Appendix A documents NEEA's methodology to calculate and track energy savings. Details about the baseline and technical assumptions by measure are included in the attached Excel spreadsheet.

Background

Pacific Power Washington, Avista Washington, and Puget Sound Energy have developed a joint approach to calculate savings from NEEA programs. As part of the utilities' biennial savings updates, NEEA provides a two-year electric energy savings forecast.[1] The utilities subtract the savings from their conservation forecast to develop their Biennium Conservation Target.

NEEA would like to thank Pacific Power for its partnership and continued support of the alliance. Please do not hesitate to contact Christina Steinhoff at 503.688.5427 with any questions about this report.

2016-2017 Biennium Savings Final

NEEA estimates Pacific Power's 2016-2017 savings is **0.62 aMW**. These savings were enabled by alliance market transformation programs as well as investments in infrastructure (e.g., tools, training and

[1] The utilities agreed that NEEA would develop a Total Regional Savings estimate using baseline and technical assumptions from the most recent Power Plan. NEEA would remove estimated savings counted by the utilities, the Bonneville Power Administration and the Energy Trust of Oregon. NEEA would allocate the remaining savings to the utilities based on their NEEA funder share percentage.

Northwest Energy Efficiency Alliance
421 SW Sixth Avenue, Suite 600, Portland, OR 97204
503.688.5400 | Fax 503.688.5447
neea.org | info@neea.org

resources), data and research that support the market's capability to deliver greater efficiency and NEEA's ability to measure and verify savings (Table 1).[2]

Table 1: Final Remaining Site Savings Estimate[3]

				Biennium	
		2016 (Estimate)	2017 (Forecast)	Forecast	Target
	Total	**0.33**	**0.30**	**0.62**	*0.55*
Industrial & Commercial	Building Operator Certification Expansion	0.01	0.00	0.02	*0.03*
	Commercial Real Estate	0.00	-	0.00	-
	Commissioning Buildings	0.04	0.02	0.06	*0.04*
	Desktop Power Supplies	0.05	0.05	0.10	-
	Existing Building Renewal	0.00	-	0.00	-
	Luminaire Level Lighting Controls	-	-	-	-
	Other Codes (Commercial)	-	0.01	0.01	*0.01*
	Reduced Wattage Lamp Replacement	0.01	0.02	0.03	*0.10*
	Drive Power	0.00	0.00	0.01	*0.00*
	Certified Refrigeration Energy Specialist (CRES)	0.00	0.00	0.00	-
Residential	Clothes Washers (Long-term Monitoring & Tracking)	0.06	-	0.06	-
	Refrigerators (Long-term Monitoring & Tracking)	0.01	-	0.01	-
	Ductless Heat Pumps	0.03	0.04	0.07	*0.11*
	Heat Pump Water Heaters	0.01	0.02	0.04	*0.03*
	Other Codes (Multifamily)	-	0.00	0.00	-
	Residential New Construction/Next Step Homes	0.03	0.03	0.06	*0.02*
	Residential Lighting (CFLs)	0.04	0.03	0.07	*0.22*
	Retail Product Portfolio	0.01	0.05	0.05	-
	Super-Efficient Dryers	0.02	0.02	0.04	-

Note: values might not add up because of rounding.

Variance from Targets

Pacific Power's 2016-2017 savings exceeds NEEA's original forecast by 0.08 aMW[4]. Much of these additional savings come from new programs, such as Super-Efficient Dryers, Certified Refrigeration Energy Specialist and Retail Products Portfolio, which were in early development when NEEA created its

[2] NEEA did not include savings from Residential LED bulbs or Non-residential LED tubes in the total. NEEA only included savings from product categories for which it has or has had a program.

[3] Estimates are based on actual sales data.

[4] Note: values do not match the table above because of rounding.

targets in August 2015. As a result, NEEA did not have enough information to include them in the original forecast.

Other more mature programs, such as Next Step Home and Heat Pump Water Heaters, achieved savings above the initial forecast:

- Next Step Homes: Efforts in the Next Step Homes program enabled NEEA to measure savings from partner programs such as Built Green, ENERGY STAR and Home Energy Rating System. NEEA works with these home certification programs to align technical specifications, modeling requirements, and partner support, where possible. Doing this has the potential to increase participation in home certification programs and helps move the market in a coordinated effort that influences code advances, increases energy savings, and builds market capacity for above code home building.
- Heat Pump Water Heaters: Since the biennium targets were set in 2015, all major water heater manufacturers are now making and marketing multiple models of Heat Pump Water Heaters. In that time, regional sales have more than doubled from less than 6,000 in 2015 to over 13,000 in 2017. Today, Heat Pump Water Heaters make up more than 6% of the total installations of water heaters in the Northwest (existing and new construction).

Previous investments also continue to deliver savings above the Power Plan baseline. These include Clothes Washers, Refrigerators and Desktop Power Supplies. Two of the programs— Clothes Washers and Refrigerators— are now part of NEEA's Retail Products Portfolio.

A few programs fell short of the target set in 2015.

- Reduce Wattage Lamp Replacement: This program, which was in early development in 2015, missed its target primarily because of regional growth in the LED product category. Despite missing its targets, this program has successfully secured access to full-category lighting data to inform future lighting programs for the region.
- Residential Lighting: The residential lighting market is changing very quickly and market share for CFL lamps has declined much faster than NEEA had forecasted. CFLs for general purpose applications decreased from 31% market share in 2015 to 5% in 2017, and CFLs for specialty applications decreased from 7% market share in 2015 to less than 1% in 2017. LED lamps are the primary technology that has gained market share from CFLs, representing up to 53% and 41% of general purpose and specialty applications respectively in 2017.[5]
- Ductless Heat Pumps: DHPs show reduced savings as compared to the 2016-2017 forecast due to slowing growth in the target markets. While the overall volume of regional DHP sales has continued to grow steadily, through NEEA evaluation efforts we have learned that the greatest growth is happening in applications outside of targeted housing and heating types such as commercial, new construction, multifamily, and even gas-heated homes.

[5] Through NEEA's efforts in the lighting market, NEEA is also able to collect and analyze data for all lighting types. The attached spreadsheet reports the additional market savings for LEDs as 'other tracked' for reference. The savings is not included in the savings target reporting.

Appendix A: Methodology to Estimate Savings

Baseline

NEEA met with Council staff in June 2015 to align its measures with the draft 7th Power Plan. The baseline values from that meeting are what NEEA uses in this report. Aside from an update to the CFL general purpose bulb savings rate, these values are not significantly different from the final 7th Power Plan.

The Baseline sources are listed in the attached Excel spreadsheet.

Technical Assumptions

Where available, the technical assumptions come from the draft 7th Power Plan. For measures not in the Power Plan, NEEA uses either the Regional Technical Forum or other third-party research.

To compare the actual savings against the targets, NEEA freezes the technical assumptions. As a result, the savings rate only changes based on actual market data such as a change in the configuration of products sold.

The Key Assumption are listed in the attached Excel spreadsheet.

New Savings Stream

This report includes additional measures from the original forecast. At the time, NEEA forecasted zero savings from programs with limited sales and/or per-unit savings data such as programs with site-based savings and products new to the portfolio.

The current forecast adds those savings streams using the 7th Power Plan baseline and technical assumptions unless NEEA has more up-to-date data. These programs include:

- Existing Building Renewal
- Clothes Washer Long-term Monitoring and Tracking
- Refrigerators Long-term Monitoring and Tracking
- Retail Products Portfolio
    - Room Air Conditioners
    - Freezers
    - Clothes Washers
    - Refrigerators
    - Air Cleaners
- Super-Efficient Dryers
- Commercial Real Estate
- Certified Refrigeration Energy Specialist
- Desktop Power Supplies

Local Programs

To avoid double counting, the values exclude an estimate of savings the Energy Trust of Oregon, Bonneville Power Administration and local utilities claim through their programs. NEEA surveys these stakeholders every February to estimate the savings overlap. Then, NEEA subtracts theses savings from the regional value to calculate Remaining Savings.

Allocation

NEEA allocates the Remaining Savings using funder shares. The shares vary based on the funding cycle. Savings from previous investments receive the previous funder share. Savings from current investments receive the current funder share. The funder shares are available in the attached spreadsheet.