Appendix 3

Evaluation, Measurement & Verification Framework for Washington

Evaluation, Measurement & Verification Framework For Washington

Updated October 1, 2021
(with updates to Measure Installation Verifications effective 1/1/2024)

SOURCE DOCUMENTS

Information used in the development of this document came from PacifiCorp practices and experience, and knowledge gained from numerous guides, protocols, papers and reports. References that were used in the development of this framework are:

- Uniform Methods Project: Determining Energy Efficiency Savings for Specific Measures and Uniform Methods Project for Determining Energy Efficiency Program Savings.
- National Action Plan for Energy Efficiency (2007). Model Energy Efficiency Program Impact Evaluation Guide. Prepared by Steven R. Schiller, Schiller Consulting, Inc. www.epa.gov/eeactionplan
- SEE Action (2012) Energy Efficiency Program Impact Evaluation Guide December 2012
- California Evaluation Framework (January 24, 2006) Consortium for Energy Efficiency (2008): "Metering the Unmetered Resource: Evaluation Methods for Achieving Diverse Energy-Efficiency Policy Objectives"
- Efficiency Valuation Organization (2010): "International Performance Measurement and Verification Protocol"
- American Evaluation Association: Guiding Principles for Evaluators
- SEE Action (2012): "EM&V of Residential Behavior-Based Energy Efficiency Programs: Issues and Recommendations" by Lawrence Berkeley National Laboratory
- Roadmap for the Assessment of Energy Efficiency Measures. Regional Technical Forum. December 8, 2015
- Avista Utilities (April 2017): "Evaluation, Measurement and Verification (EM&V) Framework"
- Puget Sound Utilities (March 29, 2011): "Evaluation, Measurement and Verification (EM&V) Framework"
- PacifiCorp's Washington Demand-side Management Advisory Group
- Ethan Goldman, 2018. Your Guidebook to Adoption of M&V 2.0. Prepared by VEIC for the Missouri Department of Economics, Division of Energy under a U.S. Department of Energy, State Energy Program grant-funded project.
- Franconi, Ellen, Matt Gee, Miriam Goldberg, Jessica Granderson, Tim Guiterman, Michael Li, and Brian A. Smith. The Status and Promise of Advanced M&V: An Overview of "M&V 2.0" Methods, Tools, and Applications. Rocky Mountain Institute, 2017 and Lawrence Berkeley National Laboratory, 2017. LBNL report number #LBNL-1007125.

Several of the Source Documents include Glossary's which have informed this updated framework. These Glossary's, including the California Evaluation Framework and the Model Energy Efficiency Program Impact Evaluation Guide, are extensive, subject to updates and not replicated in this version of the framework. PacifiCorp would like to extend special acknowledgments to Avista Utilities, Puget Sound Energy, and PacifiCorp's Washington Demand-side Management Advisory Group for their assistance in the documentation of this framework.

LIST OF ABBREVIATIONS AND ACRONYMS

Advisory Group	PacifiCorp's Demand-side Management Advisory Group
CEE	Consortium for Energy Efficiency
DSMC	DSM Central
DEER	California Database for Energy Efficiency Resources
ECM	Energy conservation measure
EM&V	Evaluation, Measurement & Verification
EUL	Effective Useful Life (measure life)
IPMVP	International Performance Measurement and Verification Protocol
IRP	Integrated Resource Plan
kWh	Kilowatt-hour
M&V	Measurement and Verification
M&V 2.0	Measurement & Verification 2.0
NEEA	Northwest Energy Efficiency Alliance
Portfolio	Energy Efficiency Programs and Market Transformation Efforts
PCT	Participant Cost Test
PacifiCorp Total Resource Cost (recognizes Northwest Region 10 percent Conservation Adder)	
RFP	Request for Proposal
RIM	Ratepayer Impact Measure
Regional Technical Forum of the Northwest Power and Conservation Council	
TRC	Total Resource Cost
UCT	Utility Cost Test
WUTC	Washington Utilities and Transportation Commission
TRL	Technical Reference Library

PREFACE

Purpose and Scope

The purpose of this document is to describe the framework by which PacifiCorp ("the Company") conducts the evaluation, measurement and verification (EM&V) of its energy efficiency programs, incorporating industry best practices with regards to principles of operation, methodologies, evaluation methods, definitions of terms, and protocols. The framework serves as a guide for PacifiCorp and external evaluators in the EM&V of savings acquired through Company energy efficiency programs.

This EM&V Framework document was originally prepared in response to Order 02 in Docket UE-100170 before the Washington Utilities and Transportation Commission ("WUTC"), and updated in response to additional requirements noted in WUTC Docket UE-132047 Order 01 and Docket UE-131723 General Order R-578. The intent of the Framework is to provide clarity, transparency, and a common understanding of methods and assumptions to consider in determining energy and demand savings of energy efficiency program activities. The document provides an overarching and transparent approach to EM&V processes including principles, objectives, metrics, methods, and reporting. The Framework is a "living document" that will undergo modifications as appropriate.

Background

PacifiCorp works with its customers to reduce the need for investment in supply-side resources and infrastructure by reducing energy and peak consumption through cost-effective energy efficiency programs and market transformation efforts.

The Company currently offers a comprehensive portfolio of customer-focused energy efficiency incentives, services, and a robust communication plan. In addition, the Company receives energy savings and market transformation benefits through its affiliation with the Northwest Energy Efficiency Alliance (NEEA). In the acquisition of cost-effective energy efficiency savings, the Company aspires to best practices in planning, program design, program implementation, customer outreach, and measurement, verification and evaluations.

The Company provides monetary incentives directly to customers and technical assistance to commercial, industrial and agricultural customers in the form of engineering analyses. Customers use the incentives to offset the cost of energy efficient equipment and weatherization. Company programs also provide incentives to retailers or distributors to reduce the cost of energy efficiency equipment sold to customers. Trade allies who install qualifying equipment may also be eligible to receive incentives. The Home Energy Report program provides comparative energy usage data for similar homes within a geographic area. The Low Income Weatherization program provides weatherization services at no cost to income qualified customers. Measures and programs must have an objective analysis to describe whether the investment in electrical energy savings is expected to be cost-effective and how the savings will be achieved.

PacifiCorp maintains and utilizes an external group (the "Advisory Group") to advise the Company on, among other items, the development and modification of a written framework to evaluate, measure, and verify energy savings, and to provide guidance to PacifiCorp regarding EM&V

methodology and measure assumptions used in the assessment of program cost effectiveness. The Advisory Group meets a minimum of four times per year and provides non-binding external oversight of PacifiCorp's EM&V activities.

OVERVIEW OF EM&V FRAMEWORK

This document describes PacifiCorp's approach to evaluating its energy efficiency measures, programs, and portfolio. Evaluations are planned, conducted and reported in a transparent manner recognizing that sound evaluation of energy efficiency programs requires transparency and independence as outlined and documented in this EM&V Framework. Evaluations are conducted using best-practice approaches and techniques including those outlined in the Source Documents section of this Framework.

New technological advances in data collection are pushing traditional EM&V into a relatively new paradigm, collectively referred to as M&V 2.0.[1][2] While M&V 2.0 is not intended to replace traditional EM&V activities, it may serve as a useful tool to and provide quicker programmatic feedback to PacifiCorp. Much of the opportunity is available with granular data from advanced meter infrastructure (AMI), but the literature is clear that the techniques also work in non-AMI environments such as PacifiCorp's Washington territory. PacifiCorp's efforts to date have been focused on assessing whether M&V 2.0 tools provide accurate identification of major end use(s) utilizing only monthly billing data.

PacifiCorp has implemented a database ("Technical Reference Library") that is used to catalog measures, the methods and assumptions and data sources used for those assumptions. The database is updated as necessary to reflect updates to program offerings and measure-level assumptions. The Company has also implemented a tracking system ("DSM Central") that tracks project- and/or program-specific information at a more granular and process-centric level. This functionality helps automate the application of business rules associated with each program and system control of claimed savings using an interface with the Technical Reference Library. The cost of developing and maintaining these systems for the benefit of all programs is considered a portfolio-level expense, and depending on the magnitude of the costs in any given year, may be allocated across two years (50/50 allocation) for calculation of cost-effectiveness of the portfolio.

EM&V tasks are segregated within PacifiCorp's organization to ensure they are performed and managed by personnel who have a neutral interest in the benefits associated with anticipated savings. While the Company's standard operating procedure for performing EM&V activities is to use external independent evaluators selected through a competitive bid, the Company reserves the right, as appropriate, provided in Docket UE-132047 Order 01 to conduct internal evaluations.

[1] EFX16 Session: The Evolution of Evaluation: Revolution or Resolution? EM&V 2.0 New Approaches vs. Traditional Methods. Presentation is available at: https://conduitnw.org/Pages/File.aspx?rid=3436

[2] Your Guidebook to Adoption of M&V 2.0. Definition from page 5. M&V 2.0 refers to the increasing granularity of available energy consumption data, and the enabling of automated M&V methods that continuously analyze the data and provide early, accurate and valuable insights to various stakeholders about energy savings estimates.

Evaluations are planned, conducted and reported in a transparent manner, affording opportunities for review and comment by the Advisory Group.

- Priorities for evaluation activities, including budgets and schedules, will be provided to the Commission annually as part of the Company's Annual Conservation Plan or Biennial Conservation Plan, depending on the year. These plans will include a summary of each scheduled evaluation activity, whether the activity will be performed by an external evaluator or internal by PacifiCorp, including summary of work to be completed and budgets.

- Other documents including project scopes, requests for proposals, detailed evaluation plans, and draft and final reports will be prepared for each major EM&V activity and elements can be shared with the Advisory Group upon request.

Reports from EM&V activities including evaluation of energy and demand savings and cost-effectiveness will be available to the Advisory Group, WUTC and other interested stakeholders, consistent with the reporting schedules summarized in Table 3.

EVALUATION PRINCIPLES, OBJECTIVES AND METRICS

EM&V is a catch-all term used in energy efficiency literature to represent the determination of program and project impacts. Evaluation includes "the performance of studies and activities aimed at determining the effects of a program."[3] By definition, Measurement and Verification refers to "Data collection, monitoring, and analysis associated with the calculation of gross energy and demand savings from individual sites or projects. M&V can be a subset of program impact evaluation." [4]

Evaluations should be based on credible and transparent methods and efforts to be successful in capturing the savings that energy efficiency programs offer. Energy efficiency evaluations will develop retrospective estimates of energy savings attributable to a program. Evaluations should also go beyond simply documenting savings to actually improving programs and providing a basis for future savings estimates. While energy efficiency evaluations will be retrospective in nature, the information obtained will be used to inform future conservation potential assessments, conservation plans, forecasts and targets.

Evaluations fall into two major categories, Formative and Outcomes. Formative evaluations are used to develop or improve program designs, and include evaluation types of market characterization studies, potential assessments and process evaluations. Outcomes evaluations help in determining program results, and include evaluation types of impact evaluation and cost-effectiveness analysis.[5] Table 1 provides a summary of the evaluation categories and types of energy efficiency program evaluations.

[3] National Action Plan for Energy Efficiency (2007). Model Energy Efficiency Program Impact Evaluation Guide. Prepared by Steven R. Schiller, Schiller Consulting, Inc. www.epa.gov/eeactionplan

[4] Ibid.

[5] Consortium for Energy Efficiency (2008): "Metering the Unmetered Resource: Evaluation Methods for Achieving Diverse Energy-Efficiency Policy Objectives"

Table 1: Categories and Types of Energy Efficiency Program Evaluation

Evaluation Category	Phase at which Implemented	Evaluation Type	Assessment Level
Formative	Planning and design phase	Market characterization study	Market and/or Program
		Potential Studies	Market and/or Program
	Implementation phase	Process evaluation	Program
Outcomes	Implementation and/or post implementation (ex-post)	Impact evaluation	Program
		Cost effectiveness analysis	Program or Portfolio

- **Process Evaluations** assess program delivery, from design to implementation, in order to identify bottlenecks, efficiencies, what worked, what did not work, constraints, and potential improvements. Timeliness in identifying opportunities for improvement is essential to making corrections along the way.

- **Impact Evaluations** determine the impacts (e.g., energy and demand savings) and co-benefits (e.g., job creation, water savings) that directly result from a program. Impact evaluations also support cost effectiveness analyses aimed at identifying relative program costs and benefits.

- **Cost-Effectiveness Analysis** is the exercise to determine the cost-effectiveness of programs and measures from various viewpoints including Total Resource Cost as modified by the Northwest Power and Conservation Council, Total Resource Cost, Utility Cost, Ratepayer Impact Measure and Participant Cost tests.

- **Market Characterization and Potential Studies** are described in PLANNING AND DESIGN STUDIES section.

This framework, and the industry as a whole, focuses on impact evaluations and the measurement and verification of demand and energy savings associated with specific programs. The results of impact evaluations will inform prospective cost-effectiveness analysis with regards to future program planning.

Guiding Principles and Ethics – Outcomes Evaluations

Evaluation principles for energy efficiency programs are defined by completeness and transparency; relevance and balance in risk management, uncertainty, and cost; and consistency.[6] Consistently applying these principles results in high quality information on which business decisions can be made.

1. *Completeness and transparency*. Results and calculations are coherently and completely compiled. Calculations are well documented in a transparent manner.

[6]National Action Plan for Energy Efficiency (2007). Model Energy Efficiency Program Impact Evaluation Guide. Prepared by Steven R. Schiller, Schiller Consulting, Inc. www.epa.gov/eeactionplan

2. *Relevance and balance in risk management, uncertainty, and costs*. The data, methods, and assumptions are appropriate for the evaluated program. The level of effort expended in the evaluation process is balanced with respect to the value of the savings, the uncertainty of their magnitude, and the risk of overestimated or underestimated savings levels.
3. *Consistency*. Evaluators working with the same data and using the same methods and assumptions will reach the same conclusion.

As outlined in the Evaluation Cycle section below, PacifiCorp will perform EM&V activities on a rotation schedule such that, over the EM&V cycle, all major programs are covered.
When using external evaluators, vendor credibility is essential for providing credible findings and results for the program and for providing recommendations impacting program and investment decisions. See Impact Evaluation Methods and Key Assumptions below for more information.

Evaluation Planning

PacifiCorp plans and scopes its evaluation activities in order to provide the greatest value from its evaluation resources and to ensure transparency in methods and results. The criteria will assist the Company in 1) measuring the effects of the program as a reliable energy resource, 2) evaluating the cost-effectiveness of the program for purpose of program design, 3) identifying recommendations to improve the program, and 4) meeting the requirements of completing timely evaluations. The Company intends to consider the following criteria to assist in prioritizing evaluation activities:

- Size of the program – larger programs, in terms of budget and/or savings, are prioritized above smaller programs.
- Uncertainty regarding the results (e.g., maturity of program, magnitude of changes in the program market, related evaluation results available, etc.) – higher level of uncertainty would increase prioritization, all else equal.
- Combining evaluations of the same programs in other states to leverage economies of scale and reduce the cost to Washington customers.[7]
- Impact on regulatory processes or regulatory oversight: information necessary for regulatory oversight will receive a higher EM&V priority than information that is not necessary for that purpose, all else being equal.
- Cost of evaluation. Alternative approaches should be considered when the value of incrementally better data is less than the cost of that data.
- Timeliness in providing important information for regulatory reporting, program planning, program improvements and other needs.

The following guiding principles will be taken into consideration when planning evaluations:

- Leveraging secondary research as appropriate with modifications as deemed necessary and useful.
- Expert review of program operation and design.
- Key assumptions will be verified in evaluations.
- Over time, evaluations are used to refine input assumptions used in savings estimation and resource analysis in order to improve program delivery.

[7] In addition to Washington, PacifiCorp delivers and evaluates energy efficiency programs in California, Idaho, Utah, and Wyoming.

Verification

A component of the overall evaluation efforts is aimed at the reasonable verification of installations of energy efficient measures and associated documentation through review of documentation, surveys and/or ongoing onsite inspections. Verification of the potential to achieve savings involves regular inspection and commissioning of equipment. However, such verification of the potential to generate savings is considered a program cost and should not be confused with M&V.

PacifiCorp engages in programmatic verification activities, including inspections, quality assurance reviews, and tracking checks and balances as part of routine program implementation and may rely upon these practices in the verification of installation information for the purposes of savings verifications in advance of more formal impact evaluation results. See Appendix 1 for Measure of Installation Verifications.

In addition, an independent third-party evaluator will be contracted through a competitive bid process to verify calculations of total portfolio MWh savings as well as review EM&V activities for best practices which is memorialized in WAC 480-109-120(4)(b)(v) as a component of utility biennial conservation reports due June 1 of each even-numbered year.

Budget

The budget includes reasonable EM&V activity costs associated with, but not limited to, market studies, process and impact evaluations, cost effectiveness analyses, and costs associated with EM&V adherence and modifications of framework conducted by both internal PacifiCorp staff and external evaluators.

In WUTC Docket UE-171092, Order 01, spending requirements were set for EM&V activities to ensure adequate attention and resources are expended to verify conservation program results. Consistent with the requirements of Order 01, PacifiCorp must spend a reasonable amount of its conservation budget on EM&V, including a reasonable proportion on independent, third-party EM&V. These costs will be treated as portfolio costs and will not be assigned to programs for purpose of determining the cost effectiveness.

Table 2 outlines the different activities including EM&V, tracking/reporting planning and how the cost of each will be captured in program- and portfolio-level reporting.

Table 2: Treatment of Costs for EM&V Activities

Activity	Cost type	Portfolio-or Program-Specific Cost	Included in EM&V Budget
Program Impact Evaluations	Third Party	Portfolio	Yes
	Internal	Portfolio	Yes
Program Process Evaluations	Third Party	Portfolio	Yes
	Internal	Portfolio	Yes
Annual Performance Reporting, including cost effectiveness	Internal and third party	Portfolio	Yes
Cost Effectiveness Analysis	Internal and third party	Program	No
Potential Studies	Third party and internal	Portfolio	No
Market Characterization Studies	Third party and internal	Program	No
Field/site inspection as part of ongoing program quality control process	Third party	Program	No
	Internal	Program	No
Compliance with tariff and contract	Internal	Program	No
Development and Maintenance of tracking systems	Third party and licensing	Portfolio	No
	Internal	Portfolio	No

A summary report on Washington System Benefits Charge expenditures incurred by the Company in complying with Docket UE-171092 Order 01 will be incorporated into the Annual Report on Conservation Acquisition. The Annual Report will also include a description of the EM&V studies completed and/or underway during the reporting period with reporting of the type of evaluations, whether they were conducted by internal staff or external evaluators, and the program or programs studied. In addition, a URL link will be provided on completed evaluations with the submission of the annual report.

Evaluation Cycle

PacifiCorp will perform evaluations on a rotation schedule of selected programs such that, over the EM&V cycle, all major programs are covered. Evaluations are scheduled to be performed on all major programs every two years, however, new or changing programs or external influences that may impact the proposed schedule of EM&V activities.

When using external evaluators, the evaluation will be competitively bid through a Request for Proposals ("RFP") process. The rotation schedule will, when appropriate, combine programs from other states in the RFP process, allowing the Company to take advantage of potential cost reductions due to economies of scale. The DSM Business Plan contains information on evaluation specific to reach program.

Captured Data

Critical data to be evaluated are as follows:

- Annual energy acquisition gross savings

- Cost and benefit data for cost-effectiveness analysis including total project cost, measure cost, measure life, avoided costs, quantifiable non-energy impacts, etc.
- Program quality assurance and compliance to regulatory requirements
- Information on benefits accruing to highly impacted populations or underserved communities as defined in the CETA rules.
- Other information necessary for program and portfolio management
    - Market characterization attributes for measures and programs that may include, but are not limited to, product price and availability, market saturation, customer participation and satisfaction, incremental costs, and effects of codes, standards and prices
    - Other information that may include lost opportunities, demographics, budget targets and other useful information for system planning

EVALUATION PLANNING CYCLE

The hierarchy of documents outlining the planning steps for each evaluation cycle is made up of the following:

1. EM&V Framework – This document is considered a "living document" that will be updated as needed and will remain in place until superseded by regulatory modifications or changed through Advisory Group process.
2. Biennial Business Plan and Annual Conservation Plan – These documents include program-level detail that shows planned expenses and resulting projected energy savings. Program detail will include program descriptions, program measure data, measure incentives and customer and measure eligibility requirements. The plan will also include information on planned EM&V, including summaries of scheduled evaluation activities, whether the activity will be performed by an external evaluator or internally by PacifiCorp staff (see section on Roles and Responsibilities) and information regarding the evaluation activities.
3. Evaluation Plan – New energy efficiency programs will include an evaluation plan at program launch. The evaluation plan will address issues related to evaluation metrics, baselines, level of effort, estimated budget, tracking and reporting expectations.

Table 3 below illustrates the EM&V planning cycles and documents.

Table 3: Hierarchy of EM&V Planning Cycles / Documents

	EM&V Framework	EM&V Activities	Other Specific EM&V Activities
Document(s)	EM&V Framework	Included in Annual Conservation Plan or the Biennial Business Plan	• Technical Reference Library (TRL) • Statement of Work for significant EM&V projects • Evaluation Plan for new programs • Key issues requiring oversight • Final reports
Contents	The overarching structure and process for EM&V	EM&V major activities proposed for a given cycle: • High level description of major activity • Estimated budgets • Schedule	Details regarding specific EM&V activities including impact and process evaluations, market characterization studies, potential assessments. The TRL contains measures, savings assumptions and data sources used for estimating energy savings.
Schedule	The Framework remains in place as a "living document" that can be updated as needed	Reviewed no less frequently than every two years as part of biennial process and updated as needed	As needed
Reviewers	Advisory Group	Advisory Group	Share with the Advisory Group upon request.

IMPACT EVALUATION METHODS AND KEY ASSUMPTIONS

Evaluation Standards

The key objective of impact evaluations is to produce the most accurate and unbiased estimate of energy and demand savings. PacifiCorp's evaluation methods are founded on industry best practice, based on applicable industry reference documents and guidelines including, but not limited to: NAPEE Guide, IPMVP, California Evaluation Framework and SEE Action (LBNL). The Company observes the following principles in its oversight of impact evaluations:

1. Evaluators will be impartial in their work and will not have compensation, performance appraisal or goals tied to evaluation results.
2. Evaluators are expected to follow the Guiding Principles for Evaluators as documented by the American Evaluation Association, which are:
    - Systematic inquiry
    - Competence
    - Integrity/Honesty
    - Respect for people
    - Responsibilities for general and public welfare
3. Transparent methods to estimate savings and impacts will be reviewed in various forums to increase quality and reliability.
4. Majority of evaluation dollars and efforts are spent in areas of greatest importance or uncertainty.

The Company may expend resources 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 modified TRC test. These programs may include certain information-only, education, marketing, outreach, pilot projects and similar efforts to effect behavioral changes under provision 7 of Docket UE-171092 Order 01. These efforts will not be subject to evaluation.

Projected Energy Savings Estimates (Ex-Ante) versus After Impact Evaluations (Ex-Post)

Impact evaluations focus on estimating the amount of energy and demand savings a program delivered. The initial design and review of prospective programs will be based upon ex-ante savings; savings that are expected to be delivered by the program. Estimates of actual savings are ex-post savings; program savings analyzed over a specific period of time.

The results of the impact evaluations or ex-post savings, will be used to inform the Company's 10-year conservation plan, two-year biennial targets and future program design. This information will not be used to retrospectively report the Company's performance to target within a current biennial period except as agreed upon with the Advisory Group and/or Commission.

Approaches for Determining Gross Savings

Gross impact savings are determined using one of the following approaches:

1. One or more measurement and verification (M&V) methods from IPMVP, are used to determine the savings from a representative sample of projects. These savings are then applied to the entire population of projects in the program. The four IPMVP options are:[8]
    a. Option A: Key Parameter Measurement – field measurement of the key performance parameter(s) which define the energy use of the ECM's affected system(s) and/or the success of the project.
    b. Option B: All Parameter Measurement – field measurement of the energy use of the ECM affected system.
    c. Option C: Whole facility – measuring energy use at the whole facility or sub-facility level.
    d. Option D: Calibrated Simulation – simulation of the energy use of the whole facility, or of a sub-facility.
2. Deemed savings based on generally accepted impact evaluation data and/or other reliable and relevant source data that has verified savings levels. Examples of documented sources include but are not limited to the RTF or historical evaluations specific to a demographic area (e.g., DEER, CEE, impact evaluations).
3. Statistical analyses of large volumes of metered energy usage data typically collected from billing analyses.

If field inspections on specific measures are a necessity, they will be performed by third parties. In some cases, measures will be inspected to confirm that they were not only installed, but also installed per specification and that they are properly operating, and on large-scale custom measures/projects, baseline inspections may be conducted.

Home Energy Reports

Evaluations of Home Energy Reports will reflect identified evaluation challenges and accepted methods such as those outlined in the Uniform Methods Project: Chapter 17: Residential Behavior Protocol[9]

Baseline

Energy savings are determined by comparing energy use and demand after a program is implemented (the reporting period) with what would have occurred had the program not been implemented (the baseline). The baseline and reporting period energy use and demand are compared using a common set of conditions such as weather, operating hours, building occupancy, and demographics. These conditions are then adjusted so that only program effects are considered when determining savings.[10]

1. In Washington, evaluators will use or determine baselines utilizing baselines defined in the RTF Guidelines, Current Practice and Pre-Conditions[11]

[8] Efficiency Valuation Organization (2010): "International Performance Measurement and Verification Protocol"
[9] www.energy.gov/eere/about-us/ump-home
[10] National Action Plan for Energy Efficiency (2007) Model Energy Efficiency Program Impact Evaluation Guide. Prepared by Steven R. Schiller, Schiller Consulting, Inc. www.epa.gov/eeactionplan
[11] Regional Technical Forum, Roadmap for the Assessment of Energy Efficiency Measures p. 10-11 (December 8, 2015)

A CURRENT PRACTICE BASELINE IS USED IF THE MEASURE AFFECTS SYSTEMS, EQUIPMENT OR PRACTICES THAT ARE AT THE END OF THEIR USEFUL LIFE OR FOR MEASURES DELIVERING NEW SYSTEMS, EQUIPMENT OR PRACTICES, E.G., ENERGY STAR ® SPECIFICATIONS FOR NEW HOMES. FOR THESE MEASURES, THE BASELINE IS DEFINED BY THE TYPICAL CHOICES OF ELIGIBLE END USERS IN PURCHASING NEW EQUIPMENT AND SERVICES AT THE TIME OF RTF APPROVAL. THE RTF ESTIMATES THIS BASELINE BASED ON RECENT CHOICES OF ELIGIBLE END USERS IN PURCHASING NEW EQUIPMENT AND SERVICES. THESE CHOICES MAY BE INFERRED FROM DATA ON SHIPMENTS, PURCHASES (EQUIPMENT OR SERVICES) OR SELECTED DESIGN / CONSTRUCTION FEATURES.

A PRE-CONDITIONS BASELINE IS USED WHEN THE MEASURE -AFFECTED SYSTEM, EQUIPMENT OR PRACTICE STILL HAS REMAINING USEFUL LIFE (RUL). THE BASELINE IS DEFINED BY THE TYPICAL CONDITIONS OF THE AFFECTED SYSTEM, EQUIPMENT OR PRACTICE AT THE TIME OF RTF APPROVAL. THE RTF ESTIMATES THIS BASELINE BASED ON DATA FROM RECENT ADOPTERS, OR IF THERE HAS BEEN NO SIGNIFICANT ADOPTION, IT USES DATA FROM THE TYPICAL CONDITIONS FOUND AMONG ELIGIBLE END USERS

Persistence or Measure Life

Persistence is how long the energy savings are expected to last once an energy efficiency measure or activity has taken place. In certain instances, impact evaluation may consider whether the savings from the project change over time. These changes are primarily due to retention and performance degradation, changes to energy codes or equipment efficiency standards or the impact of market progression.

In most cases, persistence of savings will be determined using historical and documented persistence data, such as manufacturer's studies or values provided in relevant databases such as the Regional Technical Form (RTF) and others. However, if deemed necessary, PacifiCorp may also utilize the following basic approaches for assessing persistence:

- Laboratory and field testing of the performance of energy efficient and baseline equipment
- Field inspections, over multiple years
- Other non-site methods such as telephone surveys and interviews, analysis of consumption data, or use of other data (e.g., data from a facility's energy management system)

Uncertainty – Expectations for Savings Determination

Program evaluations will seek to reliably and accurately determine energy and demand savings by deploying the most appropriate EM&V approaches. While additional investment in the estimation process can reduce uncertainty, the tradeoffs between evaluation costs and reductions in uncertainty need to be considered. Evaluation results will be reported as expected values including some level of variability or uncertainty defined and explained.

Uncertainty of savings level estimates is a result of two types of errors, systematic and random.

1. Systematic errors are those that are subject to decisions and procedures developed by the evaluator and are not subject to chance. These include:
    a. Measurement errors, arising from meter inaccuracy or errors in recording an evaluator's observation.
    b. Non-coverage errors, which occur when the evaluator's choice of a sampling frame excludes part of the population.

c. Non-response errors, which occur when some refuse to participate in the data collection effort.
d. Modeling errors, due to the evaluator's selection of models and adjustments to the data to take into account differences between the baseline and the test period.

2. Random errors (also known as sampling errors), those occurring by chance, arise due to sampling rather than taking a census of the population. In other words, even if the systematic errors are all negligible, the fact that only a portion of the population is measured will lead to some amount of error.[12]

Evaluators are expected to control for systematic error through best practices and control random error by striving to follow industry standards which is designed to achieve a 90 percent confidence level and ±10 percent precision. If this sampling requirement can be shown to be unrealistic, an 80/20 confidence level [13]will be required in those instances. Deviations from these specifications may be permitted provided the circumstances warrant it and it is not expected to materially impact the validity of the evaluation results. The evaluation report will discuss aspects of uncertainty and the decision process that determined sample size and confidence/precision level achieved.

Net Savings

Net savings attempts to separate out the influence of a particular energy efficiency program from all other influences that determine participant and non-participant behavior and decisions of whether, when, and to what degree to adopt efficiency actions offered by a program. Two primary factors that will differentiate gross and net savings are free-ridership and spillover.

Free riders are customers who would have installed the efficient measure or changed a behavior without program intervention (e.g., incentives). Free riders can be full or partial. Spillover occurs when reductions in energy consumption are caused by the presence of the energy efficiency program, but even though the customer does not receive an incentive for the energy saving measure or practice through the program. Spillover falls into two categories:

- Participant spillover is defined as additional energy efficiency actions that program participants take outside the program as a result of having participated.
- Non-Participant spillover is defined as savings from efficiency projects implemented by those who did not directly participate in a program, but that occurred due to that influence of the program.

PacifiCorp will use the Net-to-Gross ratio of 1.0, consistent with the Council's methodology, for each program or portfolio for the purpose of cost effectiveness analysis per Order 01 (8) (a) in Docket UE-190908. The Company may assess program free-ridership since high percentage of savings that would have occurred in the program's absence is not desirable for managing costs of a program. Spillover may be a valid adjustment to evaluated savings and in consideration of program economics if there is a verifiable causal link to the program and doing so does not result in the double counting of savings or impact another program's economics.

[12] Ibid.

[13] Confidence refers to the probability the estimated outcome will fall within some level of precision.

Cost Effectiveness

PacifiCorp's cost effectiveness evaluations compare program benefits and costs, showing the relationship between the value of a program's outcomes and the costs incurred to achieve those benefits. The findings help in judging whether to retain, revise, or eliminate program elements and provide feedback on whether efficiency is a wise investment as compared to energy generation and/or procurement options.

As required by WAC 480-109-100(8): "[a] utility's conservation portfolio must pass a cost-effectiveness test consistent with that used in the Northwest Conservation and Electric Power Plan." As clarified in Order 01 (8) in Docket UE-171092, the primary test for the WUTC is the TRC test, as modified by the Northwest Power and Conservation Council, including quantifiable non-energy benefits, a risk adder, and a 10 percent conservation benefit adder.

As allowed by WAC 480-109-100(10) (a) a utility may fully fund low-income conservation measures that are determined by the implementing agency to be cost-effective consistent with the Weatherization Manual maintained by the department.

As allowed by WAC 480-109-100(10) (b) A utility may exclude low-income conservation from portfolio-level cost-effectiveness calculations.

In addition to the modified TRC test, PacifiCorp's programs and portfolios will be analyzed using cost-effectiveness tests described in the National Action Plan for Energy Efficiency "Understanding Cost- Effectiveness of Energy Efficiency Programs"[14]. These tests are described as follows:

1. Utility Cost Test (UCT): From the Company's perspective, benefits are avoided energy costs, capacity costs and line losses. Costs include any program administration, implementation or incentive costs associated with funding the program.
2. Ratepayer Impact (RIM): All ratepayers (participants and non-participants) may experience an increase in rates to recover lost revenue. Benefits are the avoided energy costs capacity costs and line losses. Costs include all program costs and lost revenue due to reduced energy bills.
3. Participant Cost Test (PCT): From this perspective, program benefits include bill reductions and program incentives. Costs include any customer contribution to the measure cost before program incentives.

MEASURE DATA

PacifiCorp has implemented a technical reference library (TRL) that is a repository for all measures, assumptions, and data sources. The TRL is a web accessible database and is integrated with the Company's project tracking system (DSM Central) to verify the appropriateness of reported savings and incentives issued to customers. This information will be updated as needed. The Advisory Group reviews and may provide comments on program changes that may drive some of the TRL updates.

The TRL includes, but is not limited to, the following measure data:

[14] https://www.epa.gov/sites/production/files/2015-08/documents/cost-effectiveness.pdf

- Description of ex ante savings estimates, considering the following categorization:
    - RTF Deemed – prescriptive savings whose values have been evaluated and deemed by the Regional Technical Forum, or
    - PacifiCorp Deemed – prescriptive savings based on:
        - Project specific engineering analysis
        - Program specific impact evaluation results
        - RTF values adjusted for the Company's service territory
        - Other verifiable sources
    - PacifiCorp Calculation – project-specific savings based on hours of operation, etc.

      If PacifiCorp uses prescriptive savings amounts other than those established by the RTF, such estimates will be based on impact evaluation data and/or other reliable and relevant source data that has verified savings levels, and will be presented to the Advisory Group for comment.
- Reference source of assumption for information used in cost effectiveness analysis (e.g., measure costs)
- Measure life

PROCESS EVALUATIONS

Process evaluations of PacifiCorp's programs involves systematic assessments of programs and internal operations. The purpose of the process evaluation is to document program operations at the time of the evaluation, and identify and recommend improvements to increase program efficiency or effectiveness in acquiring energy resources. The primary mechanisms used for process evaluations are data collection via surveys and interviews to gather information and feedback from administrators, designers, participants, implementation staff and key policy makers. Other elements of a process evaluation can include workflow and productivity measures, reviews, assessments and testing of records, databases, program-related materials and tools.

ROLES AND RESPONSIBLITITES FOR CONDUCTING AND MANAGING EM&V ACTIVITIES

EM&V tasks will be segregated within PacifiCorp's organization to ensure evaluation tasks are performed and managed by personnel who are neutral to the anticipated savings results. While the Company's standard operating procedure for performing EM&V activities is using external evaluators selected through a competed bid, the Company may conduct some evaluations internally if the approach can be shown to meet the principals outlined in the Evaluation Standards section of this Framework. External work is defined as work performed by entities outside of PacifiCorp. Evaluations performed by the Company's staff will be performed by personnel who have no part of their performance assessment or goals tied to energy efficiency acquisition targets and results.

Roles of PacifiCorp Staff and External Evaluators

Work within PacifiCorp EM&V will generally fall into four categories:

- Planning Staff (pre implementation design)
    - Establish estimated EM&V budget (joint with P&C)
    - Establish EM&V plans and processes (joint with P&C)

- Process and Compliance (P&C) Staff (post implementation assessment)
    - Preparation and management of post-implementation impact evaluations to determine ex-post evaluated savings, prepare cost-effectiveness analysis, and determine realization rates
    - Process tracking and performance data management
    - Maintenance of TRL data measure assumptions and sources
    - Design and administration of RFP for external evaluation firms for EM&V activities
    - Administration and management of external firm(s) performing EM&V
    - Preparation of performance reports
    - Establish pre-implementation estimated EM&V budget (joint with P&D)
    - Establish pre-implementation EM&V plans and processes (joint with P&D)
- Program Delivery Staff (implementation of programs)
    - Administration of program to ensure goals and targets are achieved
    - Program quality assurance and compliance to regulatory requirements
    - Oversee data collection for program
    - Implement evaluation recommendations related to program implementation
    - Provide recommendations to P&D on program improvements including but not limited to market adoption, advancing codes, new technologies, and market changes
- Evaluators (external and/or PacifiCorp staff)
    - Perform process and impact evaluations to determine ex-post evaluated savings, prepare cost effectiveness analysis, determine realization rates, and improve program adoption and processes
    - Conduct verification activities
    - Conduct market characterization studies
- Advisory Group
    - Review and provide advice as defined in WUTC Docket UE-152072, Order 01 on:
        - EM&V Framework
        - EM&V Activities
        - Third-party review of portfolio savings report

Managing Selection of External Evaluators

External evaluators will be selected using a competitive bid process consistent with PacifiCorp's Procurement procedures. Qualified firms who have demonstrated competency and experience in performing such EM&V activities will be given the opportunity to bid on a proposed RFP where the Statement of Work outlines the EM&V activity being requested.

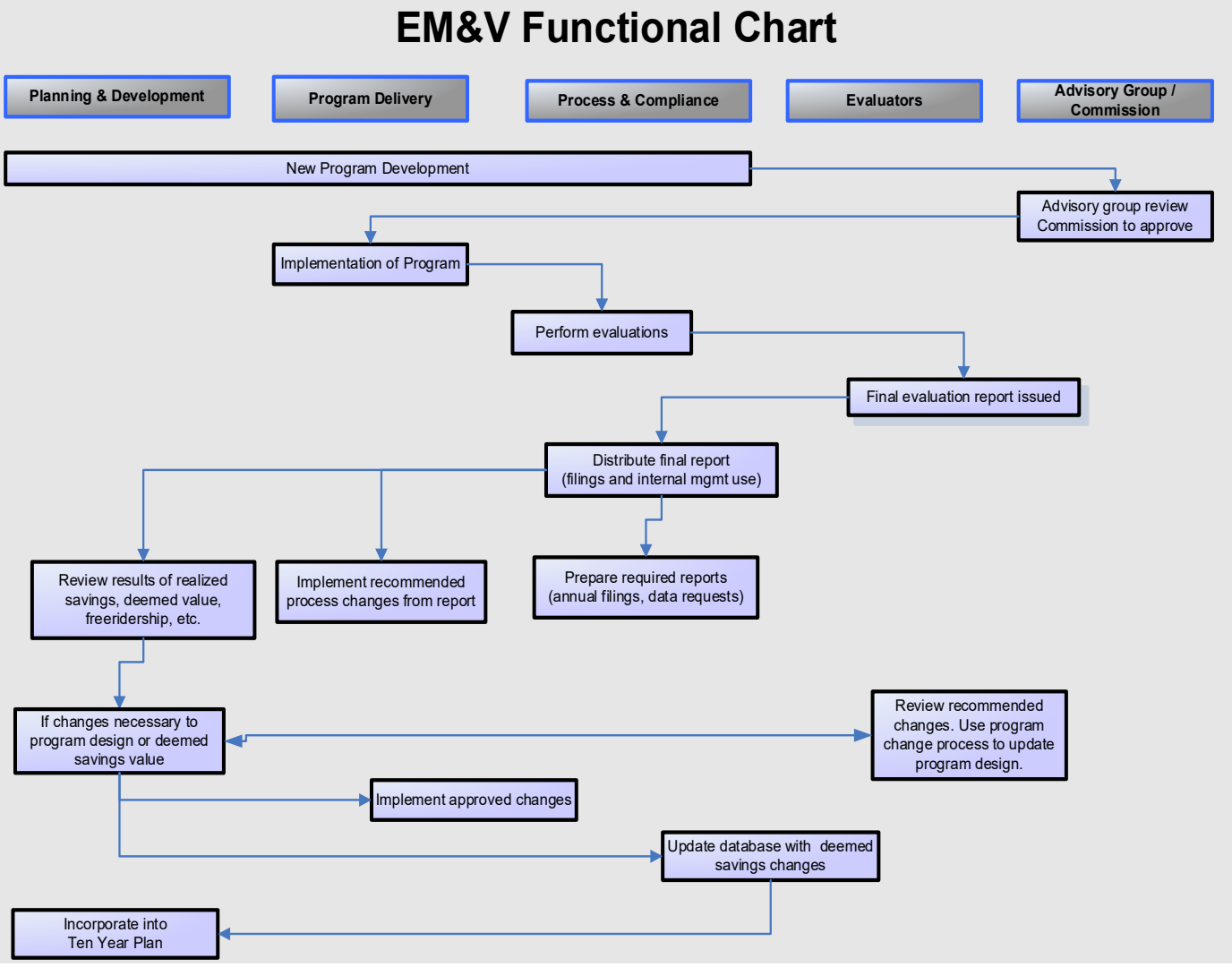
External evaluator reports will be available to the Advisory Group upon completion and referenced in the Annual Report on Conservation Acquisition.

External Oversight and Review

External review ensures that the EM&V process is thorough, transparent and conducted according to proper standards. As required by WAC 480-109-110(1)(b), (c) and (d) the Advisory Group will

be relied upon to advise PacifiCorp concerning the EM&V plans and framework outlined in this document.

Inserted below is a functional chart showing the EM&V activities and how they flow through the different responsible parties.



DATA MANAGEMENT

PacifiCorp's data management systems used to maintain, track and report for the management of energy efficiency programs is a combination of proprietary and licensed software applications. There are three active data sources, outside of the program administrators' databases, used to maintain customer-related data associated to energy efficiency programs for PacifiCorp. All of the databases within the Company are managed with restricted access capabilities. These systems are as follows:

1. CSS – PacifiCorp's major customer database containing all data related to the delivery and billing of customers.
2. SAP – Used to track detail payment information, program costs, contract terms and approval, and general accounting functionality.
3. DSM Central (DSMC) – Web enabled application that is used to track information for project, program and customer specific information for residential, commercial or industrial projects. The application is integrated with the TRL to verify the appropriateness of reported savings and incentives issued to customers.
4. Third-party program administrator's database – Program administration outsourced to contractors will utilize their own database that will capture the details of program specifics identified by the Company and needed by the program administrator including application processing, measure specifics, associated cost, and other relevant information required to manage the program.
5. Technical Reference Library – Repository for all measures, their assumptions and data sources.

REPORTING CYCLES AND SCHEDULE

The program implementation cycle operates on a calendar year basis, from January 1 through December 31 of each year. Table 4 below lists the preliminary schedule of the activities associated with EM&V reporting.

Table 4: Reporting Schedule

Report	Description	Distribution Date *	Distribution List
Annual Conservation Plan	Forward looking. Proposed revisions including program-level expected savings, expenditures, adjustments, major changes. Filed first year of biennial period.	November 15th (every even numbered year)	WUTC, Advisory Group
Annual Conservation Report**	Backward looking. Program-level savings, expenditures, adjustment, changes, EM&V activities, cost effectiveness analyses and budget variance report	Draft report due May 1st	WUTC, Advisory Group
	. Backward looking. Program-level savings, expenditures, adjustment, changes, EM&V activities, cost effectiveness analyses and budget variance report.	Final report due June 1st	
Cost Recovery Tariff Changes	Revisions to Cost Recovery Tariff with requested effective date of August 1st	June 1st	WUTC, Advisory Group
	If no adjustment is required, request for exception will be filed.	May 1st	
Biennial Conservation Plan	Forward looking. A Biennial Conservation Plan including revised program details and program tariffs, together with identification of the 10 year achievable conservation potential and 2-year biennial target.	November 1st (every odd year)	WUTC, Advisory Group
Biennial Conservation Report**	Backward looking. A two-year report on the prior two calendar year Biennial Conservation Plan achievements, including savings and cost effectiveness, third-party evaluation of portfolio-level savings, actions taken to adaptively manage, etc.	June 1st (each even numbered year)	WUTC Advisory Group

* Dates as listed in Chapter 480-109 WAC, effective April 12, 2015. Drafts, except as noted for the cost recovery tariff are to be provided to the DSM Advisory Group, the minimum of 30 days ahead of the filing date.

** Reports can be filed as one report in even numbered year, provided all information is included.

APPLICATION OF EM&V RESULTS

Performance results will be reported on the basis of gross savings, without taking into consideration adjustments for free-ridership. Program results will be filed annually on June 1st, using the estimates for measure and/or program savings utilized in the development of the conservation plan forecast and biannual targets and will not reflect the results of evaluation conducted during the biennium, unless otherwise agreed to with the Commission or Advisory Group.

EM&V efforts that result in changes to savings estimates made prior to program implementation, saving calculations (for custom measures), and/or algorithms used to calculate savings for custom measures will in most cases be applied prospectively, taking effect in subsequent evaluation or update cycle as appropriate. Such changes will be documented in the measure data information maintained by the Company.

APPENDICES

Appendix 1 – Measure Installation Verifications summary

Appendix 1
Measure Installation Verifications

Home Energy Savings (effective 1/1/2024)

Site or virtual inspections by Program Administrator staff for the following retrofit and/or new homes measures. Inspections are performed on >=5 percent of single family homes, >=5 percent of manufactured homes, >=5 percent of multifamily retrofit projects, 100 percent of multifamily new construction projects, and 20 percent of new homes projects. Single family homes inspection rates will be applied to the total aggregate of downstream mechanical and weatherization measures.

- Duct sealing
- Duct sealing and insulation
- Heat pump (conversions) 100% pre-approval required
- Heat pump water heaters
- Insulation
- Windows

No site or virtual inspections are conducted for the following measures. However, all post-purchase incented measures undergo a quality assurance review prior to the issuance of the customer/dealer incentive and recording of savings (e.g., proof of purchase receipt review) and eligible equipment review. Additionally, customer account and customer address are checked to ensure the program administrator does not double pay for the same measure or double count measure savings.

- Central air conditioners
- Clothes washers
- Evaporative cooler
- Hybrid/heat pump clothes dryers
- Line voltage connected thermostats
- New manufactured homes
- Smart thermostats
- Air purifiers

If offered, customer eligibility for mail by request kits is verified using the customer's account number and last name and cross-verifying with the current PacifiCorp customer database.

Low Income Weatherization

All projects

- All measures are qualified through US Department of Energy approved audit tool or priority list.
- 100 percent inspection by agency inspector of all homes treated, reconciling work completed and quality (corrective action includes measure verification) prior to invoicing Company.
- State inspector follows with random inspections.

The Company hires an independent inspector to inspect between 5-10 percent of homes treated (post treatment and payment).

Wattsmart Business (effective 1/1/2024)

Lighting projects
Inspection requirements vary depending on the amount of the incentive and the type of project.

- Incentive above high threshold
    - Retrofits - 100 percent pre- and post-installation site or virtual inspections of all projects with incentives over a specified dollar amount. Project cost documentation reviewed for all projects.
    - New construction - 100 percent post-installation site or virtual inspections of all projects with incentives over a specified dollar amount.
- Incentive between low and high thresholds
    - Retrofits - 100 percent pre-installation site or virtual inspections of all projects (except lighting controls only projects) with incentives between the low and high threshold amounts. Note inspections may be waived on a case-by-case basis for projects completed by Premium Vendors and below a threshold that is between the low and high threshold. A combined percent of post-installation site or virtual inspections by program administrator of projects with incentives between the low and high threshold amounts. Project cost documentation reviewed for all projects.
    - New construction – A combined percent of post-installation site or virtual inspections of projects with incentives between the low and high threshold amounts.
- Incentive below low threshold
    - A combined percent of post-installation site or virtual inspections by program administrator of projects with incentives under a specified dollar amount.

Lighting – small business
On-site or virtual post-incentive inspections will be performed by third party program administrator on a minimum of x percent of approved projects for each approved Small Business Vendor based on project count per calendar year. All projects with incentives over $y will

receive an on-site or virtual pre-inspection. On-site, virtual, or phone surveys will be conducted with participating customers to ensure documentation accuracy, installation and product quality, and customer satisfaction.

Lighting – midmarket/instant incentives
Third party program administrator will conduct regular spot checks on a sampling of approved projects after incentive processing. Inspections will include phone, virtual, and on-site inspections.

- All projects with customer incentives over $y will receive an on-site or virtual inspection.
- A minimum of x percent sampling of all remaining projects will be selected for phone inspections. An additional x percent sampling will be selected for on-site or virtual inspections.

For typical upgrades, small business, and instant incentive offers, required inspections are performed by the program administrator.

Non-lighting projects
Non-lighting projects (typical upgrades/listed measures where savings is deemed)

- 100 percent of applications with an incentive that exceeds a specified dollar amount will be inspected (via site or virtual inspection) (typically by program administrator).
- A minimum of a specified percent of remaining non-lighting applications will be inspected, either in person or via telephone interview, (typically by program administrator).

Non-lighting projects (typical upgrades/listed measures where savings is determined using a simplified analysis tool)

- 100 percent of applications with project savings that exceeds a specified threshold will be inspected (via site or virtual inspection) (typically by program administrator).
- A minimum of a specified percent of remaining non-lighting applications will be inspected, either in person or via telephone interview, (typically by program administrator).

Non-lighting – small business
On-site or virtual post-installation inspections will be performed by third party program administrator on a minimum of x percent of approved projects prior to incentive processing. All projects with incentives over $y will receive an on-site or virtual post-installation inspection prior to incentive processing. On-site, virtual, or phone surveys will be conducted with participating customers to ensure documentation accuracy, installation and product quality, and customer satisfaction.

Custom projects

- 100 percent pre/post-installation inspections, invoice reconciled to inspection results. On-site or virtual pre/post inspections are required for projects with savings over a specified threshold. For projects with savings below the threshold, inspection information may be collected by phone or email.
- No pre-inspection for new construction.
- Inspections are conducted by the program administrator.

All Programs

As part of the third-party program evaluations (two-year cycle) process, the Company has implemented semi-annual customer surveys to collect evaluation-relevant data more frequently to help compensate for customer difficulty remembering details about past projects and other detractors such as customers moving and data not being readily available at evaluation time). This will serve as a further check verifying customer participation and measures installed.

Additional record reviews and site inspections (including metering/data logging) is conducted as part of the process and impact evaluations, a final verification of measure installations.

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

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