Attachment 5, Appendix 1:

BECAR Supporting Documents

May 30, 2014

PSE PUGET SOUND ENERGY
The Energy To Do Great Things

PUGET SOUND ENERGY
2012-2013 BIENNIAL ELECTRIC CONSERVATION ACHIEVEMENT REVIEW (BECAR)
APPENDICES - VOLUME I

Submitted to

PUGET SOUND ENERGY

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

Submitted by

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

In association with

DNV GL, INC.
Oakland, CA

RESEARCH INTO ACTION
Portland, Oregon

May 19, 2014 (FINAL)

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A. GLOSSARY

The alphabetical listing of acronyms and terms below appear in the report or are otherwise relevant to the review. In cases where the glossary in the 2012 Annual Report also contained the entry, we repeated it verbatim here for the sake of consistency.

- **aMW.** Average MegaWatt. An expression of energy (versus "power"). It is used to express very large amounts of energy. The term represents an average of power (Megawatts [MW]) used over time (the standard term being one year or 8,760 hours). Thus, 1 aMW = 8,760 MWh.
- **BECAR.** Biennial Electric Conservation Achievement Review.
- **Calculated Savings.** This savings type is different than deemed values (described below). This term indicates that there is a pre-approved, stipulated input savings value (or cost) per measure. This value (or cost) is then multiplied by site-specific input values to arrive at the overall savings value (or cost). This term is used in the Savings Type field in Appendix B, List of Measures.
- **Channel.** Within a Customer Solutions Residential or Business sector, an organization that is established to focus on the value chain—consisting of manufacturer distributor, dealer, contractor to the endues customer—with the most similar market, delivery methods and ultimate purchasers or product users.
- **CHP.** Combined Heat & Power
- **CMS.** Customer Management System. A PSE proprietary software application that tracks customer activities, inventory and rebate processing.
- **Conditions.** Also “2010 Electric conservation Settlement Agreement Terms conditions”, “Energy Independence Act conditions” or “Order 01 Docket No. UE-111881 conditions”. Specific deliverables and stipulations by which the Company must operate or produce through the course of operating and managing energy efficiency programs during a specified biennium. In addition to compliance requirements outlined in Sections A through J and L, of the 2010 Settlement Agreement, the conditions are listed under Section K of the Agreed Conditions for Approval of Puget Sound Energy, Inc’s 2010-2011 Biennial Electric Conservation Targets Under RCW 19.285 Docket No. 100177, and paragraphs 30 through 41 of Order 01. There are also additional sections that regulate the Company’s energy efficiency operations.
- **CRAG.** Conservation Resource Advisory Group
- **Council.** Northwest Power and Conservation Council.
- **Custom Savings.** This savings type applies to conservation projects where a PSE EME performs specific evaluation and review of a unique customer site to determine savings values—therms or kWh—that apply only for that site. For this type of measure, there is insufficient information, the occurrence is too infrequent or it cannot be specifically defined to justify development of a Calculated or Deemed protocol.

- **DHW.** Domestic Hot Water
- **EC Motor (ECM).** Electronically Commutated Motor. *Some acronyms, such as "ECM" have a different connotation outside the purview of PSE or conservation activities. Outside of EES, "ECM" may mean "Electric Conservation Measure". Within PSE, though, it means "Electronically Commutated Motor".*
- **EES.** Energy Efficiency Services; a department of Puget Sound Energy. This is the former name, prior to 2012, of the Customer Solutions department.
- **EME.** Energy Management Engineer
- **EM&V.** Evaluation, Measurement and Verification
- **ERR.** Evaluation Report Response. A form used to complete an evaluation study's resultant actions.
- **GPM.** Gallons Per Minute
- **HID.** High Intensity Discharge (lamp type)
- **HVAC.** Heating, Ventilation and Air Conditioning
- **I-937.** Ballot Initiative No. 937, known as the Washington Energy Independence Act, passed by Washington voters in 2006. It is a clean energy initiative that requires large utilities to obtain 15% of their electricity from new renewable resources by 2020, as well as undertake all cost-effective energy conservation
- **kWh.** Kilowatt Hour. 1,000 watt-hours = 1 kWh, which is equivalent to 10 100-watt incandescent lamps being turned on for one hour.
- **LED.** Light Emitting Diode (lamp type)
- **LEED.** Leadership in Energy and Environmental Design
- **Measure Metrics.** PSE's database for tracking current and retired deemed measures in each program, and corresponding energy savings, incentive, and measure cost information.
- **MEF.** Manufacturer's Energy Factor (applies primarily to appliances)
- **MWh.** Megawatt-hour. 1,000 kWh = 1 MWh
- **NEEA.** Northwest Energy Efficiency Alliance
- **NEMA.** National Electrical Manufacturers Association
- **O&M.** Operations & Maintenance
- **PSE Deemed.** Relative to measure savings types (Custom, Calculated, PSE Deemed or RTF Deemed), these measures are supported by PSE engineering calculations or evaluation studies, in compliance with Settlement Agreement condition K(6)(c). This term is used in the Savings Type field in Appendix B, List of Measures.
- **RCW.** Revised Code of Washington.

- **RTF.** Regional Technical Forum, an advisory committee and a part of the Northwest Power and Conservation Council. The RTF develops standardized protocols for verifying and evaluating conservation.
- **RTF Deemed.** Former reference to the RTF's UES (Unit Energy Savings). Relative to PSE savings types (Custom, Calculated, PSE Deemed or RTF Deemed), supported by RTF analyses, in compliance with Settlement Agreement condition (6)(b).
- **SOS.** Source of Savings: The PSE documentation called out in MeasureMetrics that provides the basis for a PSE deemed savings value.
- **Settlement.** Refers to a 2010 Washington Utilities and Transportation Commission order that adopted a settlement agreement between Puget Sound Energy and various stakeholder parties. The settlement included conditions for approving PSE's ten-year electric conservation potential and biennial electric energy savings target, in compliance with the electric energy conservation portfolio standard required by I-937.
- **System**. System may have the following meanings: 1) Any software program—supported by PSE's IT department or otherwise—or physical apparatus used to record, track, compile, report, archive, audit energy savings claims or financial data.2) Electrical, and/or gas equipment that is either attached together or works in concert to provide space conditioning, plumbing functions or other end-uses associated with structures, such as HVAC systems, pumping systems, etc.
- **TRC.** Total Resource Cost: The cost to the customer and/or other party costs to install or have installed approved Measures plus Utility Costs and minus Quantifiable Benefits (or Costs)
- **UC.** Utility Cost: The Company's costs of administering programs included, but not limited to, costs associated with incentives, audited, analysis, technical review and funding specific to the Measure or program and evaluation.
- **V-team.** PSE's internal Verification Team, which helps ensure high energy efficiency programs through independent verification of installed equipment and assessment of program participant satisfaction.
- **WAC.** Washington Administrative Code
- **WSEC.** Washington State Energy Code
- **WUTC** (or **UTC).** Washington Utilities and Transportation Commission.

B. WUTC DOCKET AND ORDER

[Highlighted Sections (specifically, Sections 14, 35, and 39) of the Order below lay out the BECAR, as well as methods PSE must use to document savings and cost-effectiveness]

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

In the Matter of PUGET SOUND ENERGY 2012-2021 Ten-Year Achievable Conservation Potential and 2012-2013 Biennial Conservation Target Under RCW 19.285.040 and WAC 480-109-010	DOCKET UE-111881 ORDER 01 ORDER APPROVING PUGET SOUND ENERGY'S 2012-2021 ACHIEVABLE CONSERVATION POTENTIAL AND 2012-2013 CONSERVATION TARGET SUBJECT TO CONDITIONS

BACKGROUND

A. The Energy Independence Act and Docket UE-100177

1 Washington voters approved Initiative 937, the Energy Independence Act, in the 2006 general election. Now codified in Chapter 19.285 of the Revised Code of Washington, it requires electric utilities with 25,000 or more customers to set and meet energy conservation targets, among other things.

2 Under RCW 19.285.040(1)(a) and (b), utilities are required to do the following:

(1) Each qualifying utility shall pursue all available conservation that is cost-effective, reliable, and feasible.

(a) By January 1, 2010, using methodologies consistent with those used by the Pacific Northwest Electric Power and Conservation Planning Council in its most recently published regional power plan, each qualifying utility shall identify its achievable cost-effective conservation potential through 2019. At least every two years thereafter, the qualifying utility shall review and update this assessment for the subsequent ten-year period.

(b) Beginning January 2010, each qualifying utility shall establish and make publicly available a biennial acquisition target for cost-effective conservation consistent with its identification of achievable opportunities in (a) of this subsection, and meet that target during the subsequent two-year period. At a minimum, each biennial target must be no lower than the qualifying utility's pro-rata share for that two-year period of its cost-effective conservation potential for the subsequent ten-year period.

3 Under RCW 19.285.040(1)(e), the Washington Utilities and Transportation Commission (Commission) has authority to "rely on its standard practice for review and approval of investor-owned utility conservation targets." A rule adopted by the Commission, WAC 480-109-010, guides investor-owned utilities' compliance with RCW 19.285.040(1). WAC 480-109-010(1) requires each utility, by January 1, 2010, and every two years thereafter, to project its cumulative ten-year conservation potential. WAC 480-109-010(3) requires each utility, beginning January 2010, and every two years thereafter, to establish a biennial conservation target. WAC 480-109-010(3) directs that, "On or before January 31, 2010, and every two years thereafter, each utility must file with the commission a report identifying its ten-year achievable conservation potential and its biennial conservation target." WAC 480-109-010(4) describes the process for review by the commission. Under WAC 480-109-010(4)(c), upon conclusion of that review, "the Commission will determine whether to approve, approve with conditions, or reject the utility's ten-year achievable conservation potential and biennial conservation target."

4 On October 13, 2010, in Docket UE-100177, the Commission issued Order 05 (Amended) approving Puget Sound Energy's (PSE or Company) 2010-2019 ten-year achievable conservation potential and 2010-2011 biennial conservation target with conditions. One of the conditions was this:[1]

> (8) PSE must file the following:
>
> * * *
>
> (f) A report identifying its ten-year achievable potential and its biennial conservation target (Biennial Conservation Plan), including revised program details and program tariffs by November 1, 2011 . . . .

B. PSE's October 2011 Filings

5 On October 28, 2011, PSE initiated this docket by filing a report identifying its 2012-2021 ten-year achievable conservation potential and its 2012-2013 biennial conservation target. The report, entitled "2012-2013 Biennial Conservation Plan," was supported by detailed exhibits and attachments. The Biennial Conservation Plan identified a 2012-2021 ten-year achievable conservation potential of 3,531,508 megawatt-hours (403.1 average megawatts), and a 2012-2013 biennial conservation target of 666,000 megawatt-hours (76.0 average megawatts) at the customer meter. As required by WAC 480-109-010(3)(b), PSE stated that it had used its 2011 Integrated Resource Plan[2] as the basis for its calculations. PSE also stated a general intent to continue operating in accordance with the conditions the Commission had adopted in Docket UE-100177.

6 In a separate filing on October 27, 2011, PSE filed revised tariffs for its electric conservation programs. That matter was assigned Docket No. UE-111860. The Commission considered the revised program tariffs during

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[1] *Wash. Utils. & Transp. Comm'n v. Puget Sound Energy*, Dockets UE-011570, UG-011571, and UE-100177, Order 05 (Amended) (Oct. 13. 2010) (adopting Agreed Conditions for Approval of Puget Sound Energy's 2010-2011 Biennial Electric Conservation Target Under RCW 19.285 and Agreed Modifications to Electric Settlement Terms for Conservation in Docket No. UE-011570, filed Sept. 3, 2010 and hereafter referred to as "EIA Settlement"). The quoted material is from condition (8)(f), in Section K on page 11 of the EIA Settlement.

[2] WAC 480-100-238 requires electric utilities regulated by the commission to file an integrated resource plan every two years. *See* RCW Chapter 19.280. PSE presented its 2011 Integrated Resource Plan to the Commission in Docket UE-100961.

its December 29, 2011, Open Meeting, and allowed them to go into effect by operation of law under RCW 80.28.060.

7 On November 4, 2011, the Commission issued a Notice of Opportunity to Comment on PSE's Biennial Conservation Plan by December 7, 2011, and a notice that the Commission would consider the matter at its Open Meeting on December 15, 2011. During the comment period, the Commission received written comments from Public Counsel, the NW Energy Coalition (NWEC), and Commission Staff. The Commission heard additional oral comments from the same entities and from PSE during its December 15, 2011, Open Meeting.

8 All commenters praised the process PSE had used to keep interested persons informed and involved during the development of PSE's 2012-2021 conservation potential and 2012-2013 conservation target. All agreed that PSE had complied with the conditions required by Order 05 in Docket UE-100177. NWEC stated that PSE "does a fantastic job" of providing materials to its Conservation Resources Advisory Group (CRAG).

9 All commenters stated that they supported or did not oppose the 2012-2021 ten year achievable conservation potential and 2012-2013 biennial conservation target that PSE identified in its 2012-2013 Biennial Conservation Plan. However, NWEC expressed concern about PSE's analysis of production efficiencies, noting that PSE had not included out-of-state facilities or opportunities for production output efficiency improvements. NWEC said it was not asking the Commission to require PSE to redo its analysis for 2012-2013, but urged the Commission to direct PSE to include in future analyses the elements NWEC said were missing. Questions from Commission members revealed that PSE and NWEC disagree about the required scope of production efficiency analysis under the Energy Independence Act. As described below, PSE and NWEC, with the concurrence of PSE's CRAG, have agreed on a process for presenting that legal question to the Commission so that it can be resolved before PSE develops its 2014-2015 biennial conservation target.

10 Public Counsel, Commission Staff, and PSE said that they had reached general agreement on a set of conditions to recommend to the Commission for approval of PSE's 2012-2021 ten-year achievable conservation potential

and 2012-2013 biennial conservation target. NWEC said it did not oppose the conditions.

11 At the conclusion of the December 15, 2011, Open Meeting, the Commission urged interested parties and PSE to work together to develop a draft order for approval of PSE's 2012-2021 ten-year achievable conservation potential and 2012-2013 biennial conservation target with an agreed set of conditions. The Commission announced that it would consider whether to adopt the draft order at another Open Meeting.

C. Development of Conditions for Approval of PSE's 2012-2021 Ten-Year Achievable Conservation Potential and 2012-2013 Biennial Conservation Target

12 As the Commission requested, Public Counsel, NWEC, PSE, and Commission Staff developed an agreed upon set of conditions to recommend to the Commission for approval of PSE's 2012-2021 Ten-Year Achievable Conservation Potential and 2012-2013 Biennial Conservation Target. PSE's CRAG also reviewed the conditions. Although most of the conditions are the same as those that the Commission adopted in Docket UE-100177, some of the conditions have been revised. The conditions in this Order, and not those in Section K of the EIA Settlement in Docket UE-100177, shall apply to PSE's 2012-2021 Ten-Year Achievable Conservation Potential and PSE's 2012-2013 Biennial Conservation Target.

13 In Docket UE-100177, the Commission required PSE's expenditures on evaluation activities[3] to be within a specific percentage range of its electric conservation program budget. PSE, Public Counsel, and Commission Staff agree that those requirements are no longer necessary, and no one has opposed deleting them.

14 In Docket UE-100177, the Commission required PSE to conduct a "one-time only, independent third-party evaluation of portfolio-level electric energy

[3] *See* EIA Settlement in Docket UE-100177. The conditions are in Section K of the EIA Settlement. Condition (6)(f)(i) contains the requirements proposed for deletion.

savings for the 2010-2011 biennial period."[4] PSE has agreed to conduct a similar evaluation for the 2012-2013 biennial period.

15 To address NWEC's concern that the Energy Independence Act requires pursuit of certain generation output efficiency improvements, NWEC and PSE have agreed that PSE will file a petition for declaratory order with the Commission by July 6, 2012.[5] NWEC and PSE propose a procedural schedule under which responses from interested parties would be due by August 24, 2012, and replies would be due by September 12, 2012, with a Commission order anticipated by mid-November 2012.

16 NWEC and PSE have also agreed that PSE will review and consider the feasibility of pursuing cost-effective conservation in the form of reduction in electric power consumption resulting from increases in the efficiency of energy use at electric power production facilities it owns in whole or in part outside the boundaries of Washington State. No one has objected to this commitment.

17 The Commission considered the draft order and conditions at its June 14, 2012, Open Meeting.

FINDINGS AND CONCLUSIONS

18 (1) The Washington Utilities and Transportation Commission is an agency of the state of Washington vested by statute with the authority to regulate the rates, rules, regulations, practices, accounts, securities, transfers of property and affiliated interests of public service companies, including electric companies. RCW 80.01.040, RCW 80.04, RCW 80.08, RCW 80.12, RCW 80.16, RCW 80.28.

19 (2) Under RCW 19.285.040(1)(a) and (b), electric utilities that serve more than 25,000 customers in the State of Washington are required to do the following:

[4] *Id.*, Condition (6)(g).

[5] The procedure for declaratory orders is described in RCW 34.05.240 and WAC 480-07-930.

(1) Each qualifying utility shall pursue all available conservation that is cost-effective, reliable, and feasible.

(a) By January 1, 2010, using methodologies consistent with those used by the Pacific Northwest electric power and conservation planning council in its most recently published regional power plan, each qualifying utility shall identify its achievable cost-effective conservation potential through 2019. At least every two years thereafter, the qualifying utility shall review and update this assessment for the subsequent ten-year period.

(b) Beginning January 2010, each qualifying utility shall establish and make publicly available a biennial acquisition target for cost-effective conservation consistent with its identification of achievable opportunities in (a) of this subsection, and meet that target during the subsequent two-year period. At a minimum, each biennial target must be no lower than the qualifying utility's pro-rata share for that two-year period of its cost-effective conservation potential for the subsequent ten-year period.

20 (3) As used in RCW 19.285.040(1), "'Conservation' means any reduction in electric power consumption resulting from increases in the efficiency of energy use, production, or distribution." RCW 19.285.030(4).

21 (4) The Washington Utilities and Transportation Commission has authority to determine investor-owned utilities' compliance with RCW 19.285.040(1). RCW 19.285.060(6). The Commission has authority to review and decide whether to approve investor-owned utility conservation targets. The Commission may rely on its standard practice in exercising that authority. RCW 19.285.040(1)(e). The Commission has adopted WAC 480-109-010 to implement RCW 19.285.040(1).

22 (5) Puget Sound Energy is an electric company and a public service company subject to Commission jurisdiction. PSE is a qualifying investor-owned electric utility under RCW 19.285.030.

23 (6) In accordance with Order 05 (Amended) in Docket UE-100177, PSE timely identified its 2012-2021 ten-year achievable conservation potential and 2012-2013 biennial conservation target, and timely submitted a report, entitled "2012-2013 Biennial Conservation Plan," to the Commission under WAC 480-109-010 and WAC 480-07-880. PSE used its 2011 Integrated Resource Plan, which PSE presented to the Commission in Docket UE-100961, as the basis for its 2012-2021 ten-year achievable conservation potential and 2012-2013 biennial conservation target.

24 (7) After considering PSE's 2012-2013 Biennial Conservation Plan and supporting documentation, comments received, and Staff's analysis, the Commission concludes that the 2012-2021 ten-year achievable conservation potential that PSE identified is consistent with RCW 19.285.040(1) and WAC 480-109-010(1). The Commission concludes that the 2012-2013 biennial conservation target that PSE established is consistent with RCW 19.285.040(1) and WAC 480-109-010(2).

25 (8) The Commission concludes that PSE has satisfied the staff and public participation requirements of WAC 480-109-010(3) and Order 05 in Docket UE-100177 in developing its 2012-2021 ten-year conservation potential and 2012-2013 biennial conservation target.

26 (9) PSE agreed to the Conditions described in this Order with the understanding that the Conditions in this Order, and not those in Section K of the EIA Settlement, shall apply to PSE's 2012-2021 Ten-Year Achievable Conservation Potential and PSE's 2012-2013 Biennial Conservation Target. The Conditions memorialize the Commission's standard practice with respect to investor-owned utility conservation programs and facilitate the Commission's ability to determine PSE's compliance with the provisions of RCW 19.285. RCW 19.285.040(1)(e); RCW 19.285.060(6); RCW 80.28.303(1).

27 (10) PSE's 2012-2021 ten-year achievable conservation potential of 3,531,508 megawatt-hours (403.1 average megawatts), and PSE's 2012-2013 biennial conservation target of 666,000 megawatt-hours (76.0 average megawatts), are appropriate subject to the Conditions included in this Order.

28 (11) After reviewing PSE's 2012-2013 Biennial Conservation Plan filed on October 28, 2011, and giving due consideration to all relevant matters and for good cause shown, the Commission finds it is in the public interest to approve with conditions PSE's 2012-2021 ten-year achievable conservation potential and 2012-2013 biennial conservation target identified in the 2012-2013 Biennial Conservation Plan, as authorized by RCW 19.285.040(1)(e) and WAC 480-109-010(4).

29 (13) This matter came before the Commission at its regularly-scheduled meeting on December 15, 2011. With input from interested parties and PSE, Commission Staff prepared a draft order, which the Commission considered at its regularly-scheduled meeting on June 14, 2012.

ORDER

THE COMMISSION ORDERS:

30 (1) **Ten-Year Potential/Biennial Conservation Target – Approval and Conditions.** Puget Sound Energy's 2012-2021 ten-year achievable conservation potential of 3,531,508 megawatt-hours (403.1 average megawatts), and Puget Sound Energy's 2012-2013 biennial conservation target of 666,000 megawatt-hours (76.0 average megawatts) at the customer meter, identified in Puget Sound Energy's 2012-2013 Biennial Conservation Plan (BCP) filed on October 28, 2011, are approved with conditions pursuant to RCW 19.285.040(1)(e) and WAC 480-109-010(4)(c). This approval is subject to the Conditions described in Paragraphs (2) through (12) below. The Conditions in this Order, and not those in Section K of the EIA Settlement filed September 3, 2010 and approved by the Commission in Order 05 in Docket UE-100177, shall apply to Puget Sound Energy's 2012-2021 Ten-Year Achievable Conservation Potential and Puget Sound Energy's 2012-2013 Biennial Conservation Target.

31 (2) **Puget Sound Energy Retains Responsibility.** Nothing within this Agreement relieves Puget Sound Energy of the sole responsibility for complying with RCW 19.285 and WAC 480-109, which requires Puget Sound Energy to use methodologies consistent with those used by the Pacific Northwest Electric Power and Conservation Planning Council (Council). Specifically, the conditions regarding the need for a high degree of transparency, and communication and consultation with external stakeholders, diminish neither Puget Sound Energy's operational authority nor its ultimate responsibility for meeting the biennial conservation target approved herein.

32 (3) **Advisory Group**.

(a) Puget Sound Energy must maintain and use an external conservation Advisory Group of stakeholders to advise Puget Sound Energy on the topics described in subparagraphs (i) through (ix) below. To meet this condition, Puget Sound Energy shall continue to use its Conservation Resources Advisory Group

(CRAG), initially created under Docket UE-011570 and UG-011571, and its Integrated Resource Planning Advisory Group created under WAC 480-100-238. The Advisory Groups shall address but are not limited to the following issues:

(i) (1) Updates to the evaluation, measurement, and verification (EM&V) framework as implemented by Puget Sound Energy which guides its approach to evaluation, measurement, and verification of energy savings. This framework must be reflected in the Biennial Conservation Plan for the next biennium, 2014-2015, and
(2) Modification of existing or development of new EM&V conservation protocols based on Puget Sound Energy's current evaluation, measurement and verification approach.

(ii) Development of conservation potential assessments under RCW 19.285.040(1)(a) and WAC 480-109-010(1).

(iii) Guidance to Puget Sound Energy regarding methodology inputs and calculations for updating cost-effectiveness.

(iv) Review the market assessments and the data values used in updating Puget Sound Energy's supply curves.

(v) Review need for tariff modifications or mid-course program corrections.

(vi) Review appropriate level of and planning for:
(1) Marketing conservation programs.
(2) Incentives to customers for measures and services.

(vii) Consideration of issues related to conservation programs for customers with low-income.

(viii) Program achievement results with annual and biennial targets.

(ix) Review conservation program budgets; and review the actual expenditures compared to the program budgets. Puget Sound Energy shall inform the CRAG members when its projected expenditures indicate that Puget Sound

Energy will spend more than 120% or less than 80% of its annual conservation budget.

(b) The CRAG shall meet face-to-face at least semi-annually to hear updates, review program modifications, or consider need for revisions. In addition, the CRAG shall meet at least two additional times per year through conference calls or face-to-face meetings. CRAG members may call meetings at any time with sufficient notice for meeting attendance. Puget Sound Energy shall make arrangements to hold a meeting within 2 weeks from the date of the request.

(c) Except as provided in Paragraph (8) below, Puget Sound Energy will provide the CRAG an electronic copy of all tariff filings related to programs funded by the Electric Conservation Service Rider that Puget Sound Energy plans to submit to the Commission at least two months before any proposed effective date. When extraordinary circumstances dictate, Puget Sound Energy may provide the CRAG with a copy of a filing concurrent with the Commission filing. This condition does not apply to a general rate case filing.

(d) Puget Sound Energy will notify the CRAG of public meetings scheduled to address Puget Sound Energy's integrated resource plan. Puget Sound Energy will also provide the CRAG with the assumptions and relevant information utilized in the development of Puget Sound Energy's integrated resource plan as they apply to development and/or modification of the ten-year conservation potential as requested through the integrated resource plan public process. This will include updated information such as conservation supply curves and avoided cost analysis.

33 (4) **Annual Budgets and Energy Savings**.

(a) Puget Sound Energy must submit annual budgets to the Commission each year. The submissions must include program-level detail that shows planned expenses and the resulting

projected energy savings. In odd-numbered years, the annual budget may be submitted as part of the Biennial Conservation Plan required under Paragraph (8)(f) below. In even-numbered years, the annual budget may be submitted as part of the Annual Conservation Plan required under Paragraph (8)(b) below. The Annual Conservation Plan will include program descriptions and annual budget details as contained in the Biennial Conservation Plan (BCP).

(b) Puget Sound Energy must provide its proposed budget 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.

34 (5) **Program Details**. Puget Sound Energy must maintain its conservation tariffs, with program descriptions, on file with the Commission. Program details about specific measures, incentives, and eligibility requirements must be filed as tariff attachments as shown in the BCP. Puget Sound Energy may propose other methods for managing its program details in the Biennial Conservation Plan required under Paragraph (8)(f) below, after consultation with the CRAG as provided in Paragraph (9)(b) below.

35 (6) **Approved Strategies for Selecting and Evaluating Energy Conservation Savings.**

(a) Puget Sound Energy has identified a number of potential conservation measures described in the BCP. The Commission is not obligated to accept savings identified in the BCP for purposes of compliance with RCW 19.285. Puget Sound Energy must demonstrate the prudence and cost-effectiveness of its conservation programs to the Commission after the savings are achieved. *See* RCW 19.285.040(1)(d).

(b) Except as provided in Paragraph (6)(c) below, Puget Sound Energy must use the Council's Regional Technical Forum's

("RTF's") "deemed" savings for electricity measures. As of the date of this Agreement, the RTF maintains a Web site at http://www.nwcouncil.org/energy/rtf/.

(c) If Puget Sound Energy uses savings estimates that differ from those established by the RTF, such estimates must be based on generally accepted impact evaluation data and/or other reliable and relevant source data that has verified savings levels, and be presented to the CRAG for comment.

(d) When Puget Sound Energy proposes a new program tariff schedule, it must present it to the CRAG for comment with program details fully defined. After consultation with the CRAG in accordance with Paragraph (3) above, Puget Sound Energy must file a revision to its Annual Conservation Plan in this Docket. The revision may be acknowledged by placement on the Commission's No Action Open Meeting agenda.

(e) Puget Sound Energy must provide opportunities for the CRAG to review and advise on the development of evaluation, measurement and verification protocols for conservation programs. See Paragraph (3)(a)(i) above.

(f) Puget Sound Energy must spend a reasonable amount of its conservation budget on EM&V, including a reasonable proportion on independent, third-party EM&V. Puget Sound Energy must perform EM&V annually on a four-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 Paragraphs (8)(c) and (g) below.

(g) An independent third-party evaluation of portfolio-level electric energy savings reported by Puget Sound Energy for the 2012-2013 biennial period, from existing conservation programs operated during that period, shall be conducted to verify those savings. The independent third-party evaluator shall be selected through an RFP process. The review will be funded by the Puget Sound Energy Electric Conservation Service Rider. The review will be managed by UTC and Puget Sound Energy staff with input on the scope, cost, RFP development, evaluator selection and ongoing oversight by the CRAG. The scope shall:

(i) Focus on portfolio level EM&V of the existing 2012-2013 Puget Sound Energy conservation portfolio regarding impact, process, market, and cost-effectiveness analysis;

(ii) Examine selected existing 2012-2013 programs or measures in more depth than others, as called for in the RFP,;and

(iii) Provide for some additional but limited detailed independent EM&V study at the program or measure level to be selected by the independent third-party evaluator from Puget Sound Energy's existing 2012-2013 programs.

This evaluation shall include a review of Puget Sound Energy's reported electric savings on a semi-annual basis, with results provided to Commission staff and Puget Sound Energy and then discussed with the CRAG. A final report for the entire 2012-2013 biennium shall be submitted as part of Puget Sound Energy 's two-year report on conservation program achievement, required by Paragraph (8)(i) below. The report shall be finalized and made available no later than June 2014 and may be implemented in phases and delivered as a final product at an earlier date, as needed by Puget Sound Energy.

36 (7) **Program Design Principles**

(a) All Sectors Included — Puget Sound Energy must offer a mix of tariff-based programs that ensure it is serving each customer

sector, including programs targeted to the low-income subset of residential customers. Modifications to the programs must be filed with the Commission as revisions to tariffs or as revisions to Puget Sound Energy's Annual Conservation Plan, as appropriate.

(b) Outreach on Programs — Puget Sound Energy must establish a strategy and proposed implementation budget for informing participants about program opportunities in the relevant market channels for each of its energy efficiency programs. Puget Sound Energy must share these strategies and budgets with the CRAG for review and comments, and provide updates at CRAG meetings.

(c) Incentives and Conservation Program Implementation — Puget Sound Energy must offer a cost-effective portfolio of programs in order to achieve all available conservation that is cost-effective, reliable, and feasible. Programs, program services, and incentives may be directed to consumers, retailers, manufacturers, trade allies or other relevant market actors as appropriate for measures or activities that lead to electric energy savings. Incentive levels and other methods of encouraging energy conservation need to be periodically examined to ensure that they are neither too high nor too low. Incentive levels and implementation methods should not unnecessarily limit the acquisition of all available conservation that is cost-effective, reliable, and feasible. Puget Sound Energy shall work with the CRAG to establish appropriate penetration levels consistent with Council methodology and the Energy Independence Act.

(d) Conservation Efforts without Approved EM&V Protocol — Puget Sound Energy 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.

(i) Information-only services refers to those information services that are not associated with an active incentive program or that include no on-site technical assistance or on-site delivery of school education programs. Information-only services and behavior change services shall be assigned no quantifiable energy savings value without full support of the CRAG.

(ii) If quantifiable energy savings have been identified and Commission-approved for any aspect of such programs, the budget associated with that aspect of the program will no longer be subject to this ten percent spending restriction.

Puget Sound Energy may ask the Commission to modify this spending limit following full CRAG consultation. As of the date of this Agreement, an outline of the major elements of the Council's methodology for determining achievable conservation potential, including the Total Resource Cost test, is available on the Council's Web site at http://www.nwcouncil.org/energy/powerplan/6/supplycurves/I937/CouncilMethodology_outline%20_2_.pdf.

37 (8) **Required Reports and Filings**

Puget Sound Energy must file the following:

(a) Semi-annual Conservation Acquisition Report, comparing budgeted to actual kWh's and expenditures, by August 15, 2012.[6]

(b) By December 1, 2012, the 2013 Annual Conservation Plan, containing any changes to program details and an annual budget with a requested acknowledgement date of January 1, 2013. The Annual Conservation Plan may be acknowledged by

[6] *See In re Puget Sound Energy*, Docket UE-970686, Second Supplemental Order Requiring Reporting on Programs Funded by the Tariff Rider Mechanism, Ordering ¶ 1 (March 29, 2000) ("Puget Sound Energy is required to submit semi-annual reports on the progress of electricity conservation programs delivered under Schedule 83, Electricity Conservation Service, within 45 days of the end of the second and fourth quarters, until such time as the tariffed services are no longer offered").

placement on the Commission's No Action Open Meeting agenda. A draft will be provided to the CRAG by November 1, 2012.

(c) 2012 Annual Report on Conservation Acquisition, including an evaluation of cost-effectiveness and comparing budgets to actual, by February 15, 2013.[7]

(d) Revisions to cost recovery tariff (Schedule 120) by March 1, 2013, with requested effective date of May 1, 2013.

(e) Semi-annual Conservation Acquisition Report, comparing budget to actual kWh's and dollar activity, by August 15, 2013.[8]

(f) A report identifying its ten-year achievable potential and its biennial conservation target (Biennial Conservation Plan), including revised program details and program tariffs by November 1, 2013, requesting an effective date of January 1, 2014. In addition to the usual customer-based measures, the plan will also include both distribution and generation energy efficiency program plans as required by RCW 19.285. Prior to filing the Biennial Conservation Plan, Puget Sound Energy shall provide the following information to the CRAG: ten-year conservation potential and two-year target by August 1, 2013; draft program details, including budgets, by September 1, 2013; and draft program tariffs by October 1, 2013.

(g) 2013 Annual Report on Conservation Acquisition, including an evaluation of cost-effectiveness, by Feb. 15th, 2014.[9]

(h) Revisions to cost recovery tariff (Schedule 120) by March 1, 2014, with requested effective date of May 1, 2014.

(i) Two-year report on conservation program achievement by June 1, 2014. This filing is the one required in WAC 480-109-040(1)

[7] *See id*.

[8] *See id*.

[9] *See id*.

and RCW 19.285.070, which require that the report also be filed with the Washington Department of Commerce.

38 (9) **Required Public Involvement in Preparation for the 2014-2015 Biennium**

(a) Puget Sound Energy must consult with the Advisory Groups to facilitate completion of a 10-year conservation potential analysis by November 1, 2013. *See* RCW 19.285.040(1)(a); WAC 480-109-010(1). This must be based on a current conservation potential assessment study of Puget Sound Energy's service area within Washington State. This may be conducted within the context of Puget Sound Energy's integrated resource plan. If Puget Sound Energy chooses to use the supply curves that make up the conservation potential in the Council's Northwest Power Plan, the supply curves must be updated for new assumptions and measures.

(b) Puget Sound Energy must consult with the Advisory Groups between April 1, 2013, and October 31, 2013, to identify achievable conservation potential for 2014-2023 and set annual and biennial targets for the 2014-2015 biennium, including necessary revisions to program details. *See* RCW 19.285.040(1)(b); WAC 480-109-010(2) and (3).

(c) Fuel switching program will continue to use current practice of upgrading only to high-efficiency gas measures.

39 (10) **Cost-Effectiveness Test is the Total Resource Cost (TRC) Test**

(a) The Commission uses the TRC, as modified by the Council, as its primary cost-effectiveness test. Puget Sound Energy's portfolio must pass the TRC test. In general, each program shall be designed to be cost-effective as measured by this test. Puget Sound Energy must demonstrate that the cost-effectiveness tests presented in support of its programs and portfolio are in compliance with the cost-effectiveness definition (RCW 80.52.030(7)) and system cost definition (RCW 80.52.030(8)) and incorporate, quantifiable non-energy benefits, the 10

percent conservation benefit and a risk adder consistent with the Council's approach. An outline of the major elements of the Council's methodology for determining achievable conservation potential, including the Total Resource Cost test, is available on the Council's website at http://www.nwcouncil.org/energy/powerplan/6/supplycurves/I937/CouncilMethodology_outline%20_2_.pdf.

(b) In addition to the Council-modified TRC, Puget Sound Energy must provide portfolio calculations of the Program Administrator Cost test (also called the Utility Cost test), Ratepayer Impact Measure test, and Participant Cost test described in the National Action Plan for Energy Efficiency's study "Understanding Cost-effectiveness of Energy Efficiency Programs." The study is available on the Web site of the United States Environmental Protection Agency at http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf.

(c) Overall conservation cost-effectiveness must be evaluated at the portfolio level. Costs included in the portfolio level analysis include conservation-related administrative costs. All cost-effectiveness calculations will assume a Net-to-Gross ratio of 1.0, consistent with the Council's methodology.

40 (11) **Recovery Through an Electric Conservation Service Rider**

(a) Annual Filing — Puget Sound Energy's annual Electric Conservation Service Rider filing, required under Paragraph (8)(d) above, will recover the future year's budgeted expenses and any significant variances between budgeted and actual income and expenditures during the previous period.

(b) Scope of Expenditures — Funds collected through the Electric Conservation Service Rider must be used on approved conservation programs and their administrative costs. Additionally, Rider funds may be used as approved by the

Commission; e.g., for net metering administration costs, small-scale renewable programs and demand response pilots.

(c) Recovery for Each Customer Class — Puget Sound Energy shall retain existing Rider mechanisms, subject to the Commission's Order in Docket UE-970686.

41 (12) **Additional Commitments**

(a) In accordance with RCW 34.05.240 and WAC 480-07-930, Puget Sound Energy will file a petition for a declaratory order with the Commission by July 6, 2012 concerning whether capital investments in electric power production turbines that increase the efficiency of electric power production are considered part of the requirement in RCW 19.285.040(1), which states: "Each qualifying utility shall pursue all available conservation that is cost-effective, reliable and feasible." If the Commission determines that such capital investments in electric power production turbines fall within the requirements of RCW 19.285.040(1), then Puget Sound Energy will analyze whether such conservation is feasible, achievable, and cost-effective prior to filing its 2014-2015 biennial conservation target. Nothing in this Order limits the Commission's discretion or legal authority to issue a declaratory order in accordance with its interpretation of RCW 19.285.

(b) Puget Sound Energy will review the feasibility of pursuing cost-effective conservation in the form of reduction in electric power consumption resulting from increases in the efficiency of energy use at electric power production facilities it owns in whole or in part outside the boundaries of Washington State, and report back to the CRAG on the status by September 1, 2012. The review may include, but is not limited to: economic reasonableness; contractual obligations or limitations; tariff schedule limitations; legal limitations; rule limitations; cost-recovery limitations; financial limitations; practical limitations; operational limitations; transmission capacity limitations; and any other limitations or considerations that are a result or a

combination of interactions between or among these noted limitations and considerations (e.g., the impact of operational limitations on legal limitations). Puget Sound Energy shall work with the CRAG to identify options for overcoming obstacles to the feasibility of pursuing cost-effective conservation in the form of reduction in electric power consumption resulting from increases in the efficiency of energy use at electric power production facilities that Puget Sound Energy owns in whole or in part outside the boundaries of Washington State, prior to filing its 2014-2015 biennial conservation target.

DATED at Olympia, Washington, and effective June 14, 2012.

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

JEFFREY D. GOLTZ, Chairman

PATRICK J. OSHIE, Commissioner

PHILIP B. JONES, Commissioner

C. PRIORITIZATION PLAN

PUGET SOUND ENERGY
2012-13 BIENNIAL ELECTRIC CONSERVATION ACHIEVEMENT REVIEW (BECAR)
PRIORITIZATION PLAN

Submitted to

PUGET SOUND ENERGY
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

Submitted by

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

April 1, 2013

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ENERGY · WATER · EFFICIENCY

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1. Overview

This Evaluation Prioritization Plan describes the approach for accomplishing the 2012-13 Biennial Electric Conservation Achievement Review (BECAR)[1], taking into account scoping conversations between the BECAR team and key stakeholders--namely, Puget Sound Energy (PSE), the Washington Utilities and Transportation Commission (WUTC), and the PSE Conservation Resource Advisory Group (CRAG)--that occurred in late 2012 and early 2013.

Also underpinning this plan is an advisory study[2] to advise the stakeholders about scoping of the 2012-13 BECAR. This study, prepared by Schiller Consulting and CAD Consulting in November 2012, is referred to in this document as the Schiller report. It drew on the experience gained from the previous 2011-12 BECAR, industry experience with portfolio evaluations, and the needs and perspectives of the WUTC and CRAG. The report provided specific recommendations for improving the BECAR to better meet the needs of all stakeholders. Concepts from the Schiller report of particular relevance to the BECAR include the following:

1. Impact evaluations can use these approaches: (1) deemed savings and calculations, (2) measurement and verification, or (3) large-scale billing analysis.
2. The BECAR must provide an independent estimate of portfolio savings. Reviewing and accepting PSE estimates is viable if the evidence supports it. If not, though, the evaluator must have latitude to provide alternative estimates good enough to establish whether or not PSE hit their target.
3. Approaches for reviewing and/or revising savings estimates should rely on one or more of the following:
   a. Verification for RTF [Regional Technical Forum] deemed/calculated, using documentation audits, site inspections, and/or analysis reviews *[Note: we propose enhancing this approach by providing additional scrutiny to PSE deemed compared to RTF deemed savings values.]*
   b. Review of existing evaluation reports completed by others *[Note: we propose enhancing this approach by not only examining existing evaluation reports, but also critiquing and possibly shaping future evaluation studies to provide useful review information.]*
   c. Direct assessment of claimed savings, if needed
4. The BECAR and PSE internal evaluations should be better coordinated over the 2012-13 and 2014-15 biennia.

[1] The WUTC orders and the advisory report mentioned later both refer to the effort described in this plan as an "evaluation." In energy program evaluation parlance, it is better considered a review. It certainly is not an impact evaluation, though it will perform a meta-analysis of other impact evaluations, and may undertake evaluation-like activities. Additionally, the 2010-11 effort was generally referred to as the "third-party review." For these reasons, we opted to refer to this effort as a *review*, rather than an *evaluation*.

[2] Schiller Consulting, Inc., *Advice on the Appropriate Scope of an Independent Third Party Evaluation of the 2012-13 Electric Conservation Program Portfolio*, for Puget Sound Energy, November, 2012

One of the recommendations in the Schiller report, which stakeholders found useful, was to begin the 2012-13 BECAR with the preparation of this Evaluation Prioritization Plan. This Plan describes our approach to blending three methods described above in Item 3. It has been prepared in advance of the evaluation work plan to prioritize the programs to be evaluated and recommend approaches to be undertaken to independently determine the 2012-13 savings and cost-effectiveness. Once this Plan is approved, the subsequent work plan will provide more specific information on how the work will be accomplished, such as preliminary sampling targets, and the budget and schedule for implementing it. Our expectation is that the BECAR will be a two-step process, consisting of (1) an initial comprehensive review, with (2) follow-up direct assessments of claimed savings afterwards should we identify significant problems during the comprehensive review. Examples of potential problems include inadequate impact evaluations or major discrepancies between our on-site inspections and those performed by the program.

The most fundamental difference between the current 2012-23 biennium and the previous 2010-11 one is the presence of an operational PSE internal verification effort (the known as the "V-team"), which is systematically inspecting a large portion of the portfolio. Another important difference is that unlike the 2010-11 biennium, we will have a significant number of recently-completed and ongoing impact evaluations to draw from. We expect these evaluations to be directly relevant to the current biennium's programs, and to be an important supplemental source of validating information.

Thirdly, onsite inspections have been incorporated into the initial review activities, rather than being back-loaded. This fact, coupled with the expanded timeframe for dealing with issues, will enable us to reach more meaningful conclusions.

2. Prioritization Methodology

The methods we used to establish the program level priorities for 2012-13 BECAR savings validation included a review of materials relevant to this process that PSE provided, consideration of the experiences gained from the 2010-11 BECAR, discussions with PSE staff, and the professional judgment of the evaluation team as to the appropriate level of effort to place on the individual program assessments within a realistic budget.

As suggested by the proposed scope of work included in the Schiller report, PSE has provided the following materials to date for the evaluation team to review:

- Relevant WUTC orders and conditions
- 2010-11 Biennial Conservation Achievement Evaluation and related documents, including comments from WUTC staff, PSE, and the CRAG
- PSE Evaluation Framework
- PSE efficiency program plans for 2012 and 2013, including projected energy savings and, 2012 claimed savings
- PSE internal evaluation schedule

- PSE existing internal reports and evaluations for program years being implemented during 2012 and 2013
- Other relevant documents, such as procedures and accomplishments for the recently-established PSE internal verification team (V-Team)

We reviewed these listed materials for information relevant to savings validation, including that needed to prioritize the review effort and develop customized approaches for each program or program element. We also had numerous conversations and e-mail exchanges with PSE staff to obtain other relevant information. The approaches considered the four evaluation prioritization factors listed in the Schiller report, as listed below:

1. Level of expected savings
2. Level of uncertainty around the savings estimates
3. Level of risk to the portfolio savings estimate if the internal impact evaluation results are outdated, or overestimated
4. Quality and applicability of results from recent and ongoing PSE evaluations

These are defined in more detail in the next section.

3. Prioritization Results

Before developing program-specific approaches, we assigned ratings to each of the four Schiller report prioritization factors, so that we could develop an overall BECAR rigor level that will help determine our level of effort and allocation of available resources to each program or program element. The ratings bases for each factor are described below:

- **Expected savings** – We assigned a value of high, medium or low to each program or program element. Programs or program elements were rated *high* (i.e., a key program) if their expected 2012-13 savings were 5 percent or more of the total portfolio savings. We assigned a rating of *medium* to programs or program elements with expected savings between 1 and 5 percent of the two-year portfolio total. We assigned a *low* rating to programs or program elements with expected savings less than 1 percent of the portfolio total. For example, we assigned a rating of *high* to the C/I Retrofit program because the savings claim is more than 5% of the portfolio.
- **Savings uncertainty** – We also assigned each program or program element a level of uncertainty of high, medium, or low based our judgment of the reliability of the PSE-assigned savings. We assigned a *low* level of uncertainty to programs or program elements where all or most of the claimed savings were based on RTF unit energy savings, V-team or PSE staff site inspections and/or impact evaluation results. We assigned a *medium* level of uncertainty to programs or program elements where claimed savings were based only partially on RTF unit energy savings and impact evaluation results were of limited value. We assigned a *high* level of uncertainty to programs or program elements where impact evaluation results will not be available for this effort and where the RTF unit energy savings had little or no influence on the claimed savings. For example, we assigned a rating of *low* to

the C/I Retrofit program because the recent impact evaluation was of high quality and applicability.

- **Evaluation risk** – We assigned a risk level of *low* or *high* to each program or program element that has been or currently is being subjected to an internal PSE impact evaluation, based upon our assessment of the impact that overestimated savings from an internal PSE evaluation would have on the reliability of the portfolio total savings. For example, we assigned a rating of *high* to the C/I Retrofit program because should the internal PSE impact evaluation have overestimated savings, the adverse effect on portfolio savings would be significant. There is substantial overlap between this factor and the Expected Savings factor in many cases, since programs with large savings pose high evaluation risk should the evaluations be inaccurate. But because many programs have not been evaluated, though, we deemed it helpful to maintain these two factors separately.
- **Evaluation quality and applicability** – This BECAR will rely heavily on results from recent and ongoing internal PSE impact evaluations, especially for evaluations that are of high quality (i.e., applied impact evaluation best practices to a robust participant sample) and are directly applicable to the program or program element being reviewed. Quality in this context can mean not only applying impact evaluation best practices to determine savings, but also selecting a fully representative participant sample. We assigned ratings of *high* or *low* quality and applicability to programs where internal PSE evaluation results are available. For example, we assigned a rating of *high* to the C/I Retrofit program because the recent impact evaluation was rigorous, comprehensive, and directly applicable to the program. Up to this point, all of the evaluations we have initially reviewed have been of high quality; but some have been found to have low applicability due to the limited scope and/or sample size as it relates to their potential contribution to informing realization rates.

Based on an examination of the ratings assigned to the four factors above, we assigned a BECAR level to each program or program element in Table 1. The proposed review level is shown in the last column of the table. We assigned a *high* review level to programs or program elements that should be targeted for a greater portion of the review focus because they involved a large portion of the claimed savings and had a high level of risk, or no impact evaluation results to draw from. We assigned a *medium* review level to programs or program elements that had a high level of savings and risk, but had a low uncertainty and had high quality and applicable impact evaluation results to draw upon. A *medium* review level was also assigned to cases where there was a medium level of savings and no impact evaluation results to draw from. We assigned a *low* review level to programs or program elements that had a medium level of savings but had low uncertainty, whether it had high or low quality and applicable impact evaluation results to draw upon. A *low* review level also applied to cases with a low savings level and no impact evaluation results to draw upon.

Table 1: Summary of Assigned Prioritization Factors by Program or Program Element

Program	Prioritization Factors from Schiller Report (see Notes 1, 2)				BECAR Level (see Note 1)
	Expected savings	*Savings Uncertainty*	*Evaluation Risk*	*Evaluation Quality/ Applicability*	
E201 Low Income Weatherization	Low	Medium	NA	NA	Low
E214 Existing SF Residential					
Lighting	High	Medium	NA	NA	High
Space Heat	Medium	Medium	NA	NA	Medium
Water Heat	Low	High	NA	NA	Low
HomePrint	Low	High	NA	NA	Low
Appliances	Medium	Low	Low	Low	Low
Showerheads	Medium	Low	Low	High	Low
Weatherization	Medium	Medium	NA	NA	Medium
Mobile Home Duct Sealing	Low	High	NA	NA	Low
Home Energy Reports	Medium	Low	Low	High	Low
E215 SF New Construction	Low	Medium	NA	NA	Low
E216 Fuel Conversion	Low	High	NA	NA	Low
E217 Existing MF Residential	High	Medium	High	Low	Medium
E218 MF New Construction	Low	Medium	NA	NA	Low
E250 C/I Retrofit	High	Low	High	High	Low to Medium (focus on controls, tune-ups)
E251 C/I New Construction	Medium	Low	Low	High	Low
E253 RCM Services	High	Low	High	High	Medium
E255 Small Business Lighting Rebate	Medium	Low	High	High	Medium
E258 Large Power User	High	Low	High	High	Medium

E262 Commercial Rebate	High	Low	High	High	Low to High (focus on highly variable savings, third-party implementers)
E292 General T&D	Low	Medium	NA	NA	Low

Notes

1. Colors assigned to the factors are meant to provide a sense of elements being low (green), medium (blue), or high (red) uncertainty. Consequently, the evaluation quality/applicability being high is a good thing that lowers uncertainty, so "High" for this factor is colored green. Conversely, a program accounting for a high fraction of savings increases uncertainty, so that "High" for this factor would be colored red.
2. NA = not applicable

4. Program Information and Review Details Provided in Matrix

Supporting details that underlie the review level assignments in the preceding section can be found in a separate detailed matrix[3], which is part of this Plan. This matrix shows the 44 different program elements and sub-elements we are considering in the PSE portfolio. It includes information regarding how the programs are implemented, internally verified, and evaluated. It also includes a summary of an assigned review uncertainty and a summary of the proposed approaches to be used in the BECAR. Separate rows are provided for each program or program element.

The spreadsheet columns of the matrix display the following items:

Program Description

- PSE tariff number.
- Name of program element or sub element.
- Brief description of important program features.

2010-11 BECAR (third-party review) information

- Number of file reviews completed.
- Number of site visits completed, if applicable.
- Summary of relevant findings and other notes.

[3] The file name of the Adobe Acrobat PDF file "PSE 2012-13 BECAR Research Prioritization Matrix.pdf".

2012-13 portfolio information relevant to program implementation and evaluation

- **Savings estimation methods**
  - Projected percent of 2012-13 portfolio savings for the program or program element.
  - Method(s) used by the program to estimate ex ante savings, with bullets indicating all applicable ones:
    - Unit energy savings (UES) from the RTF.
    - Unit energy savings developed by PSE.
    - Calculated savings using standard protocols.
    - Custom savings developed on a site-specific basis.
- **On-site inspections**
  - Post-implementation inspections performed by the PSE V-team in 2012, including counts for random inspections, counts of the program target population, counts for requested inspections and the percent of the 2012 population that these inspections represent (a bullet indicates yes).
  - Post-implementation inspections by PSE V-team planned for 2013 (a bullet indicates yes).
  - Post-implementation inspections performed by a PSE energy management engineer (a bullet indicates yes).
  - Inspections performed by the third-party implementer (a bullet indicates yes; notes accompany these in some cases).
- **Evaluations**
  - The program received an evaluation in the recent past (a bullet indicates yes). If so, additional bullets indicated the type(s) of evaluation(s) performed (impact, process, best practice and/or market).
  - The program is currently or will perform an evaluation in 2013. If so, additional bullets indicated the type(s) of evaluation(s) performed (impact, process, best practice and/or market).
  - Notes and completion dates (actual or anticipated) relevant to past, current or future evaluations.

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- **Key program:** A bullet indicates a "key" program or program element, where "key" is defined as having the expected 2012-13 ex ante savings greater than 5% of the portfolio savings.
- **Schiller Prioritization Factors and BECAR Level**: The assigned ratings for the four prioritization factors described in the Schiller report. Ratings are provided for expected savings, savings uncertainty, evaluation risk and evaluation applicability. In addition a

proposed BECAR level is provided for each program or program element. The review level is based on our assessment of the Schiller Report prioritization factors, as well as other relevant information. The review level can be high, medium or low. The prioritization factors and review levels correspond to the information provided in Table 1 in the previous section.

- **Possible BECAR methods:**
  - **PSE deemed savings review**: For prescriptive measures with unit energy savings developed by PSE, the BECAR evaluator will examine relevant supporting documentation in Measure Metrics. If appropriate, we will also compare this to relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to conditions in the PSE service area. This documentation may include, but is not limited to:
    - Northwest Power and Conservation Council Regional Technical Forum (RTF) measure workbooks
    - Energy Star calculators and supporting documents
    - California Energy Commission Database for Energy Efficient Resources (DEER)
    - Technical Reference Manuals for the states of New York, Massachusetts, Vermont, Ohio, Minnesota, Wisconsin, Maine, New Jersey, Connecticut and Pennsylvania.
    - Department of Energy Technical Support Documents

    If we determine a UES value is not valid, we will adjust it based on best available info among the listed sources, and possibly others. This adjustment may serve to either increase or decrease the UES value. PSE will have an opportunity to review our assessment for UES values that may be adjusted.
  - ***Phone survey***: the BECAR evaluator will perform a survey and collect data by telephone because it is not possible to observe the measures in a site inspection (e.g., refrigerator decommissioning).
  - ***Site visit to confirm PSE EME inspection***: the BECAR evaluator will perform an independent site visit of a site that was previously post-inspected by a PSE energy management engineer (EME).
  - ***Ride-along with PSE EME***: for future projects, the BECAR evaluator will accompany a PSE engineer on a post-inspection that was scheduled by the PSE engineer.
  - ***Site visit to confirm third-party implementation***: the BECAR evaluator will perform an independent visit to a project that was completed, and possibly inspected, by a third-party program implementer.
  - ***Ride-along with third-party implementer***: for future projects, the BECAR evaluator will accompany a representative of a third-party implementation contractor, to observe them performing their own regularly-scheduled post-implementation inspection.

- ***Site visit to confirm V-team inspection***: the BECAR evaluator will perform an independent site visit of a site that was inspected by the PSE V-team.

  For V-team inspections that have already been completed in 2012, and the first months of 2013, we will randomly select records for inspected sites. This selection will be weighted towards programs where the V-Team found problems, as well as those identified as important programs/program elements by the review team. The full V-team report for 2012 is due out in March-April of this year. This will provide a basis for selecting this sample. The report is expected to include internal recommendations on how to improve V-Team efforts, and we will consider these during our sample design. For upcoming V-Team inspections for the remainder of 2013, we would sample a smaller percentage to re-inspect, focusing on past problem areas, if any.

- ***V-team ride-along***: (beginning second quarter 2013) the BECAR evaluator will accompany a representative of the PSE V-team on a regularly-scheduled inspection, to observe how they carry out their work.

- ***Review impact evaluation results***: the BECAR evaluator will base all or part of the third-party review on an assessment of the results from a recent or ongoing PSE impact evaluation. This is the preferred approach, in situations where the evaluation can be shown to be of adequate applicability and quality. The scope of this effort will vary with the circumstances encountered for each evaluation. Possible considerations include:

  - Was the evaluation based on a reasonable sample that adequately represented the population of the entire program? Was the sample large enough to provide 90/10 statistical confidence and precision?
  - Did the evaluation use a sound technical approach that used best practice methods for data collection and analysis of measure savings? Did these methods produce reasonable estimate of savings for the sampled measures? Was this done for the PSE deemed measures, the calculated measures, and/or custom measures? Did the evaluation verify that the RTF deemed measure savings values were properly applied?
  - Did the evaluation produce realization rates that are directly applicable to this review? A realization rate in this context is statistically and technically valid ratio of evaluated savings for a program to the corresponding utility claimed savings for that program. This is fundamentally different from a *verification rate*, defined as the ratio of the number of projects verified to be installed and operational, divided by the total number of projects so verified. The latter is not as good an indicator of actual realized savings.
  - If the evaluation was performed on program years prior to 2012-13, are all or portions of the results applicable to the population of program participants in the 2012-13 program years?

- Were the programmatic action items described in the PSE internal evaluation report response (ERR) implemented, particularly those that could have potentially affected future savings values?

Based on the response to the above questions, SBW will conduct supplemental analyses, as necessary, to bring the available results from recent or ongoing evaluations into conformance with the needs of this review.

- ***Direct assessment of claimed savings***: the BECAR evaluator will perform an independent assessment of the savings associated program or program element, because other methods are not available. This effort may be carried out in conjunction with PSE and/or other evaluation contractors, as appropriate. For example, determining which customer sectors received lights provided as part of the E214 Existing Single Family Residential Lighting sub-program described in Section 5.2.1 could be accomplished collaboratively through BECAR evaluator and PSE efforts.
- ***Total number of methods proposed***: a count of the number of review methods that may be applicable for a given program or program element.

A more detailed description of the proposed approach for each program or program element is provided in the next section.

5. Program-Level Evaluation Approaches

This section describes our approach for validating savings for each program or program element for the 2012-13 biennium. We considered the assigned prioritization factors described above in Section 3, the information summaries in the attached spreadsheet, and our own professional judgment. The approaches rely on the following assumptions, which are consistent with (a) the recommendations in the Schiller report, (b) discussions with the WUTC, PSE, and CRAG, and (c) recent developments in the PSE verification procedures.

1. **RTF savings**: The BECAR will accept approved RTF values for unit energy savings after verifying that they were applied correctly by PSE in the claimed savings.
2. **PSE deemed savings**: The BECAR will review these values and compare with other reliable industry sources to verify they are appropriate.
3. **PSE verifications**: To the extent possible, the BECAR will leverage the site inspection work of the recently enacted PSE V-team. The third-party review will verify work performed by the V-team through spot checks of inspections that they have performed and pursue a more in-depth investigation only if the spot checks uncover a significant problem with their work.
4. **Sampling precision**: Whenever possible and practical, the BECAR will be performed on participant samples that are designed to achieve ±10% precision at a 90% level of confidence. It is important to distinguish between impact evaluations, which often selected samples that provided that level of sampling precision around the claimed *savings*, and V-team inspections, which set sample sizes that would provide 90/10 precision around project *counts*.

5. **Impact evaluations**: To the extent possible, the BECAR will leverage some or all of the results from recently completed and/or ongoing PSE impact evaluations. If no evaluation exists, we will rely on reviews of PSE deemed savings and verifications. In instances where none of these exist, such as with the E214 Single-family Lighting program element, we will perform a direct assessment.
6. **Direct assessment**: The BECAR will perform the more costly direct assessment of claimed savings only for programs or program elements where other methods are not possible.

5.1. E201 Low Income Weatherization

This program provides weatherization and energy-related repairs for low-income, single- and multi-family residences, including mobile homes. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	0.4%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	Medium
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

Program savings estimates are all UES-based. We will accept the RTF UES values and not review them, except for applicability. We will review the sampled PSE UES values for reasonableness and applicability. There is no previous PSE impact evaluation to review, nor is one planned in the near future. There are ongoing third-party inspections and the V-team did perform six inspections in 2012. We will verify the proper installation of program measures through independent spot checks of 2012-13 V-team inspections and ride-alongs for later 2013 third-party inspections. We will expand the review to further investigate problems that are uncovered through either the checks of PSE UES values or the V-team and third-party inspections. If significant problems are identified, we will adjust the claim accordingly.

5.2. E214 Existing Single Family Residential

This very large program accounts for 37% of the total electric portfolio. It has nine elements, which will be treated as follows:

5.2.1. Lighting

This element of the E214 Single-family Existing program provides incentives and promotions so retailers can offer a wide range of compact fluorescent (CFL) and LED lamps and fixtures. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	25.7%
Key program or program element (>5% of savings)	Yes
Prioritization factors from Schiller report	
▪ Expected savings	High
▪ Savings uncertainty	Medium
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	High

Program savings estimates are all UES-based (relevant lighting measures are CFLs and LEDs). We will accept the RTF UES values and not review them, except for applicability. We will review the PSE UES values for reasonableness and applicability. There is no previous PSE impact evaluation to review, nor is one planned in the near future. This is an upstream program, so PSE does not perform inspections. Since this is a key program and no impact evaluation information will be available, we propose a direct assessment of program claimed savings. The scope of this effort will include the following four tasks:

- **Proportion Non-residential.** The program assumes that all lamps (CFL and LED) distributed under this program went to residential customers. However, some of lamps went to non-residential customers, since they were not prevented from participating in this program. It is important to determine the fraction of the lamps that were purchased and installed by non-residential customers. The number of operating hours for non-residential lamps is typically much greater than observed for residential customers, so the savings for this program are very sensitive to the assumed split between residential and non-residential applications. We will estimate the sector split based on information obtained from a telephone survey of lighting retailers that will be performed as part of the review. The survey will ask participating retailers to estimate the percentages of all CFL and LED lamps that they sold in 2012 that were bought by business and residential customers, respectively. We will analyze the survey responses to support an estimate of the proportion of lamps that are distributed to non-residential applications. We will perform a separate analysis for CFL and LED lamps.

  It is important to note that we recently deployed this survey-based approach on an impact evaluation for another Pacific Northwest utility, with good results. We are also familiar with similar studies performed in other regions, and results from these could be brought to bear if needed as an alternative to or to supplement the primary research.

- **Unit Energy Savings for Residential CFLs and LEDs.** For residential customers, we will take the UES per lamp value for CFLs directly from the RTF. We will accept the RTF values without review, except for applicability. The RTF values include the effects of lamp storage and removal. Since the RTF does not have UES values for LED lamps, we will derive the LED UES values by applying the methodology used by the RTF for CFLs to the performance characteristics of LEDs. We will consult other secondary data sources to verify that the UESs derived in this way are reasonable.
- **Unit Energy Savings for Non-residential CFLs and LEDs,** The RTF does not provide CFL or LED UES values for non-residential customers. Therefore, our review will estimate the UES by lamp type and wattage based on an analysis of lamp energy characteristics data collected during the implementation and/or evaluation of other PSE non-residential programs, such as the Small Business Lighting Rebate program and/or the C/I retrofit program. We will collect supplemental data during the site inspections performed as part of the review. We will base the UES on characteristics such as the pre-retrofit and post-retrofit wattages, the observed hours of operation, storage rates and removal rates.
- **Installed Lamp Counts.** We will verify the installed counts documented in the PSE tracking database through a review of the monthly sales documentation provided by the retailers. We will correct any data entry errors discovered in the tracking data. We will analyze the retailer data to disaggregate total fixture and lamps counts into counts for each lamp and fixture type (e.g., 13 watt CFLs). We will determine an appropriate baseline wattage for each lamp or fixture type, based on standard practice and an assessment of equivalent lumens. We will then compute a wattage difference for each lamp and fixture type.

Our review will combine the data above discussed above to estimate program savings and the program realization rate.

5.2.2. Space Heat

This element of the E214 Single-family Existing program provides air-source, geothermal, and ductless heat pumps, as well as integrated space and water heating. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	2.0%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Medium
▪ Savings uncertainty	Medium
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Medium

Program savings estimates are all UES-based. We will accept the RTF UES values and not review them, except for applicability. We will review the sampled PSE UES values for reasonableness and applicability. There is no previous PSE impact evaluation to review, nor is one planned in the near future. Some useful information on the performance of ducted air source heat pumps may come from the single family appliance impact evaluation currently being performed (see Section 5.2.5 below).

Some portions of this program are inspected by the V-team, while others are inspected by a third-party. The V-team performed 1,058 random and 29 requested inspections in 2012, out of 6,151 targeted installations, for an 18% inspection rate. Additional V-team inspections are planned for 2013. The third-party implementer performed some inspections in 2012 and will perform additional inspections in 2013. We will verify proper installation of program measures through independent spot checks of 2012-13 V-team inspections and ride-alongs for 2013 third-party inspections. We will apply the same verification to the third-party inspections. We will expand the review to further investigate problems uncovered through either the checks of PSE UES values or the V-team/third-party inspections. We will adjust the claim if significant problems are identified.

5.2.3. Water Heat

This element of the E214 Single-family Existing program provides efficient water heaters and heat pumps, as well as wastewater heat recovery systems. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	0.2%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	High
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

Program savings estimates are all UES-based. Savings for all measures are based on UES values developed by PSE. We will review the sampled PSE UES values for reasonableness and applicability. There is no previous PSE impact evaluation to review, nor is one planned in the near future. Some portions of this program are inspected by the V-team, while others are inspected by a third-party. The V-team performed 105 random and 7 requested inspections in 2012, out of 169 targeted installations, for a 66% inspection rate. Additional V-team inspections are planned for 2013. The third-party implementer performed some inspections in 2012 and will perform additional inspections in 2013. We will verify proper installation of program measures through independent spot checks of 2012-13 V-team inspections and ride-alongs for

2013 third-party inspections. We will apply the same verification to the third-party inspections. We will expand the review to further investigate problems uncovered through either the checks of PSE UES values or the V-team/third-party inspections. We will adjust the claim if significant problems are identified.

5.2.4. HomePrint

For this element of the E214 Single-family Existing program, HomePrint specialists evaluate homes and install CFLs. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	0.9%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	High
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

Program savings estimates are all UES-based. Savings for all measures are based on UES values developed by the RTF. We will accept and not review the RTF UES values, except for applicability.. There is no previous PSE impact evaluation to review, nor is one planned in the near future. Some portions of this program are inspected by the V-team, while others are inspected by a third-party. The V-team performed 227 random and 25 requested inspections in 2012, out of 4,208 targeted installations, for a 6% inspection rate. Additional V-team inspections are planned for 2013. The third-party performed some inspections (by phone) in 2012 and will perform additional inspections in 2013. We will verify proper installation of program measures through independent spot checks of 2012-13 V-team inspections and ride-alongs for 2013 third-party inspections. We will apply the same verification to the third-party inspections. We will expand the review to further investigate problems that are uncovered through either the checks of PSE UES values or the V-team/third-party inspections. We will adjust the claim if significant problems are identified.

5.2.5. Appliances

This element of the E214 Single-family Existing program provides efficient washers, refrigerators, and freezers, as well as pickup, recycling and rebate for working refrigerators and freezers. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	3.1%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Medium
▪ Savings uncertainty	Low
▪ Evaluation risk	Low
▪ Evaluation applicability	Low
Proposed BECAR level	Low

Program savings estimates are all UES-based. Savings for all measures are based on UES values developed by the RTF. We will accept and not review the RTF UES values, except for applicability. There is no previous PSE impact evaluation to review. However, an impact evaluation is currently underway for refrigerators (replacement and decommissioning) and clothes washers. The results are expected in early 2013.

Some portions of this program are inspected by the V-team, while others are inspected by third-party implementers. The V-team did not perform any inspections in 2012 but intends to do so in 2013. The third-party implementer performed some inspections in 2012 and will perform additional inspections in 2013. We will verify proper installation of program measures through independent spot checks of 2013 V-team inspections and ride-alongs for 2013 V-team inspections. We will apply the same verification approach to the third-party 2012-13 inspections. We will verify the refrigerator decommissioning measure through a telephone survey, since it is not possible to observe this measure in a site inspection.

After we review the impact evaluation report and we have a better understanding of the information that the evaluation will provide, we will develop a more detailed approach for this program. Additional data collection and analysis may be required to supplement the impact evaluation results for the purposes of this review. In addition, we will expand the review to further investigate problems uncovered in review of the PSE UES values or the V-team/third-party inspections. We will adjust the claim if significant problems are identified.

5.2.6. Showerheads

This element of the E214 Single-family Existing program provides free low-flow showerheads to residential customers. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	1.4%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Medium
▪ Savings uncertainty	Low
▪ Evaluation risk	Low
▪ Evaluation applicability	High
Proposed BECAR level	Low

This is an event-based program where showerheads and/or CFLs are given to event participants at no cost. There is no previous PSE impact evaluation of this program to review. However, an impact evaluation is currently underway. The results are expected in early 2013. Results from the impact evaluation will be heavily relied upon for the review. The scope of the impact evaluation is the survey-based estimation of installation rates and placement rates (primary or secondary shower) for event-based showerheads, by fuel, given to PSE residential customers. It also includes estimates of the installation rates for event-based CFLs given to PSE customers. Since this is an event-based program, inspections are not possible during program implementation or this review. We will review the evaluation results for reasonableness.

Program savings estimates for both showerheads and CFLs are UES-based. The RTF has established UESs for both of these measures but they are not relevant to the event-based application. Based on the results from the impact evaluation, we will modify the RTF UES values to bring them into conformance with this application. We will also estimate a realization rate for the program, using the results of the evaluation, PSE tracking data and the revised RTF UES values. We will adjust the claim, if significant differences are identified.

5.2.7. Weatherization

This element of the E214 Single-family Existing program provides home insulation and HVAC duct sealing. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	2.2%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Medium
▪ Savings uncertainty	Medium
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Medium

Program savings estimates are all UES-based. We will accept the RTF UES values and not review them, except for applicability. We will review the sampled PSE UES values for reasonableness and applicability. There is no previous PSE impact evaluation to review, nor is one planned in the near future. Some portions of this program are inspected by the V-team, while others are inspected by a third-party. The V-team performed 182 random and 1 requested inspections in 2012, out of 587 targeted installations, for a 31% inspection rate. Additional V-team inspections are planned for 2013. The third-party implementer performed some inspections in 2012 and will perform additional inspections in 2013. We will verify proper installation of program measures through independent spot checks of 2012-13 V-team inspections and ride-alongs for 2013 third-party implementer inspections. We will apply the same verification to the third-party implementer inspections. We will expand the review to further investigate problems uncovered through either the checks of PSE UES values or the V-team/third-party inspections. We will adjust the claim, if significant problems are identified.

5.2.8. Mobile Home Duct Sealing

This element of the E214 Single-family Existing program provides duct sealing services for mobile homes. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	0.2%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	High
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

Since this is a new 2013 program element, we had not yet received much information on it. We will review UES-based savings as appropriate. We will accept the RTF UES values and not review them, except for applicability. We will review the sampled PSE UES values for reasonableness and applicability. There is no previous PSE impact evaluation to review, nor is one planned in the near future. This program is not currently inspected by the V-team. We will verify proper installation of program measures through independent spot checks of completed projects and ride-alongs for some ongoing implementer inspections. We will expand the review to further investigate problems uncovered in the UES values or inspections. We will adjust the claim, if significant problems are identified.

5.2.9. Home Energy Reports

This element of the E214 Single-family Existing program provides customized reports to help residential customers understand their energy usage and find ways to save. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	1.6%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Medium
▪ Savings uncertainty	Low
▪ Evaluation risk	Low
▪ Evaluation applicability	High
Proposed BECAR level	Low

Because of the nature of this program, inspections are not possible during program implementation or this review. Impact evaluations for this program rely on comparison of billed use between control and participant groups, and are specific to the subject year. PSE completed the first of these evaluations for the 2011 program year. A similar impact evaluation for the 2012 program year is currently underway, with results expected in early 2013. We will review and validate the methodology and findings from this evaluation. If we uncover problems during this review, we will expand it to further investigate each problem. We will adjust the claim if significant problems are identified.

5.3. E215 Single Family New Construction

This program provides rebates and incentives for efficient lighting, appliances, HVAC, water heating in new single-family residences, including manufactured homes. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	0.4%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	Medium
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

Program savings estimates are all UES-based (RTF and PSE). There is no previous PSE impact evaluation to review. However, a process and market evaluation is currently underway. The evaluation does include a UES savings review but the scope of the review is limited and is not intended to be a full impact evaluation. The results are expected in December of 2013. We will review the results from this evaluation and accept the results from the UES savings review, if the scope of the evaluation is found to be complete and rigorous. We will perform additional reviews of the sampled PSE UES values for reasonableness and applicability, if the evaluation results are not reasonable.

This program is inspected by the V-team. The V-team performed 397 random inspections in 2012, out of 2,000 targeted installations, for a 20% inspection rate. Additional V-team inspections are planned for 2013. Proper installation of program measures will be verified through independent spot checks of 2012-13 V-team inspections and ride-alongs for 2013 V-team inspections. We will expand the review to further investigate problems are uncovered in the evaluation findings or the V-team inspections. We will perform additional analysis of the evaluation findings and inspection results to estimate a realization rate for this program. If necessary, we will adjust the claim based on these results.

5.4. E216 Single Family Fuel Conversion

This program provides incentives to replace electric space or water heating equipment with high-efficiency gas counterparts. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	0.6%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	High
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

Program savings estimates are all UES-based. Savings for all measures are based on UES values developed by PSE. We will review the sampled PSE UES values for reasonableness and applicability. There is no previous PSE impact evaluation to review, nor is one planned in the near future. This program is inspected by the V-team. The V-team performed 76 random inspections in 2012, out of 237 targeted installations, for a 32% inspection rate. Additional V-team inspections are planned for 2013. We will verify proper installation of program measures through independent spot checks of 2012-13 V-team inspections and ride-alongs for 2013 V-

team inspections. We will expand the review, if problems are uncovered in the UES reviews or the V-team inspections. We will adjust the claim, if significant problems are identified.

5.5. E217 Existing Multifamily Residential

This program provides rebates and incentives for efficient lighting, appliances, HVAC, water heating, and improved building envelope components. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	5.9%
Key program or program element (>5% of savings)	Yes
Prioritization factors from Schiller report	
▪ Expected savings	High
▪ Savings uncertainty	Medium
▪ Evaluation risk	High
▪ Evaluation applicability	Low
Proposed BECAR level	Medium

Some program savings estimates are UES-based (RTF and PSE) while others involve a custom analysis of measure performance. A previous impact evaluation of this program was completed in 2011. This previous work was limited in scope to a review and analysis of unit savings for shell and non-shell measures, with an emphasis on establishing accurate unit savings for future program years. It did not estimate a realization rate for the program years included in the work. Since this effort was completed, the RTF has sponsored additional research relevant to the measures included in this program. We will consider the results from this effort in our review. To the extent possible, our review will rely on the results from these previous efforts to establish reliable estimates of unit savings.

Some portions of this program are inspected by the V-team, while others are inspected by a third-party. The V-team performed seven requested inspections in 2012 and does not intend to perform any inspections in 2013. The third-party performed some inspections in 2012 and will perform additional inspections in 2013. We will verift proper installation of program measures through independent spot checks of 2013 third-party inspections and ride-alongs for 2013 third-party inspections. We will expand the review to further investigate problems that are uncovered in the evaluation findings or the third-party inspections. We will adjust the claim, if significant problems are identified.

5.6. E218 MultiFamily New Construction

This program provides rebates and incentives for efficient lighting, appliances, HVAC, water heating, and improved building envelope components in new multi-family residences. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	0.3%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	Medium
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

Some program savings estimates are UES-based (RTF and PSE) while others involve standardized calculations and custom analysis of measure performance. There is no previous PSE impact evaluation to review. However, a process and market evaluation is currently underway. The evaluation does include a UES savings review, but the scope of the review is limited and is not intended to be a full impact evaluation. The results are expected in December 2013. We will review the results from this evaluation and we will accept the results from the UES savings review, if the scope of the evaluation is found to be complete and rigorous. We will perform additional reviews of the sampled non-RTF values for reasonableness and applicability, if the evaluation results are not reasonable.

This program is inspected by the V-team. The V-team performed 18 random inspections and one requested inspection in 2012, encompassing all completed projects. Additional V-team inspections are planned for 2013. Proper installation of program measures will be verified through independent spot checks of 2012-13 V-team inspections and ride-alongs for 2013 V-team inspections. We will expand the review to further investigate problems uncovered in the evaluation findings or the V-team inspections. We will perform additional analysis of the evaluation findings and inspection results to estimate a realization rate for this program. If necessary, the claim will be adjusted based on these results.

5.7. E250 Commercial/Industrial Retrofit

This program provides incentives for upgrades to equipment (lighting, HVAC, refrigeration, etc.), building shell, industrial process, and select operations and maintenance improvements. Includes the Energy Smart Grocer and Building Energy Optimization (existing retrocommissioning) programs.The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	21.1%
Key program or program element (>5% of savings)	Yes
Prioritization factors from Schiller report	
▪ Expected savings	High
▪ Savings uncertainty	Low
▪ Evaluation risk	High
▪ Evaluation applicability	High
Proposed BECAR level	Low to Medium, depending on element

Program savings are estimated through calculated and custom analysis of measure performance. A previous evaluation was completed in 2012. It provided a thorough analysis of program performance, including site inspections, re-estimation of savings and the calculation of realization rate. Our review will rely heavily on the results from this previous work, including an assessment of whether the mix of measures and technologies previously evaluated has changed during the current biennium. Our review will focus on areas that have changed significantly. Two particular areas of focus will be controls-based retrofits, such as new energy management and control systems (EMCS) and other HVAC controls modifications, as well as building tune-up and tracking projects (including energy tracking, education, commissioning, and the Building Energy Optimization Program - BEOP). Savings in these named areas tend to be more uncertain than traditional retrofit projects, and thus deserve closer scrutiny.

Installations performed for this program have been and continue to be inspected by PSE energy engineers. We will conduct independent and ride-along inspections of a sample of 2012-13 sites to verify that the measures were installed properly. We will expand the review to further investigate problems are uncovered in the evaluation findings or the site inspections. We will adjust the claim if significant problems are identified.

5.8. E251 Commercial/Industrial New Construction

This program provides incentives for efficiency upgrades that exceed codes or standard practice for new facilities or major remodels of all sizes. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	1.3%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Medium
▪ Savings uncertainty	Low
▪ Evaluation risk	Low
▪ Evaluation applicability	High
Proposed BECAR level	Low

Program savings are estimated through calculated and custom analysis of measure performance. A previous impact evaluation of this program was completed in 2007. An additional impact evaluation is currently underway, with an expected report date of December 2013. The scope of the current impact evaluation includes a thorough analysis of program performance, including site inspections, re-estimation of savings and the calculation of realization rate. Our review will rely heavily on the results from this current work. Installations performed for this program have been and continue to be inspected by PSE energy engineers. We will conduct independent and ride-along inspections of a sample of 2012-13 sites to verify that the measures were installed properly. We will expand the review to further investigate problems uncovered in the evaluation findings or the site inspections. We will adjust the claim, if significant problems are identified.

5.9. E253 Resource Conservation Manager Services

This program provides grants for large customers with multiple facilities to hire a dedicated resource manager to reduce energy use by 10% or more over a three-year term. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	5.2%
Key program or program element (>5% of savings)	Yes
Prioritization factors from Schiller report	
▪ Expected savings	High
▪ Savings uncertainty	Low
▪ Evaluation risk	High
▪ Evaluation applicability	High
Proposed BECAR level	Medium

Program savings are estimated through custom billing analysis of measure performance. An impact evaluation of this program is currently underway, in response to questions raised during the 2010-11 BECAR. It is examining RCM projects claimed in 2011 and the first half of 2012, and will be completed in April 2103. The current impact evaluation includes detailed site inspections of a sample of projects, custom analysis of annual energy savings using engineering and billing analysis, and a calculation of realization rate. We will assess changes that have occurred in the program in the latter half of 2012 and 2013, particularly in response to evaluation findings, and determine how best to apply the evaluation results to the biennium claim.

5.10. E255 Small Business Lighting Rebate

This program provides rebates for a wide range of lighting conversions in small businesses. It also provides a contractor and vendor network. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	4.9%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Medium
▪ Savings uncertainty	Low
▪ Evaluation risk	High
▪ Evaluation applicability	High
Proposed BECAR level	Medium

Program savings are estimated through calculated analysis of measure performance. A previous impact evaluation of this program was completed in 2007. An additional impact evaluation is currently underway, with an expected report date of June 2013. The scope of the current impact evaluation includes a thorough analysis of program performance, including site inspections, re-estimation of savings and the calculation of realization rate. Our review will rely heavily on the results from this current work.

This program is inspected by the V-team. The V-team performed 368 random inspections and 19 requested inspection in 2012, out of 1,800 targeted installations, for a 22% inspection rate. Additional V-team inspections are planned for 2013. We will verify proper installation of program measures through independent spot checks of 2012-13 V-team inspections and ride-alongs for 2013 V-team inspections. The review will be expanded if problems are uncovered in the evaluation findings or the V-team inspections. If necessary, we will adjust the claim based on these results.

5.11. E258 Large Power User – Self Directed

In this program, large commercial and industrial customers submit proposals for efficiency upgrades using the funds allocated by their tariff. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	5.3%
Key program or program element (>5% of savings)	Yes
Prioritization factors from Schiller report	
▪ Expected savings	High
▪ Savings uncertainty	Low
▪ Evaluation risk	High
▪ Evaluation applicability	High
Proposed BECAR level	Medium

Program savings are estimated through custom analysis of measure performance. A previous impact evaluation of this program was completed in 2012 in combination with the E250 C/I Retrofit program. Our review will rely heavily on the results from this previous work. Installations performed for this program have been and continue to be inspected by PSE energy engineers. We will conduct independent and ride-along inspections of a sample of 2012-13 sites to verify that the measures were installed properly. We will expand the review to further investigate problems uncovered in the evaluation findings or the site inspections. We will adjust the claim, if significant problems are identified.

5.12. E262 Commercial Rebate

This program provides standardized rebates for common, relatively uniform measures in various areas, such as cooking equipment, interior lighting, and heat pumps. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	10.4%
Key program or program element (>5% of savings)	Yes
Prioritization factors from Schiller report	
▪ Expected savings	High
▪ Savings uncertainty	Low
▪ Evaluation risk	High
▪ Evaluation applicability	High
Proposed BECAR level	Low to High, depending on element

Some program savings estimates are UES-based (RTF and PSE) while others involve calculated analysis of measure performance. Previous impact evaluations that considered portions of this program were completed in 2009 (Premium HVAC Service) and 2011 (PC Power Management).

An additional impact evaluation is currently underway, with an expected report date of June 2013. The scope of the current impact evaluation includes a thorough analysis of program performance, including site inspections, re-estimation of savings and the calculation of realization rate. Our review will rely heavily on the results from this current work. Several areas within this program deserve somewhat closer scrutiny, such as: (1) variable speed drive projects, where savings can be highly variable, (2) Premium HVAC Service, which has a third-party implementer and savings that can be difficult to determine, and (3) third-party-implemented programs such as Green Motor Rewinds and direct-install initiatives. Some of the latter, such as pre-rinse spray valve, aerator, and CoolerMiser direct-install initiatives, are run by SBW Consulting, and so DNV KEMA would need to review them to avoid a conflict of interest.

Most elements of this program are inspected by the V-team. The V-team did not perform any inspections in 2012, but intends to do so in 2013. We will verify proper installation of program measures through independent spot checks of 2013 V-team inspections and ride-alongs for 2013 V-team inspections. Our review will rely on inspections performed as part of the impact evaluation to verify measure installation for program elements not treated by the V-team. We will expand the review if problems are uncovered in the evaluation findings or the V-team inspections. If necessary, we will adjust the claim based on these results.

5.13. E292 General Transmission and Distribution

This program implements energy conservation within PSE's own generation and distribution facilities. The table below summarizes important aspects of the program, in relation to the BECAR.

Percentage of 2012-13 portfolio savings (projected)	1.2%
Key program or program element (>5% of savings)	No
Prioritization factors from Schiller report	
▪ Expected savings	Low
▪ Savings uncertainty	Medium
▪ Evaluation risk	NA
▪ Evaluation applicability	NA
Proposed BECAR level	Low

PSE predicts that the actual savings from this program will likely be much lower than projected, particularly because no savings were reported for 2012. Consequently, despite the fact that this is a new program, the review level is low. Program savings are estimated through custom analysis of measure performance. Since this is a new program, there are no previous impact evaluations. Because the program will likely represent a very small portion of the portfolio and the savings calculations are straightforward, our review will be limited to a review of a sample of project files provided by PSE.

D. WORKPLAN

D.1. Background

On September 28, 2010, the Washington Utilities and Transportation Commission (Commission) issued an order to adopt a settlement agreement between Puget Sound Energy (PSE) and various stakeholder parties, including conditions for approving PSE's ten-year electric conservation potential and biennial electric energy savings target in compliance with the electric energy conservation portfolio standard required by the Washington Energy Independence Act (Initiative 937). The settlement agreement established the terms under which PSE has agreed to operate its electric energy efficiency programs. Among the conditions in the settlement agreement is the requirement to conduct an independent third-party review of the electric energy savings reported by PSE for each biennium, beginning with 2010-2011.

The 2010-2011 Biennial Electric Conservation Achievement Review (BECAR) was performed by SBW Consulting, Inc. (SBW) under contract to PSE. The final report, which documented the methodology, findings and conclusions from the first biennial review, was issued in May 2012. It was presented to PSE's Conservation Resource Advisory Group (CRAG) in April 2012. In general, the first biennial review verified that PSE's 2010-11 savings claim for the portfolio was sound, defensible, and well-documented. The only exception was the Resource Conservation Manager Program (Tariff E253), where owing to concerns that the claimed savings might be overstated, program savings were reduced slightly to account for the uncertainties existing at that time.

One of the important comments that came from the CRAG review of the 2010-2011 final report was the need for more clarity about the scope of future reviews, particularly about the level of rigor that should be placed on determining the veracity of the claimed savings. Stakeholders suggested that PSE solicit outside advice to help them more clearly develop the scope for the 2012-2013 BECAR. PSE retained the services of Schiller Consulting and CAD Consulting to conduct an advisory study[10] to advise the stakeholders about scoping of the 2012-13 BECAR. The study, which was completed in November 2012, is referred to in this document as the Schiller report. It drew on the experience gained from the previous 2010-11 BECAR, industry experience with portfolio evaluations, and the needs and perspectives of the WUTC and CRAG. The report provided specific recommendations for improving the BECAR to better meet the needs of all stakeholders.

Concepts from the Schiller report of particular relevance to the 2012-2013 BECAR include the following:

1. Impact evaluations can use these approaches: (1) deemed savings and calculations, (2) measurement and verification, or (3) large-scale billing analysis.

[10] Schiller Consulting, Inc., *Advice on the Appropriate Scope of an Independent Third Party Evaluation of the 2012-13 Electric Conservation Program Portfolio*, for Puget Sound Energy, November 2012

2. The BECAR must provide an independent estimate of portfolio savings. Reviewing and accepting PSE estimates is viable if the evidence supports it. If not, though, the evaluator must have latitude to provide alternative estimates good enough to establish whether or not PSE hit their target.
3. Approaches for reviewing and/or revising savings estimates should rely on one or more of the following:

   Verification of RTF [Regional Technical Forum] deemed/calculated savings, using documentation audits, site inspections, and/or analysis reviews [Note: we propose enhancing this approach by providing additional scrutiny to PSE deemed savings values].

   Review of existing evaluation reports completed by others [Note: we propose enhancing this approach by not only examining existing evaluation reports, but also critiquing and possibly shaping future evaluation studies to provide useful review information].

   Direct assessment of claimed savings, if needed.
4. The BECAR and PSE internal evaluations should be better coordinated over the 2012-13 and 2014-15 biennia.

SBW was retained by PSE to perform the 2012-2013 BECAR, with a scope largely based on the recommendations from the Schiller report. This workplan documents our scope of work, budget, timeline, and management structure for the 2012-2013 review. An appendix to this plan also includes the specific approaches that we will use to review each program in the portfolio, based on the information that was available to us at the time the workplan was prepared.

D.2. Objectives

The primary purpose of the BECAR is to assess the extent to which the electric energy savings that PSE reported for their electric conservation portfolio in the 2012-13 biennium were achieved. We are completing the review under the direction of PSE and WUTC staff, with further input and oversight provided by the Conservation Resource Advisory Group (CRAG).

The two objectives of this study are as follows:

- **Portfolio Savings Review**. Determine the veracity of total portfolio electric energy savings[11] reported by PSE, relative to the targets and baselines established at the time of program approval by the Commission. This includes verifying that both RTF deemed and non-RTF-derived measure savings are being applied consistent with the Settlement.
- **Cost-effectiveness Calculation Review**. Audit of cost-effectiveness results, including review of methodology, inputs, and calculation, to determine if it is consistent with the Settlement.

[11] The energy savings discussed throughout this report are *gross* savings, and do not take into account adjustments commonly made to derive *net* savings, including factors such as free drivers, free riders, and participant spillover.

This review is limited to those existing electric conservation programs that PSE operated in 2012 and 2013, and that were the basis for the electric energy savings which PSE has reported for that two-year period.

D.3. Scope of Work

The 2012-2013 BECAR will be performed as a series of five tasks. In general, these tasks are consistent with the workplan recommendations in the Schiller report. Each of the tasks is described below.

Task 1: Prepare Evaluation Prioritization Plan

The BECAR began with our development of a prioritization plan. This plan was the initial scoping activity recommended in the Schiller report (where it is referred to as a memo). It described our approach for accomplishing the BECAR, taking into account scoping conversations between the BECAR team and key stakeholders--namely, Puget Sound Energy (PSE), the Washington Utilities and Transportation Commission (WUTC), and the PSE Conservation Resource Advisory Group (CRAG)--that occurred in late 2012 and early 2013.

We prepared the prioritization plan in advance of the evaluation workplan to prioritize the programs to be evaluated and recommend approaches to be undertaken to independently determine the 2012-13 savings and cost-effectiveness. In the workplan, which is described under Task 2, we provide more specific information on how the work will be accomplished, such as preliminary sampling targets, and the budget and schedule for implementing it.

We submitted a draft prioritization plan to PSE and WUTC in March 2013. We responded to review comments, and finalized it after it was submitted to the CRAG in April 2013. A summary of important methods and results included in the plan is provided in Section 4 below. A description of the review approach that we proposed for each program in the PSE portfolio is provided in Appendix A.

Task 2: Prepare Workplan

The second task involved the preparation of this workplan. We developed it in parallel with the prioritization plan. This workplan describes the methodologies that we will use for each task in the study, and includes a description of the major deliverables that we will produce. It also includes a preliminary sampling plan, a project timeline, an initial project budget and a description of the management structure that we will use to implement the project. This workplan represents our current understanding of the PSE portfolio, and may change as additional information becomes available during the review, as programs evolve, or as other factors emerge. We will discuss significant changes with PSE and WUTC as they develop.

Each element of the workplan is described more fully in the next section.

Task 3: Implement the Workplan for the 2012 and 2013 Program Years

This task involves the implementation of the workplan for the 2012 and 2013 program years. We will apply the approaches described in Appendix A for each program in the portfolio. We developed these approaches during formulation of the prioritization plan based on the best

information available to us at that point in the study. Changes to the approach are possible, if they are justified based on findings from our ongoing analysis or new information that is uncovered during the work. The approach for each program will be applied to a sample of measures that are randomly selected to be representative of the participant population under study. Further discussion of the sampling plan that we developed for this study is provided in Section 5 below.

The validation approaches include program-specific combinations of the following five data collection and analysis methods, as well as an overall assessment of cost-effectiveness calculations. We will use the results from these validation approaches to determine realization rates[12] for each program in the portfolio. We will provide the realization rates, as well as the rationale and approach for estimating them, to PSE and the WUTC for review and comment. We will respond to review comments and produce the final realization rates that will be used to adjust the PSE savings claim.

A. RTF deemed savings review

For prescriptive measures with unit energy savings based on RTF values, will accept the approved RTF values without further review. Our analysis will be limited to verifying that PSE applied appropriate values to develop their savings claim.

B. PSE deemed savings review

For prescriptive measures with unit energy savings (UES) values developed by PSE (known as "PSE deemed savings"), we will examine relevant supporting documentation in the applicable version of Measure Metrics. The review will be applied to relevant measures whose savings make a significant contribution to the 2012 and 2013 savings claim. The threshold for a measure being a significant saver will be mutually agreed upon with the PSE project manager. If appropriate, we will also compare this to relevant documentation from prior studies and efficiency program development throughout the country; with special emphasis on studies that were relevant to conditions in the PSE service area. This documentation may include, but is not limited to:

- Previous PSE impact evaluations that included a rigorous UES review
- Northwest Power and Conservation Council Regional Technical Forum (RTF) measure workbooks
- Energy Star calculators and supporting documents
- California Energy Commission Database for Energy Efficient Resources (DEER)
- Technical Reference Manuals for the states of New York, Massachusetts, Vermont, Ohio, Minnesota, Wisconsin, Maine, New Jersey, Connecticut and Pennsylvania.

[12] A *realization rate* in this context is a statistically and technically valid ratio of evaluated savings for a program to the corresponding utility claimed savings for that program. This is fundamentally different from a *verification rate*, defined as the ratio of the number of projects verified to be installed and operational, divided by the total number of projects so verified. The latter is not an indicator of actual realized savings.

- Department of Energy Technical Support Documents

If we determine a UES value is not valid, we will adjust it based on the best available information among the listed sources, and possibly others. This adjustment may serve to either increase or decrease the UES value. PSE will have an opportunity to review our assessment for UES values that may be adjusted. SBW will have primary responsibility for the savings reviews. However, DNV GL will provide the reviews for measures that SBW has been implementing for PSE under the Commercial Rebate program, to avoid a conflict of interest.

C. Surveys and on-site inspections

For all measures (prescriptive and non-prescriptive), we will, whenever possible, conduct site inspections on a sample of participants in each program. Phone surveys will be used for situations where site inspections would not be useful. The site inspections will be used to verify measure counts and determine if the program measures are eligible and operational. The data collection options include:

- ***Phone survey***: we will perform a survey and collect data by telephone in cases where it is not possible to observe the measures in a site inspection (e.g., refrigerator decommissioning).
- ***Site visit to confirm PSE EME inspection***: we will perform an independent site visit of a site that was previously post-inspected by a PSE energy management engineer (EME).
- ***Ride-along with PSE EME***: for future projects, we will accompany a PSE engineer on a post inspection that was scheduled by the PSE engineer.
- ***Site visit to confirm third-party implementation***: we will perform an independent visit to a project that was completed, and possibly inspected, by a third- party program implementer.
- ***Ride-along with third-party implementer***: for future projects, we will accompany a representative of a third-party implementation contractor, to observe them performing their own regularly-scheduled post-implementation inspections.
- ***Site visit to confirm V-team inspection***: we will perform an independent site visit to a project inspected by the PSE V-team.
- ***Ride-along with V-team inspector:*** for future projects, we will accompany a representative of the PSE V-team on a regularly-scheduled inspection, to observe how they carry out their work.

We will carefully examine the results from the site inspections. If a significant number of sampled measures in a program are found to have problems with counts, eligibility and/or operational performance, we will potentially select additional sample points and conduct additional inspections to further confirm that our findings are representative with a high degree of confidence.

D. Review impact evaluation results

We will base all or part of the third-party review of each program on an assessment of the results from a recent or ongoing PSE impact evaluation. This is the preferred approach in

situations where the evaluation can be shown to be of adequate applicability and quality. The scope of this effort will vary with the circumstances encountered for each evaluation. Possible considerations include:

- Was the evaluation based on a reasonable sample that adequately represented the population of the entire program? Was the sample large enough to provide high statistical confidence and precision?
- Did the evaluation use a sound technical approach that used best practice methods for data collection and analysis of measure savings? Did these methods produce reasonable estimate of savings for the sampled measures? Was this done for the PSE deemed measures, the calculated measures, and/or custom measures? Did the evaluation verify that the deemed measure savings values were properly applied?
- Did the evaluation produce realization rates that are directly applicable to this review? If the evaluation was performed on program years prior to 2012-13, are all or portions of the results applicable to the population of program participants in the 2012-13 program years?
- Were the programmatic action items described in the PSE internal evaluation report response (ERR) implemented, particularly those that could have potentially affected future savings values?

Based on the response to the above questions, we will conduct supplemental analyses, as necessary, to bring the available results from recent or ongoing evaluations into conformance with the needs of this review.

E. Direct assessment of claimed savings

We will perform an independent assessment of the savings associated with a program or program element in cases where other methods are not available. This effort may be carried out in conjunction with PSE and/or other evaluation contractors, as appropriate. Currently, the only planned direct assessment deals with the Residential Lighting sub-program of the E214 Existing Single Family program, as described in Section **Error! Reference source not found.**. BW and a surveying subcontractor will perform the latter work.

F. Cost-effectiveness assessment

The objective of this assessment is to examine the methodology, inputs, and calculations used to determine portfolio and program cost-effectiveness for the 2012 and 2013 program years, and establish whether they were consistent with the terms of the settlement. Order 01 of Docket No. UE-111881 (the Order) establishes that PSE's overall portfolio must pass is the Total Resource Cost (TRC) test, using a methodology consistent with the Northwest Pacific Power and Conservation Council (the Council) approach. The Order also stipulates that PSE must provide portfolio calculations of the Utility Cost (UC), Ratepayer Impact Measure (RIM), and Participant Cost (PC) tests. In addition, PSE must demonstrate that its analysis includes quantifiable non-energy benefits, the 10 percent conservation benefit, and a risk adder consistent with the Council approach.

Building off the previous 2010-11 BECAR, we will compare PSE's calculation approach to the Council approach, perform due diligence reviews of the calculations, and determine if PSE is in

compliance with the above-stated conditions. To assess compliance, we will review the following elements:

1. Correct methodology, if necessary, to be consistent with National Action Plan for Energy Efficiency (NAPEE) and industry practices for calculating RIM, PCT, TRC, and UC:
   - Document equations
   - Confirm consistent with NAPEE
2. Confirm consistent with the Council
   - Run PSE program data in the ProCost tool to calculate TRC using the Council load shapes, avoided costs, and other inputs
3. Conduct due diligence review of calculations:
   - Did PSE properly summarize the individual programs in calculation sheets?
   - Was proper load shape used?
   - Was proper program measure life used?
4. Assess validity of calculation inputs, including:
   - Avoided costs
   - Administrative costs
   - Incremental measure costs
   - Discount rate
5. Ensure compliance with settlement agreement:
   - Review PSE's interpretation of calculations and ensure all elements are in compliance with the settlement agreement

Task 4: Additional Activities

The following additional activities may be required and/or requested by the stakeholders:

More Detailed Study

After initiation of the workplan and further evaluation of each of PSE's programs portfolio savings reports, we may submit a follow-up proposal to PSE for more detailed study of specific programs or measures. This would be limited to additional study that is clearly justified based on its importance in providing accurate portfolio realization rates. The proposal will include the rationale for selecting a particular program or measure, a description of the additional work to be done for each additional program or measure, a schedule for completion that is consistent with the overall project time frame, and any additional cost for this follow-up work not already included in the initial budget. Note that these proposals may be developed at the behest of one or more stakeholders, as mutually agreed upon.

Recommendations

We will develop, in conjunction with PSE, WUTC, and the CRAG, recommendations for changes and improvements, if any, to future biennial EM&V and review activities.

Task 5: Project Management and Reporting

We will prepare three additional reports beyond this workplan. They include:

- **2012 Interim Report,** that discusses the methods used and results obtained from the third-party review of the 2012 program year results.
- **2013 Semi-Annual Interim Report,** that discusses the methods used and results obtained from the third-party review of the first half of the 2013 program year results.
- **Final Report,** a comprehensive report that addresses work completed for both program years.

All of the reports will include the following elements:

- Executive Summary
- Introduction and Project Overview
- Methodology
- Findings
- Conclusions and Recommendations
- Appendices

We will submit all reports in draft form for review and comment by PSE, the WUTC and the CRAG. We will submit final version of the reports in response to the review comments. These versions will be accompanied by red-line markups and review comment responses, so it is clear what changes were made between iterations. The final report will be accompanied by electronic databases with clear documentation.

In addition to the formal reports described above, we will submit progress reports on a monthly basis throughout the contract period. As requested, we can also submit informal memos and work summaries throughout the study.

D.4. Summary of BECAR Prioritization Plan

One of the recommendations in the Schiller report, which stakeholders found useful, was to begin the 2012-13 BECAR with the preparation of an Evaluation Prioritization Plan. We prepared a BECAR prioritization plan[13] in advance of the workplan to prioritize the programs to be evaluated and recommend approaches to be undertaken to independently determine the 2012-13 savings and cost-effectiveness.

Before developing program-specific approaches, we assigned ratings to each of the four prioritization factors described in the Schiller report, so that we could develop an overall BECAR (review) level. The assignment of an overall review level helped to determine our level of effort and allocation of available resources to each program or program element. The ratings bases for each factor are described below:

- **Expected savings.** We assigned a value of high, medium or low to each program or program element. Programs or program elements were rated *high* (i.e., a key program) if their expected 2012-13 savings were 5 percent or more of the total portfolio savings. We assigned a rating of *medium* to programs or program elements with expected savings between 1 and 5 percent of the two-year portfolio total. We assigned a *low* rating to programs or program elements with expected savings less than 1 percent of the portfolio total. For example, we assigned a rating of *high* to the C/I Retrofit program because the savings claim is more than 5% of the portfolio.
- **Savings uncertainty.** We also assigned each program or program element a level of uncertainty of high, medium, or low based our judgment of the reliability of the PSE-assigned savings. We assigned a *low* level of uncertainty to programs or program elements where all or most of the claimed savings were based on RTF unit energy savings, V-team or PSE staff site inspections and/or impact evaluation results. We assigned a *medium* level of uncertainty to programs or program elements where claimed savings were based only partially on RTF unit energy savings and impact evaluation results were of limited value. We assigned a *high* level of uncertainty to programs or program elements where impact evaluation results will not be available for this effort and where the RTF unit energy savings had little or no influence on the claimed savings. For example, we assigned a rating of *low* to the C/I Retrofit program because the recent impact evaluation was of high quality and applicability.
- **Evaluation risk.** We assigned a risk level of *low* or *high* to each program or program element that has been or currently is being subjected to an internal PSE impact evaluation, based upon our assessment of the impact that overestimated savings from an internal PSE evaluation would have on the reliability of the portfolio total savings. For example, we assigned a rating of *high* to the C/I Retrofit program because should the internal PSE impact evaluation have overestimated savings, the adverse effect on portfolio savings would be

[13] SBW Consulting, Inc., *2012-13 Biennial Electric Conservation Achievement Review Prioritization Plan*, for Puget Sound Energy, April 2013.

significant. There is substantial overlap between this factor and the Expected Savings factor in many cases, since programs with large savings pose high evaluation risk should the evaluations be inaccurate. But because many programs have not been evaluated, though, we deemed it helpful to maintain these two factors separately.

- **Evaluation quality and applicability** – This BECAR will rely heavily on results from recent and ongoing internal PSE impact evaluations, especially for evaluations that are of high quality (i.e., applied impact evaluation best practices to a robust participant sample) and are directly applicable to the program or program element being reviewed. Quality in this context can mean not only applying impact evaluation best practices to determine savings, but also selecting a fully representative participant sample. We assigned ratings of *high* or *low* quality and applicability to programs where internal PSE evaluation results are available. For example, we assigned a rating of *high* to the C/I Retrofit program because the recent impact evaluation was rigorous, comprehensive, and directly applicable to the program. Up to this point, all of the evaluations we have initially reviewed have been of high quality; but some have been found to have low applicability due to the limited scope and/or sample size as it relates to their potential contribution to informing realization rates.

Based on an examination of the ratings assigned to the four factors above, we assigned an overall BECAR level to each program or program element in Table 1. The proposed review level is shown in the last column of the table. We assigned a *high* review level to programs or program elements that should be targeted for a greater portion of the review focus because they involved a large portion of the claimed savings and had a high level of risk, or no impact evaluation results to draw from. We assigned a *medium* review level to programs or program elements that had a high level of savings and risk, but had a low uncertainty and had high quality and applicable impact evaluation results to draw upon. A *medium* review level was also assigned to cases where there was a medium level of savings and no impact evaluation results to draw from. We assigned a *low* review level to programs or program elements that had a medium level of savings but had low uncertainty, whether it had high or low quality and applicable impact evaluation results to draw upon. A *low* review level also applied to cases with a low savings level and no impact evaluation results to draw upon.

Table 1: Summary of Assigned Prioritization Factors by Program or Program Element

Program	Prioritization Factors from Schiller Report (see Notes 1, 2)				BECAR Level (see Note 1)
	Expected savings	*Savings Uncertainty*	*Evaluation Risk*	*Evaluation Quality/ Applicability*	
E201 Low Income Weatherization	Low	Medium	NA	NA	**Low**
E214 Existing SF Residential					
Lighting	High	Medium	NA	NA	**High**
Space Heat	Medium	Medium	NA	NA	**Medium**
Water Heat	Low	Low	NA	NA	**Low**
HomePrint	Low	Low	NA	NA	**Low**
Appliances	Medium	Low	Low	Low	**Low**
Showerheads	Medium	Low	Low	High	**Low**
Weatherization	Medium	Medium	NA	NA	**Medium**
Mobile Home Duct Sealing	Low	High	Low	High	**Low**
Home Energy Reports	Medium	Low	Low	High	**Low**
E215 SF New Construction	Low	Medium	NA	NA	**Low**
E216 Fuel Conversion	Low	High	NA	NA	**Low**
E217 Existing MF Residential	High	Medium	High	Low	**Medium**
E218 MF New Construction	Low	Medium	NA	NA	**Low**
E250 C/I Retrofit	High	Low	High	High	**Low to Medium** (focus on controls, tune-ups)
E251 C/I New Construction	Medium	Low	Low	High	**Low**
E253 RCM Services	High	Low	High	High	**Medium**
E255 Small Business Lighting Rebate	Medium	Low	High	High	**Medium**
E258 Large Power User	High	Low	High	High	**Medium**

E262 Commercial Rebate	High	Low	High	High	**Low to High** (focus on highly variable savings, third-party implementers)
E292 General T&D	Low	Medium	NA	NA	**Low**

Notes

1. Colors assigned to the factors are meant to provide a sense of elements being low (green), medium (blue), or high (red) uncertainty. Consequently, the evaluation quality/applicability being high is a good thing that lowers uncertainty, so "High" for this factor is colored green. Conversely, a program accounting for a high fraction of savings increases uncertainty, so that "High" for this factor would be colored red.
2. NA = not applicable

The prioritization plan also included a description of our approach for validating savings for each program or program element for the 2012-13 biennium. In developing the approaches, we considered the assigned prioritization factors described above, experienced gained from the 2010-11 BECAR, information that is available to this review, and our own professional judgment. The approaches rely on the following assumptions, which are consistent with (a) the recommendations in the Schiller report, (b) discussions with the WUTC, PSE, and CRAG, and (c) recent developments in the PSE verification procedures.

1. **RTF savings**: The BECAR will accept approved RTF values for unit energy savings after verifying that they were applied correctly by PSE in the claimed savings.
2. **PSE deemed savings**: The BECAR will review these values and compare with other reliable industry sources to verify they are appropriate.
3. **PSE verifications**: To the extent possible, the BECAR will leverage the site inspection work of the recently enacted PSE V-team. The third-party review will verify work performed by the V-team through spot checks of inspections that they have performed and pursue a more in-depth investigation only if the spot checks uncover a significant problem with their work.
4. **Sampling precision**: Whenever possible and practical, the BECAR direct assessments will be performed on participant samples that are designed to achieve ±10% precision at a 90% level of confidence.
5. **Impact evaluations**: To the extent possible, the BECAR will leverage some or all of the results from recently completed and/or ongoing PSE impact evaluations. If no evaluation exists, we will rely on reviews of PSE deemed savings and verifications. In instances where none of these exist, such as with the E214 Single-family Lighting program element, we will perform a direct assessment.
6. **Direct assessment**: The BECAR will perform the more costly direct assessment of claimed savings only for programs or program elements where other methods are not possible.

The program-specific approaches that we will use to perform the third party review are described in Appendix A. We developed these approaches during the preparation of the prioritization plan, based upon the best information available to us at that stage of the study. They are subject to change as the study unfolds, based upon findings from our ongoing analysis or new information that is revealed during the work.

D.5. Sampling Plan

The validation approach that we selected for each program in the portfolio will be applied to a representative sample of program participants. The participants will be randomly selected from the program population for each program year. Table 2 shows the proposed sample size for each of the programs under study by program year. The matrix shown in the table takes into account numerous factors, as reflected in the prioritization plan discussed in the previous section, and allocates sampling points considering the BECAR level. It favors areas of higher uncertainty, including specific programs, as well as third-party implementation and V-team activities. At the same time, it is comprehensive in that it covers all programs where sampling is appropriate. It achieves this coverage within project budgetary constraints.

The total number of projects in the sample shown in Table 2 is 295. These are allocated to favor 2012 slightly, so that about 57% of them apply to 2012 projects, and the remaining 43% to 2013 projects. The reasons for this allocation are that (1) no major changes are expected between 2012 and 2013, and (2) favoring 2012 increases the likelihood that we can identify problems early, giving PSE more time to address them before the end of the biennium.

We will perform site inspections on a sample of participants for each program where site inspections are possible. Site inspections will be performed to verify site inspection work done by PSE energy management engineers (EMEs), third party implementers and the V-team as part of program implementation. For 2012 sites, the inspections will only involve sites that have been previously inspected in 2012. For 2013 sites, the inspections will involve a combination of previously inspected sites and ride-alongs for sites that have not yet been inspected during the implementation process.

For the direct assessment study of residential lighting described previously, we will sample retail stores so that we achieve ±10% precision at a 90% level of confidence. We will also weight subsequent results to account for differences in lighting sales volume between stores, which will provide more accurate results.

Table 2: Sampling Plan

	Tariff		Program elements / sub-elements	BECAR review level	Review Methods: Phone survey 2012	Phone survey 2013	Check PSE energy: Confirmation visit 2012	Check PSE energy: Confirmation visit 2013	Check PSE energy: Ride-along 2013*	Check 3rd party: Confirmation visit 2012	Check 3rd party: Confirmation visit 2013	Check 3rd party: Ride-along 2013*	Check V-team (3rd party &: Confirmation visit 2012	Check V-team (3rd party &: Confirmation visit 2013	Check V-team (3rd party &: Ride-along 2013*	Check PSE sites 2012	Check PSE sites 2013	Check PSE sites Ride-along 2013*	TOTAL
Residential	E201		Low Income Weatherization	Low						1	1	1							3
	E214	a	SF existing - Residential Lighting	High															N/A
		b	SF existing - Space Heat	Medium									9	4	2	5	2	2	24
		c	SF existing - Water Heat	Low						1	1	1	6	2	1				12
		d	SF existing - HomePrint	Low									6	2	1	1	1	1	12
		e	SF existing - Appliances	Low	6	4				7	4	1							22
		f	SF existing - Showerheads	Low															N/A
		g	SF existing - Weatherization	Medium						5	2	2	9	4	2				24
		h	Mobile home duct sealing	Low						1	1	1							3
		i	SF existing - Home Energy Reports	Low															N/A
	E215		SF New Construction	Low									6	2	1				9
	E216		SF Fuel Conversion	Low									6	2	1				9
	E217		MF Existing	Medium						7	2	2	7	4	2				24
	E218		MF New Construction	Low									6	2	1				9
Business	E250		***C/I Retrofit***																
			Custom Grant Programs																
		a	Standard retrofits	Low			1	1											2
		b	Controls-based retrofits	Medium			3	1	1										5
		c	Energy Smart Grocer-REBATE (ESGR)	Low			1												1
		d	Comprehensive Building Tune-up (CBTU)	Medium			3		1										4
			Contracted Programs																
		e	Energy Smart	Low			1	1											2
		f	Data center efficiency (DCEEP)	Low				2	1										3
		g	Industrial systems optimization (ISOP)	Low				2	1										3
		h	Simplified Building Tune-up (SBTU)	Medium				3	1										4
	E251		C/I New Construction	Low			1	1											2
	E253		RCM Services	Medium															0
	E255		Small Business Lighting Rebate	Medium									9	4	2				15
	E258		Large pwr user, self-directed	Medium			4	1	1										N/A
	E262		***Commercial Rebate***																
		a	Cooking Equipment	Low										3	1	5			9
		b	Laundry	Low										3	1	5			9
		c	Variable Speed Drives	Medium						5	2	2							9
		d	ECM Motors	Low												1	1		2
		e	Heat Pump & Air Conditioner	Low												1	1		2
		f	Hospitality	Low												1	1		2
		g	PC Power Management	Low												1	1		2
		h	LED traffic lights	Low												1	1		2
		i	Interior lighting	Low										3	1	5			9
		j	Premium HVAC service	High						7	3	1							11
		k	Lighting point-of-sale incentives	Low										3	1	5			9
		l	Green motor rewinds	Medium						1	2	1							4
		m	Pre-rinse spray valves, aerator direct installs	Medium						5	2	2							9
		n	CoolerMisers direct installs	Medium						4									4
		o	Small Business direct installs	High						7	3	1							11
	E292		General, xmission, distribution	Low			1	1	1										3
Subtotal					6	4	15	13	7	51	23	15	64	38	17	31	8	3	
Total by group, overall					**10**		**35**			**89**			**119**			**42**			**295**

* Because V-team inspections bunch many types of projects, it may not be possible to reach these exact quotas by sub-element.

D.6. Project Management

We will utilize the same project team as we used for the 2010-2011 BECAR. SBW will be the prime contractor. SBW will perform all work except as noted below. Work will be assigned to SBW staff based on relevant skills and experience. Key SBW staff include:

- **Marc Schuldt**, a principal with SBW, will be the project director. He will be an advisor to the SBW project manager throughout the study. He will be most heavily involved in the planning and procedure development phase of the study. He will have a major role in the preparation of the prioritization plan and the workplan. He will have high-level oversight over the budget, schedule and deliverable preparation. He will review and approve all major deliverables before submission to PSE. He will be available to the PSE project manager throughout the study to discuss any issues of concern.
- **Bing Tso**, a senior project manager with SBW, will be the project manager. He will be the primary contact with PSE. He will also be the primary contact with the DNV GL project manager. He will work very closely with the SBW project director to ensure that all aspects of the project are being conducted in accordance with the contract requirements. He will also have overall responsibility for supervising SBW and DNV GL staff and for making sure that all aspects of the project are organized and implemented consistent with the agreed-upon scope, budget, and schedule. He will be responsible for SBW staff assignments and coordinating all data collection and analysis activities. He will also be the primary author of the final report.

Our team also includes DNV GL, who will be responsible for completing the cost-effectiveness portion of the work. They will also handle aspects of the review that affect programs where SBW is a program implementer, so as to avoid a conflict of interest. Key DNV GL staff include:

- **Karen Maoz**, a senior engineer and project manager with DNV GL, will have overall management responsibility for work performed by DNV GL and will coordinate with the SBW project manager and the SBW data collection and analysis lead so that DNV GL's work is completed in a timely and efficient manner. She will also take the lead role in the cost-effectiveness methods review in Task 4. In addition, she will be actively involved in assessments of conformance to industry practice.

New to our team is Research Into Action, which has a small role performing surveys for the residential lighting direct assessment. They bring expertise and recent experience with this type of survey work on a very similar study performed in the Pacific Northwest.

D.7. Timeline

This study will be performed between October 2012 and June 2014. Within this performance period, we will perform a separate third-party reviews of the 2012 and 2013 program years. For each program year there are a series of milestones tied to the delivery of key project deliverables. Estimated dates for completion of each program milestone are provided below.

Table 3: Project Schedule

Project Milestone	Submission Date
Prioritization Plan	March 2013
Workplan	April 2013
2012 Interim Report	August 2013
2013 Interim Report (first half of year)	December 2013
Final Report (2012-2013)	May 2014

D.8. Budget

During the development of the prioritization plan, we prepared two preliminary budgets that spanned a range in level of effort that could be placed on this study. These budget options were presented to the WUTC and the CRAG for review and comment. General consensus was reached that all parties preferred a workplan be developed to be consistent with the lower end of the cost range and that the workplan have the flexibility to include additional resources, if during the course of the study, it was determined by stakeholders that an increase in the level of effort was warranted.

The task-level budget for this study is provided below in Table 4. This budget was prepared using the following assumptions:

- Tracking data is complete and accurate.
- The survey and onsite inspection sample sizes presented in Section D.5 will be adequate for the review.
- Impact evaluations will generally be acceptable, and thus will require little adjustment to apply.
- We will need to review about 30 PSE UES values. PSE deemed assumptions are generally reasonable.
- The direct assessment currently stipulated, for upstream lighting, will not require more than the modest scope presently established.
- About $40,000 is set aside for additional activities not yet identified (Task 4).
- Single-family homes that participate in the on-site portion of the review are eligible to receive $20 gift cards.

Table 4: Budget by Task

Task	Task description	Hours	% of hours	Cost	% of cost
1	Prioritization plan	299	6%	$ 49,981	8%
2	Workplan (WP)	120	3%	$ 20,731	4%
3A	Implement WP: RTF deemed	219	5%	$ 24,783	4%
3B	Implement WP: PSE deemed	261	6%	$ 30,458	5%
3C	Implement WP: Surveys, on-sites	2,091	45%	$ 236,374	40%
3D	Implement WP: Impact evaluations	388	8%	$ 49,834	8%
3E	Implement WP: Direct assessment	252	5%	$ 29,630	5%
3F	Implement WP: Cost-effectiveness	118	3%	$ 19,996	3%
4	Additional activities	295	6%	$ 40,093	7%
5	PM and reporting	618	13%	$ 89,682	15%
Total		**4,661**	**100%**	**$ 591,562**	**100%**

E. On-site Inspection Findings

Below are the details of findings from the BECAR on-site inspections.

Residential sample

Across the 129 sites visited, we did not find any significant issues. We did find several issues worth noting here for the purpose of providing feedback that may be useful to PSE in their future inspections. It is important to note, however, that in the review team's judgment, none of these issues warrant additional investigation to establish potential savings adjustments.

Uninstalled CFLs. Our site inspection found one HomePrint site with only 14 CFLs installed. The V-team field form, which was completed via third-party phone survey, reports the same quantities as the tracking database: 19 installed CFLs. Also, the V-team field form reports one *installed* low flow (leave behind) showerhead; our inspection found that the showerhead was never installed. This leave-behind showerhead is correctly accounted for in the tracking database.

Ambiguous V-team comment. Our site inspection found one HomePrint site with 12 program CFLs installed, which matches the measure count in the tracking database. The V-team field form, which was completed via third-party phone survey, records a "Match" but includes a comment reporting only 10 installed CFLs.

Over-claimed window area. Our site inspection found one Weatherization site where the total window area at the site matches the rebate form and sales invoice; the PSE tracking database claims a larger area. The V-team field form does not record a "Finding," but lists an extra window which is not included in the sales invoice, resulting in a total window area greater than the tracking database.

Under-claimed insulation area. Our site inspection found one Weatherization site with 1770 sq. ft. of attic insulation, which is consistent with the rebate form. The PSE tracking database evidently contains a typo because the area is listed at 170 sq. ft. This site was not inspected by the V-team.

Over-claimed window area. At one 2013 Weatherization site we found the total window area at the site (189 sq. ft.) matches the rebate form and sales invoice; however, likely due to a transcription error, the window area in the PSE tracking database (1891 sq. ft.) is off by a factor of ten. The energy saving tracked in the PSE database (39408 kWh) is therefore also high by a factor of ten. This site was previously visited by the V-team; they verified the actual window area (158 sq. ft. according to their notes) against the rebate and/or sales invoice and marked the site as a "match." But evidently the values in the PSE tracking database are not verified as part of the V-team review.

Follow-up from the PSE V-Team:

History: The V-Team staff received this job through CMS residential program team to verify 189 sq. ft. windows. The V-Team visited the site and marked it as "matched" in Vdatabase with a quantity of 158 sq. ft. From CSY, the systems channel then uploaded Vdatabase sq. ft. 158. There was a manual entry in CSY for 1891 sq. ft.

V-Team Opportunity: Vdatabase should have marked the job as "finding."

Rebates Process Opportunity: PSE should match data systems between CSY back up (which EES Tracks) and Vdatabase- to generate a report to confirm #'s match between CSY and Vdatabase.

Unclaimed CFL fixtures. Our site inspection found one Single Family New Construction site with 12 Energy Star CFL indoor fixtures. The PSE tracking database lists only eight fixtures. The V-team field form records a "Match" and the comment reads "Energy Star lighting at 90%;" there is no record of the actual count on the V-team form.

Uninstalled CFL fixtures. Our site inspection found one Single Family New Construction site with nine Energy Star CFL indoor fixtures – two of which contained incandescent lamps. The PSE tracking database lists 11 Energy Star CFL fixtures. The V-team field form reads "Lighting 89%;" there is no record of the actual count on the V-team form.

Business sample

Across the 117 sites we visited, we found the issues listed below. It is important to note, however, that in the review team's judgment, only the first two of these issues deserved follow-up investigation to determine whether this type of situation is significant for the overall program. The remaining did not warrant such additional investigation.

Non-operational occupancy-based HVAC controls. Our site inspection found one Commercial Rebate –Hospitality site where all 104 of the occupancy-based HVAC controls are installed but none of them are operational. The customer contact at this site reported that the occupancy sensors were never activated.

Uninstalled LEDs. Our site inspection found one Commercial Rebate -Interior Lighting site with only 716 Integral Omnidirectional LEDs installed. The project files and PSE tracking database claim 800 as the measure quantity.

Uninstalled LED exit signs. Our site inspection found one Commercial Rebate - Interior Lighting site with only two LED Exit Signs installed. The project file and PSE tracking database both list four as the measure quantity.

Uninstalled T8 lamps. Our site inspection found one Commercial Rebate -Small Business Direct Install site with 61 2L-fixtures instead of 31 4L-fixtures as claimed in the tracking database. So all together there are two fewer lamps (T8 28W) installed than tracked in the database.

Uninstalled T8 lamps. Our site inspection found one Commercial Rebate -Small Business Direct Install site with only six 3L-fixtures (T8 28W) instead of ten as claimed in the PSE tracking database.

Uninstalled CFLs and LEDs. Our site inspection found one Commercial Rebate -Small Business Direct Install site with only approximately 75% of the 262 CFLs and LEDs installed. Customer interview confirmed that the direct install project has not been completed.

Re-wound motor no longer at facility. Our site inspection found that re-wound motor was no longer at the facility. We determined that the motor had been on production equipment (compressor) that had since been sold.

Possible over-claimed savings for lighting fixtures plus controls. Our inspection of a C/I New Construction site found approximately the same number of LED fixtures (222) as PSE V-team during their previous inspection (233); however, both counts differed from the proposed quantity (184) listed in the project file. (Note: because this is a custom calculation, the measure quantity listed in the tracking database is one, not the number of LED fixtures). The project documentation includes savings calculations for only a portion of the LED/OS measure; the database annual savings are considerably greater (159,987 kWh) than this partial savings (52,394). The difference in fixture counts would not be expected to account for this difference in savings.

Possible under-claimed savings for refrigeration anti-sweat heaters. Our inspection of the C/I New Construction site discussed in the paragraph above found the anti-sweat to heaters to operate approximately 12% of the time. Based on the documentation provided for this measure, it appears that the savings are based on 50% anti-sweat heater on-time, suggesting the true savings could be increased beyond the calculated savings. It is not clear how the claimed savings were arrived at, but they appear to substantially understate the actual savings by as much as 36%. Project file and door counts at the site are in agreement.

Uninstalled LEDs. Our inspection of a CFL Markdown (MCFL)site found only four LEDs installed and operating vs. 10 claimed. According to the business owner, one LED had recently been broken by vandals (the LEDs are located on the outside of a drive-up coffee stand). The V-team, during their initial inspection, found 5 LEDs installed which matches our inspection results (four installed + one recently broken) but does not match the tracking database. The V-team marked this site as a "match" and noted that the other five LEDs had been "stolen/broken" during a break-in. There are only five sockets at the site, so it seems the V-team should have marked this site with a "finding."

Follow-up from the PSE V-Team:

History: The V-Team staff received this job through an upload from Commercial Program Team to verify 10 LED's. During the site visit, the V-Team staff found only 5 LED's were installed, the other 5 LED's were reported to be stolen from the business.

V-Team Opportunities: The V-Team should have marked the job as "finding" because 10 LED's were not installed and there were only 5 sockets. PSE recommends additional training for V-team staff.

Uninstalled LEDs. Our inspection of a MCFL site found only nine lamps installed and operating vs. 24 claimed; the remaining 15 lamps are waiting for the owner to install new fixtures which will accept the LED lamps. The V-team, during their initial inspection, had the same finding: only nine lamps installed. The V-team revisited the site three months later and recorded a "match" (i.e. all lamps installed).

Follow-up from the PSE V-Team:

History: The V-Team staff received this job through an upload from Commercial program to verify 24 LED's. The V-Team staff visited the site and updated Vdatabase with correct "finding" because only 9 LED's were installed. Later, a follow-up call was placed by the Commercial PSE Program Implementer to determine if the lamps had been installed and to inform this customer that the installation of all lamps must be completed to obtain the rebate (Commercial Team member Findings Reconciliation process includes either phone verification or visual verification. Onsite inspections are typically reserved for projects with a high count of uninstalled lamps or when the inspection revealed unusual results. In this case, a phone call seemed sufficient, given the distance and time required to count the project). During the phone call, the customer informed the Program Implementer of their intention to install the lamps in the coming days. The tone of the follow-up phone call led the Implementer to think that the project would be resolved by the customer, and as a result, the Program Implementer decided to take the customer's word for it and have the rebate paid as submitted with no findings.

Commercial Program Process Opportunity: Commercial Team members should ensure that all lamps are installed before paying the rebate. In the event a customer states they will be installing the lamps, PSE will wait to pay the rebate until they confirm that the lamps are installed. If it seems that a visual verification is necessary, PSE will either conduct an onsite inspection or request digital images from the customer.

During our follow-up investigation at four additional sites (two Commercial Rebate-Hospitality and two Commercial-Rebate-Interior Lighting). We found one additional issue.

Overridden occupancy-based HVAC controls. Our site inspection found that in five rooms (out of 26 rooms that we inspected) the PTHP (portable terminal heat pump) power cords were plugged into the override socket after maid service. The maids are directed to plug the PTHP's into the controlled socket when they do their service.

F. PSE Cost-Effectiveness Calculation Documentation

Calculating the Cost-Effectiveness of Puget Sound Energy's Energy Efficiency Programs

July 2011

Prepared By:
Bobette Wilhelm
Sr. Market Analyst

Contents

1. Introduction

1.1. Background

Puget Sound Energy (PSE) has been providing energy efficiency services since the 1970's (then Puget Power) and will continue to deliver these services for the foreseeable future. With increasing customer demand for energy, PSE must continue to acquire new energy resources to meet the increasing energy needs of its customers. Every two years, PSE goes through a process of planning how it will meet expected customer demands over the next twenty years. Though this process, PSE compiles its Integrated Resource Plan (IRP). This plan provides guidance to assist PSE in selecting resources to meet expected energy demands.

Demand side resources (i.e. Energy Efficiency) are some of the least cost ways for PSE to meet expected customer demand. When selecting which demand side resources to obtain, PSE conducts a series of cost-effectiveness tests which will assist PSE in determining which demand side resources to acquire compared to the alternative resources available.

Currently, PSE conducts four cost-effectiveness tests; each of the four tests views cost-effectiveness from a slightly different perspective. The four tests PSE conducts are: Utility Cost Test (UC), Total Resource Cost Test (TRC), Ratepayer Impact Measurement Test (RIM), and the Participant Cost Test (PCT). These tests measure whether or not the benefits obtained by the demand side resource meet or exceed the costs to obtain the resource. Two of the tests, the Utility Cost Test and the Total Resource Cost Test, are primarily of interest in the selection of demand side resources.

How these tests are calculated can dramatically impact which demand side resources PSE obtains, whether or not the resources have a positive or negative impact on future customer rates, and if the resources save money for the customers who install items through PSE's demand side resource programs.

It is the intent of this paper to give a broad overview of the cost-effectiveness tests PSE is required to conduct. The body of this paper is intended for audiences unfamiliar with cost-effectiveness tests. The appendices to this paper were written for those who want a more detailed overview of avoided costs and the "AutoFund" grant calculator.

The specific costs tests described in this paper are required of PSE to meet conditions agreed upon with the State of Washington in 2011.

1.2. Agreed Conditions

AGREED CONDITIONS FOR APPROVAL OF PUGET SOUND ENERGY, INC.'S 2010-2011 BIENNIAL ELECTRIC CONSERVATION TARGETS UNDER RCW 19.285. DOCKET NO. UE-100177

K. Conditions

(10) **Cost-Effectiveness Test is the Total Resource Cost (TRC) Test**

(a) The Commission uses the TRC, as modified by the Council, as its primary cost-effectiveness test. PSE's portfolio must pass the TRC test. In general, each program shall be designed to be cost-effective as measured by this test. PSE must demonstrate that the cost-effectiveness tests presented in support of its programs and portfolio are in compliance with the cost-effectiveness definition (RCW 80.52.030(7)) and system cost definition (RCW 80.52.030(8)) and incorporate, quantifiable non-energy benefits, the 10 percent conservation benefit and a risk adder consistent with the Council's approach. An outline of the major elements of the Council's methodology for determining achievable conservation potential, including the Total Resource Cost test, is available on the Council's website at http://www.nwcouncil.org/energy/powerplan/6/supplycurves/l937/CouncilMethodology_outline%20_2_.pdf.

(b) In addition to the Council-modified TRC, PSE must provide portfolio calculations of the Program Administrator Cost test (also called the Utility Cost test), Ratepayer Impact Measure test, and Participant Cost test described in the National Action Plan for Energy Efficiency's study "Understanding Cost-effectiveness of Energy Efficiency Programs." The study is available on the Web site of the United States Environmental Protection Agency at http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf.

(c) Overall conservation cost-effectiveness must be evaluated at the portfolio level. Costs included in the portfolio level analysis include conservation-related administrative costs. For the additional cost-effectiveness tests identified in 10b - PSE must consult with the CRAG to determine when it is appropriate to evaluate measure and program level cost-effectiveness. All cost-effectiveness calculations will assume a Net-to-Gross ratio of 1.0, consistent with the Council's methodology.

2. Overview of Cost-Effectiveness Tests

2.1. Introduction

The four cost-effectiveness tests discussed in this chapter each provide a unique set of information to assist different stakeholders in understanding if the investment in demand side resources is of an overall benefit to them.

At a very basic level, cost-effectiveness tests are performed by calculating the ratio of the net present value of benefits (in dollars) to the net present value of costs.

NPV $\sum$ benefits ÷ NPV $\sum$ costs

Holding all other factors constant, energy efficiency programs which have a benefit-cost ratio greater than one are in the best interest of the stakeholder for whom the ratio was calculated.

2.2. Utility Cost Test

The Utility Cost Test (UC) views demand side resource acquisition from the utility's perspective. This test is required for both gas and electric conservation programs. This test determines, from the utility's perspective, whether it is cheaper to purchase the demand side resource than it is to acquire an alternative supply side resource, like building a power plant or purchasing energy on the open market.

Generally speaking, a benefit-cost ratio of one or greater in the UC is essential for a program to be considered in a demand side resource portfolio. However, there are some exceptions to this rule. State regulations currently allow PSE to run low-income weatherization programs that have a benefit-cost ratio as low as 0.6 when there are significant non-energy benefits which cannot be quantified.

As the name suggests, the UC only considers utility costs and utility benefits for the construction of the benefit-cost ratio. The basic costs and benefits included in the calculation of the test are listed below:

Costs:

1. Program Overhead Cost
    a. Marketing[1]
    b. Outside services[2]
    c. Internal labor & overhead[3]
    d. Miscellaneous expenses related to program activities[4]
2. Incentives provided to customers who purchase an energy efficient measure
3. Other program specific costs[5]

Benefits:

1. Avoided cost of energy
    a. Market Cost of Energy
    b. Line losses
    c. Planning adjustments[6]
    d. Incremental cost avoidance of compliance with renewable portfolio standards
2. Avoided costs of capacity
    a. Deferred transmission and distribution (T&D) expense
    b. Total annual fixed cost of generating capacity

[1] Marketing costs include all costs of advertising, bill inserts, campaigns, radio advertisements, etc. related to the program.
[2] Many of PSE programs are run, in part, by outside vendors. Outside services costs include all costs to contractors and vendors, who are not PSE employees, which are incurred by the energy efficiency program.
[3] Internal labor and overhead include all PSE employee expenses and PSE incurred overhead costs
[4] Miscellaneous expenses include any incurred costs for event prizes, car rentals, PSE employee hotel rooms, etc. which are incurred as a result of operating the program.
[5] The costs listed above are standard for all program UC calculations with the exception of cost element three, 'other program specific costs'. Some programs have additional costs associated with them, such as the additional cost of natural gas on an electric to natural gas fuel conversion program. These costs need to be included in the costs for the UC calculation.
[6] The Planning adjustment represents the value of conservation not captured in market prices, capacity, or the renewable portfolio standard. (See Appendix A, Section 2.3 for details)

2.3. Total Resource Cost Test (TRC)

The Total Resource Cost Test (TRC) views demand side resource acquisition from a total cost perspective. The test determines the benefit of the demand side resource given the total cost to all parties involved, not simply the acquisition cost to the utility. PSE is required to run the TRC for both gas and electric programs.

As with the UC, a TRC benefit-cost ratio of one or greater is essential for programs to be considered for inclusion in a demand side resource portfolio. However, like the UC, there are also exceptions to this rule. State regulations allow PSE to run low-income weatherization programs which have a benefit cost-ratio as low as 0.6 when there are significant non-energy benefits which cannot be quantified.

The TRC considers all costs, including those incurred by the utility, by the customer and by others who may have contributed. The costs and benefits included in the calculation of the TRC Test are listed below:

Costs:

1. Program Overhead Cost
    a. Marketing
    b. Outside Services
    c. Internal Labor & overhead
    d. Miscellaneous expenses related to program activities
2. Incentives provided to customers to purchase an energy efficient measure
3. Tax credits and other contributions from third parties
4. Customer cost of acquiring the efficient equipment or item, net of any incentives provided by the utility, tax credits, or other contributions
5. Other Program specific costs

Benefits:

1. Avoided cost of energy
    a. Market Cost of Energy
    b. Line losses
    c. Planning adjustments
    d. Avoided cost of compliance with renewable portfolio standards
    e. Conservation credit[7]

[7] The conservation credit is a 10% adder for the electric benefits only. It does not apply to gas conservation programs. For more information about the conservation credit, read appendix A.

2. Avoided costs of capacity
    a. Deferred T&D expense
    b. Total annual fixed cost of generating capacity
    c. Conservation credit
3. Non-energy related benefits[8]

For the majority of programs, the benefit-cost ratio calculated through the TRC will be smaller than the ratio developed through the UC. This is because the additional customer costs, which typically are far greater than, thus outweighing, the addition of the conservation credit to the benefits in the TRC.

The benefit-cost ratio in the TRC may be higher than the ratio developed in the UC for programs with little to no customer cost. In these cases, the conservation credit, which is added to the benefits in the TRC, outweighs the small contribution of customer costs.

In theory, programs where non-energy benefits are significant and quantifiable, the benefit-cost ratio of the TRC can be far greater than the ratio developed though the UC. However, most non-energy related benefits are difficult to quantify and often the non-energy benefit is not included in the calculation of the TRC.

PSE recognizes that many of its programs also save water. However, PSE does not currently invest the effort to quantify non-energy benefits for programs that pass the TRC using only energy benefits. For the Low Income Weatherization Program, the value of health and safety improvements was included as a non-energy benefit for the 2012-2013 gas cost-effectiveness calculations.

[8] Non-Energy Benefits include savings on non-energy related items. These include items like cost savings on water for low-flow showerheads.

2.4. Ratepayer Impact Measure Test (RIM)

The use of the Ratepayer Impact Measure Test (RIM) is new to PSE in 2012-2013 program planning. Unlike the UC and the TRC, the RIM does not have hard and fast decision making criteria for program selection. Instead, it is an attempt to understand the total impact to the utility, and thus ratepayers, by including lost utility revenue in the cost-effectiveness calculation. Currently, the RIM is required for PSE's electric portfolio evaluation only. It is not required for the gas energy efficiency cost-effectiveness analyses.

The costs and benefits included in the calculation of the RIM Test are listed below:

Costs:

1. Program Overhead Cost
    a. Marketing
    b. Outside services
    c. Internal labor & overhead
    d. Miscellaneous expenses related to program activities
2. Incentives provided to customers to purchase an energy efficient application
3. Lost utility revenues due to demand side resource
4. Other program specific costs

Benefits:

1. Avoided cost of energy
    a. Market Cost of Energy
    b. Line losses
    c. Planning adjustments
    d. Avoided cost of compliance with renewable portfolio standards
    e. Conservation credit
2. Avoided costs of capacity
    a. Deferred T&D expense
    b. Total annual fixed costs of generating capacity

2.5. Participant Cost Test (PCT)

The final test, the Participant Cost Test (PCT) is also new to PSE beginning with the 2012-2013 program planning. This test compares the

customer costs of purchasing the efficient equipment to the customers' associated utility bill savings. Essentially, this test allows the utility to understand if the investment in the efficient equipment pays off for the customer.

The PCT considers all customer costs and bill savings, ignoring all utility incurred costs and utility benefit. This test is required for the electric portfolio evaluation only; it is currently not required for gas energy efficiency program cost-effectiveness evaluations. The costs and benefits included in the calculation of the PCT are listed below:

Costs:

1. Equipment costs

Benefits:

1. Bill savings
2. Program incentives
3. Applicable tax credits or incentives
4. Non-energy benefits which are incurred by the customer[9]

[9] The participant cost test only considers non-energy benefits which are incurred by the customer, such as water savings. Non-Energy benefits that are not directly incurred by the customer cannot be included in the participant cost test.

3. Key Drivers of the Cost-Effectiveness Calculations

3.1. Framework for Cost-Effectiveness Calculations

Cost-effectiveness calculations have several key drivers, which include:

1. The avoided cost of energy,
2. The avoided costs of capacity,
3. Program overhead costs,
4. Customer costs,
5. Program incentives,
6. Non-energy benefits,
7. Measure life,
8. The load shape used in the calculation of avoided costs;
9. The discount rate used for calculating the present value of benefits and costs.

Each of the major drivers to the outcome of the cost-effectiveness calculations are discussed below.

3.2. Avoided Cost of Energy & Capacity

Avoided costs are those costs the utility does not incur when purchasing a demand side resource instead of a supply resource. Avoided costs of energy and capacity are the main driver of the benefits that are included in PSE's cost-effectiveness calculations for energy efficiency programs. Higher avoided costs of energy and capacity make energy efficiency programs more attractive to PSE and more cost-effective for the utility, all other things being equal.

Because avoided costs are developed for individual end-use[10] types, each end-use will be impacted differently by changes in energy costs[11]. In addition, changes in the avoided cost of capacity will impact the cost-effectiveness of energy programs differently. Because PSE is a winter peaking utility, programs which save energy from heating-related efficiency upgrades will be impacted significantly by changes in the avoided cost of capacity because they have a higher coincident savings (savings on peak) than programs that save energy in the summer[12]. Changes in the avoided cost of capacity will have relatively little impact on energy efficiency programs which provide low savings in the peak hours.

[10] An end-use type is a category for which energy efficiency items are placed, such as water heating, space heating, or lighting.

[11] If, for example, winter prices of energy increase but summer prices remain the same, the avoided costs of space heat measures will increase more dramatically than the avoided energy costs of water heating measures, and there would be no impact on residential air conditioning avoided energy costs.

[12] PSE plans for a winter peak, not for a summer peak.

Avoided costs of capacity are a function of the cost of building capacity resources for peak load and the load shape of the measure being assessed in the avoided cost calculation. PSE's peak load typically occurs during the weekday mornings or evenings during the month of December. For equipment where loads coincide with peak hours, capacity costs are included in the avoided costs.

Space heating measures have a higher coincidence with peak than non-heating related measures, such as lighting. Therefore, the avoided costs of capacity have a much greater impact on space heat measures than they do on measures which are used at a fairly constant rate throughout the year. This is because a larger portion of the savings for space heat measures coincides with times where PSE is paying for peak resources.

3.3. Program Overhead Costs

Program overhead costs consist of all costs incurred to run an efficiency program, except those that are incentive-related. Program overhead costs consist of marketing costs, expenses incurred for outside services, internal labor and labor overhead costs, and miscellaneous expenses[13] related to other costs of program activity.

Program overhead costs have a direct impact on the cost-effectiveness of the related energy efficiency programs. All else equal, an increase in program overhead costs will decrease the cost-effectiveness of efficiency programs.

3.4. Measure Costs

Like program overhead costs, measure costs have a direct impact on the outcome of the cost-effectiveness calculations. To the extent that total measure costs influence the incentive provided by the utility, thus impacting the utility cost, the measure cost impacts all of the tests discussed in this document. All other things equal, an increase in the cost of a measure can decrease the benefit-cost ratio in the cost-effectiveness tests.

3.4.1. Incremental Cost or Full Measure Cost

For the calculation of benefit-cost ratios, PSE defines measure cost as either the full measure cost or the incremental measure cost, depending on the item being offered though the energy efficiency programs and the delivery mechanism where the rebate occurs.

The majority of participants in PSE efficiency programs receive monetary incentives when they are replacing old, worn equipment such as a furnace, water heater, or light bulbs. For these programs, PSE uses the incremental measure cost when calculating the benefit-cost ratios. The incremental measure cost is defined as the cost difference between the pieces of equipment installed though the PSE program and the item the customer would have installed without program intervention; e.g. the added cost of

[13] Miscellaneous expenses refer to non-typical program expenses such as travel, gift cards for program participants, etc.

a new high efficiency furnace versus a standard efficiency furnace that complies with the Energy Code. Therefore, it's not prudent to include the entire cost of the efficient equipment in the cost-effectiveness test.

For programs where customers receive monetary incentives to make changes to existing items which are fully functioning, PSE utilizes the full measure cost when calculating the benefit-cost ratios. Examples of measures for where the full measure costs are used include insulation, windows, and some early replacement programs[14].

3.4.2. Incentive

The incentive amount provided by the utility has no impact on the TRC because this test uses the full or incremental measure cost, both of which include the incentive and customer cost when calculating the benefit-cost ratio. A change in the incentive will change the cost to the customer, but the total or incremental measure cost will remain the same.

However, the incentive provided by the utility has a direct impact on the outcome of the UCT, RIM Test and the PCT. When incentives are increased, all else equal, the benefit-cost ratio of the UC and the RIM will decrease, since this will increase the cost to the utility and/or ratepayers with no change in the level of benefits. On the other hand, incentives are included in the numerator (benefits) of the PCT. When the utility increases incentives, all else held constant, energy efficient equipment becomes more cost-effective for customers.

3.4.3. Customer Cost

Customer costs are those costs that the customer pays for the item being installed. For programs which use a full measure cost, the customer cost is the full measure cost minus the incentive provided to the customer. For programs which use the incremental measure cost, the customer cost is the incremental cost minus the incentive provided to the customer. There are a small number of programs which offer incentives greater than the incremental measure cost, where the incremental measure cost is used on the cost-effectiveness analyses. For these programs, customer costs are set to zero.

Assuming a constant incentive amount, the customer cost associated with a measure offered though PSE efficiency programs does not have an impact on the UC or RIM because customer costs are excluded from these tests. In addition, the customer cost doesn't directly impact the TRC or PCT because those tests use either the full measure cost or the incremental cost, both of which include the customer cost, when calculating the benefit-cost ratio.

[14] In 2011, PSE is launching an early refrigerator replacement program. This program removes older, working refrigerators from customer homes and replaces them with new, efficient refrigerators. Because the customer was not going to purchase a refrigerator without the help of this program, incremental measure costs is non-existent. Therefore, full measure cost is considered for cost-effectiveness analyses of this program.

Customer costs indirectly impact the TRC and the PCT in that they are a component of the total or incremental cost of the item being offered though the efficiency programs. For a given level of incentives, an increase in customer cost is a reflection of an increase in total or incremental measure cost. The increase in total or incremental measure cost will decrease the benefit-cost ratios of the TRC and the PCT.

3.5. Additional Costs & Benefits (O&M)

To be consistent with the Northwest Power and Planning Council (The Council), additional costs and savings (which are a negative cost) for operation and maintenance faced by customers installing energy efficient equipment through a PSE program are counted as an additional customer cost for the TRC and PCT.

The cost of natural gas in a fuel switching program is an example of additional cost associated with participating in an energy efficiency program. To be consistent with the methodology used by the Council, PSE adds the cost of gas to the total utility cost when calculating the cost-effectiveness of fuel switching programs, which convert PSE electric customer to PSE gas. The reason this cost is not included as an additional customer cost is because it would not be reflected in the UC if the cost of gas was only applied to the customer. In fuel switching programs, PSE is required to purchase more natural gas and that needs to be reflected in the UC as well as the TRC. All else equal, additional operation and maintenance costs faced by the customer will decrease the benefit-cost ratios of the TRC and PCT. Added customer costs will have no impact on the UC or RIM Tests.

3.6. Non-Energy Benefits

Non-energy benefits are defined as all benefits from energy efficiency program which are not energy-related. Examples of these benefits are: water and other resource savings, improved health and safety, fewer shutoff notices for the utility and improved quality of life or product quality. Non-energy benefits are only included in the TRC, but PSE typically only quantifies these for the Low Income Weatherization Program when we have solid documentation. PSE does not typically include non-energy benefits in the TRC for standard programs because they are difficult to quantify and most programs pass the TRC without including the non-energy benefits.

Non-energy benefits can be positive or negative and are always included in the numerator of the test, regardless of the sign. Changes in non-energy benefits are positively correlated with the benefit-cost ratio of the TRC Test increases, all else equal.

3.7. Measure Life

The measure life is the rated useful life of the item(s) being provided though the program. Measure life is typically assessed using Regional Technical Forum[15] guidance or from PSE engineers and program managers who have a significant level of knowledge regarding the item being assessed.

Measure life and the associated benefit-cost ratios are positively correlated for all four of the cost-effectiveness tests conducted by PSE, all else equal.

3.8. End-Use Load Shape

The shape of the load for each measure being assessed in the cost-effectiveness calculations impacts the TRC, RIM, and UC Tests. Because PSE generally does not offer time-of-use rates, the shape of the load for each measure being assessed does not impact the Participant Cost Test.

PSE calculates avoided costs using multiple inputs. The avoided costs are higher for those items which have a significant portion of their load occurring in the winter. Because winter savings typically coincide with the system peak, which increases the avoided capacity cost, items which save energy in the winter are assigned a higher value for avoided capacity costs.

3.9. Discount rate

For the 2012-2013 program years, the discount rate for PSE efficiency program avoided costs is set at 8.10%. This discount rate is the most recently approved rate of return on rate base ("ROR") by PSE's state regulators (in the 2009 General Rate Case) and was used in the development of the 2011 Integrated Resource Plan. As utility discount rates increase, the present value of avoided costs decreases. All else equal, an increase in the discount rate decreases the benefit-cost ratios of PSE's cost effectiveness tests. This discount rate is used for the avoided costs of energy and capacity in the UC, the TRC, and the RIM. The PCT does not consider utility avoided costs, so the utility's Discount Rate does not apply to the PCT.

[15] The Regional Technical Forum (RTF) is an advisory committee which was developed in 1999 to develop standards for the evaluation of conservation savings.

3.1. Summary of Key Drivers

Key Driver	Direction of Key Driver	Direction of Benefit-Cost Ratios			
		TRC	UC	RIM	PCT
Avoided Energy and Capacity Costs	↓	↓	↓	↓	↓
	↑	↑	↑	↑	↑
Program Overhead Costs for the utility	↓	↑	↑	↑	N/A[16]
	↑	↓	↓	↓	N/A
Measure Cost	↓	↑	N/A[17]	N/A	↑
	↑	↓	N/A	N/A	↓
Incentive	↓	N/A	↑	↑	↓
	↑	N/A	↓	↓	↑
Non Energy Benefits	↓	↓	N/A	N/A	↓
	↑	↑	N/A	N/A	↑
Measure Life	↓	↓	↓	Ambiguous	↓
	↑	↑	↑	Ambiguous	↑
Discount Rate	↓	↑	↑	↑	↑
	↑	↑	↑	↑	↓

4. Constructing Benefit Cost Ratios

4.1. Using Benefit-Cost Ratios for Program Planning

Benefit-cost ratios provide useful information to PSE implementation teams. Programs with high benefit-cost ratios, and low free-ridership rates, are of primary interest for expansion should PSE need to acquire more demand side resources.

Before benefit cost-ratios can be used for program planning, the inputs into the ratios need to be accounted for correctly. This section provides

[16] The Participant Cost Test is not impacted by utility overhead costs because it only considers participant costs and the rebate provided by the utility
[17] The Utility cost and Ratepayer Impact Measure tests are not impacted

clarification on what to include as non-energy benefits, how to correctly account for additional O&M costs (or cost savings) incurred by the customer, and how to select discount rates for O&M costs (or cost savings) incurred by the customer.

4.2. Accounting for Non-Energy Benefits

When including non-energy benefits in the benefit-cost ratios, always include the benefit in the numerator of the benefit-cost ratio. These benefits should not be included in the UC or RIM. All non-energy benefits which are quantifiable can be included in the TRC. Customer facing non-energy benefits can be counted in the PCT. Non-energy benefits which cannot be estimated with supporting documentation should not be included in the TRC or the PCT cost effectiveness test. Moreover, non-energy benefits which are included in the TRC and/or the PCT should be accompanied with supporting documentations and calculations.

4.3. Incorporating Additional Customer Costs

Additional customer incurred costs, which are not included in the cost of the measure being purchased through the efficiency program, can be negative (cost savings) or positive. If the cost is negative (cost savings), the absolute value of the cost savings should be included in the numerator (non-energy benefit) of the benefit-cost ratio. The cost should be included in the denominator of the benefit-cost ratio whenever the cost is positive (representing an additional cost).

Examples of additional customer costs include the cost of natural gas when participating in an electric to gas fuel conversion program. The added cost of natural gas, for an electric to gas fuel switching program, is difficult to assess. On one hand, the cost of gas can be counted as an additional cost to the customer. On the other hand, the cost of gas can be counted as a cost incurred by the utility.

The UC ignores customer costs, which would exclude the additional cost of gas if counted as a customer cost. Therefore, the additional cost of gas is counted as a utility cost in the UC and placed in the denominator of the benefit-cost ratio. Similarly, because the TRC is a function of the UC, with added customer costs and non-energy benefits, the additional cost of gas for fuel conversion programs is also included as a utility cost and placed in the denominator of the benefit-cost ratio.

For the PCT, the cost of gas from an electric to gas fuel switching program is counted as a customer cost. Therefore, the additional cost of gas is included in the denominator of the Participant Cost Test.

4.4. Applying the Correct Discount rate

The rate used to discount costs or benefits for energy efficiency programs can impact the outcome of the benefit-cost ratios of PSE's cost-effectiveness tests.

When discounting additional costs, nominal discount rates should be used. For additional costs (or savings) faced by the utility, program teams

should use PSE's the ROR approved in its most recent General Rate Case as the nominal discount rate.

4.5. Summary of Benefits and Costs to Include in Each Test

TEST	Benefits (NUMERATOR)	Costs (Denominator)
Perspective of Puget Sound Energy		
Utility Cost Test	1. Avoided Energy 2. Avoided Capacity Costs	1. Program Overhead Costs 2. Incentives
Perspective of All PSE Customers		
Total Resource Cost Test	1. Avoided Energy 2. Avoided Capacity Costs 3. Non-Energy Benefits 4. Additional cost savings from Non-program related Items	1. Program Overhead Costs 2. Incentives 3. Customer Costs (incremental or full measure cost-incentive)
Impact of Efficiency on Non-Participating Rate Payers		
Ratepayer Impact Measurement Test	1. Avoided Energy Costs 2. Avoided Capacity Costs	1. Program Overhead Costs 2. Incentives 3. Customer Costs (incremental or full measure cost-incentive) 4. Lost Revenues due to reduced bills
Perspective of the Customer Installing the Measure		
Participant Cost Test	1. Incentive Payments 2. Bill Savings 3. Applicable Tax Credits 4. Non-Energy Benefits 5. Cost Savings from Non-program related Items (section 5.3)	1. Incremental or full cost of equipment being installed 2. Additional costs from non-program related items (section 5.3)

Appendix A: Avoided Cost Calculations for Electric Energy Efficiency Programs

Prepared By:
Bobette Wilhelm

Appendix A to Calculating Cost-Effectiveness of Puget Sound Energy's Energy Efficiency Programs

Contents

Appendix A to Calculating Cost-Effectiveness of Puget Sound Energy's Energy Efficiency Programs

1. Introduction

Puget Sound Energy's (PSE) avoided cost of electricity is used by the Energy Efficiency Department in the calculation of benefits for three of four cost-effectiveness tests conducted when selecting and verifying energy efficiency programs. The tests that utilize PSE's avoided cost of electricity as benefits for the cost-effectiveness calculations include: the Utility Cost Test (UC), the Total Resource Cost Test (TRC), and the Ratepayer Impact Measure (RIM) Test. The fourth test, the Participant Cost Test (PCT), calculates benefits using customer bill savings, program incentives, and tax credits.

PSE calculates the avoided cost of electricity, which consists of two main components: the avoided cost of energy and the avoided cost of capacity, over a thirty-year time period. This range of costs allows PSE to assess measures that have a savings life ranging from one to thirty years. The avoided cost of energy and capacity are calculated for each year the thirty year time period. The present value of the annual avoided cost are then included as a benefit in the relevant cost-effectiveness test.

Appendix A1: Avoided Cost Calculations for the TRC contains the present value calculations of the annual avoided cost for electricity (energy and capacity) for the TRC. Similar avoided cost calculations supporting the UC and the RIM are contained in *Appendix A2: Avoided Cost Calculations for the UC and RIM*.

This paper provides the background assumptions and calculation of avoided costs used in PSE 2012-2013 cost-effectiveness calculations. The calculation of the avoided energy costs is explained in section two; the calculation of the avoided capacity costs is explained in section three. Section four provides details on how the avoided cost of energy and capacity are combined to calculate the total avoided cost of electricity.

2. Avoided Cost of Electric Energy

PSE calculated the 2012-2013 avoided cost of electricity for sixteen end-uses[i] which are representative of the measures PSE currently offers though energy efficiency programs. When calculating benefits for use in the cost-effectiveness tests, each measure is assigned to one of the sixteen end-uses which best fits the measure description. Since the value of the energy varies throughout the year, the avoided cost of energy is calculated separately for each of the sixteen representative end-uses. Calculating avoided cost of energy by end-use allows PSE to account for the variance in energy usage patterns for different end-uses.

Avoided energy cost is calculated using the following inputs:

1. Weighted average annual market price of electricity
2. Avoided line losses
3. Planning adjustment
4. Avoided incremental costs of compliance with renewable energy standards
5. Conservation credit (set to zero for the UC & RIM)

The basic calculation of the avoided energy cost, for the TRC, is contained in *Appendix A1: Avoided Cost Calculations for the TRC*. This appendix contains individual tabs for each end-use, and these tabs are labeled by end-use type. Additionally, all tabs which contain the basic avoided cost calculation are highlighted in yellow. The avoided cost calculations for the UC and RIM tests are contained in *Appendix A2: Avoided Cost Calculations for the UC and RIM*.

Each input to the calculation of the avoided cost of energy is described in the remainder of this section.

2.1. Weighted Average Annual Market Price of Energy

The first step in calculating avoided cost of energy is to calculate a weighted average annual market price for energy (WAAMPE) over the next thirty years. This price represents the average annual price PSE expects to pay to purchase energy from the market to serve the load which is being reduced though an energy efficiency technology.

To calculate the weighted average annual market price of energy, PSE uses a combination of hourly market prices and hourly load shapes, for the 16 representative end-uses.

2.1.1 Hourly Load Shapes

Hourly load shapes for each of the 16 end-uses are provided as a distribution of one megawatt (MW) of energy over an entire year, providing the portion of that megawatt used in each hour throughout a typical year.[ii] Therefore, the sum of the hourly loads over 8760 hours, for each of the end-uses, is one MWh. Load shapes used in the calculation of avoided energy costs are contained in *Appendix A3: Weighted Average Annual Market Price of Electricity Calculations*.

2.1.2 Hourly Market Prices

Hourly market prices from the 2011 Integrated Resource Plan (IRP) were used in the estimation of the weighted average annual price of energy from 2012 through 2032. The 2011 IRP hourly market prices came from the most recent ARORA forecast. Hourly Market prices, from the 2011 IRP, are contained in *Appendix A3: Weighted Average Annual Market Price of Electricity Calculations.*

2.1.3 Calculation

To calculate the weighted average annual market price of energy for years 2012 through 2032, PSE energy efficiency evaluation staff obtained the hourly load shapes[iii] used in the 2011 IRP and the hourly market prices for electricity used in the 2011 IRP. The weighted average annual cost of energy was then calculated for each of the sixteen end-uses for each year 2012-2032.

Because hourly market prices in PSE's 2011 IRP only cover 21 of the 30 years required to perform the cost-effectiveness tests, further assumptions were required to project the prices to the end of the 30-year period. This was done by inflating the weighted average annual market price of energy in 2032 (the last year of the IRP projections) by the assumed long-run inflation rate in the IRP (2.5%).

The weighted average annual market price of energy is calculated for each year, by end-use, by summing the product of the hourly market energy prices, in year y, and hourly loads for each end-use.

The methodology for calculating the weighted average annual cost of energy for years 2012 through 2032, for each end-use, is summarized below. The actual calculations are provided in *Appendix A3: Weighted Average Annual Market Price of Electricity Calculations.*

$$WAAMPE_{j_y} = \sum_{h=1}^{8760} load_{j_h} * price_{h_y}$$

Where:

$load_{jh}$: Percent of one MW used in hour h for end-use j

$Price_{hy}$: Price of electricity in hour h of year y

$WAAMPE_{jy}$: Weighted average annual market price of electricity for end-use j in year y ($/MWh)

2.2. Avoided Cost of Line Losses

As energy is transmitted from a generation facility to a customer premise, a portion of this energy is lost (to resistance in the lines). As a result, when PSE runs an efficiency program that saves energy at a customer's home, let's say one kilowatt-hour, PSE actually saves slightly more than one kilowatt during that hour. PSE avoids serving that house with one kilowatt during that hour and also avoids the line losses experienced while delivering that one kilowatt to the customer. To account for energy line losses in the 2012-2013 avoided cost calculations, a loss factor of 8.02% was applied to the weighted average annual market price of energy for residential programs; a loss factor of 6.55% was applied to the weighted average annual market price of energy for commercial and industrial programs.

The energy losses factors listed above include other forms of unmetered usage, in addition to the line losses that are of primary interest in PSE's cost-effectiveness calculations. Therefore, these loss factors slightly overestimate energy losses that are due solely to the transmission of energy across PSE's electric delivery system.

When AMR meters were installed in the majority of PSE service territory, PSE stopped tracking unmetered usage on an ongoing basis. Therefore, it is not possible to estimate this unmetered usage, subtract them from total loss, and estimate line loss based on that difference. Notwithstanding these deficiencies, PSE has included the total energy loss factor in the avoided cost calculations as a proxy for avoided line losses.

PSE recognizes that these losses may slightly overstate the benefits attributable to its energy efficiency programs. However, PSE believes these effects are minor..

A copy of the energy loss calculations used in the 2012-2013 avoided cost calculations is located in *Appendix A4: Line Loss Calculations.*

2.2.1. Calculation of Avoided Cost of Line Losses (LL_{jy})

Residential Line $Loss_{jy}$ $WAAMPE_{jy}$ * 8.02%

Commercial/Industrial Line $Loss_{jy}$: $WAAMPE_{jy}$ * 6.55%

Where:

$WAAMPE_{jy}$: Weighted Average Annual Market Price of Energy for end-use *j* in year *y*

2.3 Planning Adjustment

The 2011 IRP provided guidance for an all market portfolio, adjusted for firm capacity needs and the renewable portfolio standards. Therefore, the planning adjustment for the 2012-2013 programs is simply the cost difference- which is not attributable to the market value of energy, the avoided capacity costs, or the avoided renewable portfolio standard costs- between the 2011 IRP portfolio with no demand side resources (DSR) and the 2011 IRP portfolio with optimal DSR. This is shown formulaically below.

Levelized Avoided Cost of Planning Adjustment:

$$PA = \frac{\sum_{y=1}^{20} [[(PNDSR_y - PWDSR_y) - (PNDSRC_y - PWDSRC_y) - (PNDSRR_y - PWDSRR_y) - (PNDSRE_y - PWDSRE_y)]/(1+I)^y]}{\sum_{y=1}^{20} [EnergySavings_y/(1+I)^y]}$$

Where:

PNDSR: Cost of the portfolio with no DSR

PWDSR: Cost of the portfolio with DSR

PNDSRC: Cost of peaking resources (capacity) in the portfolio with no DSR

PWDSRC: Cost of peaking resources (capacity) in the portfolio with DSR

PNDSRR: Cost of the renewable portfolio standards in the portfolio with no DSR

PWDSRR: Cost of the renewable portfolio standards in the portfolio with DSR

PNDSRE: Market price of energy in the portfolio with no DSR

PWDSRE: Market price of energy in the portfolio with DSR

I: Interest rate used for discounting, PSE ROR (8.10%).

$EnergySavings_y$: Energy Savings in year y from the portfolio with DSR

Because resources are built to meet demand over time, the value of the planning adjustment is calculated as a levelized[iv] payment over the life of the portfolio, which is 20 years. The levelized avoided cost of the planning adjustment, over the 20-year planning horizon in the 2011 IRP, is $0.23 per MWh. However, PSE cost-effectiveness calculations require avoided costs calculated over a 30 year planning horizon. For years 2032 through 2041, PSE held the nominal cost of the planning adjustment flat at $0.23 per MWh. The value of the planning adjustment does not change by end-use; it is a constant $0.23 per MWh for every end-use[v].

The calculation for the planning adjustment is obtained in *Appendix A:Planning Adjustment and Renewable Portfolio Standards.*

2.4 Avoided Cost of Renewable Portfolio Standard

Chapter 19.285 of the Revised Code of Washington (RCW)[vi] statutorily requires PSE to use "eligible" renewable resources, or acquire equivalent renewable energy credits (RECs), to meet annual renewable energy targets. PSE must use these renewable resources, RECs or some combination of the two to meet at least three percent of the load by January 1, 2012, and each year thereafter through December 31, 2015. That requirement grows to nine percent by January 1, 2016, and each year thereafter through December 31, 2019; and at least fifteen percent by January 1, 2020 and thereafter.

As suggested above, the size of PSE's renewable portfolio is dependent upon the amount of energy required to serve customers. In as much as energy efficiency programs reduce the energy requirements of PSE's customers, the need for PSE to purchase renewable energy also shrinks. Therefore, the cost of meeting this renewable portfolio standard that is avoided due to energy efficiency activities needs to be accounted for in PSE's avoided costs for energy.

Because the IRP is a 20-year plan, the avoided cost of the renewable portfolio standard is first calculated as a levelized payment over 20 years. Based on the assumptions in the 2011 IRP, that levelized payment is currently $11.49 per MWh. For years 2032 through 2041, PSE held the avoided cost of the renewable portfolio standard flat, at a nominal rate of $11.49 per MWh. For purposes of calculating cost-effectiveness, the value for the avoided cost of PSE's renewable energy standard is assumed to not change by end-use.

The calculations for the avoided cost of renewable energy standards due to energy efficiency are contained in *Appendix A5: Planning Adjustment and renewable Portfolio Standards*. The basic formula used in these calculations is shown below.

Levelized Avoided Cost of Renewable Portfolio Standard:

$$RPSC = \frac{\sum_{y=1}^{20}[(PNDSRR_y - PWDSRR_y)/(1+I)^y]}{\sum_{y=1}^{20}[EnergySavings_y/(1+I)^y]} = \$11.49/MWh$$

Where:

PNDSRR: Cost of renewable energy standards from the portfolio with no DSR

PWDSRR: Cost of renewable energy standards from the portfolio with DSR

I: Interest rate used for discounting, PSE ROR (8.10%).

$EnergySavings_y$: Energy savings in year y from the portfolio with DSR

PSE's statutory renewable portfolio requirements can be viewed with the following link:

http://apps.leg.wa.gov/rcw/default.aspx?cite=19.285.040

2.5 Conservation Credit for Energy

Section 3(4)(D) of the Pacific Northwest Electric Power Planning and Conservation Act ("NW Power Act") directs the Northwest Power and Conservation Council, and the Bonneville Power Authority, to apply a 10 percent cost advantage to conservation when comparing it with sources of electric generation. The Northwest Power and Conservation Council applies this cost credit to the value of market prices, deferred transmission and distribution investments, and risk avoidance in the formulation of their periodic Regional Power Plans. Further Section 1(a) of RCW 19.285.040 requires PSE to use a methodology "consistent" with that outlined in the NW Power Act when evaluating relative merits of demand-side resource vs. supply-side alternatives.

PSE applies this cost advantage to conservation only in the calculation of avoided electric cost for the TRC test. Specifically, the avoided cost of market priced energy, the line loss reductions, the planning adjustment, and the avoided cost of renewable standards are all increased by 10%.

This cost advantage is not applied to the UC, RIM, or PCT. Information about this conservation credit is contained in *Appendix A6: Sixth Northwest Conservation and Power Plan-Conservation Supply Development* and provided formulaically below:

Conservation Credit for Energy:

$$CCE_{j_y} = (WAAMP_{j_y} + PA + RPSC + LL_{jy}) * 0.10$$

Where:

CCE_{jy}: Conservation Credit for Energy for end use j in year y

$WAAMPE_{jy}$: Weighted Average Annual Market Price of Energy for end-use j in year y

LL_{jy}: Avoided cost of line loss

PA: Levelized value of the planning adjustment

RPSC: Levelized value of the renewable portfolio standard costs

2.6 Calculation of Avoided Cost of Energy

Within the cost-effectiveness tests, the avoided cost of energy is calculated as the present value of the stream of avoided costs, over the life of the measure being assessed. Obtaining the value of avoided costs in a present value is essential in producing valuable benefit-cost ratios because it allows an apples-to-apples comparison of the benefits (avoided costs) of a program, or measure, with the costs associated with obtaining those benefits, typically incurred in the first year of the measure installation.

PSE calculated the present value (in 2012 dollars) of the stream of avoided costs using the total avoided cost of energy, for years 2012 through 2041. Once the present value of avoided costs (for years 2012 through 2041) are known, PSE can calculate the present value of the stream of avoided costs for various measure lives.

2.6.1 Avoided Cost of Energy for years 2012 through 2041

The total avoided cost of energy, for years 2012 through 2041, are calculated by summing the values for the weighted average annual market price, the value of line losses, the planning adjustment, the avoided cost associated with PSE's renewable portfolio standards, and the conservation credit. The total yearly avoided cost of energy is defined below:

$$TCE_{jy} = WAAMPE_{jy} + LL_{jy} + PA_y + RPSC_y + CC_{jy}$$

Where:

TCE_{jy}: Total avoided cost of energy for end-use j in year y

$WAAMPE_{jy}$: Weighted average annual market price of energy for end-use j in year y

LL_{jy}: Line losses for end-use j in year y

PA_y: Value of the planning adjustment in year y ($0.23/MWh)

$RPSC_y$: Value of the avoided cost associated with renewable portfolio standard in year y ($11.49/MWh)

CC_{jy}: Value of the conservation credit for end-use j in year y. This is set to zero for the Utility Cost Test and the RIM Test.

2.6.2 Present Value of Avoided Cost of Energy

Once the total avoided cost of energy, for years 2012 through 2041, are calculated, the present value of the avoided cost of energy are calculated in 2012 dollars.

PSE uses its authorized rate of return on rate base (ROR) of 8.1% as the discount rate in its present value calculations. This rate was approved in PSE's 2009 General Rate Case and was used in its 2011 IRP[viii].

The present value of the avoided cost of energy is defined below:

$$PV_{j_y} = TCE_{j_y} / (1+I)^y$$

Where:

PV_{j_y}: Present value of year y's avoided costs of energy for end-use j.

TCE_{j_y}: Total avoided cost of energy for end-use j in year y.

I: Interest rate used for discounting, PSE's ROR (8.10%).

2.6.3 Present Value of the Stream of Avoided Energy Costs

The present value of the stream of avoided energy costs is equal to the total benefits of avoided energy costs over the life of the measure being assessed. The present value of the stream of avoided costs are calculated for years 2012 through 2041 and are equal to the sum of avoided costs for each year, y, and all years previous. The calculation of the present value of the stream of avoided costs is below:

$$PVSACE_{Jy} = \sum_{y=1}^{N} TCE_{J_Y} /(1+I)^{y}$$

Where:

$PVSACE_{jy}$: Present value of the stream of avoided costs for a measure with end-use j and a savings life of y.

TCE_{J_y}: Total avoided cost of energy for end-use j in year y.

I: Interest rate used for discounting, PSE's ROR (8.10%).

3. Avoided Cost of Capacity

PSE's peak load (highest load of the year) is expected to increase over time. As peak loads increase, PSE incurs a cost to build resources which are specifically attained to assist the company in meeting the energy demands of customers during the peak hour. In addition to the costs of the peaking resources, PSE incurs a cost to upgrade the current transmission and distribution system so that it can handle the larger peak loads.

A portfolio with Demand Side Resources (DSR) , which saves energy on the peak hour, will assist the utility in avoiding the purchase of some peaking resources. The portfolio with DSR will also assist in deferring some of the transmission and distribution system upgrades. When calculating the avoided cost of energy efficiency activities, it's important to include the avoided costs of capacity which occur because of the investment in energy efficiency resources.

The avoided costs of capacity are added to the avoided cost of energy when calculating the benefits for energy efficiency measures and programs. The avoided costs of capacity are quantified by kW-yr, unlike the avoided cost of energy which is in units of megawatt hour of energy. Therefore, for each end-use in the efficiency portfolio, the value of capacity (or kW) is multiplied by the percent of total load, for end-use *j*, which occur on the peak hour per the end-use load shape[viii].

When calculating the benefits for the TRC, a 10% conservation credit is applied to the fixed cost of capacity and the deferred transmission and distribution costs.

The application of capacity costs within the avoided cost calculations for the Utility Cost Test is contained in *Appendix A1 Avoided Cost Calculations for the TRC*.

Avoided capacity cost is calculated using the following inputs:

1. Fixed cost of capacity
2. Avoided cost of transmission and distribution
3. Conservation credit (set to zero for the UC & RIM)

3.1 Fixed Capacity Costs

The avoided fixed capacity cost are calculated as an annual payment, over twenty years, on the difference in fixed capacity costs (cost of building peaking resources) between the portfolio with no demand side resources and the portfolio with optimal demand side resources, on a per KW-year basis. The levelized value for the 2012-2013 avoided costs calculations is currently $202.15.

$$FCC = \frac{\sum_{y=1}^{20}[(PNDSRC_y - PWDSRC_y)/(1+I)^y]}{\sum_{y=1}^{20}[PeakBuilds_y/(1+I)^y]}$$

Where:

FCC: Fixed Cost of Capacity

PNDSRC: Cost of peaking resources (capacity) in the portfolio with no DSR

PWDSRC: Cost of peaking resources (capacity) in the portfolio with DSR

Peak Builds: The megawatts of peaking resources built in year y under the optimal portfolio with DSR.

For years 21 through 30, PSE held the avoided fixed cost of capacity flat at $202.15 per megawatt KW-year.

The calculations for the annual fixed cost of capacity are located in *Appendix A7: Fixed Capacity Cost*

3.2 Avoided Cost of Transmission and Distribution Costs

Currently, PSE uses the value of avoided transmission and distribution from the 6th Northwest Power Plan. The plan used monetary values of avoided transmission and distribution capacity which were recommended by the Regional Technical Forum. The value recommended for avoided transmission is $23 per kW-year; the value recommended for avoided distribution is $25 per kW-year.

The values of transmission and distribution in the 6th Northwest Power Plan are in 2006 prices. To obtain a value for 2012, the price in 2006 was inflated using Moody Analytics full CPI[1] from 2006 to 2012. The reason the assumed inflation rate in the IRP was not used is because past inflation values are known and the assumed inflation rate in the IRP is an assumed future inflation rate.

The combined value of avoided transmission and distribution is $54.32 per kW-year in 2012 dollars. The 2012 value of transmission and distribution was inflated by the assumed inflation rate in the IRP of 2.5% to obtain avoided transmission and distribution costs for years 2013 through 2041.

[1] The Consumer Price Index (CPI) is a measure of the average change over time in the prices paid for a market basket of consumer goods and services.

The explanation of avoided transmission and distribution costs for the 6th Northwest Power Plan is contained in *Appendix A6: Sixth Northwest Conservation and Power Plan-Conservation Supply Development.*

$$TD_y = (TD_{(y-1)} * 1.025)$$

Where:

TD_y: Avoided cost of transmission and distribution for end-use j in year y.

3.3 Conservation Credit for Capacity

Section 3(4)(D) of the Pacific Northwest Electric Power Planning and Conservation Act ("NW Power Act") directs the Northwest Power and Conservation Council, and the Bonneville Power Authority, to apply a 10 percent cost advantage to conservation when comparing it with sources of electric generation. The Northwest Power and Conservation Council applies this cost credit to the value of market prices, deferred transmission and distribution investments, and risk avoidance in the formulation of their periodic Regional Power Plans. Further Section 1(a) of RCW 19.285.040 requires PSE to use a methodology "consistent" with that outlined in the NW Power Act when evaluating relative merits of demand-side resource vs. supply-side alternatives.

PSE applies this cost advantage to conservation only in the calculation of avoided electric cost for the TRC test. Specifically, the avoided cost of market priced energy, the line loss reductions, the planning adjustment, and the avoided cost of renewable standards are all increased by 10%.

This cost advantage is not applied to the UC, RIM, or PCT. Information about this conservation credit is contained in *Appendix A6: Sixth Northwest Conservation and Power Plan-Conservation Supply Development.*

Conservation Credit for Energy:

$$CCC_y = (FCC + TD_y) \times 0.10$$

Where:

CCC_y: Conservation Credit for Capacity in year y

FCC: Fixed cost of capacity

TD_y: Avoided cost of transmission and distribution for end-use j in year y.

3.4 Calculation of Avoided Cost of Capacity

The avoided cost of capacity is calculated as the present value of the stream of avoided capacity cost over the life of the measure being assessed. This means that PSE must calculate the present value of the stream of avoided capacity costs for years 2012 though years 2041.

The present value of the stream of avoided capacity costs in each year contains the present value of avoided capacity cost in that year and in every year previous. To calculate the present value of the stream of avoided capacity costs, PSE first calculates the nominal avoided cost of capacity for each year, 2012-2041. PSE then obtains a present value of avoided cost of capacity for each year, for years 2012 through 2041, in 2012 dollars. After calculating the present value per year, PSE calculates the stream of avoided costs by summing the present value of avoided costs for each year, *y*, and every year previous.

3.4.1 Calculation of the Total Avoided Cost of Capacity

The total avoided cost of capacity is calculated by summing the values for fixed capacity costs, avoided cost of transmission and distribution, and the conservation credit.

$TCC_y = (FCC_y + TD_y + CCC_y)$

Where:

TCC_y: Total avoided cost of capacity in year *y*

FCC_y: Avoided Fixed Capacity Cost in year *y*

TD_y: Avoided Transmission and distribution

CCC_y: Conservation Credit in year *y*. This value is set to zero for the Utility Cost Test and the Ratepayer Impact Measure Test

3.4.2 Present Value of Avoided Cost of Capacity

Once the total avoided cost of capacity (for years 2012 through 2041) is calculated, the present value of the avoided cost of capacity, for year 2012 though 2041, is obtained. The present value is calculated to set all avoided costs to 2012 dollar values. All dollar values need to be in the same time period so correct comparisons of benefits and costs can be made.

For present value calculations, PSE's weighted average cost of capital (8.1%) is used as the discount rate. This rate is adopted from the commission-approved cost of capital structure from the 2009 General Rate Case and is utilized in the 2011 IRP[ix].

Present value calculations are defined below:

$$PVSACC_{J_y} = (TCC_{J_y})/(1+I)^y$$

Where:

PV_y : Present value of year y's avoided costs of energy for

TCC_y: Total avoided cost of capacity in year y

I: Interest rate used for discounting, PSE weighted average annual cost of capital (8.10%).

3.4.3 Present Value of the Stream of Avoided Capacity Costs

The present value of the stream of avoided capacity costs is equal to the total benefits of avoided capacity costs over the life of the measure being assessed. The present value of the stream of avoided capacity costs are calculated for years 2012 through 2041 and are equal to the sum of avoided capacity costs for each year, y, and all years previous. The calculation of the present value of the stream of avoided capacity costs is below:

$$PVSACC_{J_y} = \sum_{y=1}^{N} [[(TCC_{J_y})/(1+I)^y]*(LPH_J)]$$

Where:

$PVSACC_y$: Present value of the stream of avoided capacity costs for a measure and a savings life of y.

TCC_y: Total avoided cost of capacity in year y

I: Interest rate used for discounting, PSE weighted average annual cost of capital (8.10%).

LPH_j: Percent of total load on the peak hour for end-use j

N: Measure Life

4. Total Avoided Cost of Electric Energy (Energy and Capacity)

The present value of the stream of avoided costs of electricity (energy and capacity) is calculated by summing the capacity and energy components. This value is then utilized in the benefit-cost assessments in EES.

The calculation of the present value of the stream of avoided costs for electricity (energy and capacity) is provided below:

$$PVSACTE_j = \sum_{y=1}^{N} [TCE_{j_y} / (1+I)^y] + [[TCC_{j_y} / (1+I)^y] * LPH_j]$$

Where:

$PVSACTE_j$: Present value of the stream of total avoided costs for a measure and a savings life of y.

N: Measure Life

The calculation is contained in *Appendix A: Avoided Cost Calculations for the TRC* and *Appendix A2: Avoided Cost Calculations for the UC and RIM*.

Appendix A to Calculating Cost-Effectiveness of Puget Sound Energy's Energy Efficiency Programs

[i] End-use is a word used to describe the common uses of energy associated with a particular sector. For example, for the residential sector, water heating, space heating, lighting, and refrigeration are all end-use categories.

[ii] Load shapes were developed for a 365 day (8760 hour) year, not a leap year.

[iii] The majority of load shapes are derived from Energy 10 building simulations or adopted from the Northwest Power and Conservation Council. All load shapes used in the avoided cost calculations are obtained from CADMUS, the firm which completes PSE's IRP.

[iv] The planning adjustment was calculated as a levelized payment because resources are not built at continuous points in time as they are needed. Resources are built intermittently to meet future loads. Therefore, a levelized value was appropriate. This avoids the entire planning adjustment arbitrarily inflating the value of avoided costs only in certain years. Some people have questioned the present value of energy savings in this calculation. Taking a present value of costs over a present value of savings provides a levelized cost. The cost-effectiveness team had financial experts review this and it is correct.

[v] To accurately estimate the planning adjustment in years 21 through 30, PSE would need information on the resource needs and resource costs in those periods of time. Because they are unknown, we assume the payment will stay flat over 30 years.

[vi] Sometimes referred to as the "Energy Independence Act" or "I-937."

[vii] Each time avoided costs are updated, the analyst conducting the analysis is required to update the discount rate to reflect the rate used in the most recent IRP. This rate should also correlate to the most recent commission-approved cost of capital before the finalization of the IRP. The Resource Planning Group provides the base WAACC for the most recent IRP. To obtain a breakout of the WACC for equity, long-term debt, and short-term debt, speak with the Manager of the Cost of Service in the Rates Department, currently Jon Piliaris.

[viii] Peak hour is defined in the 2011 IRP as the average load of the six hours ending at 7am to 12pm and the six hours ending at 6pm to 11pm on weekdays in December. Because load shapes obtained from Cadmus are labeled in 2005 dates, the calendar for 2005 was used to estimate average load in peak hour.

[ix] Each time avoided costs are updated, the analyst conducting the analysis is required to update the discount rate to reflect the rate used in the most recent IRP. This rate should also correlate to the most recent commission-approved cost of capital before the finalization of the IRP. The Resource Planning Group provides the base WAACC for the most recent IRP. To obtain a breakout of the WACC for equity, long-term debt, and short-term debt, speak with the Manager of the Cost of Service in the Rates Department, currently Jon Piliaris.