PUGET SOUND ENERGY

Exhibit 2, Supplement 1

2024-2025 Cost-Effectiveness Overview

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I. Introduction

A. 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. Through 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 (energy efficiency) are some of the most cost-effective ways for PSE to meet expected customer demand. When selecting which demand side resources to obtain, PSE conducts cost-effectiveness tests that assist PSE in determining which demand side resources to acquire compared to the alternative resources available.

Currently, PSE conducts two cost-effectiveness tests; the Utility Cost Test (UC) and the Total Resource Cost Test (TRC). These tests measure whether or not the benefits obtained by the demand side resource meet or exceed the costs to obtain the resource. This paper presents 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 specific costs tests described in this paper are required of PSE to meet conditions agreed upon with the State of Washington in 2013, which indicate:

> (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 impacts, 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 https://www.nwcouncil.org/2021powerplan_cost-effective-methodology.
>
> (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 website of the United States Environmental Protection Agency at https://19january2017snapshot.epa.gov/sites/production/files/2015-08/documents/understanding_cost-

effectiveness_of_energy_efficiency_programs_best_practices_technical_methods_and_emerging_issues_for_policy-makers.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 Conservation Resource Advisory Group (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.

II. Overview of Cost-Effectiveness Tests

The 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 ∑ benefits ÷ NPV ∑ 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.

A. The 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 impacts 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. Social Cost of Greenhouse Gas emissions
2. Avoided costs of capacity
   a. Deferred T&D expense
   b. Total annual fixed cost of generating capacity

B. The Total Resource Cost Test

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.

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[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.

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 who purchase an energy efficient measure
3. Customer costs, either full or incremental, of acquiring the efficient equipment or services, net of any incentives provided by the utility
4. Other program specific costs

Benefits:

1. Avoided cost of energy
    a. Market cost of energy
    b. Line losses
    c. Social Cost of Greenhouse Gas emissions
2. Avoided costs of capacity
    a. Deferred T&D expense
    b. Total annual fixed cost of generating capacity
3. Conservation credit[6]
4. Non-energy impacts[7]

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 of the addition of customer costs, which typically are far greater than (and thus outweigh) 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.

[6] The conservation credit is a 10% adder provided by the Northwest Power Act to advantage energy conservation over generation resources.

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

In theory, programs where non-energy impacts are significant and quantifiable, the benefit-cost ratio of the TRC can be far greater than the ratio developed though the UC. However, non-energy related benefits can be difficult to quantify and include in the calculation of the TRC.

PSE recognizes that because non-energy impacts are often difficult to estimate, cost-effectiveness calculations typically bias toward a conservative estimate of benefits, and thereby undervaluing efficiency by excluding real benefits to customers. This is not usually the case in the Low Income Weatherization program, where the value of health and safety improvements is included as a non-energy benefit. In the 2020-2021 biennium, PSE invested time and resources into an investigation of non-energy impacts used by other North American utility jurisdictions and adopting them for use in PSE measures. This effort resulted in a significant increase in the use of non-energy impacts in areas including health and safety, property value, home comfort, and reduced energy burdens. Ongoing research and analysis will add even more quantified non-energy impacts in the coming biennium.

III. Key Drivers of Cost-Effectiveness Calculations

A. 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 impacts,
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.

B. 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[8] types, each end-use will be impacted differently by changes in energy costs[9]. 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[10]. Changes in the avoided cost of capacity will have relatively little impact on energy efficiency programs which provide low savings in the peak hours.

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.

C. 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[11] 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 being equal, an increase in program overhead costs will decrease the cost-effectiveness of efficiency programs.

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

[9] 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.

[10] For energy efficiency planning purposes, peak hours are considered to be the 5 hours in the morning and 5 hours in the evening when load is highest, every weekday in December.

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

D. 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 being equal, an increase in the cost of a measure can decrease the benefit-cost ratio in the cost-effectiveness tests.

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 out 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 equipment installed or incentivized though the PSE program and the cost of the equipment the customer would have installed without program intervention; e.g. the added cost of a more expensive high-efficiency furnace versus a lower cost standard-efficiency furnace that complies with the code minimum. 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 that are not yet at the end of their useful life, 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.[12]

E. Incentives

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. From the TRC perspective, the incentive is just a transfer from the utility to the customer, with no impact on the overall cost.

[12] In 2011, PSE launched 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.

However, the incentive provided by the utility has a direct impact on the outcome of the UCT. When incentives are increased, all else remaining equal, the benefit-cost ratio of the UC will decrease, since this will increase the cost to the utility and/or ratepayers with no change in the level of benefits.

F. Customer Cost

Customer costs are those costs that the customer pays for the item being installed. For programs that use a full measure cost, the customer cost is the full measure cost minus the incentive provided to the customer. For programs that 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 that 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 because customer costs are excluded from the test. In addition, the customer cost doesn't directly impact the TRC because that test uses either the full measure cost or the incremental cost, both of which include the customer cost, when calculating the benefit-cost ratio.

Customer costs indirectly impact the TRC 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.

G. 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.

The cost of natural gas in in dual-fuel conservation measures 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 conservation measures which might increase natural gas consumption while saving electricity. 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. All else being equal, additional operation and maintenance costs faced by the customer will decrease the benefit-cost ratios of the TRC. Added customer costs will have no impact on the UC.

H. Non-Energy Impacts

Non-energy impacts (often called "non-energy benefits") are defined as the impacts (usually positive) from energy efficiency programs that are not directly attributed to energy savings. 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 impacts are only included in the TRC, and PSE typically quantifies these when there is documentation of a sound methodology in their development. Non-energy impacts can be positive or negative and are always included in the numerator of the test, regardless of the sign. Positive changes in non-energy impacts are positively correlated with the benefit-cost ratio of the TRC Test, all else being equal.

I. Measure Life

The measure life is the rated useful life of the item(s) being incentivized though the program. Measure life is typically assessed using Regional Technical Forum[13] 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 being equal.

J. End-Use Load Shape

The shape of the load for each measure being assessed in the cost-effectiveness calculations impacts the TRC 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.

K. Discount Rate

For the 2024-2025 program years, the discount rate for PSE efficiency program avoided costs will remain at 6.8 percent. This discount rate is the most recently approved rate of return on rate base ("ROR") by PSE's state regulators and was used in the development of the 2023 Integrated Resource Plan. As utility discount rates increase, the present value of avoided costs decreases.

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

All else being equal, an increase in the discount rate decreases the benefit-cost ratios of PSE's cost effectiveness tests.

L. Summary of Key Cost Effectiveness Drivers

Key Driver	Direction of Key Driver	Direction of Benefit-Cost Ratios	
		TRC	UC
Avoided Energy and Capacity Costs	⬇	⬇	⬇
	⬆	⬆	⬆
Program Overhead Costs for the utility	⬇	⬆	⬆
	⬆	⬇	⬇
Measure Cost	⬇	⬆	N/A[14]
	⬆	⬇	N/A
Incentive	⬇	N/A	⬆
	⬆	N/A	⬇
Non Energy Benefits	⬇	⬇	N/A
	⬆	⬆	N/A
Measure Life	⬇	⬇	⬇
	⬆	⬆	⬆
Discount Rate	⬇	⬇	⬇
	⬆	⬆	⬆

[14] The Utility Cost and Ratepayer Impact Measure tests are not impacted.

IV. Constructing Benefit-cost Ratios

A. Using Benefit-Cost Ratios for Program Planning

Benefit-cost ratios (a.k.a. “cost-benefit 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 clarification on what to include as non-energy impacts, 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.

B. Accounting for Non-Energy Impacts

When including non-energy impacts 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. All non-energy impacts that are quantifiable can be included in the TRC. Non-energy impacts that cannot be supported with adequate documentation should not be included in the TRC. Moreover, non-energy impacts which are included in the TRC should be accompanied with supporting documentation and calculations.

C. 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 impacts, 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.

D. 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 ROR approved in its most recent General Rate Case as the nominal discount rate.

E. 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	1. Program Overhead Costs
	2. Avoided Capacity Costs	2. Incentives
Perspective of All PSE Customers		
Total Resource Cost Test	1. Avoided Energy	1. Program Overhead Costs
	2. Avoided Capacity Costs	2. Incentives
	3. Non-energy Impacts	3. Customer Costs (incremental or full measure cost-incentive)
	4. Additional Cost Savings From Non-program Related Items	