PSE PUGET SOUND ENERGY

Exhibit 2, Supplement 2

Non-Energy Impacts Overview

ENERGY EFFICIENCY

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I. Introduction

A. Background

Non-energy impacts (NEIs) are defined as costs or benefits from energy efficiency programs that are not directly attributed to energy savings. Examples include water and sewer cost savings, improved health and safety, fewer shutoff notices for the utility and improved quality of life or product quality. PSE includes these monetized benefits when applying the total resource cost test to its energy efficiency programs. NEIs are notoriously hard to quantify, as many of the benefits experienced by customers have subjective value or the value is aggregated over entire economic sectors. For this reason, PSE typically includes only those NEIs which could be carefully measured and documented.

Following the submission of PSE's 2020-2021 Biennial Conservation Plan, the Washington State Utilities and Transportation Commission (WUTC) provided guidance through Docket 190905, Order 01, Attachment, Conditions 10A and 10B. These conditions read as follows:

> *10) Equitable Distribution of Nonenergy Benefits*
>
> *a) During this biennium, Puget Sound Energy must demonstrate progress towards identifying, researching, and developing a plan to properly value nonenergy impacts that have not previously been quantified. The nonenergy impacts considered must include the costs and risks of long-term and short-term public health benefits, environmental benefits, energy security, and other applicable nonenergy impacts. These impacts and risks must be included in the 2022-2023 Biennial Conservation Plan.*
>
> *b) Puget Sound Energy must identify the discrete nonenergy impacts and the monetized value used in cost-effectiveness testing for each electric conservation program. This must be provided in a detailed format with a summary page and subsequent supporting spreadsheets, in native format with formulas intact, providing further detail for each program and line item shown in the summary sheet in annual plans and reports.*

To achieve compliance with these Conditions, PSE engaged with other Washington investor-owned utilities and DNV, a well-known energy analysis firm already contracted to provide evaluation services to PSE, to research and identify new NEIs. DNV had compiled a database of NEIs from jurisdictions around North America and developed a methodology used to transfer NEIs from one jurisdiction to another, consistent with the principles developed in a 2020 study by Lawrence Berkeley National Laboratory.[1]

Throughout the project, PSE provided updates to its Conservation Resource Advisory Group (CRAG). In the July 2021 CRAG meeting, the advisory board asked if a summary of the methodology DNV used in developing the NEIs for PSE could be

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[1] Study can be found at https://emp.lbl.gov/publications/applying-non-energy-impacts-other.

provided. This document responds to that request. Please note that this document presents a highly condensed version of the methodology. The full 60-page report to PSE that contains the detailed methodology is available upon request.

II.   THE DNV NEI METHODOLOGY

A. Overview

The process of identifying and incorporating new NEIs began with database created by DNV. DNV's NEI Database contains 50 separate residential and C&I NEIs from 46 publicly available studies. Their database includes NEIs from the existing literature and assigns those NEIs to relevant PSE programs and measures. After assigning the NEI to PSE programs and measures, we adjust the estimates based on plausibility, confidence, and economic adjustment factors. The adjustments improve transferability of the research to PSE territory. They also reduce the NEI values to account for uncertainty stemming from extremely high or low values, the quality of the methods used in the original study, the age of the original study, and differences in economic conditions between the area covered by the original study and PSE service territory.

The NEI Database approach consists of the following seven steps:

B. Step 1: Map PSE measures to DNV's NEI Database

NEI studies can vary considerably in how they aggregate information when reporting a quantified NEI value. The goal in this step is to standardize the PSE measure descriptions into the same taxonomy that DNV assigned to the measures from all of the studies in the Database. We then use those standardized descriptions to match the PSE measures to those in the Database.

DNV refers to the combination of the following classes of fuel saved, program participant populations, programs, and measure descriptions as the "level of aggregation" (LoA). Below is a list of the seven LoAs DNV classified for use in this study:

1. **Fuel (Level 0):** Identifies the fuel studied in the report (electricity, gas, or both).
2. **Sector (Level 1)**: Identifies the population being served by the program (C&I or Residential).
3. **Program Level (Level 2)**: Designates the class of program within the sector (Low Income, New Construction, Retrofit).
4. **Prescriptive/Custom (Level 3)**: Separates programs into Prescriptive or Custom.
5. **End-use Level (Level 4)**: High-level description of end-use systems modified through a program type.
6. **Broad Measure Level (Level 5)**: High-level description of measure within an end-use (e.g. LED Lighting).
7. **Detailed Measure Level (Level 6)**: Detailed-level description of measure within an end-use (e.g. Linear LED).

DNV standardizes and assigns the LoAs to each measure in the 46 studies contained in the Database. Doing so enables DNV to map the database measures to the PSE Measure List using the standard set of Level 0 through Level 6 match codes. The match codes are assigned to the PSE Measure List using the same match code used in the dictionary.

To illustrate, the table below illustrates how a Linear LED measure is broken out into the LoA:

Standard Levels of Aggregation	Example of Standard Levels of Aggregation Details
Detailed Measure Level (Level 6)	Linear LED
Broad Measure Level (Level 5)	LED
End-Use Level (Level 4)	Lighting
Prescriptive/Custom (Level 3)	Prescriptive
Program Level (Level 2)	Retrofit
Sector (Level 1)	C&I
Fuel (Level 0)	Electricity
Standard NEI Category Example	O&M-Participant-C&I

Example of Standard Level of Aggregation details for one measure in the PSE measure list

C. Step 2: Assign Confidence Factors

DNV assigns a Confidence Factor to each study to reflect how well the study follows research best practices. The Confidence Factor is used to discount the NEI values matched to PSE's measures to provide a conservative estimate of NEI values in the Database. Furthermore, the studies and measures in the Database are sorted from highest confidence to lowest confidence, so that the matching look-up value would select the higher confidence values first.

The questions used to calculate the Confidence Factor Score are as follows. Each factor is assigned a score of 0 to 3 based on the answer to these questions:

1. Is the study measure-specific?

2. Is the study segmented by sector?

3. Was the sample drawn using a statistical method?

4. Does the study incorporate identifiable economic factors?

5. Does the study consider open-ended questions, additivity, or double-counting?

The scores to each of these questions are then used to calculate a Confidence Factor, based on the weighting given to each question (for the purpose of the PSE study, all questions were given equal weight). The calculation for the Confidence Factor is as follows:

$$Confidence\ Factor\ Score = \frac{\begin{array}{c}(Q1\ Score * Q1\ Weight) + (Q2\ Score * Q2\ Weight) + (Q3\ Score * Q3\ Weight) \\ +(Q4\ Score * Q4\ Weight) + (Q5\ Score * Q5\ Weight)\end{array}}{Max\ Total\ Score}$$

For the purposes of remaining conservative, PSE asked DNV to include a "floor" of 50%, meaning that any NEI evaluated that results in a Confidence Factor of less than 50% would be excluded from this round of NEI adoption. The NEIs eliminated under this criteria are candidates for further research and analysis to assess their suitability for future inclusion.

D. Step 3: Assign Plausibility Factors

DNV developed a Plausibility Factor for each study to further account for nuances in NEI research outside of the actual study methodology. The Plausibility Factor is also used in conjunction with the Confidence Factor for discounting NEI values and for identifying best-fit values in the event of multiple measure-by-NEI matches. The Plausibility Factor considers three variables:

1. Level of Matching (Whether PSE's measures map to the DNV database at Level 6, Level 5, etc., from the table above).

2. Age of the study

3. Changes in energy consumption within an end-use category over time (provides a way to adjust based on technological changes. NEIs associated with lighting from a study in 2012, for example, would have different associated NEI per kWh than they would in 2020).

As with the Confidence Factor, each variable in the Plausibility is assigned a score, which is then divided by the total possible to come up with a Plausibility Factor (as with the Confidence Factors, all variables are weighted equally). PSE also asked DNV to hold each NEI to a "floor" of 50%, so that none of the NEIs adjusted below 50% were selected for inclusion in this round of NEIs, but remain potential candidates for further study.

E. Step 4: Estimate Economic Adjustment Factors

DNV uses publicly available data to develop factors that adjust NEIs based on the economic activity of the original jurisdictions to PSE's service territory. DNV used eight economic factors to adjust the NEIs. The factors are broken into Residential and C&I categories and include the following:

1. Residential economic adjustment factors:

▪ **Property Value –** Noise, visual, and air/temperature NEIs that are reflected in the differences in home values.

- **Income & Health Impacts (loss of income)** – Economic development NEIs related to income, as well as health NEIs related to longer life or missed days at work can be adjusted using differences in income.
- **Health Impacts (avoided costs)** – Health and safety NEIs related to avoided medical costs in hospitals. These NEIs are adjusted using the differential in medical costs between jurisdictions.
- **Age of Home** – Fire-related NEIs using the differential in the age of homes between jurisdictions.
- **Utility Cost - Residential** – NEIs that result from changes to utility costs such as bad debt, arrearages, and hedging. These NEIs can be adjusted using the ratio of the average utility cost per MMBtu by sector (commercial, industrial, residential).

2. **Commercial and Industrial economic adjustment factors:**

- **Labor Costs (wage-based)** – Operations and maintenance (O&M) NEIs are largely a function of the time spent to maintain, repair, or replace equipment. These NEIs are adjusted using wage differentials in C&I settings.
- **Revenue & Productivity** – NEIs that change the profitability or operating costs for C&I customers other than what can directly be attributed to O&M. Comfort changes in C&I applications result in productivity NEIs. Changes may also affect the durability of a product or the amount of sales revenue. These NEIs can be adjusted using differentials in output or GDP.
- **Utility Cost - C&I** – NEIs that result from changes to utility costs such as bad debt, arrearages, and hedging. These NEIs can be adjusted using the ratio of the average utility cost per MMBtu.

Each of these categories uses publicly available economic data sources to compile a monomial that represents an index comparing the originating jurisdiction with PSE service territory. The resulting outputs create an index that enables a direct adjustment from the jurisdiction where the original NEI study took place to PSE service territory. All NEI values are then adjusted according to the resulting index.

F. Step 5: Calculate Utility-Specific NEIs

All NEIs from the Database that match PSE measures are scored according to the combined Confidence and Plausibility scores, creating the "combined score". This combined score, along with the economic adjustment factor, are applied to the study NEI value to make it utility-specific (or more specific, where possible) as well as to discount the value based on how applicable it is. This process is reflected in the following equation:

$$NEI\ Value_{Original\ Juristiction} * CF * PF * Economic\ Adjustment_{PSE} = NEI\ Value_{PSE}$$

G. Step 6: Choose the Best Value for Each NEI/Measure Combination

The automated Database process can produce multiple matches between the published NEI values and the PSE Measure List. A multi-level ranking approach identifies the best fit for each NEI-by-measure combination. When there are multiple options for a top value, the most conservative estimate is flagged and the DNV NEI team reviews all potential matches to identify the best fit. The results produce a single matched value as the final recommended NEI for each measure-by-NEI combination.

H. Step 7: The Gap Analysis

As a final output to the project, DNV identifies areas in which follow-up research is necessary to confirm or quantify NEIs occurring within PSE territory. This process involves the following activities:

- Identify energy-efficiency measures that do not have NEIs.
- Identify gaps where no NEI is matched to the measure list but NEIs exist in the published literature.
- Identify NEIs that are heavily discounted.
- Inventory NEI types that have not been previously studied.
- Identify initial priority opportunities for future research based on the potential value gained compared to the cost to conduct the research.

Much of the additional research and analysis identified by the Gap Analysis will be conducted in the 2022-2023 biennium. PSE is committed to an ongoing effort to identify and incorporate sound, defensible NEIs backed by rigorous research and industry accepted methodologies.

III.   RESULTS AND ONGOING EFFORTS

Through the methodology described above, PSE was provided NEI values across 860 different measures. Using the DNV database and methodology saved considerable time and effort that would have been required to research and verify these NEIs independently. These NEIs were provided on a $ per kWh or therm basis, allowing PSE to incorporate NEIs using existing unit energy savings (UES) values, and enabling PSE to update the NEIs as UES values change.

The NEIs provided by DNV's methodology include impacts across categories not previously considered as viable through PSE's traditionally conservative approach, including:

- Administrative overhead cost for commercial customers.

- Improved ease of selling or leasing properties based on improved performance or desirability.

- Benefits from avoided product spoilage or defects due to malfunctioning equipment.

- Increased thermal comfort due to reduced drafts and variable temperatures in living spaces.

- Avoided waste and landfill costs.

- Reported values of reduced exterior noise heard inside living areas.

- Avoided cost of fire risk based on insurance estimates.

- Reduced carrying costs to the utility from arrearages or bad debt write-offs.

- Avoided illnesses from PM2.5 air particulate matter.

Through the Gap Analysis described in Section 2.8, PSE still has approximately 900 measures that have potential NEIs for inclusion into cost-benefit analyses. The Gap Analysis created a priority list based on potential value and ease of analysis, and PSE is using this tool to investigate additional NEIs for inclusion.

A. NEIs in the 2022-2023 Biennium

The NEIs developed using the methodology above are still being incorporated into program plans for the 2022-2023 biennium. Because of the timing of the project, many of the final NEIs received by PSE were not ready for inclusion until August 2021, which is late in the planning cycle to update measure cases. However, compared to the 2020-2021 Biennial Conservation Plan, the total present value of NEIs used in electric residential programs have increased, from $10.48 million in 2020-2021 to $11.2 million in 2022-2023, and have increased in gas residential programs from $8 million to $10 million. Similar increases do not show up in the commercial programs, primarily because of the reduction of savings potential in the commercial foodservice program (one of the largest users of the water savings NEIs) planned for 2022-2023. As more NEIs are investigated and measure cases are updated, PSE expects that the value of NEIs in the cost-effectiveness calculation will continue to grow.

B. Equitable Distribution of NEIs

PSE is developing methods to track the distribution of NEIs across its customer groups, and expects to be able to provide detailed analysis across zip codes and census tracts as program implementation commences. Because biennial plans do not include specific customer information, the 2022-2023 biennial conservation plan cannot include any information about the distribution of benefits. The 2021 Annual Report will be the first report that will be able to include details on the distribution of NEIs across customers.