2025 CONSERVATION POTENTIAL ASSESSMENT

Grant County Public Utility District

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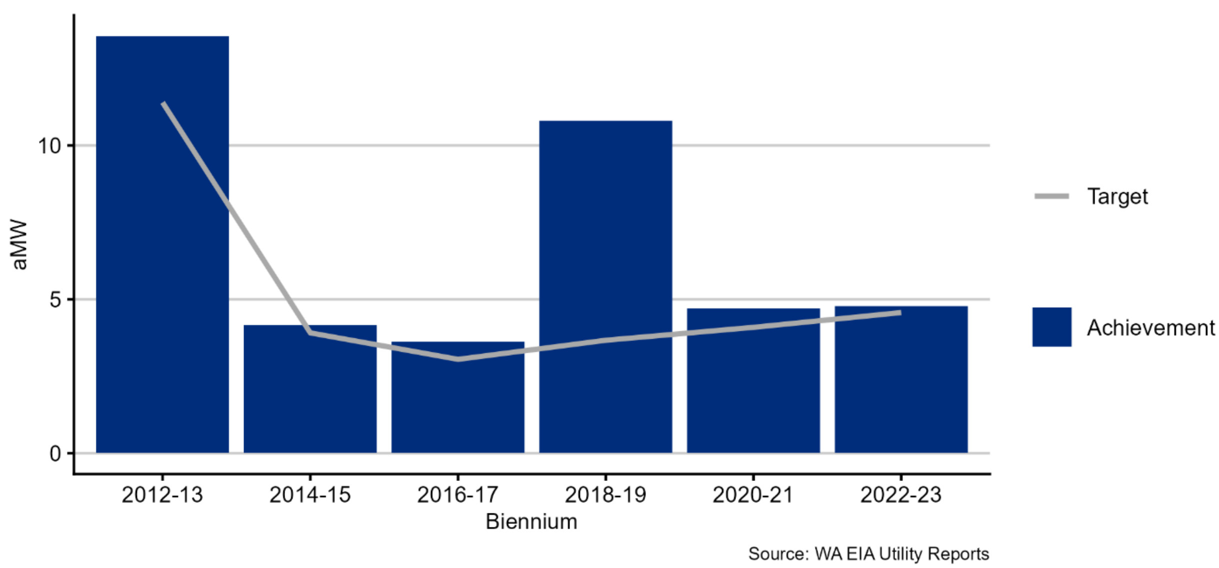
Executive Summary

Overview

This report describes the methodology and results of a conservation potential assessment (CPA) conducted by Lighthouse Energy Consulting and Nauvoo Solutions (the project team) for Grant County Public Utility District (Grant PUD). The CPA estimated the cost-effective energy savings potential for the period of 2026 to 2045. This report describes the results of the full 20-year period, with additional details on the 2- and 10-year periods that are the focus of Washington's Energy Independence Act (WA EIA) and the 4-year interim compliance period per the state's Clean Energy Transformation Act (CETA).

Grant PUD provides electricity service to approximately 56,000 customers in Grant County, Washington. Washington's EIA requires that utilities with more than 25,000 customers identify and acquire all cost-effective energy efficiency resources and meet targets set every two years through a CPA. A summary of Grant PUD's program achievements and targets since 2012 is shown in Figure 1 based on data reported to Washington's Department of Commerce.

Figure 1: Historic Targets and Achievements (aMW)



Washington's EIA specifies the requirements for setting conservation targets in RCW 19.285.040 and WAC 194-37-070 Section (5), parts (a) through (d). The methodology used in this assessment complies with these requirements and is consistent with the methodology used by the Northwest Power and Conservation Council (Council) in the 2021 Power Plan. This CPA used much of the 2021 Power Plan materials, with customizations to make the results specific to Grant PUD's service territory and customers. Appendix III details the requirements of the WA EIA and how this assessment fulfills those requirements.

In addition, Washington's CETA requires CPAs to assess the cost effectiveness of conservation measures using specific values for the social cost of carbon. This assessment incorporates those values.

Results

Figure 2 and Table 1 show the cost-effective energy efficiency potential by sector over 2-, 4-, 10-, and 20-year periods. Over the 20-year planning period, Grant PUD has nearly 74 aMW of cost-effective conservation available, which is approximately 7% of its projected 2045 load. The WA EIA focuses on the 2- and 10-year potential, which are 8.83 aMW and 37.18 aMW, respectively. In the 4-year period covered by Grant PUD's 2025 Clean Energy Implementation Plan (CEIP), there 12.62 aMW of cost-effective conservation potential available.

Grant PUD is home to several large data centers, which are reported separately from traditional industrial and commercial customers. This distinction reflects their unique energy use and market behavior. The Council's 2021 Power Plan did not include conservation potential for data centers due to the likelihood that these sites would be driven by market forces to install energy efficient equipment. Following the Council's approach, the project team did not model cost-effective potential for data centers. Instead, the reported cost-effective potential in this sector reflects estimated savings from specific projects that Grant PUD is currently pursuing or has under contract for the upcoming biennium.

Figure 2: Cost-Effective Potential by Sector (aMW)

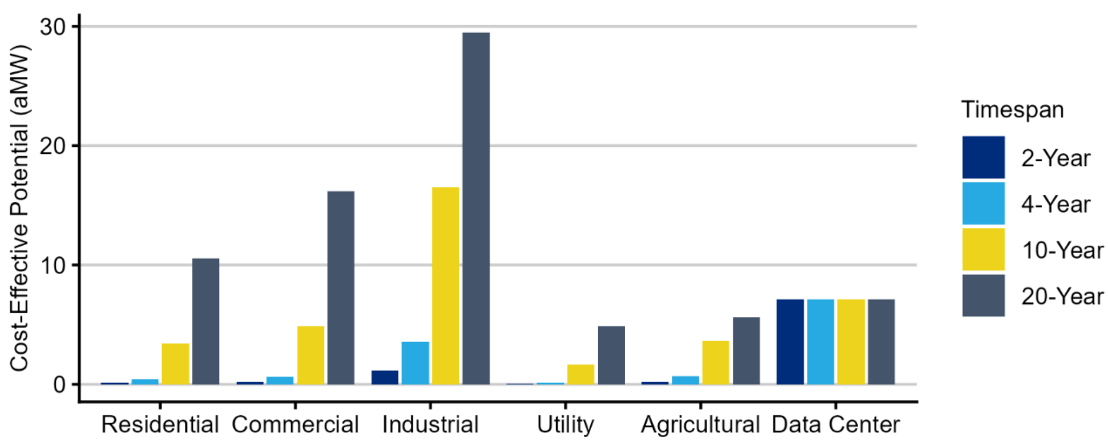


Table 1: Cost-Effective Potential by Sector (aMW)

Sector	2-Year	4-Year	10-Year	20-Year
Residential	0.12	0.44	3.40	10.57
Commercial	0.18	0.62	4.87	16.20
Industrial	1.15	3.59	16.52	29.47
Utility	0.04	0.15	1.65	4.86
Agricultural	0.21	0.70	3.62	5.62
Data Center	7.12	7.12	7.12	7.12
Total	**8.83**	**12.62**	**37.18**	**73.84**

Note: In this and all subsequent tables, totals may not match due to rounding.

Aside from the known data center savings, the cost-effective potential is greatest in the industrial sector in the near term. This is consistent with Grant PUD's historical sales, which are largely comprised of sales to industrial and data center sites. Long-term commercial and residential cost-effective potential total to 26.8 aMW, but in the short term their potential is limited based on recent program activity. Agricultural cost-effective potential in the near term reflects recent irrigation program savings, however in the long term the cost-effective potential acquisition rate declines as the market becomes saturated. Utility savings for conservation voltage reduction are limited but provide a pathway to savings through adjusted grid operations rather than customer-installed efficiency measures.

This assessment does not specify how the energy efficiency potential will be achieved. Possible mechanisms include Grant PUD's own energy efficiency programs, market transformation driven by the NEEA, state building codes, and state or federal product standards. Often, the savings associated with a measure will be achieved through several of these mechanisms over the course of its technological maturity. For example, heat pump water heaters started as one of NEEA's market transformation initiatives. They subsequently became a regular offering in utility programs across the Northwest and have recently become subject to federal product standards taking effect in 2029.

Energy efficiency measures contribute to reductions in system peak demand. For all measures apart from data centers, hourly load and savings profiles developed by the Council were applied to estimate demand reductions coincident with Grant PUD's system peak. The peak demand reduction from savings at data centers was estimated using their average load factor.

The cost-effective energy savings potential identified in this assessment will result in 106 MW of summer peak demand savings over the 20-year planning period, as shown in Table 2. This represents approximately 8% of Grant PUD's projected 2045 peak demand. Energy efficiency savings tend to occur when demand for energy is the greatest, resulting in significant contributions to reductions in peak demand.

Table 2: Peak Demand Savings from Cost-Effective Energy Efficiency Potential by Sector (MW)

Sector	2-Year	4-Year	10-Year	20-Year
Residential	0.18	0.65	5.43	19.91
Commercial	0.23	0.81	6.61	23.38
Industrial	1.41	4.41	20.53	37.31
Utility	0.04	0.15	1.56	4.60
Agricultural	0.51	1.68	8.66	13.31
Data Center	7.76	7.76	7.76	7.76
Total	**10.13**	**15.46**	**50.55**	**106.28**

The estimate of annual cost-effective potential by sector is shown in Figure 3. The available potential in 2026 includes 7.12 aMW of savings for data center projects currently in progress. Separate from data center projects, the savings in 2026 total to 0.7 aMW and grow to a maximum value of 4.95 aMW in 2036. After that point, the available potential diminishes through the remaining years of the planning period.

Figure 3: Annual Incremental Cost-Effective Energy Efficiency Potential (aMW)

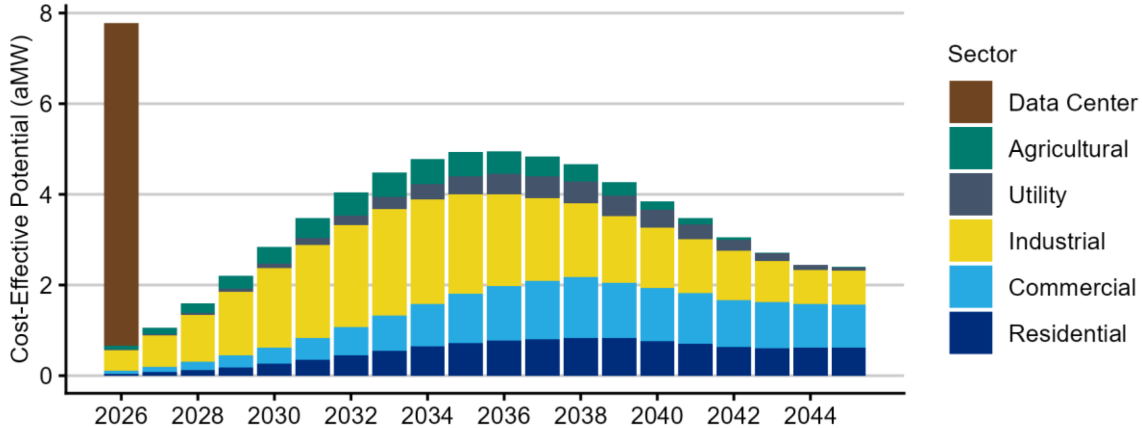
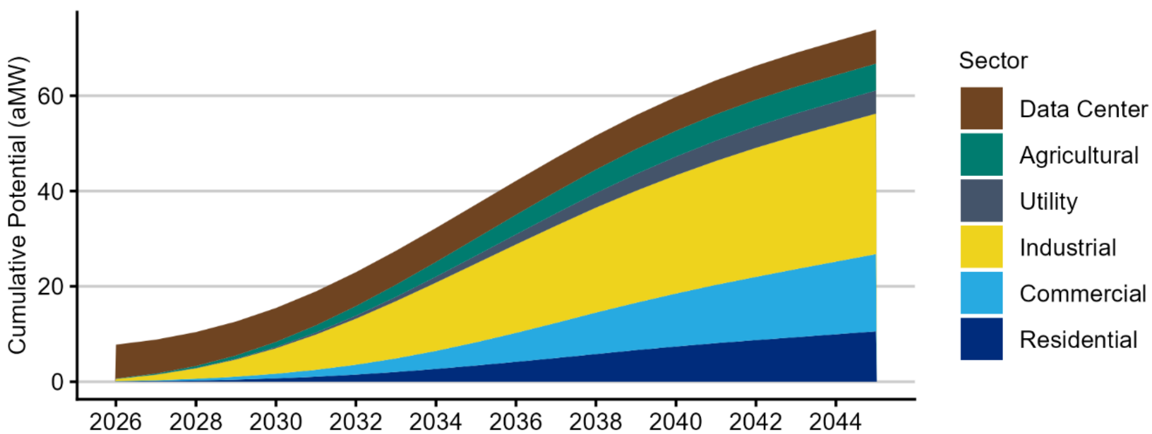


Figure 4 shows how the energy efficiency potential grows on a cumulative basis through the study period, totaling nearly 74 aMW over the 20-year planning period.

Figure 4: Annual Cumulative Cost-Effective Energy Efficiency Potential (aMW)



The year-by-year estimates of energy efficiency potential are based on ramp rates developed by the Council. Ramp rates identify the share of each measure's available potential that is projected to be acquired in each year based on its market and program maturity. For each measure, the project team applied a ramp rate that would align the near-term potential with Grant PUD's recent program achievements and the savings from NEEA's market transformation initiatives that were estimated to occur in Grant PUD's service territory. Program achievement data was provided by Grant PUD staff and the project team assigned appropriate ramp rates to each measure so that the future acquisition of energy efficiency was aligned with recent program history while ensuring the acquisition of all cost-effective energy efficiency potential over the 20-year planning period.

Conclusion

This report summarizes the CPA conducted for Grant PUD for the 2026 to 2045 timeframe. The cost-effective potential identified in this assessment can reduce Grant PUD's 2045 annual energy and peak demand by 7% and 8%, respectively.

Introduction

Objectives

This report describes the methodology and results of a CPA conducted for Grant PUD. The CPA estimated the cost-effective potential energy savings for the period of 2026 to 2045. This report describes the results of the full 20-year period, with additional detail on the 2- and 10-year periods that are the focus of Washington's EIA as well as the 4-year period covering 2026-2029 that aligns with Grant PUD's 2025 CEIP.

This assessment was conducted in a manner consistent with the requirements of Washington's RCW 19.285, and WAC 194-37. As such, this report is part of the documentation of Grant PUD's compliance with these requirements. The state of Washington's CETA includes an additional requirement for CPAs to use specific values for the social cost of carbon. The required values were incorporated into this analysis.

The results of this assessment can be used to assist Grant PUD in planning its energy efficiency programs by identifying the amount of cost-effective energy savings available in various sectors, end uses, and measures.

Background

Washington State's EIA defines "qualifying utilities" as those with 25,000 customers or more and requires them to achieve all conservation that is cost-effective, reliable, and feasible. Since Grant PUD serves approximately 56,000 customers, it is required to comply with the WA EIA. The requirements of the WA EIA specify that all qualifying utilities complete the following by January 1st of every even numbered year:[1]

- Identify the achievable cost-effective conservation potential for the upcoming 10 years using methodologies consistent with the Council's latest power plan.
- Establish a biennial acquisition target for cost-effective conservation that is no lower than the utility's pro rata share for that two-year period of its cost-effective conservation potential for the subsequent 10 years.[2]

Appendix III provides further details on this assessment's compliance with each of the requirements in Washington's EIA.

Study Uncertainties

There are uncertainties inherent in any long-term planning effort. While this assessment makes use of the latest forecasts of customers and loads, it is still subject to remaining uncertainties and limitations. These uncertainties include, but are not limited to:

- Customer Characteristic Data: This assessment used the best available data to reflect Grant PUD's customers. In some cases, however, the assessment relied upon data beyond Grant

[1] Washington RCW 19.285.040

[2] In CA No. 2011-03, the State Auditor's Office defined "pro rata" as "a proportion of an exactly calculable factor" and expects utilities to have analysis and documentation to support their identified targets, which could be more or less than 20% of the 10-year potential.

PUD's service territory due to limitations of adequate sample sizes. There are uncertainties, therefore, related to the extent that this data is reflective of Grant PUD's customer base.

- Measure Data: Measure savings and cost estimates are based on values prepared by the Council and Regional Technical Forum (RTF). These estimates will vary across the region due to local climate variations and market conditions. Additionally, some measure inputs such as applicability are based on limited data or professional judgement.
- Market Price Forecasts: This assessment uses an updated market price forecast developed in August of 2025. While this is an up-to-date forecast, market prices and forecasts are continually changing.
- Utility System Assumptions: Measures in this CPA receive cost credits based on their ability to free up transmission and distribution system capacity. The actual value of these credits is dependent on local conditions, which vary across Grant PUD's service territory.
- Load and Customer Growth Forecasts: This CPA uses projections of future customer counts and load growth over a 20-year period. Any forecast over a similar time period will include a significant level of uncertainty.
- Policy Changes: The CPA reflects policies currently in effect at the time of its development. Future changes to the policy environment are difficult to predict and could lead to significant changes to loads, cost effectiveness of measures, or other study outcomes.

Due to these uncertainties and the continually changing planning environment, the WA EIA requires qualifying utilities to update their CPAs every two years to reflect the best available data and latest market conditions.

Report Organization

The remainder of this report is organized into the following sections:

- Methodology
- Customer Characteristics
- Recent Conservation Achievement
- Results
- Sensitivity Results
- Summary
- References & Appendices

Methodology

This section provides an overview of the methodology used to develop the estimate of cost-effective conservation potential for Grant PUD.

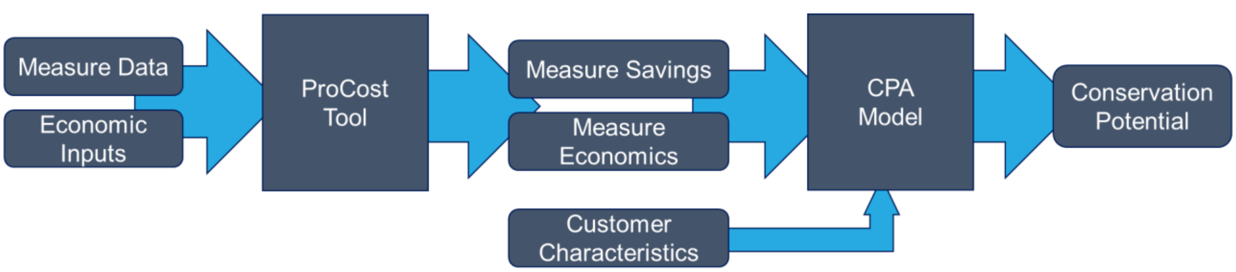
Washington's requirements for CPAs are spelled out in RCW 19.285.040 and WAC 194-37-070, Section 5 parts (a) through (d). Additional requirements are specified in the rules of Washington's CETA. The methodology used to produce this assessment is consistent with these requirements and follows much of the methodology used by the Council in developing its regional power plans, including the 2021 Power Plan.

Appendix III provides a detailed breakdown of the requirements of the WA EIA and how this assessment complies with those requirements.

High-level Methodology

The methodology used for this assessment is illustrated in Figure 5. At a high level, the process combines data on individual energy efficiency measures and economic assumptions using the Council's ProCost tool. This tool calculates a benefit-cost ratio using the Total Resource Cost (TRC) test, which is used to determine whether a measure is cost-effective. The TRC test considers all of the costs and benefits of energy efficiency measures, regardless of who receives the benefit or pays the cost. The measure savings and economics are then combined with customer data in Lighthouse's CPA model, which quantifies the number of remaining implementation opportunities. The CPA model aggregates the savings associated with each of these opportunities to determine the overall potential.

Figure 5: Conservation Potential Assessment Methodology



Economic Inputs

The project team worked closely with Grant PUD staff to define the economic inputs that were used in this CPA, including avoided energy costs, carbon costs, transmission and distribution capacity costs, and generation capacity costs. Each of these are discussed below. A full discussion of the avoided costs is included in Appendix IV.

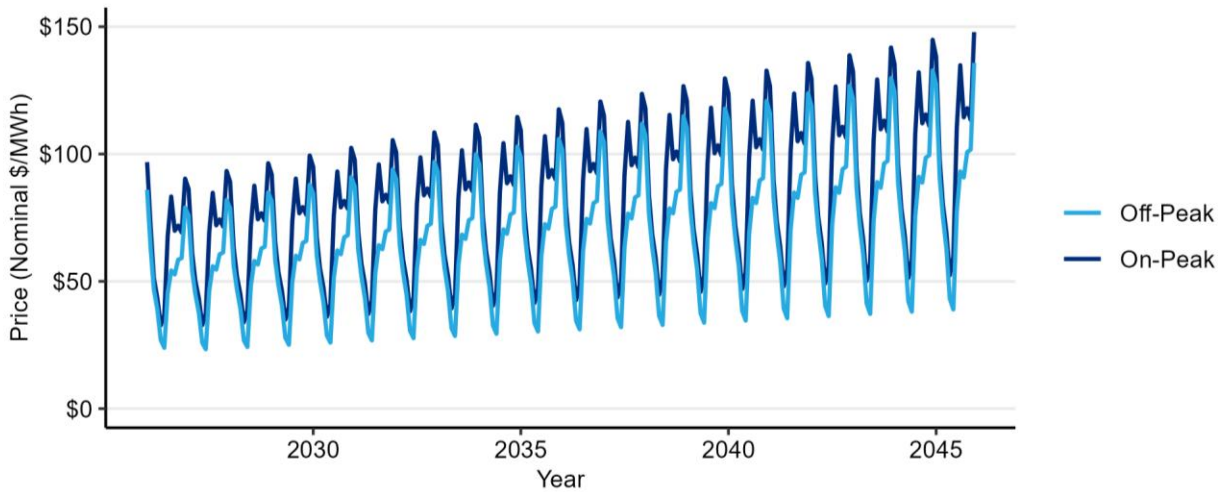
Avoided Energy Costs

Avoided energy costs represent the cost of energy purchases that are avoided through energy efficiency savings. The WA EIA requires utilities to "set avoided costs equal to a forecast of regional market prices."[3] For this CPA, Grant PUD provided a forecast of monthly on- and off-peak energy

[3] WAC 194-37-070

prices at the Mid-Columbia trading hub. Figure 6 shows the market price forecast that was used for the base case of this assessment. High and low sensitivity price forecasts were developed based on this forecast and are discussed in Appendix IV.

Figure 6: Avoided Energy Costs



Social Cost of Carbon

In addition to avoiding purchases of energy, energy efficiency measures can avoid emissions of greenhouse gases like carbon dioxide. The WA EIA requires that CPAs include a social cost of carbon, which the US EPA defines as "a measure of the long-term damage done by a ton of carbon dioxide emissions in a given year." It includes, among other things, changes in agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs, including increases in the costs of cooling and decreases in heating costs.[4] In addition to this requirement, Washington's CETA requires that utilities use the social cost of carbon values developed by the federal Interagency workgroup using a 2.5% discount rate.[5]

Renewable Portfolio Standard Compliance Costs

By reducing Grant PUD's overall load, energy efficiency reduces the cost of complying with Washington's requirements for renewable and carbon-neutral energy. In 2026, Grant PUD is required to source 15% of its sales from renewable energy. With a 15% requirement for renewable energy, Grant PUD can avoid the purchase of 15 Renewable Energy Credits (RECs) with every 100 MWh of energy savings. In 2030, CETA requires all sales to be greenhouse gas neutral, while allowing up to 20% of the requirement to be met through REC purchases through 2044. Based on this requirement, it is assumed that after 2030 every unit of energy savings results in an equivalent reduction in REC purchases. In 2045, CETA requires 100% clean energy, so the project team assumed that market prices plus REC costs would represent the cost of clean energy.

[4] See https://www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf

[5] WAC 194-40-100

Deferred Transmission and Distribution System Costs

Unlike supply-side resources, energy efficiency does not require capacity on transmission and distribution infrastructure. Instead, it frees up capacity by reducing the peak demands on these systems and can help defer future capacity expansions and the associated capital costs.

In the development of the 2021 Power Plan, the Council developed a standard methodology for calculating these values and surveyed Northwest utilities to update the values associated with these cost deferrals. This CPA uses the values developed by the Council through that process. The resulting values are $3.54 and $7.82 per kW-year (in 2016 dollars) for transmission and distribution capacity, respectively.[6] These values are applied to the demand savings coincident with the timing of the respective system peaks.

These values are applied to energy efficiency measures based on each measure's reduction in demand that is coincident with the timing of the transmission and distribution system peaks.

Program Administration Costs

In its past power plans, the Council has assumed that program administrative costs are equal to 20% of the cost of each measure. This CPA uses that assumption.

Risk Mitigation

Investing in energy efficiency can reduce the risks that utilities face by the fact that it is made in small increments over time, rather than the large, singular sums required for generation resources.

This CPA uses a sensitivity analysis to account for uncertainty, where present, in avoided cost values. The variation in inputs covers a range of possible outcomes and the amount of cost-effective energy efficiency potential is presented under each sensitivity. In selecting its biennial target based on this range of outcomes, Grant PUD is selecting its preferred risk strategy and the associated risk credit.

Northwest Power Act Credit

The WA EIA requires that a 10% cost credit be given to energy efficiency measures. This benefit is specified in the Northwest Electric Power Planning and Conservation Act and is included by the Council in their power planning work.

Other Financial Assumptions

In addition, this assessment makes use of an assumed discount rate to convert future costs and benefits to present values so that values occurring in different years can be compared. This assessment uses a real discount rate of 3.65%. Energy efficiency's benefits accrue over the lifetime of the measure, so a lower discount rate results in higher present values for benefits occurring in future years.

Assumptions about finance costs are applied to measures as well. The cost of each measure is assumed to be split across various entities, including Bonneville Power Administration (BPA), Grant PUD, and end use customers. For each of these entities, additional assumptions are made about

[6] These values reflect updates from the Council as the 2021 Power Plan was finalized.

whether the measure costs are financed, and if so, the cost of that financing. This assessment uses the finance cost assumptions that were used in the 2021 Power Plan.

Measure Characterization

Measure characterization is the process of defining each individual measure, including the savings at the meter as well as the cost, lifetime, non-energy impacts, and a load or savings shape that defines when the savings occur. The Council's 2021 Power Plan materials are the primary source for this information, although the project team incorporated updated information from the RTF for many measures. Appendix V contains the full list of energy efficiency measures considered the source(s) of information used for each.

Measure savings are typically defined via a "last in" approach. With this methodology, each measure's savings is determined as if it was the last measure installed. For example, savings from home weatherization measures are determined based on the assumption that the home's heating system has already been upgraded. Similarly, the heating system measures are quantified based on the assumption that the home has already been weatherized. This approach is conservative but prevents double counting savings over the long term as homes are likely to install both measures.

Measure savings also consider measure interaction. Interaction occurs when measures in one end use impact the energy use of other end uses. Examples of this include energy efficient lighting and other appliances. The efficiency of these appliances results in less wasted energy released as heat, which impacts the demands on heating and cooling systems.

These measure characteristics, along with the economic assumptions, are used as inputs to the Council's ProCost tool. This tool determines the savings at the generator, factoring in line losses, as well as the demand savings that occur coincident with Grant PUD's system peak. The outputs of ProCost are used to calculate each measure's levelized cost and benefit-cost ratio, the latter of which is used to determine whether the measure is cost-effective.

Customer Characteristics

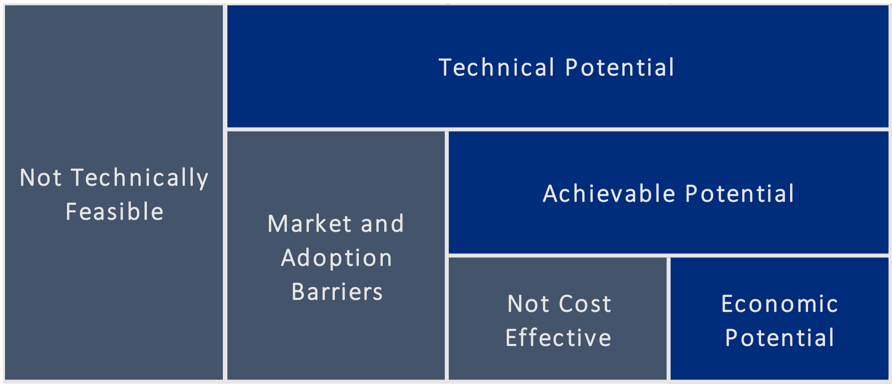
The assessment of customer characteristics is used to determine the number of remaining measure installation opportunities for each measure. This requires identifying the number of opportunities overall as well as the share that has already been completed. The characterization of Grant PUD's customer base was completed primarily using data provided by Grant PUD, NEEA's commercial and residential building stock assessments, and US Census data. Additional data sources and further details by sector are described subsequently in this report.

This CPA used baseline measure saturation data from the Council's 2021 Power Plan. This data was developed from NEEA's stock assessments, market research, and other studies. This data was supplemented with Grant PUD's conservation achievements, where applicable. This achievement is discussed in the Recent Conservation Achievement section of this report.

Energy Efficiency Potential

The energy efficiency measure data and customer characteristics are combined in Lighthouse's CPA model. The model estimates the economic (or cost-effective) energy efficiency savings potential as a subset of the technical and achievable potential based on the process shown in Figure 7. Each type of potential is discussed in further detail below.

Figure 7: Types of Energy Efficiency Potential



First, technical potential is the theoretical maximum of energy efficiency available, regardless of cost or market constraints. It is determined by multiplying the measure savings by the number of remaining feasible installation opportunities.

The model then applies several filters that incorporate market and adoption barriers to estimate the achievable potential. These filters include assumptions about the maximum potential adoption and the pace of annual achievements. Energy efficiency planners generally assume that not all measure opportunities will be installed; some portion of the technically possible measure opportunities will remain unavailable due to unsurmountable barriers. In the Northwest, energy efficiency planners typically assume that 85% of all measure opportunities can be achieved. This assumption comes from a pilot study conducted in Hood River, Oregon, where home weatherization measures were offered at no cost. The pilot was able to reach over 90% of homes and complete 85% of identified measure opportunities.[7] In the 2021 Power Plan, the Council has taken a more nuanced approach to this assumption. Measures that are likely to be subject to future codes or product standards have higher maximum achievability assumptions. This CPA follows the Council's new approach.

In addition, ramp rates are used to identify the portion of the available potential that can be acquired each year. The selection of ramp rates incorporates the different levels of program and market maturity as well as the practical constraints of what utility programs can accomplish in a given year.

Finally, economic potential is determined by limiting the achievable potential to those measures that pass an economic screen. Per Washington's EIA, this assessment uses the TRC test to determine economic potential. The TRC test considers all measure costs and benefits, regardless of who pays the cost or receives the benefit. The costs and benefits include the full incremental capital cost of the measure, any operations and maintenance costs, program administrative costs, avoided energy and carbon costs, deferred capacity costs, and quantifiable non-energy impacts. Because the TRC test considers the full cost of energy efficiency measures, Grant PUD could pay up to the full cost of measures with its incentives without impacting the cost effectiveness. However, practical constraints such as annual program budgets and rate impacts may limit this.

[7] See https://eta-publications.lbl.gov/sites/default/files/lbnl-3960e-hrcp.pdf

Customer Characteristics

This section describes the characterization of Grant PUD's customers, which is an essential component of a CPA. It includes defining the makeup and characteristics of each sector, which determines the type and quantity of opportunities to implement energy efficiency measures. Additional information about the local climate and population of the service territory is used to characterize some measures. This information is summarized in Table 3.

Table 3: Service Territory Characteristics

Heating Zone	Cooling Zone	Total Homes (2024)	Total Population (2024)
1	3	37,356	104,717

The number of homes was based on data provided by Grant PUD. The number of homes was projected to grow at 1.8%, based on the long-term trend of customer counts reported to the US Energy Information Administration (US EIA). Additionally, a demolition rate, based on assumptions for Washington State from the Council's 2021 Power Plan, was also used. The demolition rate quantifies the number of existing homes that are converted to new homes through demolition or major renovations, where building codes for new homes apply.

The population is based on US census data for Grant County, Washington.

Residential

Within the residential sector, the key characteristics are the number and type of homes as well as the saturation of end use appliances such as space and water heating equipment. Table 4 and Table 5 summarize the characteristics that were used for this assessment for existing and new homes, respectively.

Table 4: Residential Existing Home Characteristics

	Single Family	Low Rise Multifamily	High Rise Multifamily	Manufactured
Share of Homes	73%	4%	7%	16%
HVAC Equipment				
Electric Forced Air Furnace	15%	0%	1%	51%
Air Source Heat Pump	34%	0%	13%	21%
Ductless Heat Pump	5%	4%	4%	15%
Electric Zonal/Baseboard	18%	84%	64%	9%
Central Air Conditioning	33%	2%	0%	18%
Room Air Conditioning	26%	31%	15%	21%
Other Appliances				
Electric Water Heater	65%	90%	100%	95%
Refrigerator	125%	99%	100%	104%
Freezer	50%	6%	4%	51%
Clothes Washer	96%	35%	40%	98%
Electric Clothes Dryer	80%	34%	40%	85%
Dishwasher	88%	68%	47%	85%
Electric Oven	90%	71%	77%	98%
Desktop	49%	21%	19%	31%
Laptop	70%	75%	70%	66%

Monitor	74%	50%	52%	34%

Table 5: Residential New Home Characteristics

	Single Family	Low Rise Multifamily	High Rise Multifamily	Manufactured
HVAC Equipment				
Electric Forced Air Furnace	0%	0%	1%	51%
Air Source Heat Pump	49%	0%	13%	21%
Ductless Heat Pump	23%	4%	4%	15%
Electric Zonal/Baseboard	0%	84%	64%	9%
Central Air Conditioning	33%	2%	0%	18%
Room Air Conditioning	26%	31%	15%	21%
Other Appliances				
Electric Water Heater	65%	90%	100%	95%
Refrigerator	125%	99%	100%	104%
Freezer	50%	6%	4%	51%
Clothes Washer	96%	35%	40%	98%
Electric Clothes Dryer	80%	34%	40%	85%
Dishwasher	88%	68%	47%	85%
Electric Oven	90%	71%	77%	98%
Desktop	49%	21%	19%	31%
Laptop	70%	75%	70%	66%
Monitor	74%	50%	52%	34%

In these tables, numbers greater than 100% imply an average of more than one appliance per home. For example, the single family refrigerator saturation of 125% means that single family homes average nearly 1.3 refrigerators per home.

For this assessment, the project team used information from the American Community Survey to determine the proportions of home types and their heating fuel along with NEEA's 2022 Residential Building Stock Assessment (RBSA) to determine the breakdown of electric HVAC equipment and other appliances.

Commercial

In the commercial sector, the building floor area is the primary variable used to determine the number of conservation opportunities, as many of the commercial measures are quantified based on the applicable amount of floor area. Grant PUD provided non-residential customer account data that the project team used to map to the building types used in the CPA. The provided data included customer sales and square footage data that the project team utilized in conjunction with energy use intensity data from the 2019 Commercial Building Stock Assessment to estimate total commercial floor area in Grant PUD's service area.

Table 6 summarizes the resulting floor area estimates for each of the 18 commercial building segments. The total commercial floor area was estimated to be approximately 60 million square feet.

Table 6: Commercial Floor Area by Segment

Building Type	2024 Floor Area (square feet)
Large Office	680,611
Medium Office	1,141,581
Small Office	1,537,322
Extra Large Retail	316,109
Large Retail	297,910
Medium Retail	1,806,116
Small Retail	2,565,456
School (K-12)	3,851,340
University	844,775
Warehouse	33,744,669
Supermarket	1,022,543
Mini Mart	421,160
Restaurant	618,579
Lodging	3,419,840
Hospital	451,965
Residential Care	588,273
Assembly	4,507,388
Other Commercial	2,264,002
Total	**60,079,638**

The project team assumed commercial load growth of 1.6% each year based on Grant PUD's load forecast.

Industrial

The methodology used to estimate potential in the industrial sector is different from the residential and commercial sectors. Instead of building a bottom-up estimate of the savings associated with individual measures, potential in the industrial sector is quantified using a top-down approach that uses the annual energy consumption within individual industrial segments, which is then further disaggregated into end uses. Savings for individual measures are calculated by applying an assumed savings percentage to the applicable end use consumption within each industrial segment.

Grant PUD provided the 2024 non-residential customer consumption by account. The project team used this data to determine the portion of 2024 sales that could be categorized in the segments listed in Table 7. In total, over 1,440,000 MWh of sales[8] were determined to be applicable to the industrial sector.

Unlike the residential and commercial sectors where a singular growth rate for the sector was used, the project team took a more nuanced approach to future sales. Sales were adjusted by segment to incorporate any changes in industrial customer load based on Grant PUD's non-residential customer sales forecast.

[8] This total does not include sales to data center and cryptocurrency facilities. These customers were considered separately in the "Data Center" sector.

Table 7: Industrial Sector Sales by Segment

Segment	2024 Sales (MWh)
Water Supply	30,390
Sewage Treatment	14,529
Frozen Food	202,210
Other Food	34,718
Wood – Lumber	-
Wood – Panel	-
Wood – Other	-
Pulp and Paper Mills (TMP)	-
Pulp and Paper Mills (Kraft)	15,699
Paper Conversion Plants	-
Refinery	643
Chemical Manufacturing	565,437
Silicon Growing/Manufacturing	148,934
Cement/Concrete Products	2,531
Primary Metal Manufacturing	25,269
Fabricated Metal Manufacturing	20,134
Semiconductor Manufacturing	-
Transportation Equipment	16,918
Misc. Manufacturing	232,586
Refrigerated Warehouse	9,460
Fruit Storage	106,507
Indoor Agriculture	14,406
Total	**1,440,373**

Utility Distribution System

The 2021 Power Plan used a new approach for quantifying the potential energy savings in measures that improve the efficiency of utility distribution systems. The Council's new approach estimated savings potential from the 2018 sales within each sector as reported to the US EIA and based costs on the estimated number of distribution substations and feeders for each utility. Table 8 summarizes the assumptions used for this sector.

Table 8: Utility Distribution System Efficiency Assumptions

Characteristic	Count
Distribution Substations	11
Residential/Commercial Substations	4
Urban Feeders	8
Rural Feeders	3
2018 Residential Sales (MWh)	765,978
2018 Commercial Sales (MWh)	961,590
2018 Industrial/Other Sales (MWh)	3,183,187

**Note that these are estimates from the Council and may not reflect Grant PUD's actual system*

Agricultural

The project team followed the methodology of the 2021 Power Plan to characterize the agricultural sector. This approach involves estimating Grant PUD's portion of the state's irrigated land and dairy production. The project team used the US Department of Agriculture's 2022 Census of Agriculture to estimate the values shown in Table 9.

Table 9: Agricultural Characteristics Assumptions

Characteristic	Count
2022 % of WA State Dairy Production	12%
2022 % of WA State Irrigated Land	29%
2022 % of WA State Irrigated Alfalfa	41%

Recent Conservation Achievement

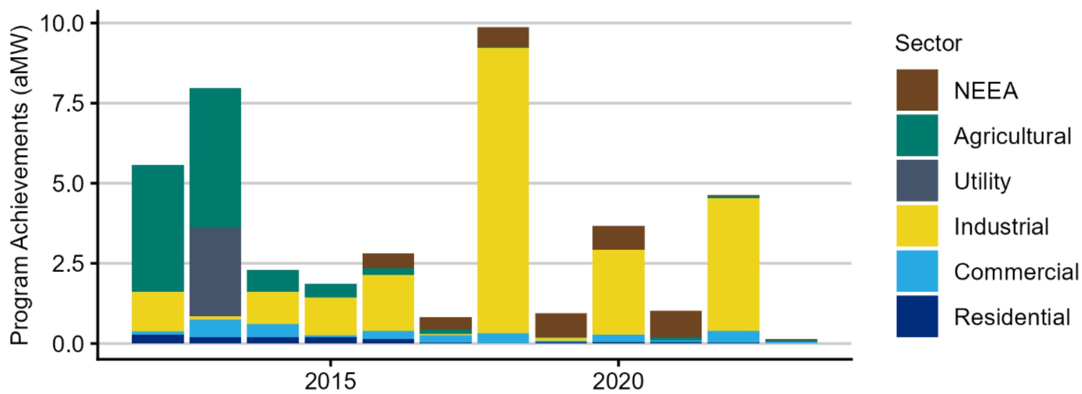
Grant PUD has a long history of energy efficiency achievement and, according to the RTF's Regional Conservation Progress Report, has achieved annual savings equal to 0.5% of its retail sales on average over the 2018-2024 timeframe.

Grant PUD currently offers programs for both residential and non-residential customers. In addition to these programs, Grant PUD receives credit for the market transformation initiatives of NEEA that accrue within its service territory.[9] NEEA's work has helped to bring energy efficient emerging technologies, like ductless heat pumps and heat pump water heaters, to the Northwest.

Overall

Figure 8 summarizes Grant PUD's 2012-2023 conservation achievement by sector as well as the savings attributed to NEEA, as reported under Washington's EIA.

Figure 8: Past Conservation Achievements by Sector (aMW)



Source: WA EIA Utility Reports

The average annual savings over this 12-year period is nearly 3.5 aMW per year with variability year-over-year based on projects and programs available each year. Savings from NEEA's market transformation initiatives are primarily in the residential sector. Savings from NEEA decreased in 2022 when the baselines that are used to quantify its market transformation efforts were reset to align with the 2021 Power Plan. After this point, the NEEA savings are barely perceptible in the figure.

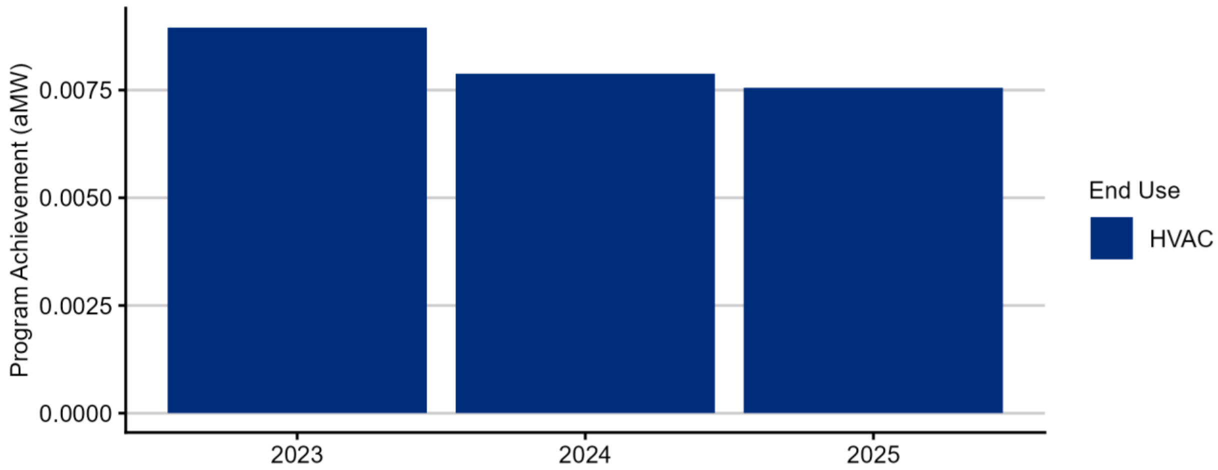
Grant PUD provided detailed program achievement data for 2023, 2024, and 2025 (through mid-August). The sections below summarize these recent achievements. Note that discrepancies may exist between the reported Washington EIA values and the following more detailed accomplishment data due to differences in reporting timelines, differences in sector definitions, and the exclusion of certain measures reported under the WA EIA that are not included in this CPA.

[9] While Grant PUD is not a direct funder of NEEA, a small portion of its service area is served by BPA, which funds NEEA on behalf of its customers. Grant PUD receives an allocation of NEEA savings through its BPA purchases.

Residential

The recent residential program achievements by end use are shown in Figure 9. The savings total approximately 0.03 aMW over the nearly 3-year period. All historical savings are attributed to ductless heat pumps (DHP), air source heat pumps (ASHP), and weatherization measures such as insulation and windows. These savings are all categorized under the HVAC end use throughout this report.

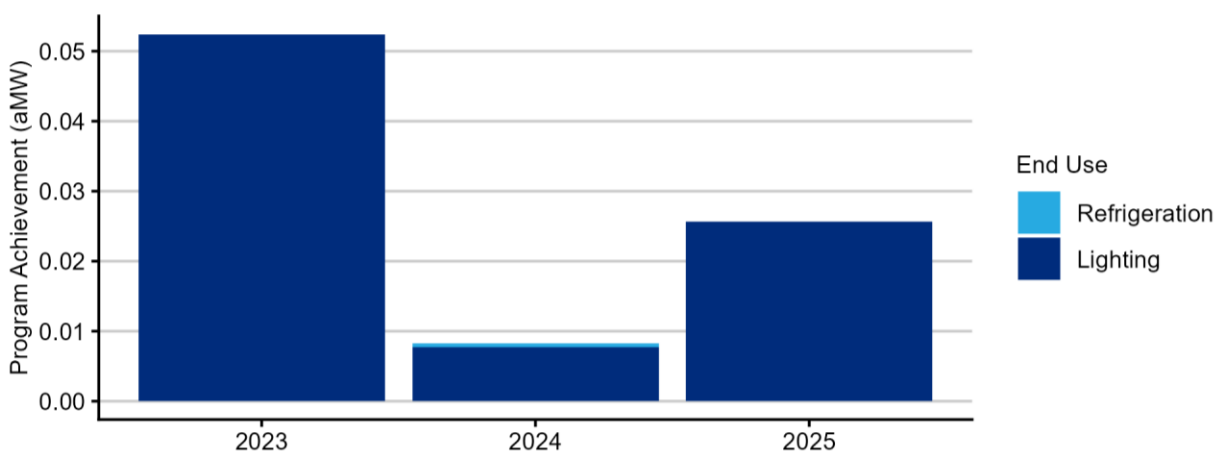
Figure 9: Recent Residential Program Achievements by End Use (aMW)



Commercial

Grant PUD's commercial savings are largely from the lighting end use, with smaller savings from the refrigeration end use as shown in Figure 10. In total, commercial savings are nearly 0.1 aMW between 2023 and September 2025.

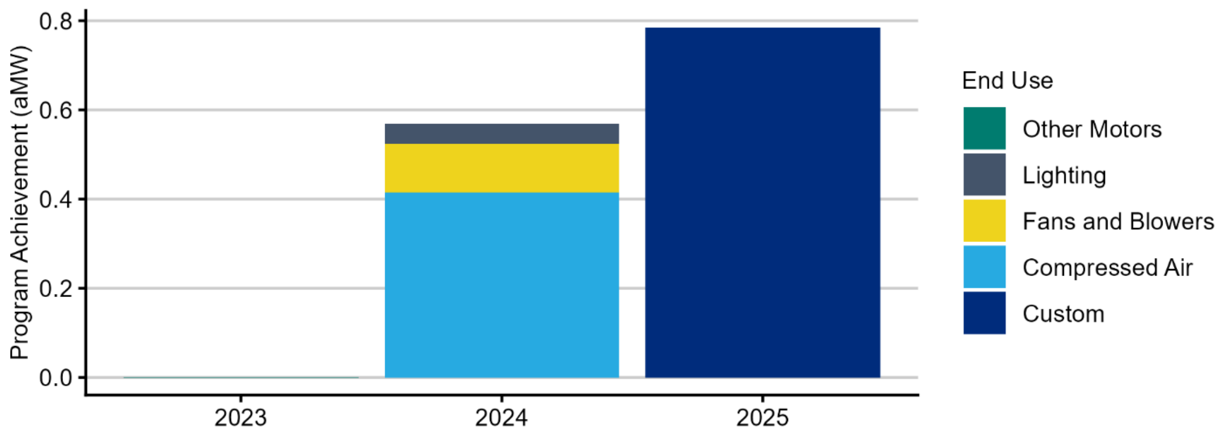
Figure 10: Recent Commercial Program Achievements by End Use (aMW)



Industrial

In the industrial sector, accomplishments commonly vary across years depending on the timeline of large customer projects. This is apparent in Figure 11 which shows minimal savings in 2023 but 1.46 aMW over the more recent two years.

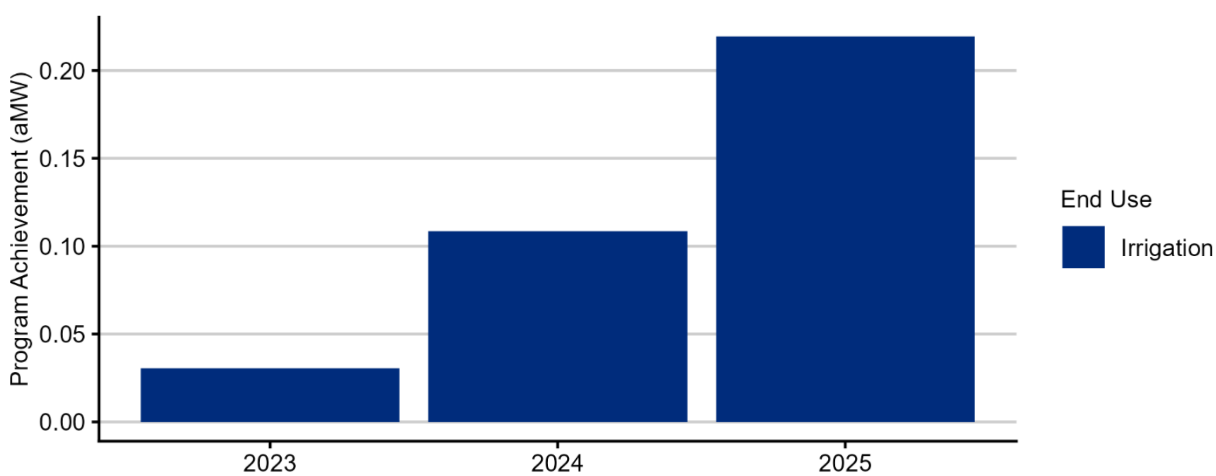
Figure 11: Recent Industrial Program Achievements by End Use (aMW)



Agricultural

Grant PUD's historical agricultural conservation savings are all attributed to the irrigation end use. From 2023 to September 2025, Grant PUD agricultural savings are 0.4 aMW. Figure 12 shows the accomplishments in each year.

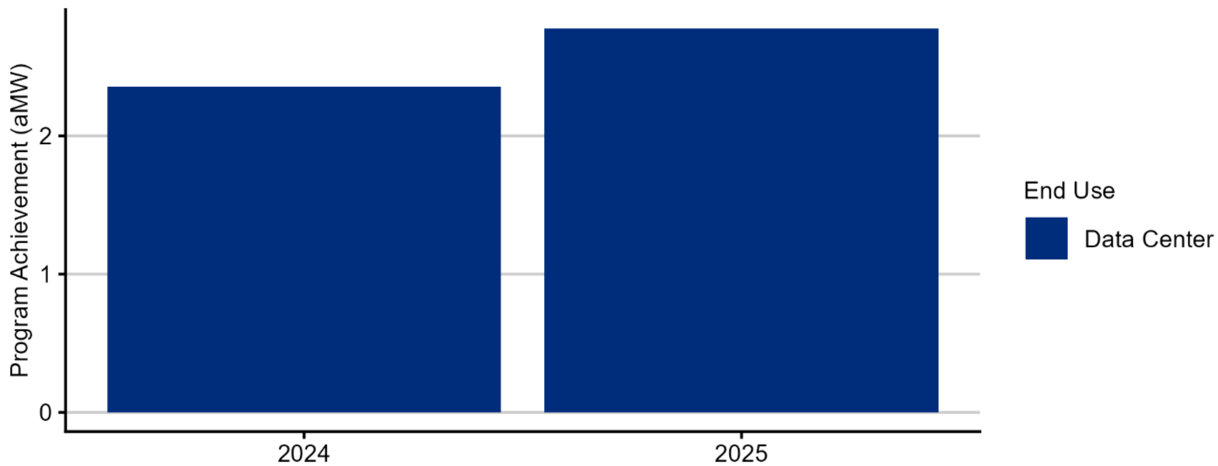
Figure 12: Recent Agricultural Program Achievements by End Use (aMW)



Data Center

Grant PUD engages with large data center and cryptocurrency customers to install efficient equipment. In 2024 and 2025, Grant PUD savings with these customers were 5.2 aMW in total. Figure 13 shows the accomplishments by year.

Figure 13: Recent Data Center Achievements (aMW)



Results

This section discusses the results of the 2025 CPA. It begins with a discussion of the high-level achievable conservation potential and then covers additional detail on the cost-effective potential within the individual sectors and end uses.

Achievable Conservation Potential

The achievable technical conservation potential is the amount of energy efficiency that can be saved without considering the cost-effectiveness of measures. It considers market barriers and the practical limits of acquiring energy savings through efficiency programs.

Figure 14 shows the supply curve of achievable potential over the 20-year study period. A supply curve depicts the cumulative potential against the levelized cost of energy savings, with the measures sorted in order of ascending cost. No economic screening is applied. Levelized costs are used to make the costs comparable between measures with different lifetimes as well as with supply-side resources. The costs include credits for deferred transmission and distribution system costs, avoided periodic replacements, and non-energy impacts to make them comparable with other resources. With these credits, some of the lowest cost measures have a net levelized cost that is negative, meaning the credits exceed the measure costs. This figure does not include the data center project savings, because the levelized cost of these projects was not evaluated.

Figure 14: 20-Year Supply Curve

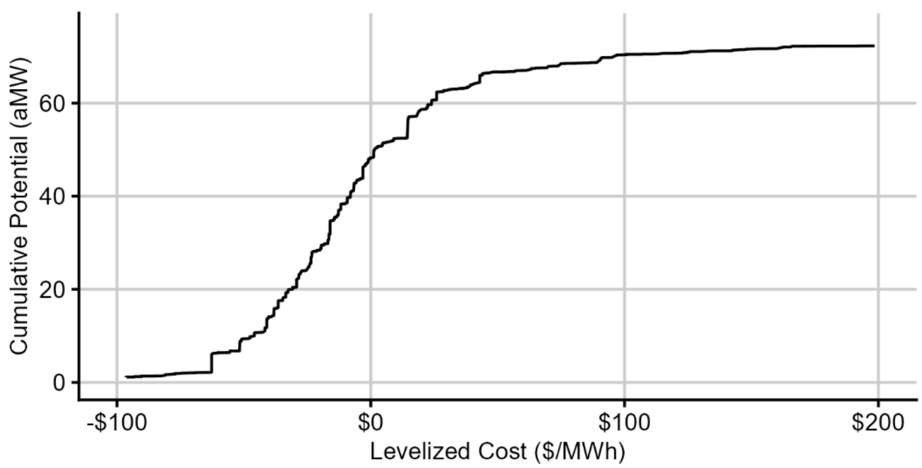


Figure 14 shows that approximately 48 aMW of potential are available at a cost at or below $0/MWh. Roughly 67 aMW of achievable potential are available for costs below $50/MWh. After approximately $60/MWh, the cost of additional potential comes at increasing costs. In total, there is more than 75 aMW of achievable technical potential available for non-data center customers in Grant PUD’s service territory over the 20-year study period, but only potential below $200/MWh is shown.

Supply curves based on levelized cost are limited in that not all energy savings are equally valued. For example, two measures could have the same levelized cost but provide different reductions in peak demand or deliver energy savings when energy costs are more or less valuable. An alternative to the supply curve based on levelized cost is one based on the benefit-cost ratio. This is shown below in Figure 15. Note that cost effectiveness of the data center projects was not considered in this study and therefore these savings are omitted here.

Figure 15: 20-Year Benefit-Cost Ratio Supply Curve

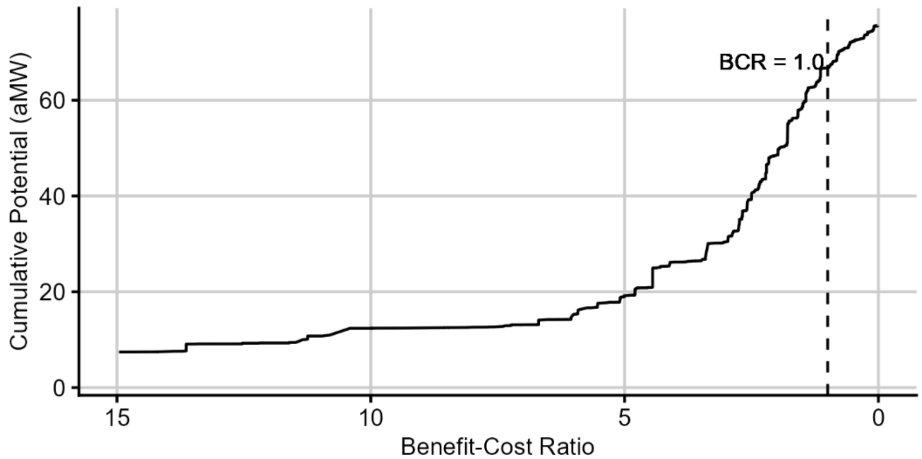


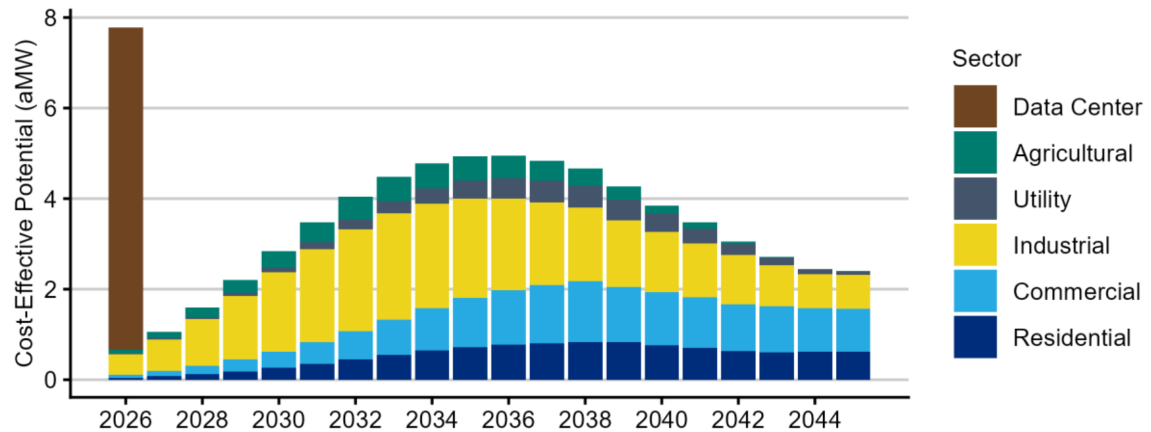
Figure 15 shows that 19.2 aMW of savings are available in 2045 with a benefit-cost ratio of 5 or more. These measures deliver benefits that are 5 times their cost over their lifetime. The figure includes a dashed line where the benefit-cost ratio is equal to one. There is approximately 66 aMW of cost-effective savings potential to the left of this line, reflecting the 20-year cost-effective potential (excluding data centers). The slope of the line to the left of the vertical dashed line where the benefit-cost ratio is equal to 1 is slightly steeper, and to the right the slope decreases. This suggests a slightly higher sensitivity to decreases in avoided cost, which would effectively move the dashed line to the left.

The economic or cost-effective potential is described below.

Cost-Effective Conservation Potential

Figure 16 shows the cost-effective potential by sector on an annual basis. Over the 20-year period, 50% of the 20-year potential is in Grant PUD's industrial and data center sectors. This is followed by the commercial sector (22%), the residential sector (14%), the agricultural sector (8%), and the utility sector (7%). The high near-term potential reflects the expected savings from data center projects in the near term.

Figure 16: Annual Cost-Effective Potential by Sector



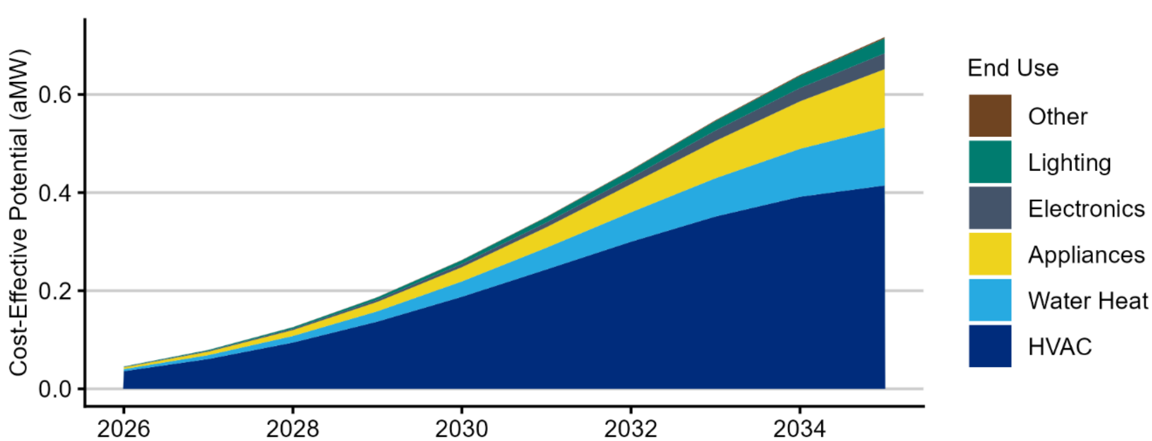
For all non-data center sectors, the project team used the ramp rates from the 2021 Power Plan to establish reasonable rates of acquisition for all measures. The project team assigned ramp rates to individual measures in order to align the near-term potential with recent and expected savings in each sector. Appendix VII has more detail on the alignment of ramp rates with program expectations.

The sections below describe the achievable potential within each sector.

Residential

Figure 17 shows the residential cost-effective potential by end use for the first 10 years of the study period. HVAC measures (including weatherization) make up 65% of the potential in the sector, followed by water heating (14%), appliances (14%), electronics (4%), and lighting (3%). In Figure 17, the other end use category primarily includes cooking measures.

Figure 17: Annual Residential Potential by End Use



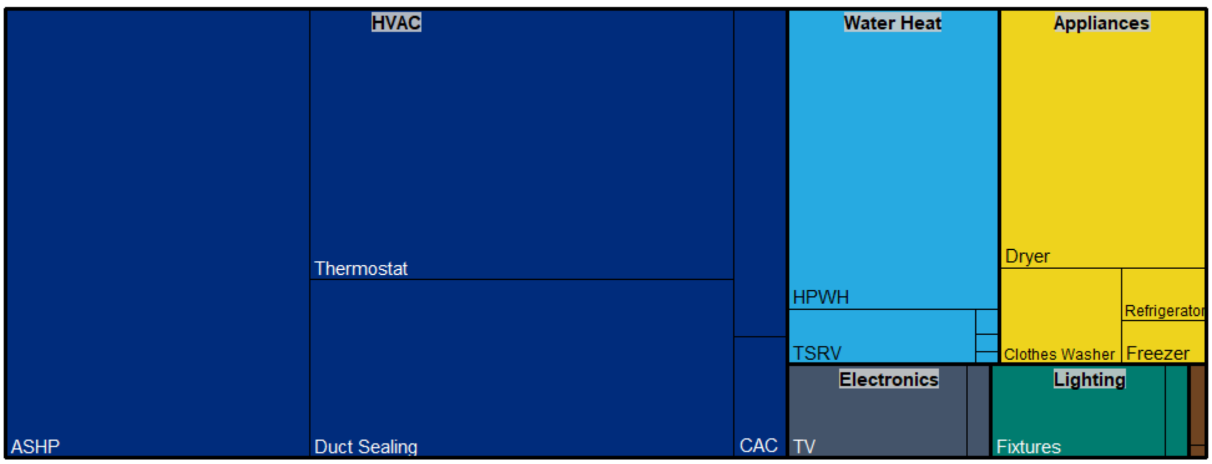
The potential grows through these years as the expected market share of efficient equipment increases along with increases in the rate of the acquisition of retrofit measures, like attic insulation, which can be achieved at any time.

Figure 18 shows how the 10-year potential breaks down into end uses and measure categories. The area of each block represents the share of the total 10-year residential potential. ASHP, smart thermostats, and duct sealing make up most of the potential in the HVAC end use, while heat pump water heaters (HPWH) are the key measure in the water heating end use. The appliance category includes clothes washers, dryers, refrigerators, and freezers.

The project team included incentives from IRA programs in the ASHP costs, improving the cost-effectiveness of this measure. Ductless heat pumps were not cost-effective after incorporating the latest RTF assumptions.

Beginning in 2029, heat pump water heaters are subject to a federal standard that will require the technology for many common tank sizes. As there are questions on possible loopholes that leave the future role of utility programs in question, the project team kept the savings potential for these measures after 2029 to show the savings that are possible and will be seen on Grant PUD's system, whether they are achieved through Grant PUD's programs or the federal standard. The state of this market can be re-evaluated in Grant PUD's 2027 CPA.

Figure 18: Residential Potential by End Use and Measure Category



Note that some residential measures, such as smart thermostats and heat pump water heaters can provide benefits as both energy efficiency and demand response resources. Demand response benefits were not included in this CPA. The decision to use them as demand response resources was treated as an incremental decision and included in Grant PUD's Demand Response Potential Assessment, although energy efficiency programs can help build a stock of flexible equipment that could be called upon in the future through demand response programs.

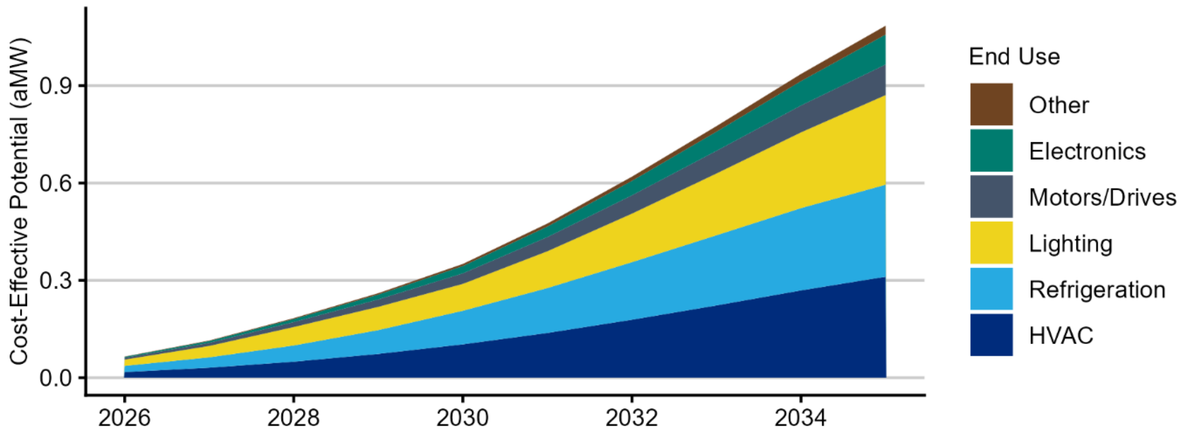
Commercial

In commercial sector, HVAC, refrigeration, and lighting[10] are the end uses with the highest potential. Combined, these three end uses comprise 82% of the 10-year potential. Other end uses with less significant contributions to the cost-effective potential include motors and drives (9%) and electronics (7%). The remaining commercial potential includes measures in the compressed air,

[10] The lighting end use includes measures applicable to both interior and exterior lighting.

food preparation, process loads, and water heating end uses. These are grouped together in Figure 19 in the "Other" end use.

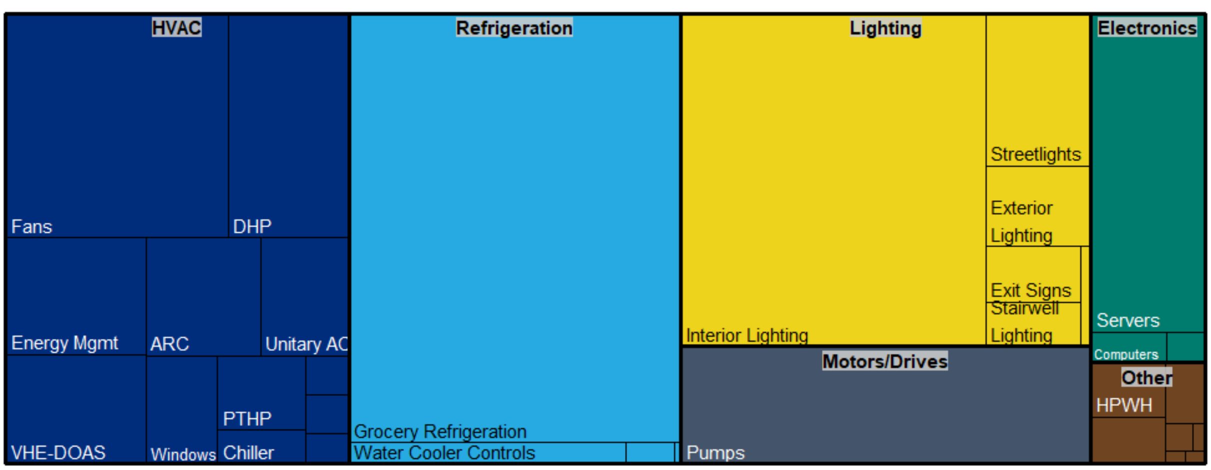
Figure 19: Annual Commercial Potential by End Use



The savings potential in the lighting end use is subject to a state law banning mercury in lighting beginning in 2029. In effect, this will raise the baseline for commercial lighting programs to LED products. The project team reduced the lighting savings beginning in 2029 to reflect this change. This can be seen in Figure 19 where the years after 2029 have lower annual lighting savings.

The end uses can be further described by their primary measure categories or equipment. The key end uses and measure categories within the commercial sector are shown in Figure 20. The area of each block is proportional to its share of the 10-year commercial potential. The commercial sector includes a variety of building types with different end uses. This is apparent in the range of measures included in Figure 20, especially the different types of HVAC equipment.

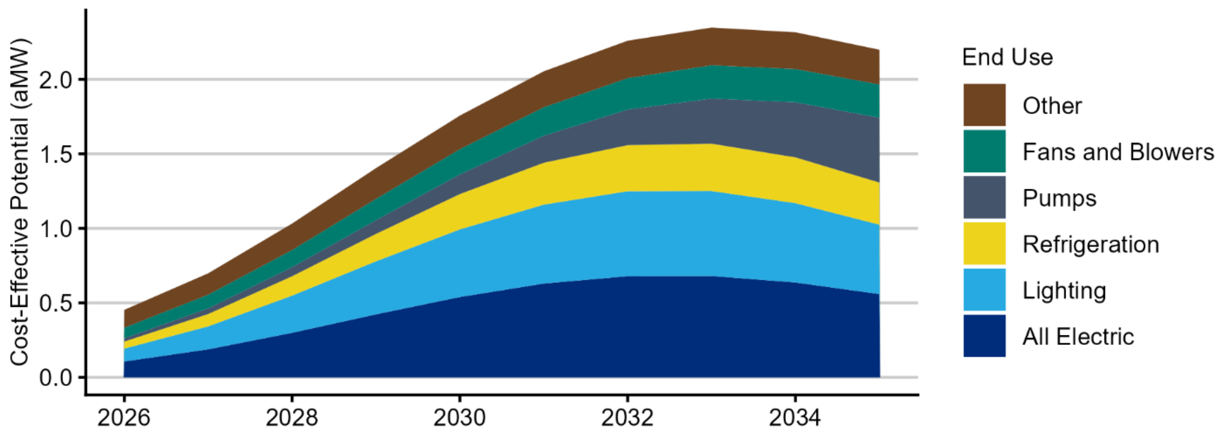
Figure 20: Commercial Potential by End Use and Measure Category



Industrial

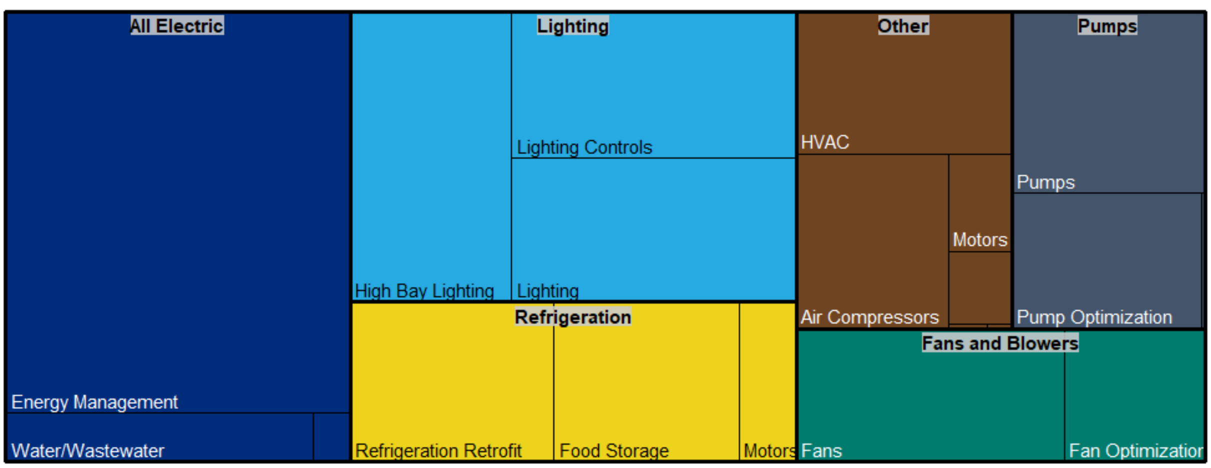
The annual industrial sector potential is shown in Figure 21. The "all electric" end use is the largest area of potential and comprises 29% of the 10-year cost-effective savings. This end use category includes strategic energy management and measures specifically applicable to wastewater and water treatment. The end use with the second greatest amount of cost-effective potential is lighting, which makes up 24% of the 10-year sector total. After these end uses, the remaining potential is spread across the refrigeration, pumps, and fans and blowers end uses. The other category in Figure 21 includes compressed air, HVAC and a variety of motor measures.

Figure 21: Annual Industrial Potential by End Use



The breakdown of 10-year industrial potential into end uses and measure categories is shown in Figure 22.

Figure 22: Industrial Potential by End Use and Measure Category

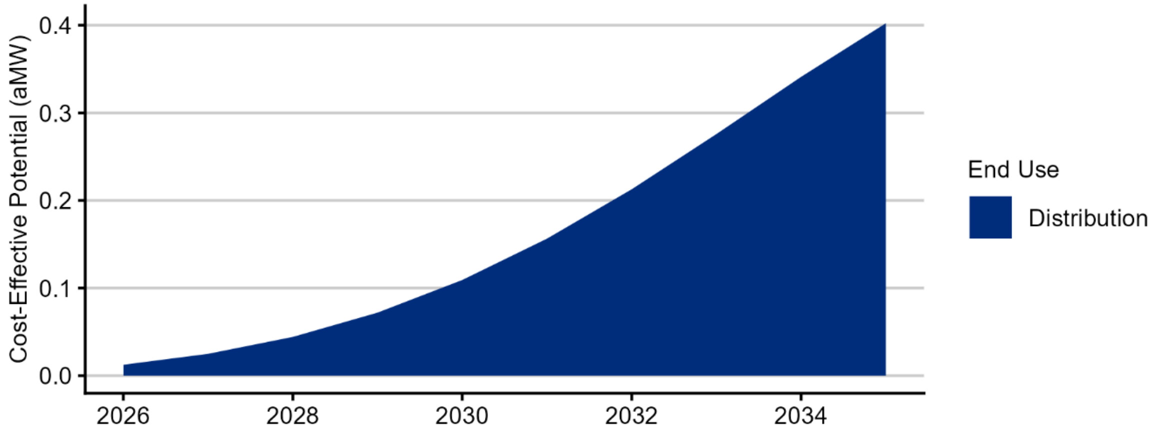


Utility Distribution System

The measures in the distribution efficiency sector involve the regulation of voltage to improve the efficiency of utility distribution systems. This analysis includes the measures characterized in the 2021 Power Plan, which includes several levels that use increasingly sophisticated control systems.

The annual distribution system potential is shown in Figure 23.

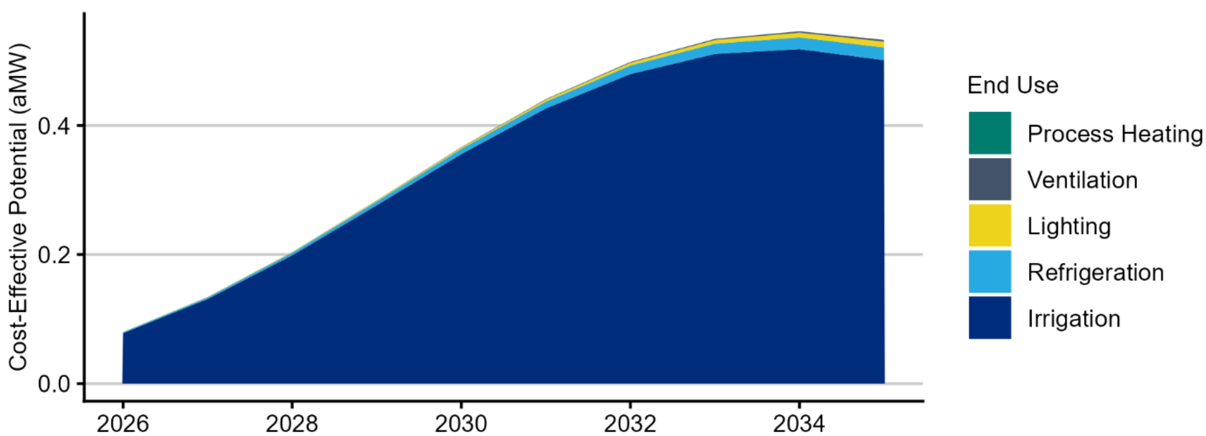
Figure 23: Annual Distribution System Potential



Agricultural

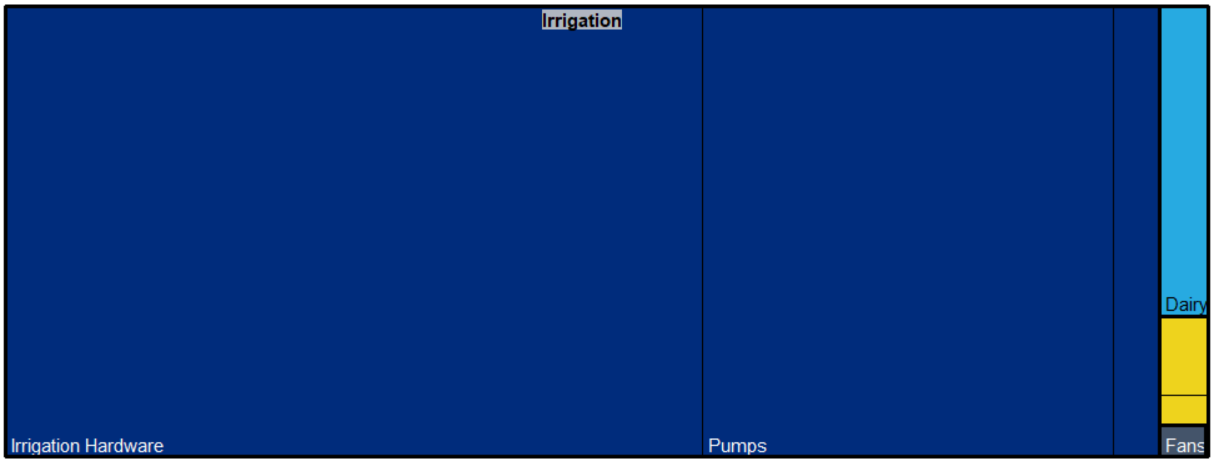
The potential in the agricultural sector is driven by the irrigated acreage, number of pumps, annual dairy production, and number of farms in the Grant PUD's service territory. As shown in Figure 24 nearly all the cost-effective potential is in the irrigation end use. Other end uses with more limited potential include refrigeration, lighting, ventilation, and process heating.

Figure 24: Annual Agricultural Potential by End Use



The breakdown of 10-year agricultural potential into end uses and measure categories is shown in Figure 25.

Figure 25: Agricultural Potential by End Use and Measure Category



Data Center

The project team did not model energy efficiency potential for data centers in the CPA because these facilities already implement continuous efficiency improvements as part of their standard operational and technological upgrade cycles, making it difficult for programs to capture these savings and for discrete potential to be appropriately characterized within the study framework. This is consistent with the approach of the Council in the 2021 Power Plan.

Instead, the team focused on incorporating known and ongoing projects scheduled for completion during the study period, ensuring that the CPA accurately reflects the energy savings and load impacts that are reasonably certain to occur. At this time, the savings anticipated for data center projects over the next biennium total to 7.12 aMW.

Sensitivity Results

This section discusses the results of two sensitivity analyses that were evaluated in addition to the base case results described in the preceding sections. These sensitivities examined low and high variations of the avoided costs values to provide a range of possible outcomes given the uncertainty inherent in estimating these costs over a 20-year period. This allows Grant PUD to understand how the cost-effective potential varies with changes in the avoided cost. All other inputs were held constant.

Table 10 summarizes the avoided cost assumptions used in each sensitivity, which are discussed further in Appendix IV.

Table 10: Avoided Cost Assumptions by Sensitivity

		Low Sensitivity	Base Case	High Sensitivity
Energy Values	**Avoided Energy Costs (20-Year Levelized Price, 2016$/MWh)**	Market Forecast minus 20%-80% ($20)	Market Forecast ($37)	Market Forecast plus 20%-80% ($55)
	Social Cost CO_2	Federal 2.5% Discount Rate Values	Federal 2.5% Discount Rate Values	Federal 2.5% Discount Rate Values
	RPS Compliance	WA EIA & CETA Requirements	WA EIA & CETA Requirements	WA EIA & CETA Requirements
Capacity Values	**Distribution Capacity (2016$)**	$7.82/kW-year	$7.82/kW-year	$7.82/kW-year
	Transmission Capacity (2016$)	$3.54/kW-year	$3.54/kW-year	$3.54/kW-year
	Generation Capacity (2016$)	$68/kW-year	$91/kW-year	$123/kW-year
	Implied Risk Adder (2016$)	-$17/MWh -$23/kW-year	N/A	$18/MWh $32/kW-year
	NW Power Act Credit	10%	10%	10%

Instead of using a single risk adder applied to each unit of energy, these two sensitivities consider potential futures with higher and lower values for the avoided cost inputs with larger degrees of uncertainty: the value of avoided energy and generation capacity.

Table 11 summarizes the variation in cost-effective potential across each avoided cost sensitivity. As foreshadowed by the benefit-cost ratio supply curve shown in Figure 15, decreases in avoided costs produce more slightly larger changes in cost-effective potential relative to the base case.

Table 11: Cost Effective Potential by Avoided Cost Sensitivity (aMW)

Sensitivity	2-Year	4-Year	10-Year	20-Year
Low Sensitivity	8.78	12.48	36.08	69.79
Base Case	8.83	12.62	37.18	73.84
High Sensitivity	8.88	12.80	38.44	76.73

Summary

This report summarized the results of the 2025 CPA conducted for Grant PUD. The assessment provided estimates of the cost-effective energy savings potential for the 20-year period beginning in 2026, with details on the first two and ten years per the requirements of Washington State's EIA. The assessment considered a wide range of measures that are reliable and available during the study period.

Compliance with State Requirements

The methodology used to estimate the cost-effective energy efficiency potential described in this report is consistent with the methodology used by the Council in determining the potential and cost-effectiveness of conservation resources in the 2021 Power Plan. Appendix III provides a list of Washington's EIA requirements and a description of how each was implemented. In addition to using a methodology consistent with the Council's 2021 Power Plan, the assessment used assumptions from the 2021 Power Plan where utility-specific inputs were not used. Utility-specific inputs covering customer characteristics, previous conservation achievements, and some economic inputs were used. The assessment included the measures considered in the 2021 Power Plan materials, updated with new information from the RTF made available since its publication.

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Appendix I: Acronyms

aMW	Average Megawatt
BPA	Bonneville Power Administration
CETA	Clean Energy Transformation Act
CPA	Conservation Potential Assessment
EUI	Energy Use Intensity
HPWH	Heat Pump Water Heater
HVAC	Heating, Ventilation, and Air Conditioning
kW	kilowatt
kWh	kilowatt-hour
LED	Light-Emitting Diode
MW	Megawatt
MWh	Megawatt-hour
NEEA	Northwest Energy Efficiency Alliance
O&M	Operations and Maintenance
RPS	Renewable Portfolio Standard
RTF	Regional Technical Forum
SEM	Strategic Energy Management
TRC	Total Resource Cost
US EIA	United State Energy Information Administration
WA EIA	Washington State Energy Independence Act

Appendix II: Glossary

Achievable Technical Potential	Conservation potential that includes considerations of market barriers and programmatic constraints but not cost effectiveness. This is a subset of technical potential.
Average Megawatt (aMW)	An average hourly usage of electricity, measured in megawatts, across the hours of a day, month, or year
Avoided Cost	The costs avoided through the acquisition of energy efficiency
Cost Effective	A measure is described as cost effective when the present value of its benefits exceeds the present value of its costs
Economic Potential	Conservation potential that passes a cost-effectiveness test. This is a subset of achievable potential. Per the EIA, a Total Resource Cost (TRC) test is used.
Levelized Cost	A measure of costs when they are spread over the life of the measure, similar to a car payment. Levelized costs enable the comparison of resources with different useful lifetimes.
Megawatt (MW)	A unity of demand equal to 1,000 kilowatts (kW)
Renewable Portfolio Standard	A requirement that a certain percentage of a utility's portfolio come from renewable resources. In 2020, Washington utilities with more than 25,000 customers are required to source 15% of their energy from renewable resources
Technical Potential	The set of possible conservation savings that includes all possible measures, regardless of market or cost barriers
Total Resource Cost (TRC) Test	A test for cost-effectiveness that considers all costs and benefits, regardless of who they accrue to. A measure passes this test if the present value of all benefits exceeds the present value of all costs. The TRC test is required by Washington's Energy Independence act and is the predominant cost effectiveness test used throughout the Northwest and US.

Appendix III: Compliance with State Requirements

This Appendix details the specific requirements for Conservation Potential Assessments listed in WAC 194-37-070. The table below lists the specific section and corresponding requirement along with a description of how the requirement is implemented in the model and where the implementation can be found.

Table 12: CPA Compliance

WAC 194-37-070 Section	Requirement	Implementation
(5)(a)	**Technical potential.** Determine the amount of conservation that is technically feasible, considering measures and the number of these measures that could physically be installed or implemented, without regard to achievability or cost.	The model calculates technical potential by multiplying the quantity of stock (number of homes, building floor area, industrial load) by the measure savings that could be installed per each unit of stock. The model further constrains the potential by the share of measures that have already been completed. See calculations in the "Units" tabs within each of the sector model files.
(5)(b)	**Achievable technical potential**. Determine the amount of the conservation technical potential that is available within the planning period, considering barriers to market penetration and the rate at which savings could be acquired.	The model applies maximum achievability factors based on the Council's 2021 Power Plan assumptions and ramp rates to identify how the potential can be acquired over the study period. See calculations in the "Units" tabs within each of the sector model files. The complete set of the ramp rates used is on the "Ramp Rates" tab.
(5)(c)	**Economic achievable potential**. Establish the economic achievable potential, which is the conservation potential that is cost-effective, reliable, and feasible, by comparing the total resource cost of conservation measures to the cost of other resources available to meet expected demand for electricity and capacity.	The project team used the benefit-cost ratio approach described in (5)(c)(ii), using the Council's ProCost model to calculate TRC benefit-cost ratios for each measure after updating ProCost with utility-specific inputs. The ProCost results are collected through an Excel macro in the "ProCost Measure Results-[sensitivity name].xlsx" files and brought into the CPA models through Excel's Power Query. See Appendix IV for further discussion of the avoided cost assumptions.
(5)(d)	**Total resource cost**. In determining economic achievable potential as provided in (c) of this subsection, perform a life-cycle cost analysis of measures or	A life-cycle cost analysis was performed using the Council's ProCost tool, which the project team configured with utility-specific inputs. Costs and benefits were included consistent with the TRC test.

WAC 194-37-070 Section	Requirement	Implementation
	programs to determine the net levelized cost, as described in this subsection:	The measure files within each sector contain the ProCost results. These results are then rolled up into the ProCost Measure Results file, which is linked to each sector model file.
(5)(d)(i)	Conduct a total resource cost analysis that assesses all costs and all benefits of conservation measures regardless of who pays the costs or receives the benefits;	The costs considered in the levelized cost include measure capital costs, O&M costs, periodic replacement costs, and any non-energy costs. Benefits included avoided energy, T&D capacity costs, avoided generation capacity costs, non-energy benefits, O&M savings, periodic replacement costs. Measure costs and benefits can be found in the individual measure files as well as the "ProCost Measure Results" file.
(5)(d)(ii)	Include the incremental savings and incremental costs of measures and replacement measures where resources or measures have different measure lifetimes;	Assumed savings, cost, and measure lifetimes are based on 2021 Power Plan and subsequent RTF updates, where applicable. Measure costs and benefits can be found in the individual measure files as well as the "ProCost Measure Results" files.
(5)(d)(iii)	Calculate the value of the energy saved based on when it is saved. In performing this calculation, use time differentiated avoided costs to conduct the analysis that determines the financial value of energy saved through conservation	The project team used a 20-year forecast of monthly on- and off-peak market prices and the load shapes developed for the 2021 Power Plan as part of the economic analysis conducted in ProCost. "MC and Loadshape" files contain both the market price forecast and the library of load shapes. Individual measure files contain the load profile assignments.
(5)(d)(iv)	Include the increase or decrease in annual or periodic operations and maintenance costs due to conservation measures	Measure analyses include changes to O&M costs as well as periodic replacement costs, where applicable. Measure assumptions can be found in the individual measure files.
(5)(d)(v)	Include avoided energy costs equal to a forecast of regional market prices, which represents the cost of the next increment of available and reliable power supply	The project team incorporated a 20-year forecast of on- and off-peak market prices at the mid-Columbia trading hub based on

WAC 194-37-070 Section	Requirement	Implementation
	available to the utility for the life of the energy efficiency measures to which it is compared	available forward prices. Further discussion of this forecast can be found in Appendix IV. See the "MC and Loadshape" file for the market prices. These prices include the value of avoided REC purchases as applicable.
(5)(d)(vi)	Include deferred capacity expansion benefits for transmission and distribution systems	Deferred transmission and distribution system benefits are based on the values developed by the Council for the 2021 Power Plan. These values can be found on the "ProData" tab of the ProCost files, cells C50 and C54.
(5)(d)(vii)	Include deferred generation benefits consistent with the contribution to system peak capacity of the conservation measure	Deferred generation capacity expansion benefits are based on monthly demand costs, which represents the utility cost of capacity. The development of these values is discussed in Appendix IV. These values can be found on the "ProData" tab of the ProCost files, cells C60.
(5)(d)(viii)	Include the social cost of carbon emissions from avoided non-conservation resources	This assessment uses the social cost of carbon values determined by the federal Interagency Workgroup using a 2.5% discount rate, as required by the Clean Energy Transformation Act. The carbon costs can be found in the MC and Loadshape file.
(5)(d)(ix)	Include a risk mitigation credit to reflect the additional value of conservation, not otherwise accounted for in other inputs, in reducing risk associated with costs of avoided non-conservation resources	This analysis uses a sensitivity analysis to consider risk. Avoided cost values with uncertain future values were varied across three different sensitivity and the resulting variation and risk were analyzed. The Sensitivity Results section of this report discusses the inputs used and the implicit risk adders used in the analysis.
(5)(d)(x)	Include all non-energy impacts that a resource or measure may provide that can be quantified and monetized	All quantifiable non-energy benefits were included where appropriate, based on values from the Council's 2021 Power Plan materials and updates from the RTF. Measure assumptions can be found in the individual measure files.

WAC 194-37-070 Section	Requirement	Implementation
(5)(d)(xi)	Include an estimate of program administrative costs	This assessment uses the Council's assumption of administrative costs equal to 20% of measure capital costs. Program admin costs can be found in the "ProData" tab of the ProCost file, cell C29.
(5)(d)(xii)	Include the cost of financing measures using the capital costs of the entity that is expected to pay for the measure	This assessment utilizes the financing cost assumptions from the 2021 Power Plan materials, including the sector-specific cost shares and cost of capital assumptions. Financing assumptions can be found in the ProData tab of the ProCost batch runner files, cells C37:F46.
(5)(d)(xiii)	Discount future costs and benefits at a discount rate equal to the discount rate used by the utility in evaluating non-conservation resources	This assessment uses a real discount rate of 3.65% to determine the present value of all costs and benefits. This represents the utility's long-term cost of capital. The discount rate used in this analysis can be found in the ProCost file, on cell C27 of the ProData tab.
(5)(d)(xiv)	Include a ten percent bonus for the energy and capacity benefits of conservation measures as defined in 16 U.S.C. § 839a of the Pacific Northwest Electric Power Planning and Conservation Act	A 10% bonus is applied consistent with the NW Power Act. The 10% credit used in the measure analyses can be found in the ProCost files, on cell C29 of the ProData tab.

Appendix IV: Avoided Costs

The methodology used to conduct conservation potential assessments for electric utilities in the State of Washington is dictated by the requirements of the Energy Independence Act (EIA) and the Clean Energy Transformation Act (CETA). Specifically, WAC 194-37-070 requires utilities to determine the economic, or cost-effective, potential by "comparing the total resource cost of conservation measures to the total cost of other resources available to meet expected demand for electricity and capacity."[11] The CPA will determine the cost-effectiveness of conservation measures through a benefit-cost ratio approach, which uses the avoided costs of energy efficiency to represent the costs avoided by acquiring efficiency instead of other resources. The EIA specifies that these avoided costs applied to energy efficiency measures include the following components:

- Time-differentiated energy costs equal to a forecast of regional market prices
- Deferred capacity expansion costs for the transmission and distribution system
- Deferred generation capacity costs consistent with each measure's contribution to system peak capacity savings
- The social cost of carbon emissions from avoided non-conservation resources
- A risk mitigation credit to reflect the additional value of conservation not accounted for in other inputs
- A 10% bonus for energy and capacity benefits of conservation measures, as defined by the Pacific Northwest Electric Power Planning and Conservation Act

In addition to these requirements, Washington's CETA requires the use of specific values for the social cost of carbon.[12] The project team has also included the value of avoided renewable portfolio standard compliance costs as energy efficiency can reduce these costs.

The CETA requirements for demand response potential assessments are less specific but do clarify that utilities must assess potential for demand response that is "cost-effective, reliable, and feasible"[13], and targets should be consistent with the utility's resource plan for distributed resources (such as energy efficiency). Therefore, the project team relied on the same avoided cost inputs for the DRPA as the CPA when the values were applicable.

This memo discusses each of these inputs in detail in the following sections.

Avoided Energy Costs

Avoided energy costs are the energy costs avoided by Grant PUD through the acquisition of energy efficiency instead of supply-side resources. For every megawatt-hour of conservation achieved, Grant PUD can avoid the purchase of one megawatt-hour of energy or sell one additional megawatt-hour of excess energy.

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[11] WAC 194-37-070. Accessed January 20, 2021. https://app.leg.wa.gov/wac/default.aspx?cite=194-37-070
[12] WAC 194-40-100. Accessed March 7, 2023. https://app.leg.wa.gov/WAC/default.aspx?cite=194-40-100
[13] WAC 194-40-330. Accessed May 7, 2025. https://app.leg.wa.gov/wac/default.aspx?cite=194-40-330

For this CPA, Grant PUD provided a forecast of monthly on- and off-peak energy prices at the Mid-Columbia trading hub. The forecast was prepared in August 2025, and the prices cover the complete study period of the CPA and DRPA, extending to December of 2045.

To benchmark these prices, the project team compared them to monthly on- and off-peak price futures for the Mid-Columbia trading hub reported by the Intercontinental Exchange (ICE) at a similar time. Comparisons of the two sources are shown in Figure 26 and Figure 27. While there are some seasonal differences, the prices are relatively similar and follow a similar trajectory.

Figure 26: Benchmarking of On-Peak Prices

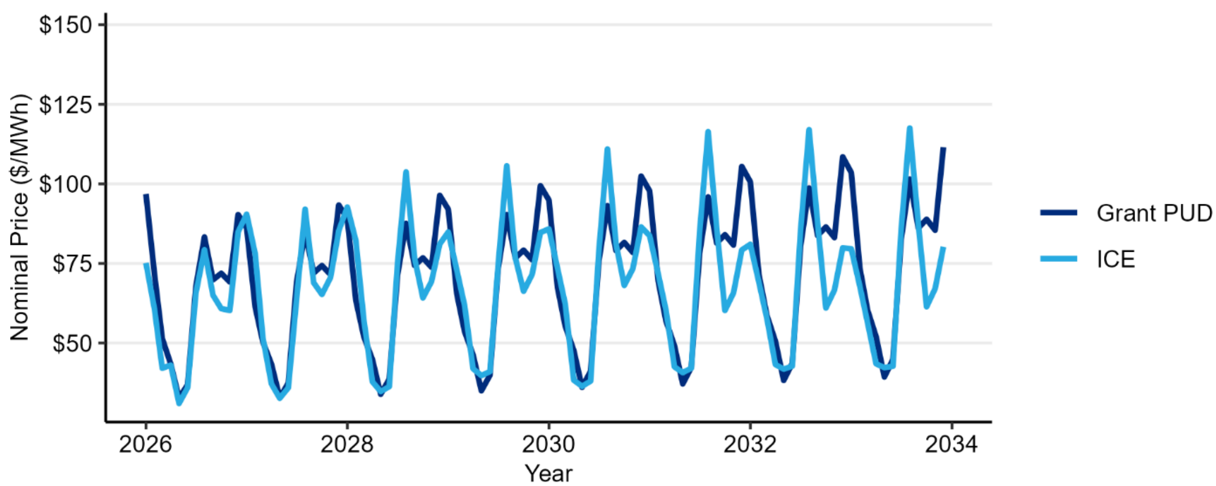


Figure 27: Benchmarking of Off-Peak Prices

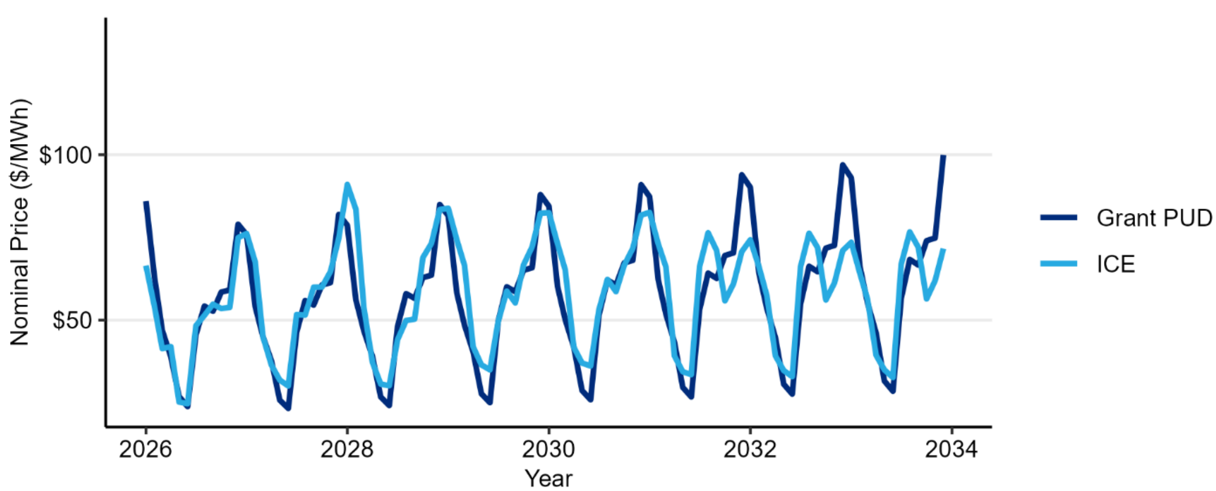
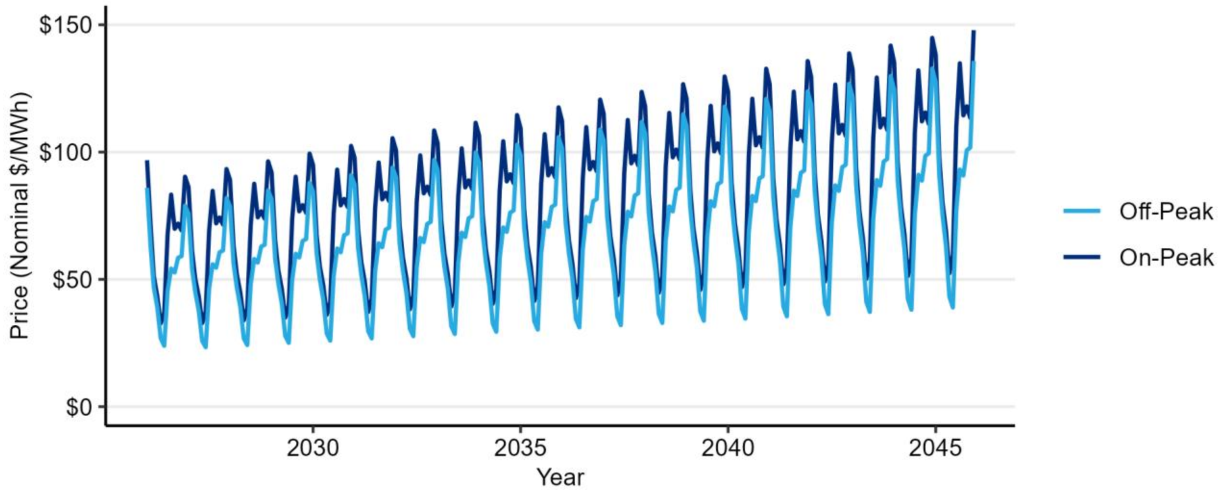


Figure 28 shows the complete on- and off-peak price forecast from Grant PUD.

Figure 28: On- and Off-Peak Price Forecast



These values will ultimately be converted to 2016 dollars for consistency with the measure cost assumptions used in the 2021 Power Plan, which are also expressed in 2016 dollars. The levelized value of the 20-year price forecast is $37/MWh (2016$).

The project team also created high and low variations of this forecast to be used in a sensitivity analysis, since the actual future values of these prices are uncertain. To develop the forecast, the project team assumed that the high and low prices would vary by approximately 20% in the near term and 80% in the long term, relative to the base case price forecast. This approach is based on the variation observed in price forecasts in the 2021 Power Plan. The project team applied this variation to the forecast described above to create high and low forecasts. The resulting forecasts for on- and off-peak prices are shown in

Figure 29 and

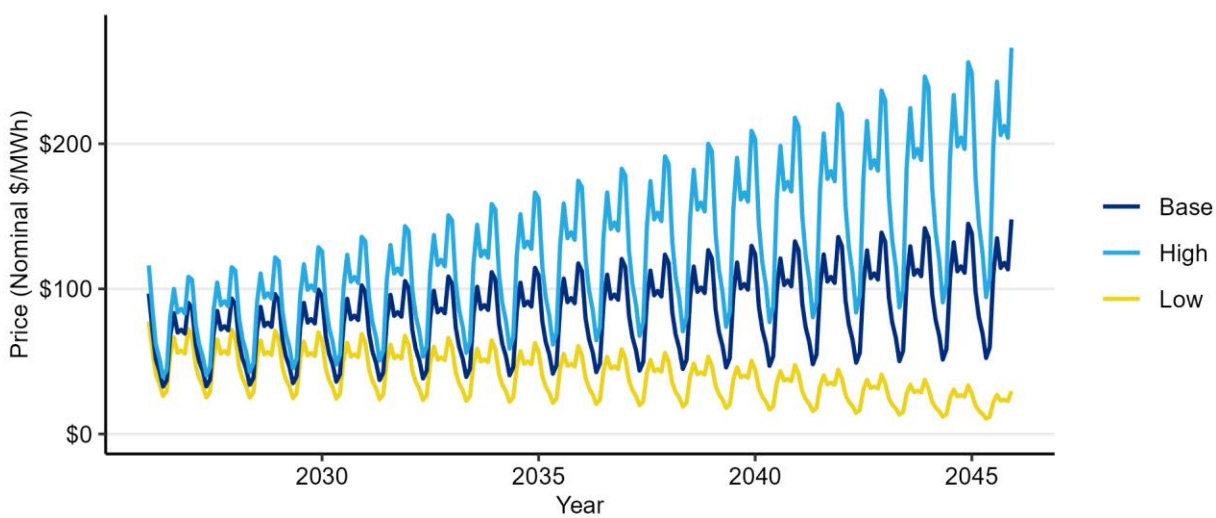


Figure 30 below.

Figure 29: Comparison of On-Peak Price Sensitivities

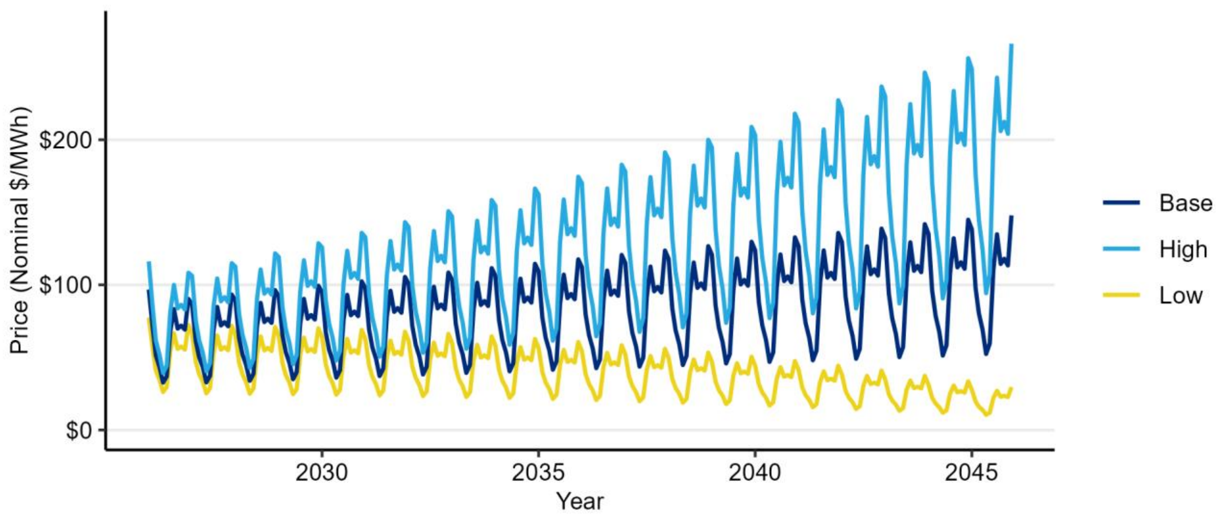
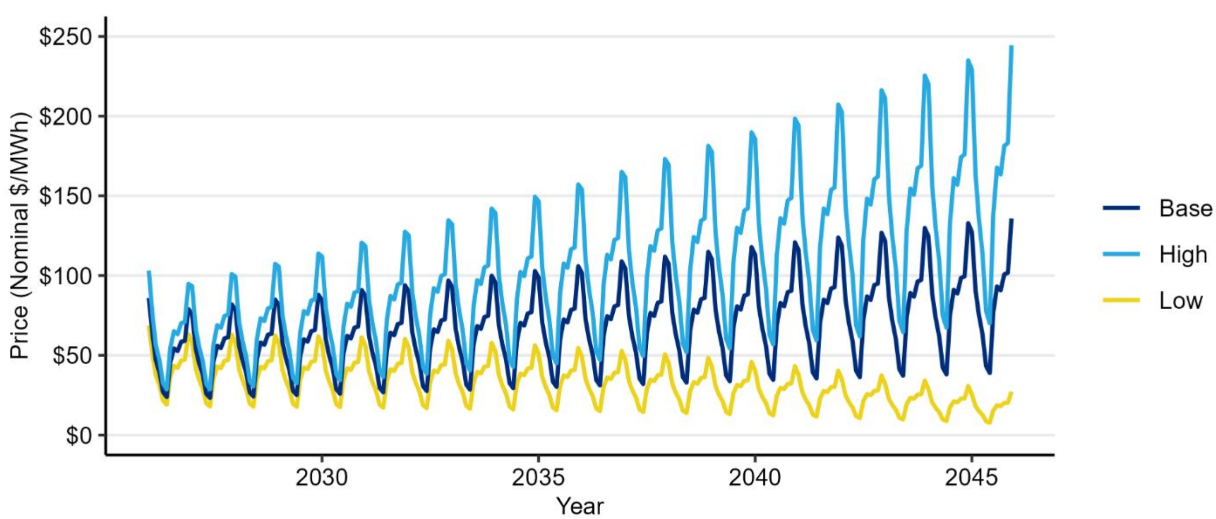


Figure 30: Comparison of Off-Peak Price Sensitivities



Deferred Transmission and Distribution Capacity Costs

Unlike supply-side resources, energy efficiency and demand response do not require transmission and distribution infrastructure. Instead, these resources free up capacity in these systems by reducing peak demands and, over time, can help defer or avoid future capacity expansions and the associated capital costs.

In the development of the 2021 Power Plan, the Council developed a standardized methodology and surveyed the region to calculate these values. This CPA and DRPA use the values developed by the Council through that process: $3.54 and $7.82 per kW-year (2016$) for transmission and distribution capacity, respectively. These values were used in Grant PUD's 2023 CPA.

These values are applied to energy efficiency and demand response measures based on each measure's reduction in demand that is coincident with the timing of the transmission and distribution system peaks.

Deferred Generation Capacity Costs

Similar to the transmission and distribution systems discussed above, acquiring energy efficiency and demand response resources can also defer or eliminate the costs of new generation resources needed to meet peak demands for electricity.

This CPA uses the generation capacity value from Grant PUD's 2023 CPA, which was $104/kW-year (2023$) or $91/kW-year (2016$). Per Grant PUD's 2023 CPA, these values were based on BPA's demand rates.

For the low case, the project team assumed a 25% decrease, resulting in a value of $68/kW-year (2016$). In the high case, the project team used Council's 2021 Power Plan value, which is $123/kW-year (2016$). This value reflects the levelized cost of capacity for a battery storage system and includes expected future cost decreases.

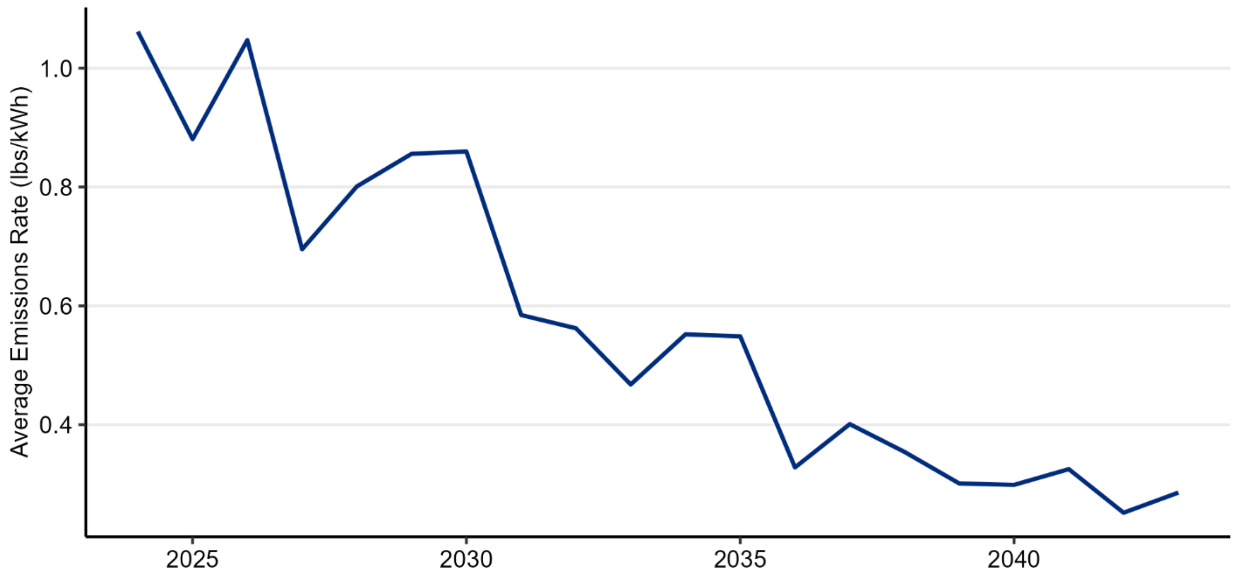
Social Cost of Carbon

In addition to avoiding purchases of energy and capacity, energy efficiency measures can avoid emissions of greenhouse gases like carbon dioxide. Washington's EIA requires that CPAs include the social cost of carbon, which the US EPA defines as a measure of the long-term damage done by a ton of carbon dioxide emissions in a given year. The EPA describes it as including, among other things, changes in agricultural productivity, human health, property damage from increased flood risk, and changes in energy system costs, including increases in the costs of cooling and decreases in heating costs.[14] In addition to this requirement, Washington's CETA requires that utilities use the social cost of carbon values developed by the federal Interagency workgroup using a 2.5% discount rate.

To implement the cost of carbon emissions, additional assumptions must be made about the intensity of carbon emissions per unit of energy. This assessment uses an updated forecast of marginal emissions rates developed by the Council in 2024.[15] The average annual values from this analysis are shown in Figure 31 below. The values start near 1, which is approximately the emissions rate from natural gas turbines and declines over time as the generation resource pool shifts to clean resources over time.

[14] https://www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf. Accessed January 21, 2021.
[15] https://nwcouncil.app.box.com/s/m2877jpsigx2m3mv0u401wtfle0t5z8y

Figure 31: Council Marginal Emissions Rate Forecast



Renewable Portfolio Standard Compliance Costs

The renewable portfolio standard established under Washington's EIA requires that Grant PUD source 15% of retail sales from renewable resources. The subsequently passed CETA furthers these requirements, mandating that 100% of sales be greenhouse gas neutral in 2030, with an allowance that up to 20% of the requirement can be achieved through other options, such as the purchase of Renewable Energy Credits (RECs).

Energy efficiency can reduce the cost of complying with these requirements by reducing Grant PUD's overall load. In 2026, a reduction in load of 100 MWh through energy efficiency would reduce the number of RECs required for compliance by 15. Therefore, one megawatt-hour of energy savings provides value equal to 15% of the cost of a REC. In 2030, it was assumed that marginal energy purchases would also include the purchase of a REC, thus the full price of a REC was added to the energy price after 2030. In 2045, the last year of the study period, CETA's requirements change, and unbundled RECs are no longer allowed for compliance. However, the combination of market prices and RECs represents a reasonable proxy for clean energy resources.

The project team developed a forecast of REC prices based on input from several Washington utility clients.

Risk Mitigation Credit

Any purchase of a resource involves risk. The decision to invest is based on uncertain forecasts of loads and market conditions. Investing in energy efficiency can reduce the risks that utilities face by the fact that it is made in small increments over time, rather than the large, singular sums required for generation resources. A decision not to invest in energy efficiency could result in exposure to higher market prices than forecast, an unneeded infrastructure investment, or one that cannot economically dispatch due to low market prices. While over-investments in energy efficiency are possible, the small and discrete amounts invested in energy efficiency limit the scale of any exposure to this risk.

In its power planning work, the Council develops a risk mitigation credit to account for this risk. This credit accounts for the value of energy efficiency not explicitly included in the other avoided cost values, ensuring that the level of cost-effective energy efficiency is consistent with the outcomes of the power planning process. The credit is determined by identifying the value that results in a level of cost-effective energy efficiency potential that is equivalent to the regional targets set by the Council.

In the 2021 Power Plan, the Council determined that no risk credit was necessary after including carbon costs and a generation capacity value in its avoided cost.

This CPA follows the process used in Grant PUD's previous CPAs and is similar to the process followed by the Council. A sensitivity analysis is used to account for uncertainty in the avoided cost values applied to energy efficiency measures, where present. The variation in energy and capacity values covers a range of possible outcomes and the sensitivity of the cost-effective energy efficiency potential is identified by comparing the outcomes of each sensitivity. In selecting its biennial target based on this range of outcomes, Grant PUD is selecting its preferred risk strategy and the associated risk credit.

Northwest Power Act Credit

Finally, this CPA includes a 10% cost credit for energy efficiency. This credit is specified in the Pacific Northwest Electric Power Planning and Conservation Act for regional power planning work completed by the Council and by Washington's EIA for CPAs completed for Washington utilities. This credit is applied as a 10% bonus to the energy and capacity benefits described above.

Summary

Table 13 summarizes the energy efficiency avoided cost assumptions used in each of the sensitivities in this CPA update.

Table 13: Energy Efficiency Avoided Cost Assumptions by Sensitivity

		Low Sensitivity	Base Case	High Sensitivity
Energy Values	**Avoided Energy Costs (20-Year Levelized Price, 2016$/MWh)**	Market Forecast minus 20%-80% ($20)	Market Forecast ($37)	Market Forecast plus 20%-80% ($55)
	Social Cost CO_2	Federal 2.5% Discount Rate Values	Federal 2.5% Discount Rate Values	Federal 2.5% Discount Rate Values
	RPS Compliance	WA EIA & CETA Requirements	WA EIA & CETA Requirements	WA EIA & CETA Requirements
Capacity Values	**Distribution Capacity (2016$)**	$7.82/kW-year	$7.82/kW-year	$7.82/kW-year
	Transmission Capacity (2016$)	$3.54/kW-year	$3.54/kW-year	$3.54/kW-year

Generation Capacity (2016$)	$68/kW-year	$91/kW-year	$123/kW-year
Implied Risk Adder (2016$)	-$17/MWh -$23/kW-year	N/A	$18/MWh $32/kW-year
NW Power Act Credit	10%	10%	10%

Appendix V: Measure List

This appendix provides a list of the measures that were included in this assessment and the data sources that were used for any measure characteristics. The assessment used all measures from the 2021 Power Plan that were applicable to Grant PUD. The project team customized these measures to make them specific to Grant PUD's service territory and updated many with new information available from the Regional Technical Forum. The RTF continually updates estimates of measure savings and cost. This assessment used the most up to date information available when the CPA was developed.

This list is high-level and does not reflect the thousands of variations for each individual measure. Instead, it summarizes measures by category. Many measures include variations specific to different home or building types, efficiency level, or other characterization. For example, attic insulation measures are differentiated by home type (e.g., single family, multifamily, manufactured home), heating system (e.g., heat pump or furnace), baseline insulation level (e.g., R0, R11, etc.) and maximum insulation possible (e.g., R22, R30, R38, R49). This differentiation allows for savings and cost estimates to be more precise.

The measure list is grouped by sector and end use. Note that all measures may not be applicable to an individual utility service territory based on the characteristics of individual utilities and their customer sectors.

Table 14: Residential End Uses and Measures

End Use	Measure Category	Data Source(s)
Appliances	Air Cleaner	2021 Power Plan, RTF
	Clothes Washer	2021 Power Plan, RTF
	Clothes Dryer	2021 Power Plan, RTF
	Freezer	2021 Power Plan, RTF
	Refrigerator	2021 Power Plan, RTF
Cooking	Electric Oven	2021 Power Plan
	Microwave	2021 Power Plan
Electronics	Advanced Power Strips	2021 Power Plan, RTF
	Desktop	2021 Power Plan
	Laptop	2021 Power Plan
	Monitor	2021 Power Plan
	TV	2021 Power Plan
EVSE	EVSE	2021 Power Plan
HVAC	Air Source Heat Pump	2021 Power Plan, RTF
	Central Air Conditioner	2021 Power Plan, RTF
	Cellular Shades	2021 Power Plan
	Circulator	2021 Power Plan
	Circulator Controls	2021 Power Plan
	Ductless Heat Pump	2021 Power Plan, RTF
	Duct Sealing	2021 Power Plan, RTF
	Ground Source Heat Pump	2021 Power Plan
	Heat Recovery Ventilator	2021 Power Plan
	Room Air Conditioner	2021 Power Plan
	Smart Thermostats	2021 Power Plan, RTF
	Weatherization	2021 Power Plan, RTF
	Whole House Fan	2021 Power Plan
Lighting	Fixtures	2021 Power Plan, RTF
	Lamps	2021 Power Plan, RTF
	Pin Lamps	2021 Power Plan, RTF
Motors	Well Pump	2021 Power Plan
Water Heat	Aerators	2021 Power Plan, RTF
	Circulator	2021 Power Plan
	Circulator Controls	2021 Power Plan
	Dishwasher	2021 Power Plan
	Gravity Film Heat Exchanger	2021 Power Plan
	Heat Pump Water Heater	2021 Power Plan, RTF
	Pipe Insulation	2021 Power Plan
	Showerhead	2021 Power Plan
	Thermostatic Restrictor Valve	2021 Power Plan, RTF
Whole Home	Behavior	2021 Power Plan

Table 15: Commercial End Uses and Measures

End Use	Measure Category	Data Source(s)
Compressed Air	Air Compressor	2021 Power Plan
Electronics	Computers	2021 Power Plan
	Power Supplies	2021 Power Plan
	Smart Power Strips	2021 Power Plan, RTF
	Servers	2021 Power Plan
Food Preparation	Combination Ovens	2021 Power Plan, RTF
	Convection Ovens	2021 Power Plan, RTF
	Fryers	2021 Power Plan, RTF
	Griddle	2021 Power Plan, RTF
	Hot Food Holding Cabinet	2021 Power Plan, RTF
	Overwrapper	2021 Power Plan, RTF
	Steamer	2021 Power Plan, RTF
HVAC	Advanced Rooftop Controller	2021 Power Plan, RTF
	Chiller	2021 Power Plan
	Circulation Pumps	2021 Power Plan, RTF
	Ductless Heat Pump	2021 Power Plan, RTF
	Energy Management	2021 Power Plan
	Fans	2021 Power Plan
	Heat Pumps	2021 Power Plan
	Package Terminal Heat Pumps	2021 Power Plan, RTF
	Pumps	2021 Power Plan, RTF
	Smart Thermostats	2021 Power Plan
	Unitary Air Conditioners	2021 Power Plan
	Very High Efficiency Dedicated Outside Air System	2021 Power Plan
	Variable Refrigerant Flow Dedicated Outside Air System	2021 Power Plan
	Windows	2021 Power Plan, RTF
Lighting	Exit Signs	2021 Power Plan
	Exterior Lighting	2021 Power Plan
	Garage Lighting	2021 Power Plan
	Interior Lighting	2021 Power Plan
	Stairwell Lighting	2021 Power Plan
	Streetlights	2021 Power Plan
Motors & Drives	Pumps	2021 Power Plan, RTF
Process Loads	Elevators	2021 Power Plan
	Engine Block Heater	2021 Power Plan, RTF
Refrigeration	Freezer	2021 Power Plan
	Grocery Refrigeration	2021 Power Plan, RTF
	Ice Maker	2021 Power Plan, RTF
	Refrigerator	2021 Power Plan, RTF
	Vending Machine	2021 Power Plan, RTF
	Water Cooler Controls	2021 Power Plan
Water Heating	Commercial Clothes Washer	2021 Power Plan, RTF
	Heat Pump Water Heater	2021 Power Plan, RTF
	Pre-Rinse Spray Valve	2021 Power Plan, RTF
	Pumps	2021 Power Plan, RTF
	Showerheads	2021 Power Plan

Table 16: Industrial End Uses and Measures

End Use	Measure Category	Data Source(s)
All Electric	Energy Management	2021 Power Plan
	Forklift Charger	2021 Power Plan
	Water/Wastewater	2021 Power Plan
Compressed Air	Air Compressor	2021 Power Plan
	Air Compressors	2021 Power Plan
	Compressed Air Demand Reduction	2021 Power Plan
Fans and Blowers	Fan Optimization	2021 Power Plan
	Fans	2021 Power Plan, RTF
HVAC	HVAC	2021 Power Plan
Lighting	High Bay Lighting	2021 Power Plan
	Lighting	2021 Power Plan
	Lighting Controls	2021 Power Plan
Low Temp Refer	Motors	2021 Power Plan
	Refrigeration Retrofit	2021 Power Plan
Material Handling	Motors	2021 Power Plan
	Paper	2021 Power Plan
	Wood Products	2021 Power Plan
Material Processing	Hi-Tech	2021 Power Plan
	Motors	2021 Power Plan
	Paper	2021 Power Plan
	Pulp	2021 Power Plan
	Wood Products	2021 Power Plan
Med Temp Refer	Food Storage	2021 Power Plan
	Motors	2021 Power Plan
	Refrigeration Retrofit	2021 Power Plan
Melting and Casting	Metals	2021 Power Plan
Other	Pulp	2021 Power Plan
Other Motors	Motors	2021 Power Plan
Pollution Control	Motors	2021 Power Plan
Pumps	Pulp	2021 Power Plan
	Pump Optimization	2021 Power Plan
	Pumps	2021 Power Plan, RTF

Table 17: Utility Distribution End Uses and Measures

End Use	Measure Category	Data Source
Distribution	Line Drop Control with no Voltage/VAR Optimization	2021 Power Plan
	Line Drop Control with Voltage Optimization & AMI	2021 Power Plan

Table 18: Agricultural End Uses and Measures

End Use	Measure Category	Data Source
Irrigation	Irrigation Hardware	2021 Power Plan, RTF
	Motor Rewind	2021 Power Plan, RTF
	Pumps	2021 Power Plan, RTF
	Variable Rate Irrigation	2021 Power Plan
Lighting	Dairy Lighting	2021 Power Plan
	Exterior Lights	2021 Power Plan
Process Heating	Block Heater	2021 Power Plan, RTF
	Stock Tanks	2021 Power Plan, RTF
Refrigeration	Dairy Refrigeration	2021 Power Plan
Ventilation	Fans	2021 Power Plan

Appendix VI: Cost-Effective Energy Efficiency Potential by End Use

Table 19: Cost-Effective Residential Potential by End Use (aMW)

End Use	2-Year	4-Year	10-Year	20-Year
Appliances	0.01	0.04	0.46	2.72
Cooking	0.00	0.00	0.01	0.06
Electronics	0.00	0.01	0.12	0.40
EVSE	-	-	-	-
HVAC	0.10	0.33	2.22	4.40
Lighting	0.00	0.01	0.12	0.64
Motors	-	-	-	-
Water Heat	0.01	0.05	0.48	2.35
Whole Home	-	-	-	-
Total	**0.12**	**0.44**	**3.40**	**10.57**

Table 20: Cost-Effective Commercial Potential by End Use (aMW)

End Use	2-Year	4-Year	10-Year	20-Year
Compressed Air	0.00	0.00	0.03	0.15
Electronics	0.01	0.03	0.36	0.81
Food Preparation	0.00	0.00	0.01	0.04
HVAC	0.05	0.17	1.39	4.93
Lighting	0.05	0.18	1.23	5.00
Motors/Drives	0.02	0.05	0.43	1.34
Process Loads	-	-	-	-
Refrigeration	0.05	0.17	1.35	3.60
Water Heat	0.00	0.01	0.07	0.33
Total	**0.18**	**0.62**	**4.87**	**16.20**

Table 21: Cost-Effective Industrial Potential by End Use (aMW)

End Use	2-Year	4-Year	10-Year	20-Year
All Electric	0.30	1.02	4.74	6.31
Compressed Air	0.21	0.43	0.96	1.37
Fans and Blowers	0.16	0.42	1.66	3.78
HVAC	0.05	0.20	0.94	1.25
Lighting	0.24	0.85	3.97	5.26
Low Temp Refrigeration	0.05	0.18	0.91	1.55
Material Handling	0.00	0.00	0.03	0.12
Material Processing	0.00	0.01	0.14	0.50
Med Temp Refrigeration	0.08	0.26	1.27	2.01
Melting and Casting	0.00	0.00	0.00	0.01
Other	0.00	0.00	0.00	0.00
Other Motors	0.00	0.00	0.02	0.09
Pollution Control	0.00	0.00	0.01	0.03
Pumps	0.06	0.21	1.87	7.20
Total	**1.15**	**3.59**	**16.52**	**29.47**

Table 22: Cost-Effective Utility Distribution Efficiency by End Use (aMW)

End Use	2-Year	4-Year	10-Year	20-Year
LDC with no VVO	0.01	0.03	0.27	0.80
LDC with VVO & AMI	0.03	0.13	1.38	4.06
Total	**0.04**	**0.15**	**1.65**	**4.86**

Table 23: Cost-Effective Agricultural by End Use (aMW)

End Use	2-Year	4-Year	10-Year	20-Year
Irrigation	0.21	0.68	3.48	5.23
Lighting	0.00	0.00	0.03	0.15
Process Heating	0.00	0.00	0.00	0.00
Refrigeration	0.00	0.01	0.10	0.19
Ventilation	0.00	0.00	0.01	0.05
Total	**0.21**	**0.70**	**3.62**	**5.62**

Appendix VII: Ramp Rate Alignment Documentation

This appendix documents the application of ramp rates in Grant PUD's 2025 Conservation Potential Assessment (CPA), developed by Lighthouse Energy Consulting and Nauvoo Solutions (the project team). Ramp rates are annual values that approximate the portion of technical potential that can be realistically achieved in each year. For example, all unweatherized homes in Grant PUD's service territory could theoretically be weatherized in a single year. However, program budgets, workforce availability, and other dynamics make this impractical. As a result, only a percentage of homes can realistically be weatherized in a single year.

For equipment measures like clothes washers, upgrading to more efficient equipment is most likely to occur when the equipment reaches the end of its life and needs to be replaced. Therefore, ramp rates for equipment measures reflect the share of equipment turning over in a given year that is replaced with a more efficient model.

The ramp rates used in this study are based on those used in the 2021 Power Plan but were updated to reflect the fact that some time has elapsed since the 2021 Power Plan. The project team assigned ramp rates that align the near-term cost-effective potential quantified in the CPA with the recent and expected achievements of Grant PUD's energy efficiency programs. Under both the Clean Energy Transformation Act (CETA) and the Washington's Energy Independence Act (WA EIA), utilities are required to pursue all conservation that is cost-effective, reliable, and achievable. Therefore, the ramp rates in this study are designed to ensure that the near-term potential is feasible and achievable for Grant PUD's programs and the measures considered for adoption meet regulatory cost-effectiveness criteria.

Ramp Rate Alignment Process

Grant PUD staff provided recent and forecasted program achievement data, which the project team summarized by sector and end use. For the residential sector, the project team further classified program achievements by high-level measure categories.

Additionally, Grant PUD benefits from the regional market transformation work of the Northwest Energy Efficiency Alliance (NEEA). To reflect this, the project team incorporated estimated energy efficiency savings from NEEA market transformation activity occurring in Grant PUD's service territory. These savings were allocated across sectors, end uses, and measure categories based on recent reporting of NEEA's regional savings.

The project team compared the recent savings from Grant PUD's programs[16] and NEEA's market transformation initiatives with the initial estimates of the cost-effective energy efficiency potential identified in the CPA. The project team made changes to the assigned ramp rates to align future savings potential with recent and expected programmatic achievements. Areas where there were little to no recent program achievements typically have a slow ramp rate applied to account for the fact that a program may need to build momentum over several years.

[16] The project team applied line loss adjustment factors to program savings and forecasts so that all energy data reported is representative of savings and potential at the generator rather than site.

The following tables show how Grant PUD's recent programmatic achievements and allocated NEEA market transformation savings compare to the potential estimated to be cost-effective after adjusting the ramp rates. Unless otherwise noted, the data summarized for 2025 includes program savings through mid-August 2025 and NEEA's 2025 forecast for Grant PUD. Color scaling has been applied to highlight the larger values. Discussion follows each table with additional detail. Note that ramp rate choices are discrete and may not provide exact alignment.

Residential

Table 24 shows how residential potential was aligned with recent achievements by measure category.

Table 24: Alignment of Residential Program History and Potential by Measure Category (MWh)

		Program History			CPA Cost-Effective Potential			
End Use	**Category**	**2023**	**2024**	**2025***	**2026**	**2027**	**2028**	**2029**
Appliances	Clothes Washer	9	8	10	5	10	17	27
Appliances	Dryer	4	4	4	23	45	77	123
Appliances	Freezer	-	-	-	2	3	5	9
Appliances	Refrigerator	5	5	6	2	4	6	10
Cooking	Microwave	-	-	-	1	1	2	3
Cooking	Oven	-	-	-	0	0	0	0
Electronics	Advanced Power Strips	0	0	0	-	-	-	-
Electronics	Desktop	1	1	1	-	-	-	-
Electronics	Laptop	-	-	-	1	1	2	4
Electronics	TV	-	-	-	6	12	21	34
HVAC	ASHP	31	19	48	135	218	330	470
HVAC	CAC	-	-	-	3	5	9	15
HVAC	Circulator	-	-	-	0	0	0	0
HVAC	Circulator Controls	-	-	-	0	0	0	0
HVAC	DHP	18	9	12	-	-	-	-
HVAC	Duct Sealing	-	-	-	71	116	177	254
HVAC	Room AC	0	0	0	-	-	-	-
HVAC	Thermostat	-	-	-	90	165	268	401
HVAC	Weatherization	51	61	30	18	29	43	62
Lighting	Fixtures	-	-	-	8	16	27	43
Water Heat	Circulator	-	-	-	0	0	1	1
Water Heat	Circulator Controls	-	-	-	0	0	1	1
Water Heat	Dishwasher	-	-	-	0	0	0	1
Water Heat	HPWH	7	7	9	28	54	92	147
Water Heat	TSRV	-	-	-	8	14	23	34
	Total	**126**	**114**	**119**	**400**	**695**	**1,102**	**1,638**

**Partial Year program savings with NEEA forecast for full year included*

Note: *For clarity, in the table above, measure categories with no program achievements and no cost-effective potential have been removed. In addition, note that some measures have savings values that are small and cannot be shown at this level of resolution. These values show as 0 in this and following tables while a true zero value is shown as a dash.*

The following sections discuss the alignment within each residential end use.

Appliances

In this end use, the savings are from NEEA's market transformation initiatives. NEEA's work includes an initiative for retail products and appliances that contributes savings. The savings from this work typically grow over time as markets transform. Ramp rates were adjusted to align with the NEEA savings.

Cooking

Neither Grant PUD nor NEEA have savings in this end use, so the measures—microwaves and ovens—were given slow ramp rates.

Electronics

Most of the historical savings in this end use come from NEEA's work advancing efficient desktop computers. The more efficient Energy Star desktop computer is not cost-effective and therefore not incorporated in the future potential. The Regional Technical Forum (RTF) has recently deactivated advanced power strips due to a lack of data and confidence in the savings, so the measure was removed from this CPA. Going forward, the cost-effective potential is associated with TVs and laptops. The project team slowed the ramp rate for these categories since there are no current Grant PUD programs or NEEA initiatives that would address these measures.

HVAC

Grant PUD's residential program savings for the past three years are all in the HVAC end use. Over 80% of the historical savings are from Grant PUD's programs while the remainder are a result of NEEA's market transformation in this area. Grant PUD's HVAC savings between 2023 and August 2025 are 50% weatherization related, 42% for air source heat pumps (ASHP), and nearly 8% for ductless heat pumps (DHP).

Measures in the HVAC end use are often expensive. Although ASHPs typically struggle to be cost-effective, the project team included the incentives provided for heat pumps through the federal Inflation Reduction Act (IRA). While much of IRA has recently been repealed, program funding has already been distributed to the states. Including these incentives improves the cost-effectiveness of ASHPs, particularly for income-qualified households, who are eligible for more substantial benefits.

None of the DHP measures were identified as cost effective after updating measure assumptions with recent RTF updates.

In the weatherization category, only a portion of the measures were determined to be cost-effective. The primary cost-effective measures included storm windows, duct insulation, and infiltration reduction.

Additional cost-effective potential is available through smart thermostats and duct sealing. The project team assumed slow ramp rates for these measures to allow time for Grant PUD to develop a program.

Lighting

The lighting end use is now subject to product standards that cover many screw-in lamps. The potential that remains is in fixtures with integrated LEDs and less common bulb types. There is not currently a program to incentivize LED fixtures, so these measures were given a slower ramp rate.

Water Heat

The past savings in the water heating category are from NEEA's market transformation efforts prioritizing a transition to heat pump water heaters.

Washington has state product standards for showerheads and aerators, so there is no potential in these categories. The project team applied slower ramp rates to the remaining measure categories with cost-effective potential, which includes circulator pumps and controls, dishwashers, and thermostatic restrictor valves (TSRV).

Table 25 below summarizes the residential measure category results in Table 24 by end use.

Table 25: Alignment of Residential Program History and Potential by End Use (MWh)

	Program History			CPA Cost-Effective Potential			
End Use	**2023**	**2024**	**2025***	**2026**	**2027**	**2028**	**2029**
Appliances	17	17	20	32	62	106	169
Cooking	-	-	-	1	1	2	4
Electronics	1	1	1	7	14	23	37
EVSE	-	-	-	-	-	-	-
HVAC	100	90	90	316	533	827	1,201
Lighting	-	-	-	8	16	27	43
Motors	-	-	-	-	-	-	-
Water Heat	7	7	9	37	69	117	184
Whole Home	-	-	-	-	-	-	-
Total	**126**	**114**	**119**	**400**	**695**	**1,102**	**1,638**

**Partial Year program savings with NEEA forecast for full year included*

Commercial

In the commercial sector, the greatest potential lies within the lighting, refrigeration, and HVAC end uses. Consistent with this, Grant PUD's historical accomplishments are nearly all in the lighting end use. Furthermore, NEEA also contributes additional savings to the lighting and HVAC end uses. Other end uses that NEEA contributes savings towards include electronics, food preparation, process loads, and motors/drives.

The project team adjusted the ramp rate assignments to align with the recent NEEA and Grant PUD program accomplishments. All end uses without historical accomplishments were assigned the slowest available ramp rates to reflect the lower program activity in these areas.

Note that lighting in the commercial sector is impacted by Washington House Bill 1185's[17] ban on the sale of lighting products containing mercury, which includes fluorescent lighting. The ban takes

[17]Accessed July 11, 2025. https://lawfilesext.leg.wa.gov/biennium/2023-24/Pdf/Bills/Session%20Laws/House/1185-S2.SL.pdf?q=20250714075226

effect in the second half of 2029. After this, much of the remaining lighting potential is associated with lighting controls and lighting technologies where fluorescent lighting is not the baseline technology.

Table 26 below shows the alignment of program history and potential in the commercial sector.

Table 26: Alignment of Commercial Program History and Potential by End Use (MWh)

	Program History			CPA Cost-Effective Potential			
End Use	**2023**	**2024**	**2025***	**2026**	**2027**	**2028**	**2029**
Compressed Air	-	-	-	2	4	7	11
Electronics	2	2	2	25	48	82	131
Food Preparation	1	1	1	0	1	2	3
HVAC	2	2	2	152	270	432	642
Lighting	494	73	242	169	308	498	628
Motors/Drives	2	2	2	50	85	135	200
Process Loads	0	0	0	-	-	-	-
Refrigeration	-	5	-	166	280	437	643
Water Heat	-	-	-	4	9	15	24
Total	**500**	**84**	**249**	**570**	**1,004**	**1,607**	**2,282**

**Partial Year program savings with NEEA forecast for full year included*

Industrial

Savings in the industrial sector are often irregular and uneven, subject to the projects that are completed in a given year. Furthermore, Grant PUD engages with large industrial customers to plan and track future projects. Grant PUD provided data on these forecasted projects with estimated completion dates in 2025 and 2026. These savings are included in Table 27 and were considered by the project team when making ramp rate assignments in the industrial sector. Note that some of these projects could not be mapped to end uses and likely cover a variety of end uses. These projects are categorized in the table as "Custom" and the cost-effective potential related to these projects is assumed to be within multiple end uses.

The project team started with the adoption rates determined in the 2021 Power Plan and adjusted ramp rate assignments based on the historical and forecasted projects. Because many projects cover a wide variety of end uses, the goal was to align the overall near-term cost-effective potential with the historical and planned project savings rather than obtain precise alignment at the end use level.

Finally, the project team did not attempt to precisely match 2026 cost-effective potential with the Grant PUD forecast for 2026 given the uncertainty in the timing and savings for the forecasted projects.

Table 27: Alignment of Industrial Program History and Potential by End Use (MWh)

	Program History & Forecast				CPA Cost-Effective Potential			
End Use	**2023**	**2024**	**2025***	**2026**	**2026**	**2027**	**2028**	**2029**
Energy Management	-	-	-	-	935	1,650	2,621	3,706
Compressed Air	-	3,916	-	-	869	928	993	977
Fans and Blowers	-	1,033	-	-	624	805	1,008	1,253
HVAC	-	-	-	-	163	298	509	743
Lighting	-	416	-	-	758	1,349	2,186	3,118
Motors	8	-	-	-	2	4	6	10
Refrigeration	-	-	-	-	413	727	1,140	1,612
Process	-	-	-	-	14	27	48	77
Pumps	-	-	-	-	191	331	532	804
Other	-	-	-	-	0	1	1	2
Custom	-	-	7,391	5,597				
Total	**8**	**5,365**	**7,391**	**5,597**	**3,969**	**6,119**	**9,044**	**12,303**

**Partial Year program actual savings and forecast of large projects for remainder of year*

Utility Distribution System

The potential in the utility distribution system is from conservation voltage reduction, where system voltages are lowered while remaining within required ranges. The potential in this sector is limited compared to other sectors. In addition, the 2021 Power Plan assumes that the potential in this sector will be acquired slowly. Table 28 shows the cost-effective potential identified for the distribution system in the near term.

Table 28: Alignment of Distribution System Program History and Potential by End Use (MWh)

	Program History			CPA Cost-Effective Potential			
End Use	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Distribution System	-	-	-	109	218	387	630

Agricultural

Grant PUD has robust historical savings in the agricultural sector. All the historical savings and the majority of cost-effective future savings are categorized in the irrigation end use. Given the agricultural customer landscape in Grant PUD's service area, other potential savings opportunities were identified in the lighting, refrigeration, and ventilation end uses. The project team aligned savings with historic accomplishments for irrigation and slowed all other ramp rates. Table 29 shows the alignment of historical savings and cost-effective potential.

Table 29. Alignment of Agricultural Program History and Potential by End Use (MWh)

	Program History			CPA Cost-Effective Potential			
End Use	**2023**	**2024**	**2025***	**2026**	**2027**	**2028**	**2029**
Irrigation	289	1,023	2,067	685	1,148	1,741	2,421
Lighting	-	-	-	2	4	8	12
Process Heating	-	-	-	0	0	0	0
Refrigeration	-	-	-	14	22	35	51
Ventilation	-	-	-	1	1	2	3
Total	**289**	**1,023**	**2,067**	**701**	**1,177**	**1,786**	**2,487**

**Partial Year program savings*

Data Center

Grant PUD is home to several data centers and expects continued load growth in this area. While future data center savings potential is hard to predict and organizations like the Council[18] and American Council for an Energy-Efficient Economy (ACEEE)[19] have found that large data centers are driven towards energy efficiency through existing market dynamics, Grant PUD expects to claim savings from several new projects. For consistency between the CPA-based target and Grant PUD's expected savings, the project team has included the expected data center savings as a separate sector for inclusion in the target. These are shown in Table 30. As of October 2025, there are no projects planned with completion dates after 2026.

Table 30: Data Center Savings Forecast (MWh)

	Expected Savings			
End Use	**2026**	**2027**	**2028**	**2029**
Data Centers	62,356	0	0	0

[18] For details, see: https://nwcouncil.app.box.com/s/3f2ga0duquci9kyoo6vzr00isjv0r2fx

[19] For details, see: https://www.aceee.org/sites/default/files/pdfs/opportunities_to_use_energy_efficiency_and_demand_flexibility_to_reduce_data_center_energy_use_and_peak_demand.pdf