# 2023 CONSERVATION POTENTIAL ASSESSMENT

Inland Power & Light

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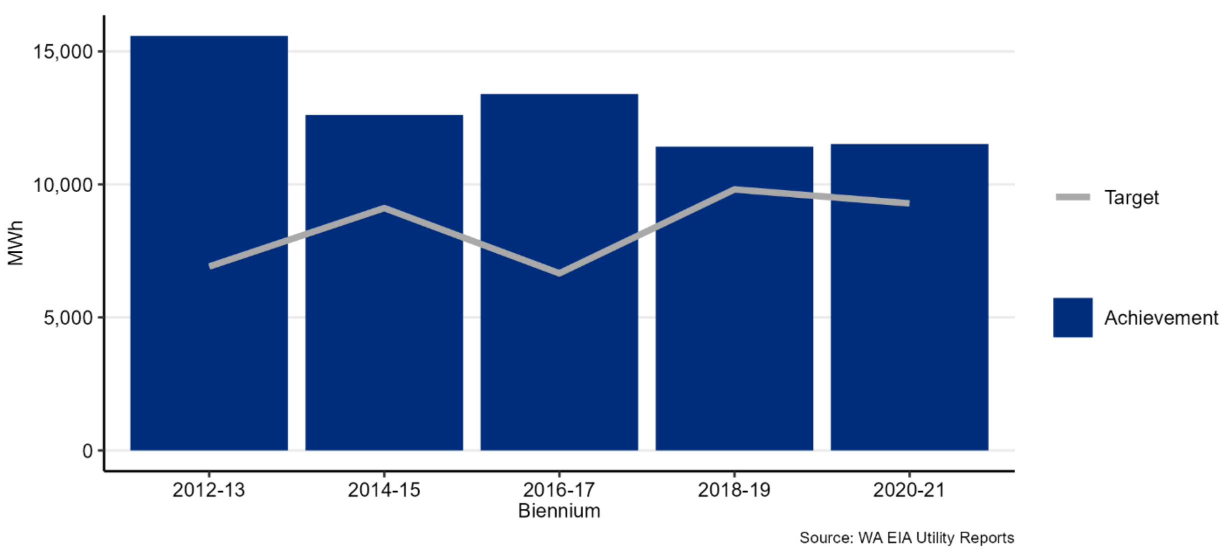
# Executive Summary

## Overview

This report describes the methodology and results of a conservation potential assessment (CPA) conducted by Lighthouse Energy Consulting (Lighthouse) for Inland Power & Light (Inland Power). The CPA estimated the cost-effective energy savings potential for the period of 2024 to 2043. This report describes the results of the full 20-year period, with additional detail on the two- and 10-year periods that are the focus of Washington's Energy Independence Act (EIA). The initial two years of this study are also the final two years of the four-year period covered by Inland Power's first Clean Energy Implementation Plan (CEIP). If desired, the results of this study can be used to update the conservation target identified in that CEIP.

Inland Power provides electricity service to over 36,000 customers across 13 counties in eastern Washington and northern Idaho. The 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. Inland Power's history of consistently exceeding its biennium conservation targets is shown in Figure 1, which is based on EIA compliance data reported to Washington's Department of Commerce.

Figure 1: Historic Targets and Achievements




The 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. Washington's Clean Energy Transformation Act (CETA) has additional requirements for CPAs; namely, that the assessment of cost-effectiveness make use of specific values for the social cost of carbon. Appendix III details these requirements and how this assessment fulfills those requirements.

This CPA used much of the 2021 Power Plan materials, with customizations to make the results specific to Inland Power's service territory and customers. Notable changes in this CPA relative to Inland Power's previous assessment include the following:

- Energy Efficiency Measures
  - This assessment uses the measures savings, costs, and other characteristics based on the measures included in the final 2021 Power Plan, with updates to dozens of measures from the Regional Technical Forum (RTF) and additional customizations to make the measures specific to Inland Power.
- Avoided Costs
  - A new market price forecast was incorporated, which has increased significantly from the 2021 CPA.
- Customer Characteristics
  - Updated counts of residential homes
  - New estimates of commercial floor area using updated load data
  - New breakdown of Inland Power's industrial sector loads
  - Updated sector growth rates
- Program Impacts
  - Consideration of Inland Power's recent conservation program achievements

## Results

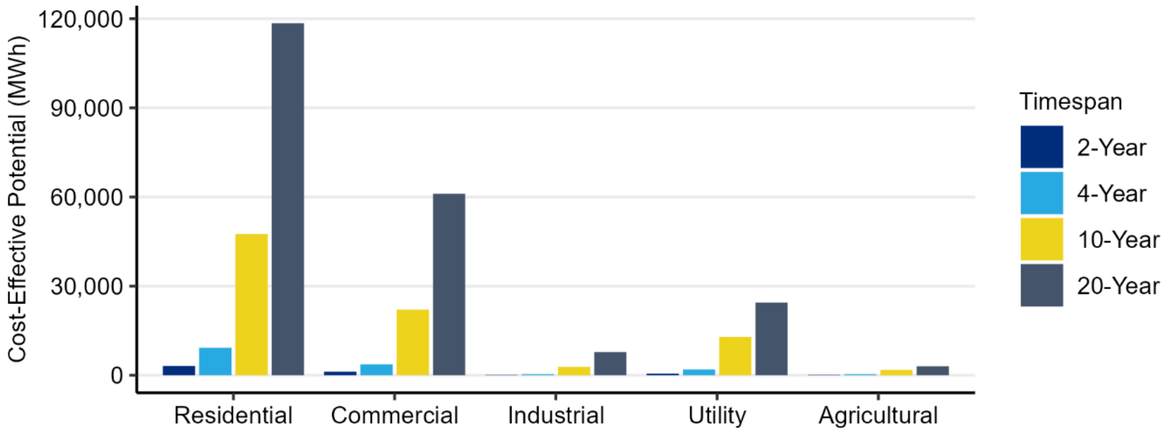
Table 1 and Figure 2 show the cost-effective energy efficiency potential by sector over two-, four-, 10-, and 20-year periods. Over the 20-year planning period, Inland Power has nearly 215,000 MWh of cost-effective conservation available, which is approximately 16% of its projected 2043 load. The EIA focuses on the two- and 10-year potential, which are 5,122 MWh and 87,110 MWh, respectively.

**Table 1: Cost-Effective Energy Savings Potential by Sector (MWh)**

| Sector | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| Residential | 3,112 | 9,241 | 47,552 | 118,483 |
| Commercial | 1,201 | 3,685 | 22,070 | 61,097 |
| Industrial | 101 | 351 | 2,829 | 7,813 |
| Utility | 588 | 1,934 | 12,891 | 24,433 |
| Agricultural | 119 | 337 | 1,768 | 3,032 |
| **Total** | **5,122** | **15,548** | **87,110** | **214,858** |

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

Figure 2: Cost-Effective Energy Savings Potential by Sector




The residential and commercial sectors are the two largest components of Inland Power's overall load, and most of the energy efficiency potential comes from these sectors. Over the 20-year timeframe, more than 80% of the potential energy savings is in these two sectors.

This assessment does not specify how the energy efficiency potential will be achieved. Possible mechanisms include Inland Power's own energy efficiency programs, market transformation driven by the Northwest Energy Efficiency Alliance (NEEA), state building codes, and state or federal product standards. Often, the savings associated with a measure will be acquired by 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. Subsequently, they became a regular offering in utility programs across the Northwest and are starting to work their way into federal product standards.

Energy efficiency also contributes to reductions in peak demand. This assessment used hourly load and savings profiles developed by the Council to identify the demand savings from each measure that would occur at the time of Inland Power's system peak. The cost-effective energy savings potential identified in this assessment will also result in 46 MW of peak demand savings over the 20-year planning period, as shown in Table 2. This represents 18% of Inland Power's 2043 peak demand, based on projections developed from BPA's Tiered Rate Methodology forecasts.

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

| Sector | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| Residential | 0.7 | 2.1 | 11.4 | 29.6 |
| Commercial | 0.3 | 0.8 | 4.6 | 11.8 |
| Industrial | 0.0 | 0.0 | 0.4 | 1.1 |
| Utility | 0.1 | 0.3 | 1.8 | 3.3 |
| Agricultural | 0.0 | 0.0 | 0.1 | 0.1 |
| **Total** | **1.1** | **3.3** | **18.3** | **46.0** |

This CPA used ramp rates to identify the share of available potential that could be acquired in each year of the study period. The ramp rates are based on those used by the Council in the 2021 Power Plan and reflect the market and program maturity of each measure. For this CPA, Lighthouse selected ramp rates that would align near-term potential of each measure with Inland Power's recent program achievements and the expected savings from NEEA's market transformation initiatives that were expected to occur in Inland Power's service territory. Inland Power staff provided program achievement data for 2021 and 2022. Lighthouse assigned appropriate ramp rates for each measure so that the future acquisition of energy efficiency was aligned with this program data while still allowing for the acquisition of all potential over the 20-year planning period.

The estimate of annual energy efficiency potential by sector is shown in Figure 3. The available cost-effective potential starts at approximately 2,000 MWh in 2024 and grows to a maximum of more than 15,000 MWh in 2034. After this point, the annual acquisition of savings potential declines through the end of the study period as the remaining opportunities become limited.

Figure 3: Annual Incremental Energy Efficiency Potential

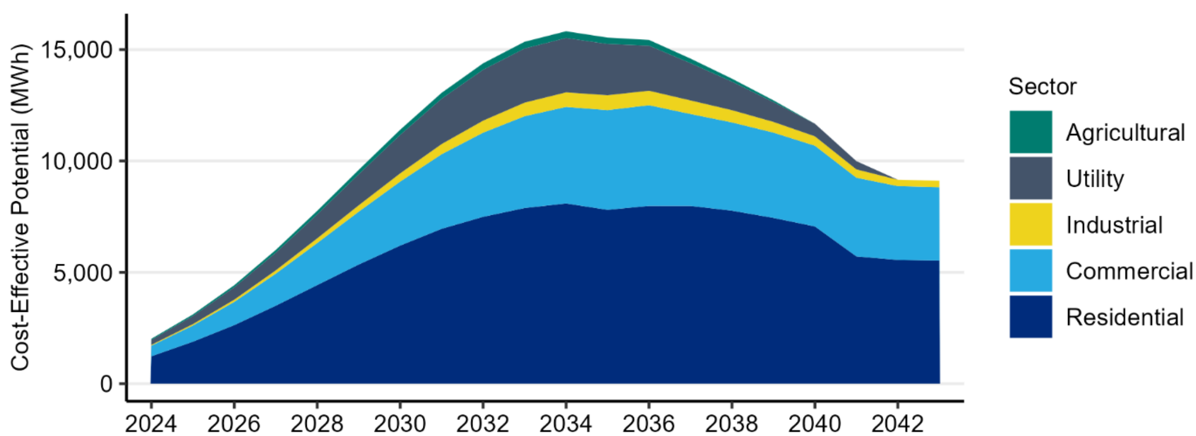
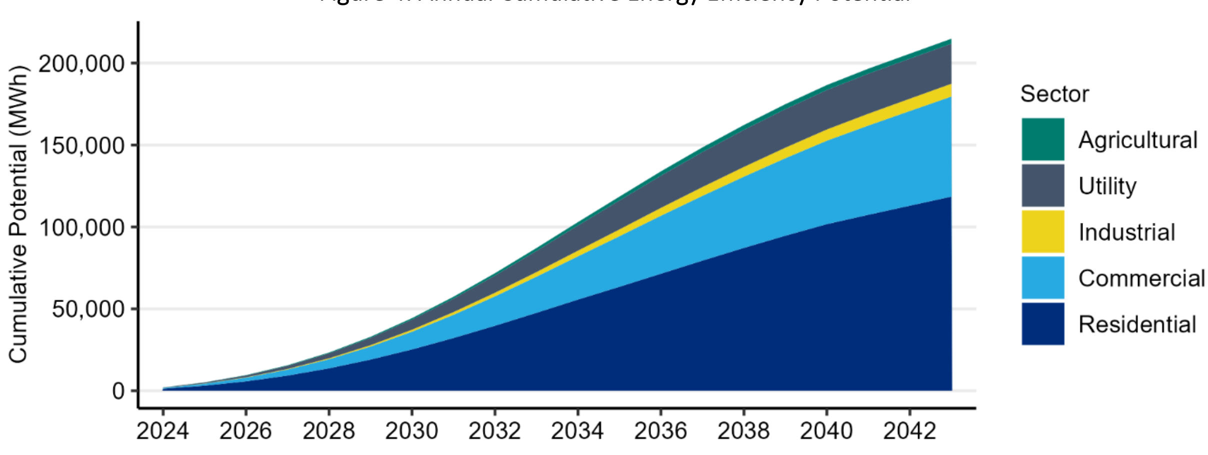



Figure 4 shows how the energy efficiency potential grows on a cumulative basis through the study period, totaling nearly 215,000 MWh over the 20-year planning period.

Figure 4: Annual Cumulative Energy Efficiency Potential



## Comparison to Previous Assessment

Table 3 shows a comparison of the two-, 10-, and 20-year cost-effective potential by sector as quantified by the previous 2021 CPA and this 2023 CPA. The overall two-year potential is 11% higher, largely due to an increase in the residential sector that was partially offset by declines in the commercial, industrial, and agricultural sectors. Over the 20-year period, the residential potential declined slightly, while there were increases in the other sectors.

Table 3: Comparison of 2021 and 2023 CPA Cost-Effective Potential (MWh)

| Sector | 2-Year Potential | | | 10-Year Potential | | | 20-Year Potential | | |
|---|---|---|---|---|---|---|---|---|---|
| | 2021 CPA | 2023 CPA | % Change | 2021 CPA | 2023 CPA | % Change | 2021 CPA | 2023 CPA | % Change |
| Residential | 1,327 | 3,112 | 134% | 37,280 | 47,552 | 28% | 122,739 | 118,483 | -3% |
| Commercial | 2,455 | 1,201 | -51% | 20,436 | 22,070 | 8% | 40,021 | 61,097 | 53% |
| Industrial | 317 | 101 | -68% | 3,500 | 2,829 | -19% | 7,183 | 7,813 | 9% |
| Utility | 188 | 588 | 213% | 8,301 | 12,891 | 55% | 24,443 | 24,433 | 0% |
| Agricultural | 336 | 119 | -65% | 2,193 | 1,768 | -19% | 2,859 | 3,032 | 6% |
| **Total** | **4,623** | **5,122** | **11%** | **71,711** | **87,110** | **21%** | **197,244** | **214,858** | **9%** |

Discussion of the factors leading to these changes is provided below.

### *Avoided Costs*

The updated market prices used in this CPA have increased. The 20-year levelized value of the forecasted prices used in this CPA is approximately $52 per megawatt-hour, an increase of nearly 50% from the equivalent value from the 2021 CPA, which was $35 per megawatt-hour (2016$). This increase resulted in an increase in the overall amount cost-effective potential.

### *Customer Characteristics*

This CPA used updated customer data based on load data provided by Inland Power. Counts of residential homes have increased slightly relative to the 2021 CPA.

In the commercial sector, updated load data has resulted in increased floor area, which added potential in that sector. Between the 2021 and 2023 CPAs, there was an increase in floor area for warehouses especially. The loads in the industrial sector have decreased relative to the 2021 CPA. This change reduces the potential in the industrial sector in the long term but was offset by the avoided cost changes described above.

### *Program History & Forecasts*

As described above, Lighthouse used ramp rates to align the cost-effective potential in the near term with Inland Power's recent and expected program achievements, as well as the expected savings from NEEA's market transformation work. Inland Power's residential savings and expected savings from NEEA are higher than forecast in the 2021 CPA, resulting in an increase in the near-term residential potential. Lighthouse also accounted for the recent program accomplishments by reducing the overall potential. Inland Power was able to offer limited-time incentives for some measures in 2021 and 2022, which resulted in high levels of achievement and corresponding reductions in potential.

## Conclusion

This report summarizes the CPA conducted for Inland Power for the 2024 to 2043 timeframe. The CPA identified a slightly higher amount of available cost-effective potential throughout the study period.

Higher avoided costs resulted in additional cost-effective potential over the 20-year period while higher near-term expectations of savings in the residential sector resulted in additional savings potential in the near term, which offset slightly lower expectations in the commercial, industrial, and agricultural sectors.

# Introduction

## Objectives

This report describes the methodology and results of a CPA conducted for Inland Power by Lighthouse. The CPA estimated the cost-effective energy savings potential for the period of 2024 to 2043. This report describes the results of the full 20-year study period, with additional details on the two- and 10-year periods that are the focus of Washington's EIA.

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 Inland Power's compliance with these requirements. The state of Washington's recently passed CETA includes an additional requirement for CPAs to use specific values for the social cost of carbon. The required values were incorporated in this analysis.

The results of this assessment can be used to assist Inland Power in planning its energy efficiency programs by identifying the amount of cost-effective energy savings available in various sectors, end uses, and measures. The results of this CPA can also be used to update the four-year energy efficiency target included in Inland Power's CEIP, if desired. Finally, the results of this assessment can be used to inform Inland Power's future resource planning.

## 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 Inland Power serves more than 36,000 customers, it is required to comply with the EIA. The requirements of the EIA specify that all qualifying utilities complete the following by January 1 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 further details how this assessment complies with each of the requirements specified for CPA by 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, loads, energy prices, and other variables, these are still subject to uncertainties and limitations, as recent global events have shown. These uncertainties include, but are not limited to:

[1] Washington RCW 19.285.040

[2] In CA No. 2011-03, the State Auditor's Office has 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.

- Customer Characteristic Data: This assessment used the best available data to reflect Inland Power's customers. In some cases, however, the assessment relied upon data beyond Inland Power's service territory due to limitations of data availability or adequate sample sizes. There are uncertainties, therefore, related to the extent that this data is reflective of Inland Power's customer base.
- Measure Data: Measure savings and cost estimates are based on values prepared by the Council and 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. These forecasts are continually changing.
- Utility System Assumptions: Measures in this CPA reflect cost credits based on their ability to provide transmission and distribution system capacity. The actual value of these credits is dependent on the demand on and capacity of these systems, which vary across Inland Power's service territory. Additionally, a value for generation capacity is included, but the value of this credit is subject to the evolving need for capacity in the Northwest.
- Load and Customer Growth Forecasts: This CPA projects future customer growth over a 20-year period. Any forecast over a similar time period will inherently include a significant level of uncertainty.

Due to these uncertainties and the continually changing planning environment, the 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
- Historic Conservation Achievement
- Customer Characteristics
- Results
- Scenario Results
- Summary
- References & Appendices

# Methodology

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

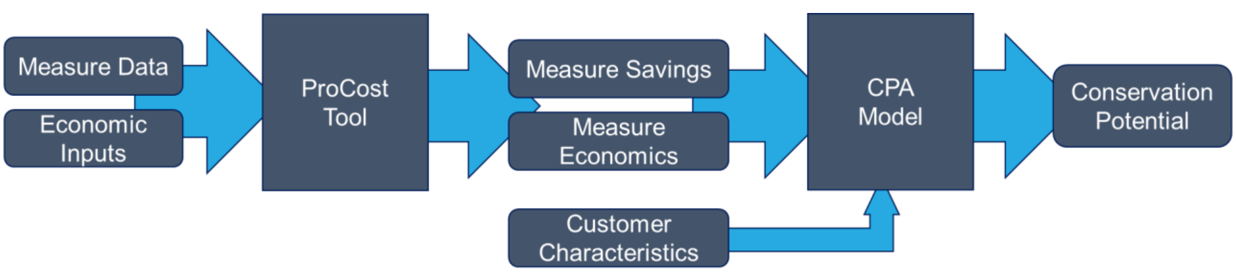
Requirements for this CPA are laid out in RCW 19.285.040 and WAC 194-37-070, Section 5 parts (a) through (d). Additional requirements are specified in the rules of Washington's CETA. The methodology used to produce this assessment is consistent with these requirements and follows much of the methodology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

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

## 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 includes all of the costs and benefits of energy efficiency measures, regardless of who receives the benefit or pays the cost. The measure savings and economic results are combined with customer data in Lighthouse's CPA model, which quantifies the number of remaining implementation opportunities. The savings associated with each of these opportunities are aggregated in the CPA model to determine the overall potential.

**Figure 5: Conservation Potential Assessment Methodology**




## Economic Inputs

Lighthouse worked closely with Inland Power staff to define the economic inputs that were used in this CPA. Inputs include avoided energy costs, carbon costs, transmission and distribution capacity costs, and generation capacity costs. These are discussed briefly below, while additional detail is included in Appendix IV.

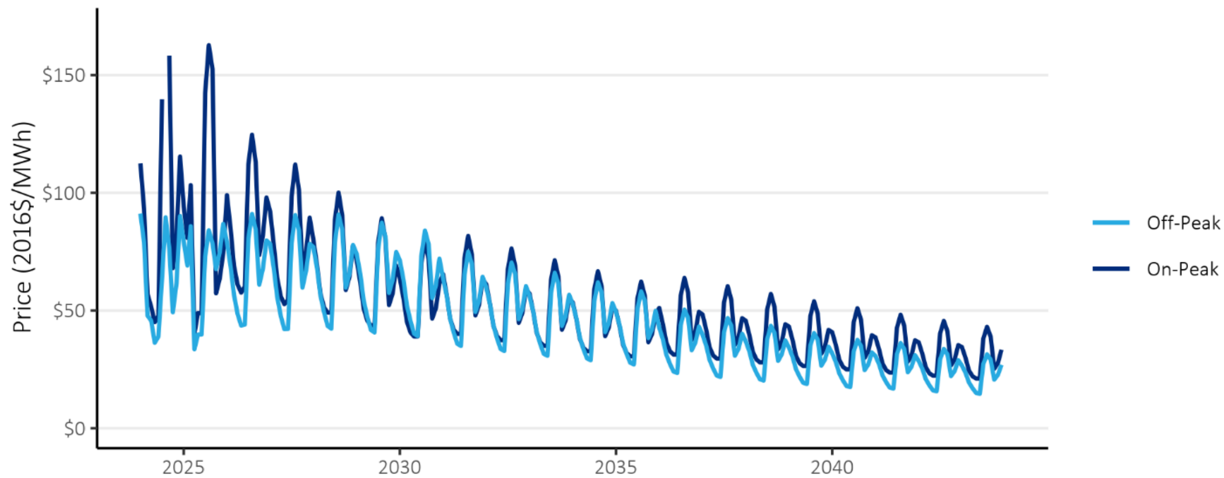
### *Avoided Energy Costs*

Avoided energy costs represent the cost of energy purchases that are avoided through energy efficiency savings. The EIA requires utilities to "set avoided costs equal to a forecast of market prices."[3] For this CPA, Lighthouse developed a forecast of on- and off-peak market prices at the Mid-Columbia trading hub. Figure 6 below shows the market price forecast that was used for the base case scenario of this

[3] WAC 194-37-070

assessment. Lighthouse also created high and low variations of this forecast that were used in separate avoided costs scenarios, which are described later in this report.

Figure 6: Avoided Energy Costs




### *Social Cost of Carbon*

In addition to avoiding purchases of energy, energy efficiency measures have the potential to avoid emissions of greenhouse gases like carbon dioxide. The EIA requires that CPAs include the social cost of carbon, which the U.S. 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.

### *Renewable Portfolio Standard Compliance Costs*

By reducing Inland Power's overall load, energy efficiency reduces the cost of complying with Washington's requirements for renewable and carbon-neutral energy. Inland Power currently purchases Renewable Energy Credits (RECs) to fulfill the EIA requirement of sourcing 15% of its sales from renewable energy resources. With a 15% requirement for renewable energy, Inland Power can avoid the purchase of 15 RECs by saving 100 MWh of energy. 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. Based on this requirement, it is assumed that after 2030, every unit of energy savings results in an equivalent reduction in REC purchases.

### *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.

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

In the development of the 2021 Power Plan, the Council developed a standardized methodology for calculating these values and surveyed Northwest utilities to update the assumed values of these cost deferrals. This CPA uses the values developed by the Council through that process: $3.54 and $7.82 per kW-year (in 2016 dollars) for transmission and distribution capacity, respectively. These values are slightly higher than the values used in the Cowlitz PUD's 2020 and 2021 CPAs as they reflect small updates to the Council values as the 2021 Power Plan was finalized.

These values are applied to the demand savings of each measure that are coincident with the timing of the respective transmission and distribution system peaks.

### *Program Administration Costs*

In each of the past three 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, which is also consistent with Inland Power's previous CPAs.

### *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 update follows the process used in Inland Power's previous CPAs. A scenario analysis is used 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 scenario. In selecting its biennial target based on this range of outcomes, Inland Power is selecting its preferred risk strategy and the associated risk credit. This process is similar to the one used by the Council to identify the risk mitigation credit in the regional power plans.

### *Northwest Power Act Credit*

The 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-year values so that values occurring in different years can be compared. This assessment uses a real discount rate of 3.75%. This is the same value used in Inland Power's 2019 and 2021 CPAs. Energy efficiency benefits accrue over the lifetime of the measure, so a lower discount rate results in higher present values for benefits occurring in future years.

## Measure Characterization

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

Measure savings are typically defined by 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 over-counting savings over the long term as homes are likely to install both measures.

Measure savings also consider 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 and the corresponding impacts to heating and cooling system energy demands.

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 Inland Power's system peak. It also determines the levelized-cost and benefit-cost ratios, the latter of which is used to determine whether measures are cost-effective.

## Customer Characteristics

The assessment of customer characteristics is used to determine the number of remaining installation opportunities for each measure. This includes both the number of opportunities overall, as well as the share, or saturation, that have already been completed. The characterization of Inland Power's customer base was completed using survey and load data provided by Inland Power, NEEA's commercial and residential building stock assessments, U.S. Census data, and other data sources. Details for each 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 Inland Power's conservation achievements where applicable. This achievement is discussed in the next section.

## Energy Efficiency Potential

The energy efficiency measure data and customer characteristics are combined in Lighthouse's CPA model. The model calculates the economic or cost-effective potential by progressing through the types of energy efficiency potential shown in Figure 7 below. Each 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, resulting in the achievable potential. These filters include an assumption 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, planners have historically assumed that 85% of all measure opportunities can be achieved. This assumption came 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. In the 2021 Power Plan, the Council took 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 each year.

Finally, economic, or cost-effective potential is determined by limiting the achievable potential to those measures that pass an economic screen. Per the EIA, this assessment uses the TRC test to determine economic potential. The TRC evaluates 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, Inland Power could pay up to the full cost of measures with its incentives without needing to reevaluate the cost-effectiveness of the measure, although practical constraints such as program budgets may limit this.

## Recent Conservation Achievement

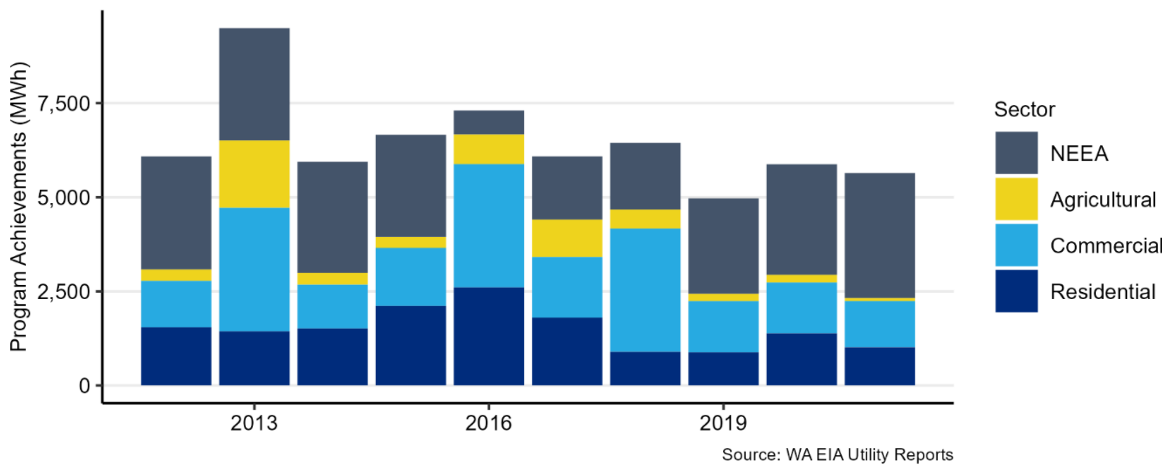
Inland Power has a long history of energy efficiency achievement and, according to the RTF's 2021 Regional Conservation Progress Report, has averaged savings equal to 0.5% of its retail sales in each year over the 2016-2021 time period.

Inland Power currently offers programs for its residential, commercial, industrial, and agricultural customers. In addition to these programs, Inland Power receives credit for the market transformation initiatives of NEEA that occur within its service territory. 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 Inland Power's recent conservation achievement by sector as well as the savings attributed to NEEA, as reported under Washington's EIA.

Figure 8: Recent Conservation Achievements by Sector




The average savings over this ten-year period is more than 6,400 MWh per year. Inland Power's residential and commercial program savings make up more than half of the savings, while savings from NEEA's market transformation initiatives represent 38% of the savings over this time period. NEEA's savings are primarily in the residential sector, so most of the historical savings are from Inland Power's residential sector. Inland Power does not currently track industrial savings separately from commercial savings.

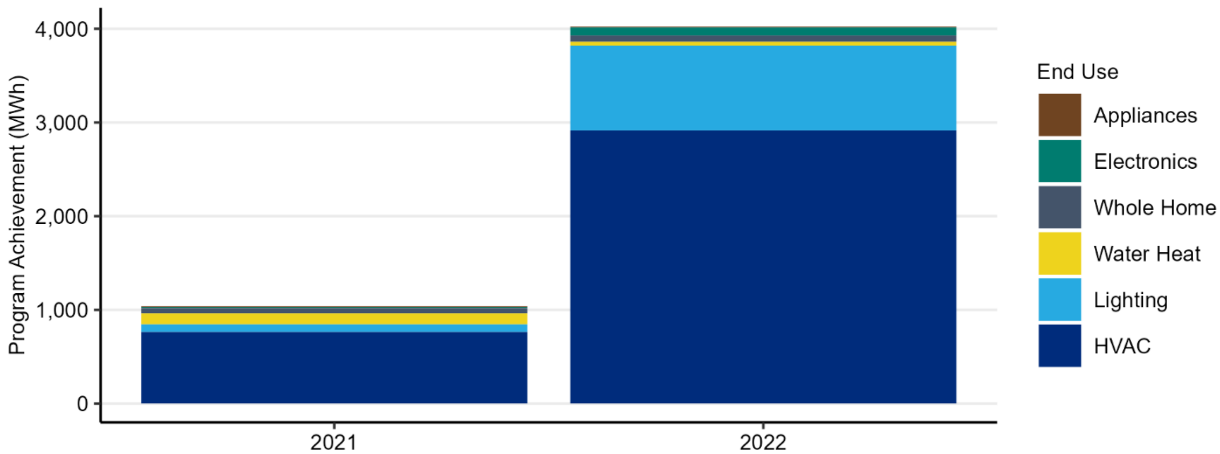
Inland Power staff provided additional details on its program savings for 2021 and 2022, which are discussed below.

### Residential

The recent residential program achievements by end use are shown in Figure 9. Most of the savings are in the HVAC end use, which includes both weatherization measures as well as heating system equipment. Lighting measures also accounted for a significant portion of the savings in 2022. In 2022, Inland Power received additional funding for conservation due to a clerical error from BPA and offered limited time promotions for energy efficiency, which resulted in higher savings for some measures. Between 2018 and

2021, Inland Power's residential savings have averaged approximately 1,000 MWh per year. Smaller amounts of savings were achieved in the whole (new) homes, appliances, and electronics end uses.

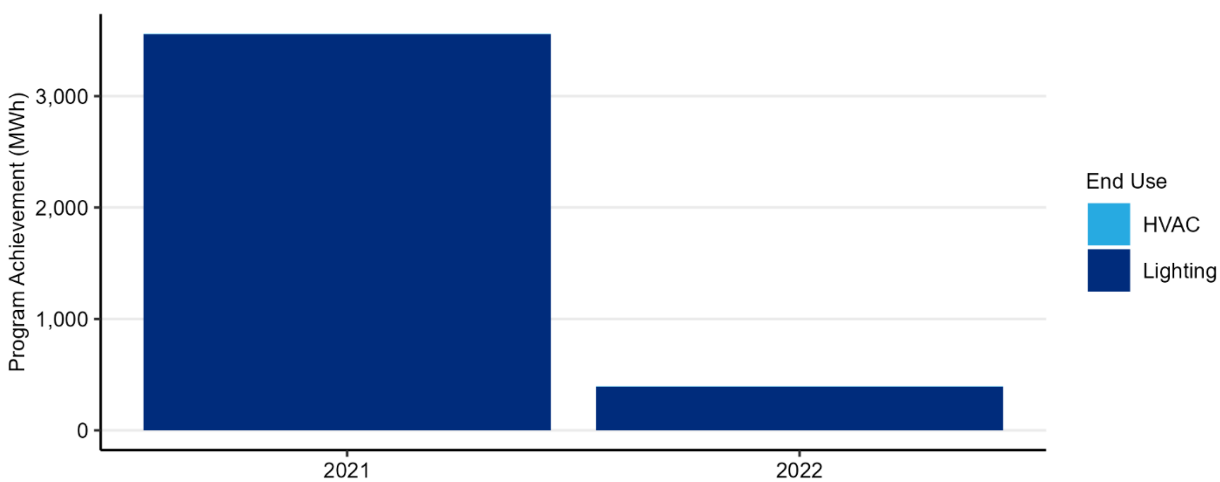
Figure 9: 2021-2022 Residential Program Achievements by End Use




## Commercial

Most of Inland Power's commercial savings are in the lighting end use, as shown in Figure 10. A much smaller amount of savings came from projects in the HVAC end use, which is imperceptible in the figure below.

Figure 10: 2021-2022 Commercial Program Achievements by End Use



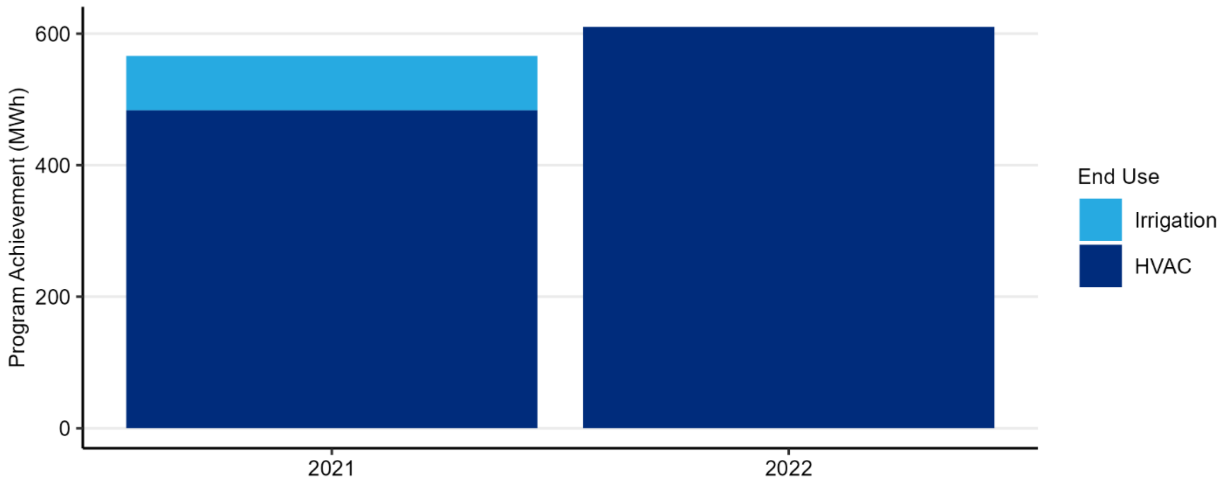

## Industrial

As discussed above, Inland Power does not currently track projects in the industrial sector separately from the commercial sector. As such, any savings in the industrial sector would be included in Figure 10 above.

## Agricultural

In the agricultural sector, Inland Power achieved savings in the HVAC end use from fans in potato storage sheds and thermostatically controlled outlets. Savings in the irrigation end use came from efficient motor rewinds for irrigation equipment.

Figure 11: 2021-2022 Agricultural Program Achievements by End Use



# Customer Characteristics

This section describes the characterization of Inland Power's customer base. This process includes defining the makeup and characteristics of each individual sector. Defining the customer base determines the type and quantity of remaining opportunities to implement energy efficiency measures. Additional information about the local climate and service territory population is used to characterize some measures. This information is summarized in Table 4.

Table 4: Service Territory Characteristics

| Heating Zone | Cooling Zone | Total Homes (2021) | Total Population (2021) |
|---|---|---|---|
| 2 | 2 | 40,885 | 85,612 |

The count of homes is based on counts of residential customers as reported to the U.S. EIA via Form 861. This count is a slight increase from the 2021 CPA. The estimated future growth in the number of homes is based on the compound average growth rate in residential customers as reported to the U.S. EIA, which is 1.5%.

Lighthouse also applied a demolition rate based on assumptions for Washington in the Council's 2021 Power Plan. The demolition rate quantifies the number of existing homes that are converted to new homes through demolition or major renovation, where codes for new construction apply.

The population is based on a combination of population estimates from the American Community Survey (ACS) and estimates of the zip codes included in Inland Power's service territory.

## 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. Lighthouse updated the distribution of homes across the single family, multifamily, and manufactured home types based on ACS data and estimates of the zip codes served by Inland Power. HVAC and other appliance saturation data was based on data from a 2020 survey fielded by Inland Power, which was developed and initially used as part of Inland Power's 2021 CPA. Table 5 and Table 6 summarize the characteristics that were used for this assessment for existing homes and new homes, respectively.

Table 5: Residential Existing Home Characteristics

| | Single Family | Low Rise Multifamily | High Rise Multifamily | Manufactured |
|---|---|---|---|---|
| Share of Homes | 71% | 2% | 15% | 12% |
| **HVAC Equipment** | | | | |
| Electric Forced Air Furnace | 15% | 13% | 13% | 49% |
| Air Source Heat Pump | 23% | 0% | 0% | 22% |
| Ductless Heat Pump | 6% | 6% | 6% | 0% |
| Electric Zonal/Baseboard | 9% | 51% | 51% | 3% |
| Central Air Conditioning | 36% | 11% | 11% | 23% |
| Room Air Conditioning | 13% | 64% | 64% | 29% |
| **Other Appliances** | | | | |
| Electric Water Heater | 63% | 78% | 78% | 91% |
| Refrigerator | 152% | 99% | 99% | 132% |
| Freezer | 104% | 26% | 26% | 96% |
| Clothes Washer | 99% | 75% | 75% | 96% |
| Electric Clothes Dryer | 93% | 74% | 74% | 93% |
| Dishwasher | 97% | 78% | 78% | 83% |
| Electric Oven | 72% | 97% | 97% | 89% |
| Desktop | 49% | 37% | 37% | 56% |
| Laptop | 53% | 33% | 33% | 38% |
| Monitor | 79% | 43% | 43% | 69% |

Table 6: Residential New Home Characteristics

| | Single Family | Low Rise Multifamily | High Rise Multifamily | Manufactured |
|---|---|---|---|---|
| Share of Homes | 71% | 2% | 15% | 12% |
| **HVAC Equipment** | | | | |
| Electric Forced Air Furnace | 15% | 13% | 13% | 49% |
| Air Source Heat Pump | 23% | 0% | 0% | 22% |
| Ductless Heat Pump | 6% | 6% | 6% | 0% |
| Electric Zonal/Baseboard | 9% | 51% | 51% | 3% |
| Central Air Conditioning | 36% | 11% | 11% | 23% |
| Room Air Conditioning | 13% | 64% | 64% | 29% |
| **Other Appliances** | | | | |
| Electric Water Heater | 63% | 78% | 78% | 91% |
| Refrigerator | 152% | 99% | 99% | 132% |
| Freezer | 104% | 26% | 26% | 96% |
| Clothes Washer | 99% | 75% | 75% | 96% |
| Electric Clothes Dryer | 93% | 74% | 74% | 93% |
| Dishwasher | 97% | 78% | 78% | 83% |
| Electric Oven | 72% | 97% | 97% | 89% |
| Desktop | 49% | 37% | 37% | 56% |
| Laptop | 53% | 33% | 33% | 38% |
| Monitor | 79% | 43% | 43% | 69% |

Where data from Inland Power's survey was not available, data from NEEA's RBSA was used. In the tables above, numbers greater than 100% imply an average of more than one appliance per home. For example, the single-family refrigerator saturation of 152% means that single family homes average approximately 1.5 refrigerators per home.

## Commercial

In the commercial sector, building floor area is the primary variable in determining the number of conservation opportunities, as many of the commercial measures are quantified based on the applicable amount of floor area. To determine the commercial floor area in Inland Power's service territory, Lighthouse used a summary of sales by building type provided by Inland Power and converted these loads to estimates of floor area using energy use intensities from the 2019 CBSA. The amount of commercial floor area has increased significantly for this CPA, largely as a result of new warehouse loads.

Table 7 summarizes the resulting floor area estimates for each of the 18 commercial building segments.

**Table 7: Commercial Floor Area by Segment**

| Building Type | 2023 Floor Area (square feet) |
|---|---:|
| Large Office | 655,005 |
| Medium Office | 253,459 |
| Small Office | 232,464 |
| Extra Large Retail | 569,289 |
| Large Retail | 44,792 |
| Medium Retail | 302,003 |
| Small Retail | 165,575 |
| School (K-12) | 3,278,200 |
| University | 38,798 |
| Warehouse | 11,219,599 |
| Supermarket | 104,945 |
| Mini Mart | 19,216 |
| Restaurant | 65,184 |
| Lodging | 609,813 |
| Hospital | 0 |
| Residential Care | 13,631 |
| Assembly | 790,834 |
| Other Commercial | 545,198 |
| **Total** | 18,908,004 |

The commercial floor area was assigned a growth rate of 2.3% based on growth in historical commercial and industrial sales reported to the U.S. EIA by Inland Power. Sales from both sectors were used since loads seem to shift between these sectors over time.

## 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 the assumed savings, expressed as a percentage, to the applicable end use consumption within each industrial segment.

To quantify the industrial segment loads, Inland Power provided energy consumption for its industrial customers categorized by industry. The resulting industrial consumption totals 45,414 MWh, as summarized in Table 8. This represents a slight decrease over the 2021 CPA. Indoor agriculture facilities comprise the largest share of Inland Power's industrial sector.

Lighthouse applied the same growth rate that was developed for the commercial sector to the industrial sector.

Table 8: Industrial Sector Sales by Segment

| Segment | 2023 Sales (MWh) |
|---|---|
| Water Supply | 4,148 |
| Sewage Treatment | 3,159 |
| Other Food | 403 |
| Chemical Manufacturing | 45 |
| Cement/Concrete Products | 3,975 |
| Fabricated Metal Manufacturing | 6,704 |
| Transportation Equipment | 169 |
| Misc. Manufacturing | 1,915 |
| Refrigerated Warehouse | 1,482 |
| Fruit Storage | 4,673 |
| Indoor Agriculture | 18,741 |
| **Total** | 45,414 |

## Utility Distribution System

The 2021 Power Plan used a new approach to quantify the potential energy savings in measures that improve the efficiency of utility distribution systems. The Council's new approach estimates the savings and cost of distribution system measures based on the sales within each sector and an estimate of the number of distribution substations and feeders for each utility. Table 9 summarizes the assumptions used for this sector.

Table 9: Utility Distribution System Efficiency Assumptions

| Characteristic | Count |
|---|---|
| Distribution Substations | 17 |
| Residential/Commercial Substations | 15 |
| Urban Feeders | 22 |
| Rural Feeders | 12 |
| 2018 Residential Sales (MWh) | 656,947 |
| 2018 Commercial Sales (MWh) | 167,846 |
| 2018 Industrial/Other Sales (MWh) | 90,710 |

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

## Agricultural

Lighthouse characterized the agricultural sector using data from the U.S. Department of Agriculture's Census of Agriculture, which is conducted every five years. This assessment used data from the 2017 Census of Agriculture, published in 2019 and is the most recent survey available.[5]

[5] United States Department of Agriculture. (2019). 2017 Census of Agriculture. Retrieved from: http://www.agcensus.usda.gov/Publications/2017/

In addition, Council staff characterized several additional measures for the 2021 Power Plan, resulting in a wider array of agricultural inputs. The primary inputs for this sector are summarized in Table 10 below.

Table 10: Agricultural Sector Inputs

| Characteristic | Count | 2017 Census Data Point |
|---|---|---|
| Number of Farms | 1,517 | Total number of farms |
| Irrigated Acres | 20,634 | Acres of irrigated land |
| Dairy Production | 0% | Share of statewide dairy production |

# Results

This section discusses the results of the 2023 CPA. It begins with a discussion of the high-level achievable and cost-effective conservation potential and then covers the cost-effective potential within individual sectors and end uses.

## Achievable Conservation Potential

The achievable 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 by efficiency programs, but not the cost.

Figure 12 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 make the costs comparable between measures with different lifetimes as well as supply-side resources considered in utility resource planning. The costs include credits for deferred transmission and distribution system costs, avoided periodic replacements, and non-energy impacts. With these credits, some of the lowest-cost measures have a net levelized cost that is negative, meaning the credits exceed the measure costs.

Figure 12: 20-Year Supply Curve

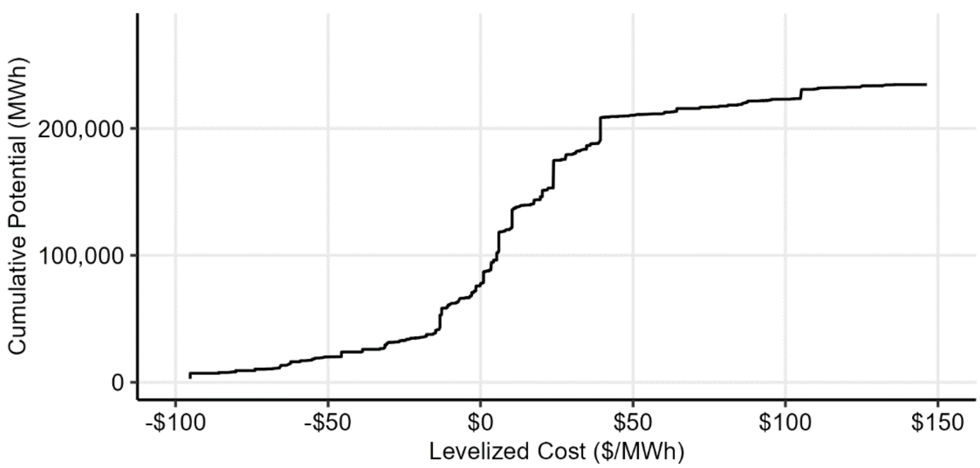



Figure 12 shows that approximately 80,000 MWh of potential are available at a cost at or below $0/MWh. These are measures where benefits such as the deferral of capacity costs and non-energy benefits exceed the measure costs. Just over 200,000 MWh of achievable potential are available at costs below $50/MWh. A total of more than 277,000 MWh is available in Inland Power's service territory over the 20-year period, but only potential below $150/MWh is shown in the supply curve. After approximately $40/MWh, any increases in potential come at increasingly higher costs.

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. An alternative to the supply curve based on levelized cost is one based on the benefit-cost ratio. This is shown below in Figure 13.

Figure 13: 20-Year Benefit-Cost Ratio Supply Curve

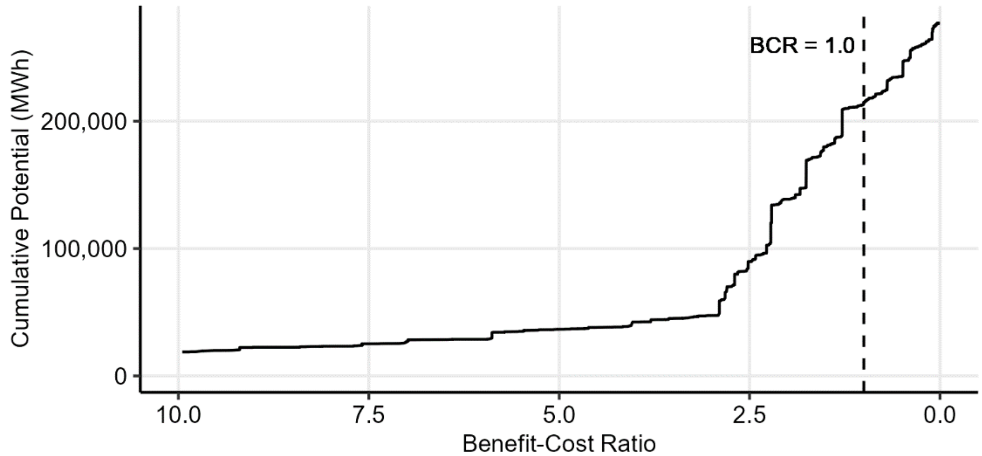


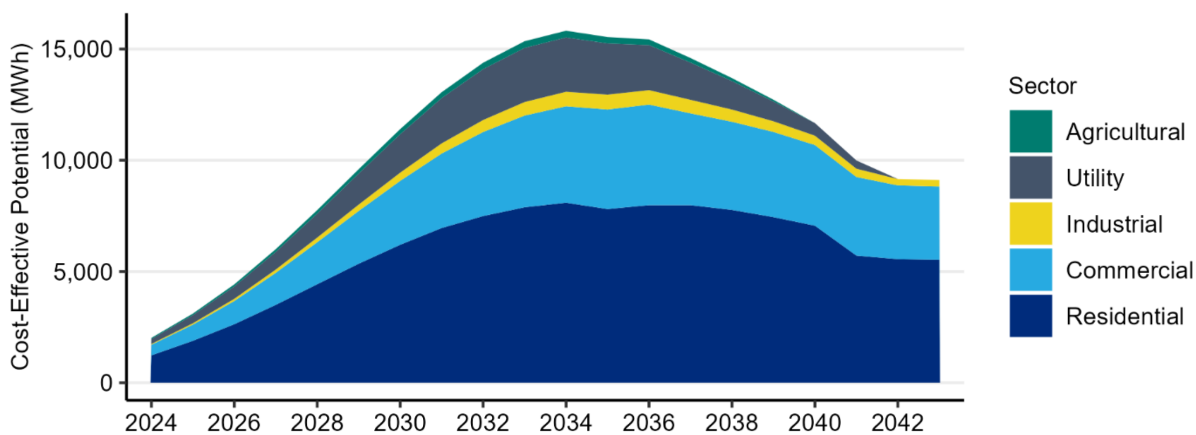

Figure 13 includes a dashed line where the benefit-cost ratio is equal to one. There are nearly 215,000 MWh of cost-effective savings potential to the left of this line, with benefit-cost ratios greater than one. This is the 20-year cost-effective potential identified earlier in this report. There are several steep steps and a slightly steeper slope to the left of the dashed line, indicating larger changes if the avoided costs were to decrease, which would effectively shift the dashed line to the left.

The economic or cost-effective potential is described further below.

## Cost-Effective Conservation Potential

Figure 14 shows the cost-effective potential by sector on an annual basis. Most of the potential is in Inland Power's residential and commercial sectors, with less available in the industrial, utility, and agricultural sectors.

Figure 14: Annual Cost-Effective Potential by Sector




Lighthouse used the ramp rates from the 2021 Power Plan to establish reasonable rates of annual savings acquisition for all sectors. This included making modifications to the assigned ramp rates for some 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.

### Sector Summary

The sections below describe the cost-effective potential within each sector.

#### *Residential*

Relative to the 2021 CPA, the cost-effective potential in the residential sector has increased in the near term but decreased slightly in the long term. Recent program achievements and updated forecasts for NEEA's market transformation savings have resulted in higher potential in the near term, while Inland's program achievements have also reduced the overall potential.

Figure 15 shows the cost-effective potential by end use for the first 10 years of the study period. Measures in the HVAC (which includes both equipment and weatherization) and water heating end uses make up the largest share of potential in the sector in the near term.

The potential for these end uses grows during the initial 10 years of the study as the expected market share of heat pump water heaters and adoption of HVAC measures increases. Potential in the appliances (including clothes washers, dryers, refrigerators, and freezers), lighting, and electronics end uses have smaller amounts of potential in the initial 10 years.

In Figure 15, the other end use category includes measures in the cooking and whole home end uses. The cost-effective potential in these categories is very small in the initial 10 years of the study period.

**Figure 15: Annual Residential Potential by End Use**

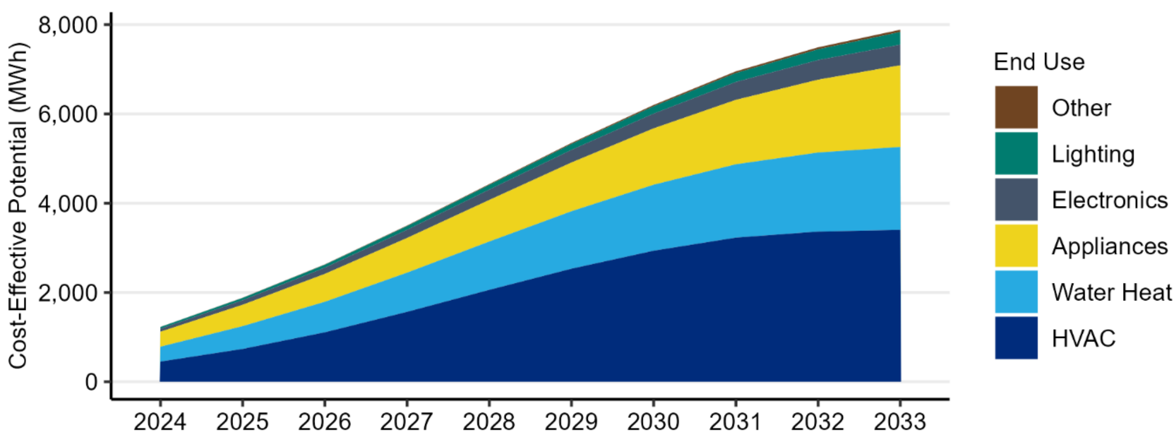
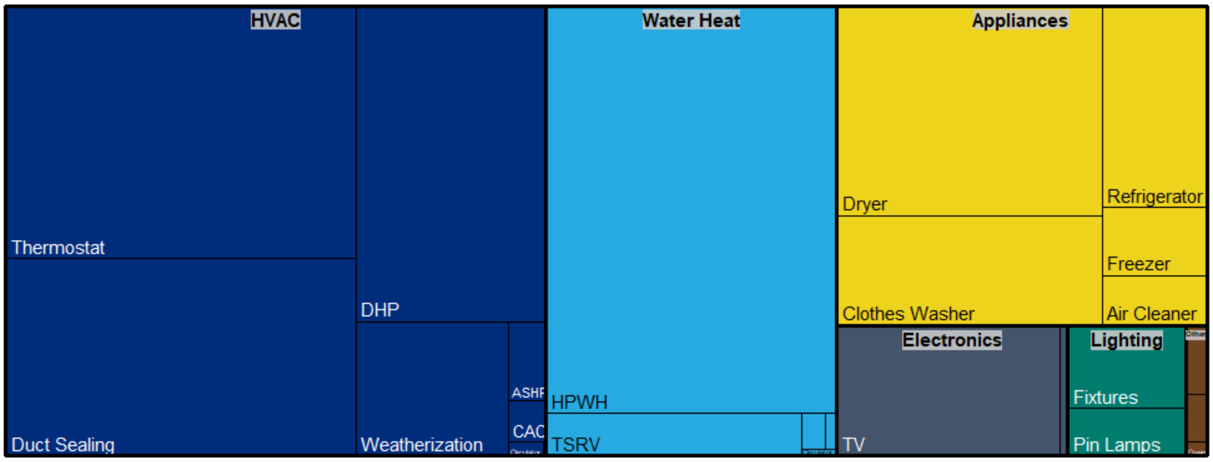



Figure 16 shows how the 10-year potential breaks down into end uses and measure categories. The area of each block represents the share of the total 10-year residential potential. Smart thermostats, ductless heat pumps (DHP), duct sealing, and weatherization make up most of the potential in the HVAC end use, while heat pump water heaters (HPWH) and thermostatic restriction valves (TSRV) are the key measures within the water heating end use. With the increases in avoided costs, heat pump dryers are now cost effective, adding to the potential in the appliance end use.

Figure 16: Residential Potential by End Use and Measure Category

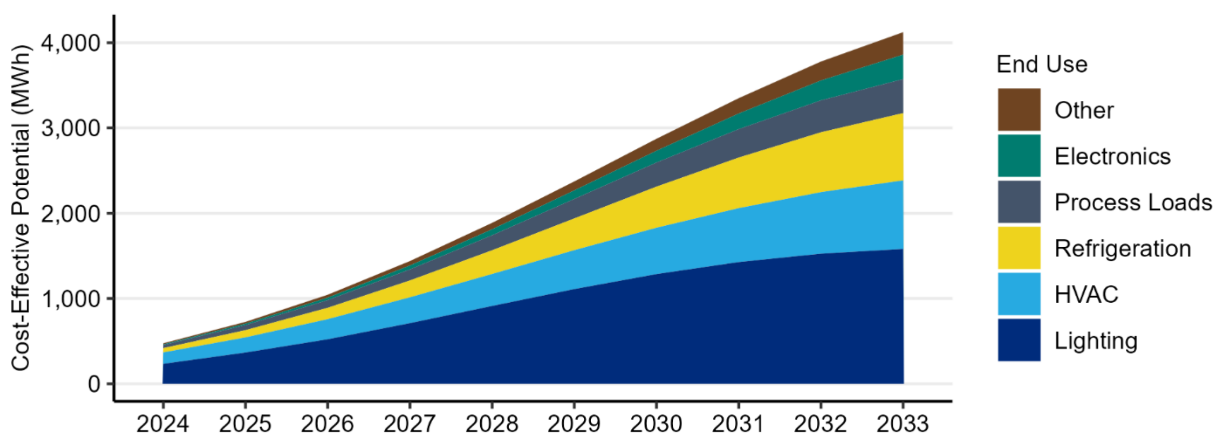



Note that some residential measures, such as smart thermostats and heat pump water heaters, can provide benefits as both energy efficiency and demand response resources. Any demand response benefits were not included in this CPA, although energy efficiency programs can help build a stock of equipment that could be called upon by demand response programs.

### *Commercial*

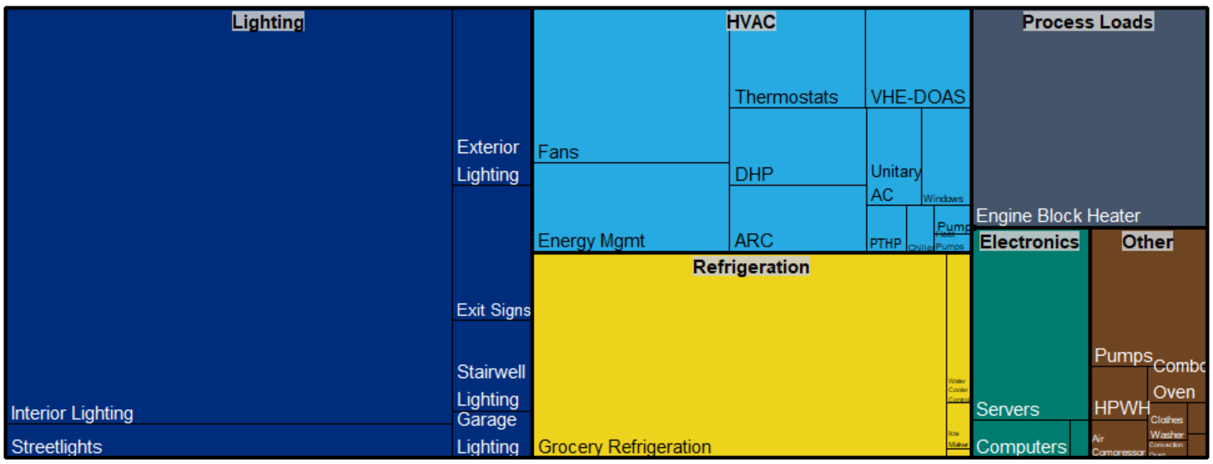
In the commercial sector, lighting, HVAC, and refrigeration measures are the end uses with the highest potential. While the potential in each end use grows through the initial ten years, the lighting potential begins to flatten in the later years, suggesting future declines in the available commercial lighting potential. In Figure 17, the other category includes measures in the compressed air, food preparation, motors, and water heating end uses.

Figure 17: Annual Commercial Potential by End Use




Key end uses and measure categories within the commercial sector are shown in Figure 18. The area of each block is proportional to its share of the 10-year commercial potential. The lighting end use includes measures applicable to both interior and exterior lighting, although most of the potential is associated with interior lighting measures. Process loads include engine block heaters, while the electronics category includes efficient computers and equipment for embedded data centers. The potential in the HVAC end use is more evenly distributed across a range of equipment types. The commercial sector includes a variety of building types and sizes with different HVAC equipment. This is apparent in the range of HVAC measure categories included in Figure 18.

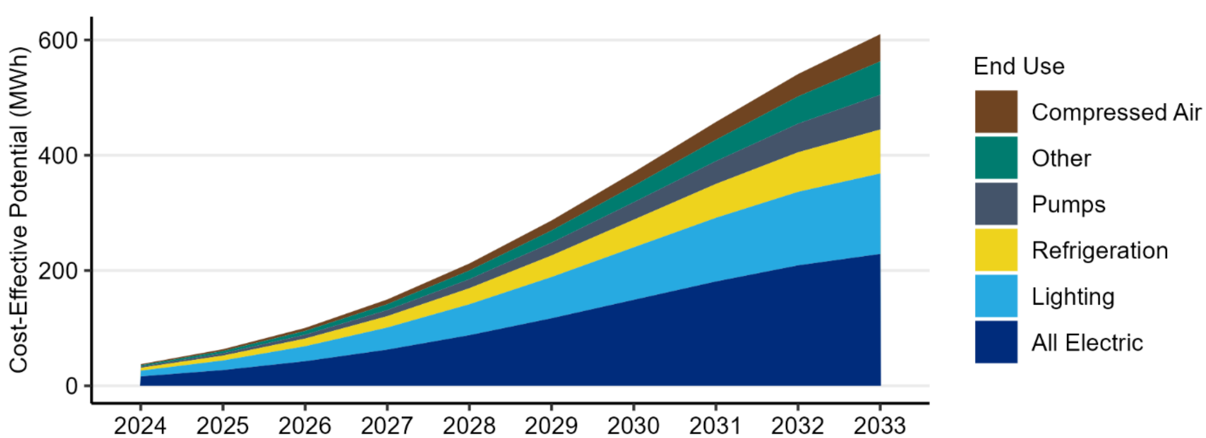
Figure 18: Commercial Potential by End Use and Measure Category




## *Industrial*

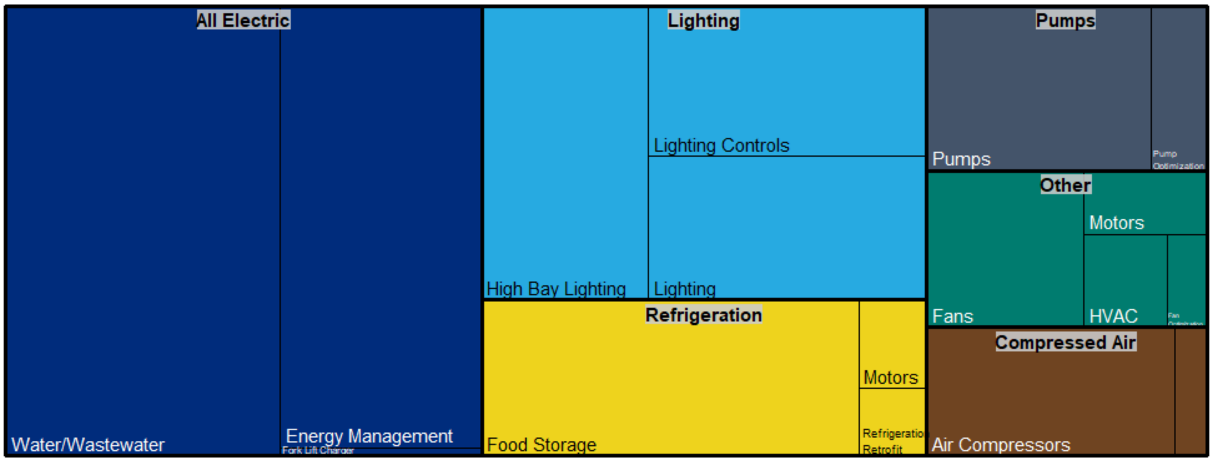
The annual industrial sector potential is shown in Figure 19, the majority of which is in the all electric and lighting end uses. The all electric end use category includes measures applicable to all end uses, such as strategic energy management programs and measures targeted toward water and wastewater treatment facilities. The other category in Figure 19 includes a variety of end uses, including fans, material handling, material processing, and several other small end uses. Note the change in scale in the vertical axis here relative to the other sectors.

Figure 19: Annual Industrial Potential by End Use




The breakdown of 10-year industrial potential into end uses and measure categories is shown in Figure 20.

Figure 20: Industrial Potential by End Use and Measure Category

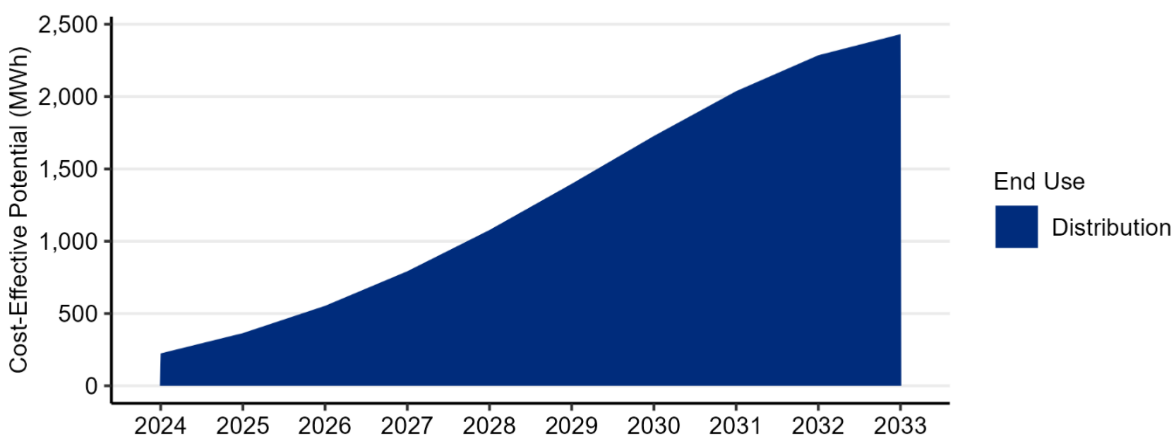



## *Utility Distribution Efficiency*

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 for the 2021 Power Plan, which are based on Inland Power's loads as well as estimates of the number of distribution substations and feeders in the system.

The annual distribution system potential is shown in Figure 21. The Council characterized three measures in the 2021 Power Plan, which use increasingly sophisticated control systems.

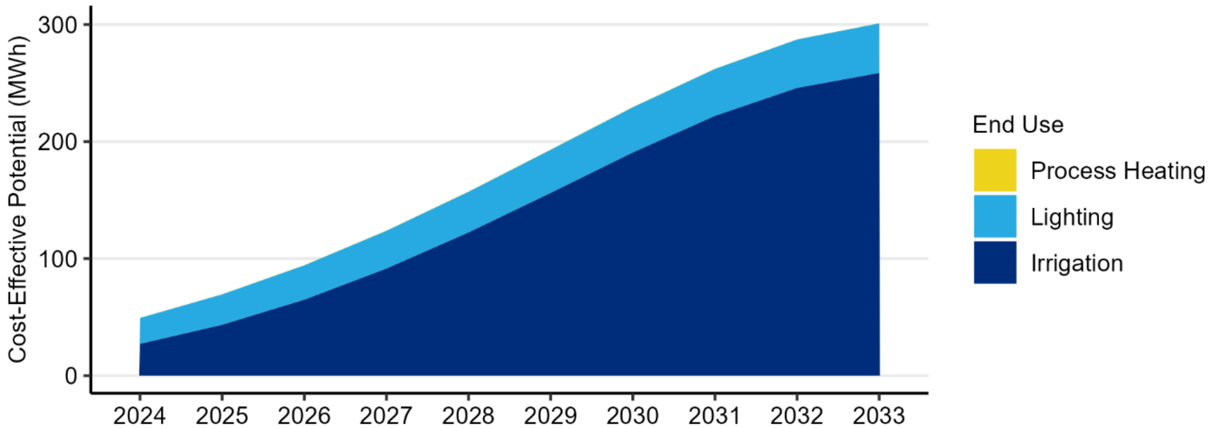
Figure 21: Annual Utility Distribution System Potential




## *Agricultural*

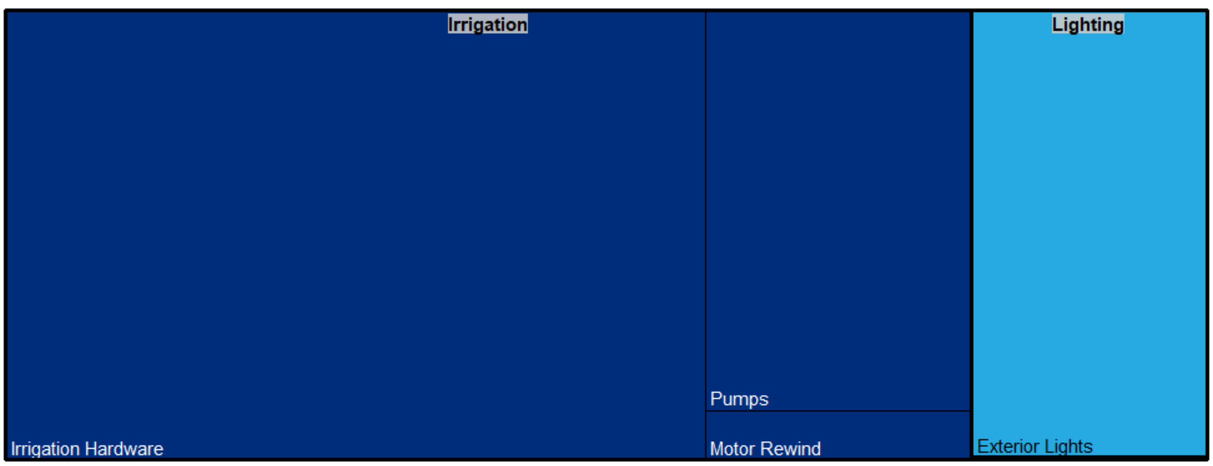
The potential in the agricultural sector is driven by the irrigated acreage, number of pumps, annual dairy production, and number of farms in Inland Power's service territory. This CPA used the agricultural measure characterizations developed for the 2021 Power Plan and new agricultural data available from the 2017 U.S. Census of Agriculture. Figure 22 shows the distribution of agricultural potential by end use, most of which is related to irrigation systems and lighting, while an imperceptible amount of potential is associated with process heating.

Figure 22: Annual Agricultural Potential by End Use




The key end uses and measures in the agricultural sector are shown **Error! Reference source not found.** in b elow. Irrigation hardware, pumps, and motor rewinds are the key measures in the irrigation end use while exterior lights is the primary measure in the lighting end use.

Figure 23: Agricultural Potential by End Use and Measure Category



## Scenario Results

This section discusses the results of two additional scenarios that were considered in addition to the base case scenario covered in the previous section. These scenarios feature low and high variations in the avoided costs values, covering a range of possible outcomes to reflect uncertainty in future values. These scenarios allow Inland Power to understand the sensitivity of the cost-effective potential to variations in avoided cost. All other inputs were held constant.

Table 11 summarizes the avoided cost assumptions used in each scenario, which are discussed further in Appendix IV.

Table 11: Avoided Cost Assumptions by Scenario

| | | Low Scenario | Base Scenario | High Scenario |
|---|---|---|---|---|
| Energy Values | Avoided Energy Costs (20-Year Levelized Price, 2016$) | Market Forecast minus 20%-80% ($28) | Market Forecast ($52) | Market Forecast plus 20%-80% ($76) |
| | 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 | $3.54/kW-year |
| | Generation Capacity (2016$) | $64/kW-year | $76/kW-year | $123/kW-year |
| | Implied Risk Adder (2016$) | -$24/MWh<br>-$10/kW-year | N/A | $24/MWh<br>$47/kW-year |
| | NW Power Act Credit | 10% | 10% | 10% |

Instead of using a single risk adder applied to each unit of energy, the two alternate scenarios consider potential futures with higher and lower values for the avoided cost inputs where some degree of uncertainty exists, including variations in the value of both energy and capacity. The implied risk adder is calculated for the low and high scenarios by totaling the differences in both energy and capacity-based values relative to the base scenario. Further discussion of these values is provided in Appendix IV.

Table 12 summarizes the cost-effective potential across each avoided cost scenario. The differences between the low and high scenarios, relative to the base case, are roughly equal over the early years of the study period. In the long term, however, there is higher sensitivity in the lower avoided cost changes. This is likely a consequence of the fact that most of the measures considered in this study are already cost effective in the base scenario, so there is comparatively little additional potential above the base avoided costs and the remaining measures that are not already cost effective are some of the most expensive measures evaluated.

Table 12: Cost Effective Potential (MWh) by Avoided Cost Scenario

| Scenario | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| Low Scenario | 4,799 | 14,571 | 80,721 | 186,771 |
| Base Case | 5,122 | 15,548 | 87,110 | 214,858 |
| High Scenario | 5,569 | 16,647 | 90,847 | 223,373 |

Overall, energy efficiency remains a low-risk resource for Inland Power since it is purchased in small increments over time, making it unlikely that the significant amounts of the resource be acquired that were over-valued.

# Summary

This report has summarized the results of the 2023 CPA conducted for Inland Power. The assessment provided estimates of the cost-effective energy savings potential for the 20-year period beginning in 2024, with details on the first 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.

Compared to Inland Power's 2021 CPA, the potential has increased in both the near and long term. The increases in near-term potential are largely a consequence of higher expectations of savings from Inland Power's programs in the residential sector, as well as market transformation savings from NEEA. Increases in the residential sector offset declines in other sectors.

In the longer term, this assessment found higher amounts of cost-effective potential. This additional potential is due to increases in avoided costs, which increased the number of measures that are cost effective. This change was partially offset by Inland Power's recent achievements, particularly in areas where additional funding was able to drive exceptional short-term results.

## 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 for 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. Lighthouse used utility-specific inputs covering customer characteristics, previous conservation achievements, and other economic assumptions. The assessment included the measures considered in the 2021 Power Plan, with updates from the RTF since its publication.

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# Appendix I: Acronyms

| | |
|---|---|
| aMW | Average Megawatt |
| BPA | Bonneville Power Administration |
| CEIP | Clean Energy Implementation Plan |
| CETA | Clean Energy Transformation Act |
| CPA | Conservation Potential Assessment |
| EIA | Energy Independence Act |
| EUI | Energy Use Intensity |
| HPWH | Heat Pump Water Heater |
| HVAC | Heating, Ventilation, and Air Conditioning |
| IRP | Integrated Resource Plan |
| 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 |

## 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, like 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 U.S. |

# Appendix III: Compliance with State Requirements

This Appendix details the specific requirements for Conservation Potential Assessments listed in WAC 194-37-080. 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 13: CPA Compliance

| WAC 194-37-080 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 number of measures 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.<br><br>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 20-year study period.<br><br>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. | Lighthouse used 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-(scenario).xlsx" files and brought into the CPA models through Excel's Power Query.<br><br>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 programs to determine the net levelized cost, as described in this subsection. | A life-cycle cost analysis was performed using the Council's ProCost tool, which Lighthouse configured with utility-specific inputs. Costs and benefits were included consistent with the TRC test.<br><br>The measure files within each sector contain the ProCost results. These results are then rolled up |

| WAC 194-37-080 Section | Requirement | Implementation |
|---|---|---|
| | | into the ProCost Measure Results files, which are linked to each sector model file through Excel's Power Query functionality. |
| (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 economic analysis included 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, and periodic replacement costs.<br><br>Measure costs and benefits can be found in the individual measure files as well as the "ProCost Measure Results" files. |
| (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.<br><br>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. | Lighthouse 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.<br><br>The "MC and Loadshape" file contains both the market price forecast as well as the library of load shapes. Individual measure files contain the load shape 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. These assumptions are based on the 2021 Plan and/or RTF.<br><br>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 available to the utility for the life of the energy efficiency measures to which it is compared. | Lighthouse developed a 20-year forecast of on- and off-peak market prices at the mid-Columbia trading hub based on available forward prices. Further discussion of this forecast can be found in Appendix IV. |

| WAC 194-37-080 Section | Requirement | Implementation |
|---|---|---|
| | | 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.<br><br>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 Inland Power's monthly demand costs, which represent their cost of capacity. The development of these values is discussed in Appendix IV.<br><br>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.<br><br>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 scenario analysis to consider risk. Avoided cost values with uncertain future values were varied across three different scenarios and the resulting sensitivity and risk were analyzed.<br><br>The Scenario 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 draft 2021 Plan materials and RTF.<br><br>Measure assumptions can be found in the individual measure files. |
| (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. |

| WAC 194-37-080 Section | Requirement | Implementation |
|---|---|---|
| | | Program admin costs can be found in the “ProData” tab of the ProCost files, 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 Plan materials, including the sector-specific cost shares and cost of capital assumptions.<br><br>Financing assumptions can be found in the ProData tab of the ProCost 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 3.75% to determine the present value of all costs and benefits. This represents Inland Power’s long-term cost of capital.<br><br>The discount rate used in this analysis can be found in the ProCost files, 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 Northwest Power Act.<br><br>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."[6] This CPA will determine the cost-effectiveness of conservation measures through a benefit-cost ratio approach, which uses avoided costs to represent the costs avoided by acquiring efficiency instead of other resources. The EIA specifies that these avoided costs 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 specific values be used for the social cost of carbon.[7] Lighthouse has also included the value of avoided renewable portfolio standard compliance costs in the avoided costs.

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

## Avoided Energy Costs

Avoided energy costs are the energy costs avoided by Inland Power through the acquisition of energy efficiency instead of supply-side resources. For every megawatt-hour of conservation achieved, Inland Power avoids the purchase of one megawatt-hour of energy.

For this CPA, Lighthouse has developed a forecast of avoided on- and off-peak energy prices at the Mid-Columbia trading hub. The forecast is based on forward on- and off-peak prices reported by the CME Group[8,9] on April 7, 2023. These prices cover approximately a six-year period, from May 2023 to December 2028.

To develop a forecast that would cover the full 20-year study period of this CPA, Lighthouse developed a set of multipliers that would transition the prices in 2028 to the mid-range of longer-term prices expected in the Northwest Power & Conservation Council's most recent market price forecast.[10] Lighthouse

[6] WAC 194-37-070. Accessed January 20, 2021. https://app.leg.wa.gov/wac/default.aspx?cite=194-37-070

[7] WAC 194-40-100. Accessed March 7, 2023. https://app.leg.wa.gov/WAC/default.aspx?cite=194-40-100

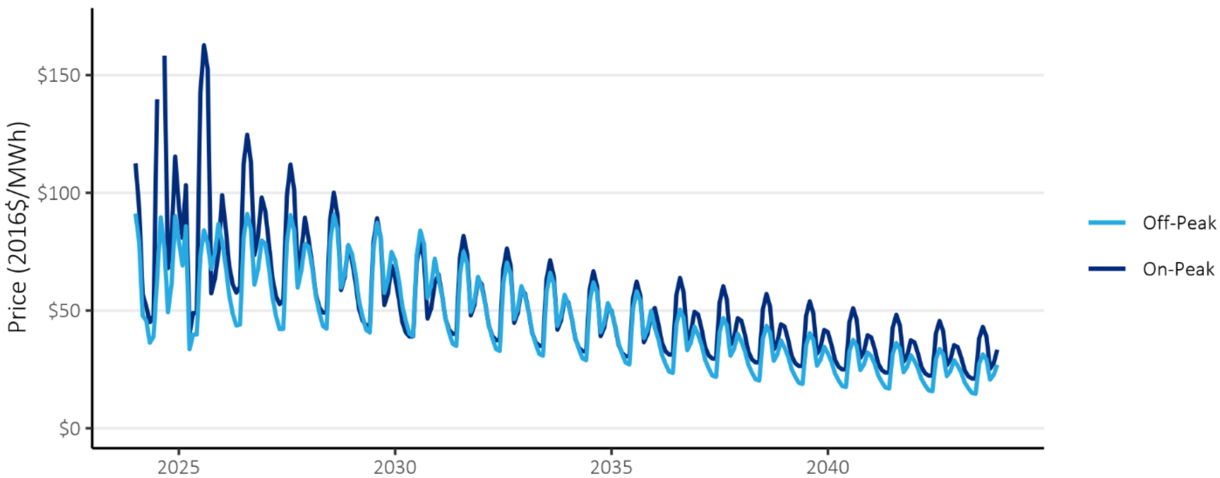
[8] https://www.cmegroup.com/trading/energy/electricity/mid-columbia-day-ahead-peak-calendar-month-5-mw-futures.html. Accessed April 7, 2023.

[9] https://www.cmegroup.com/trading/energy/electricity/mid-columbia-day-ahead-off-peak-calendar-month-5-mw-futures.html. Accessed April 7, 2023.

[10] https://www.nwcouncil.org/fs/18190/2023_02_p3.pdf. Accessed March 3, 2023.

identified this approach as a good balance that reflected both the near-term high prices and volatility while also including the longer-term forecast based on market fundamentals from the Council. Figure 24 shows the resulting on- and off-peak prices resulting from this process.

Figure 24: On- and Off-Peak Price Forecast




The levelized value of the 20-year price forecast is $52/MWh (2016$). This is nearly a 50% increase over the forecast used for Inland Power's 2021 CPA, which had a levelized value of $35/MWh (2016$).

Lighthouse also created high and low variations of this forecast to be used in the avoided cost scenarios, which are described more subsequently. To develop the forecast, Lighthouse 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. A similar approach was used in the Inland Power's 2021 CPA based on the variation observed in price forecasts in the 2021 Power Plan. Lighthouse applied this variation to the forecast described above to create high and low scenario forecasts. The resulting forecasts for on- and off-peak prices are shown in Figure 25 and

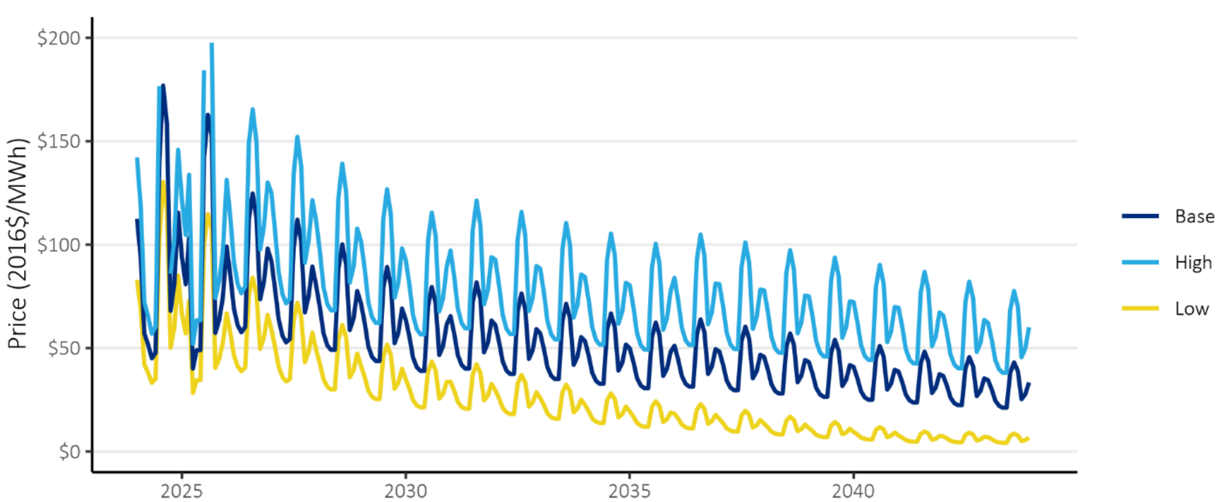


Figure 26 below.

Figure 25: Comparison of On-Peak Price Scenarios

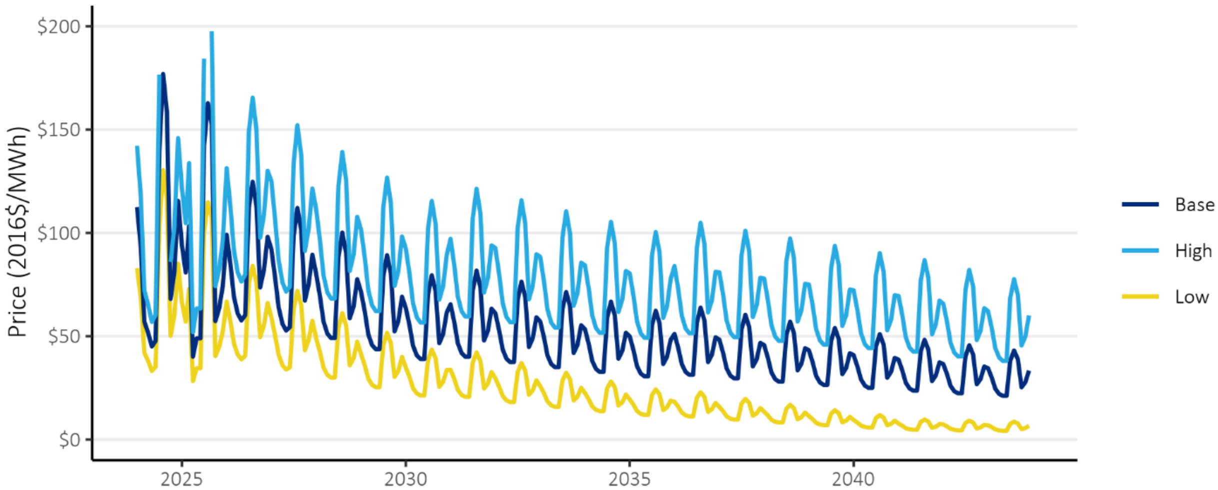
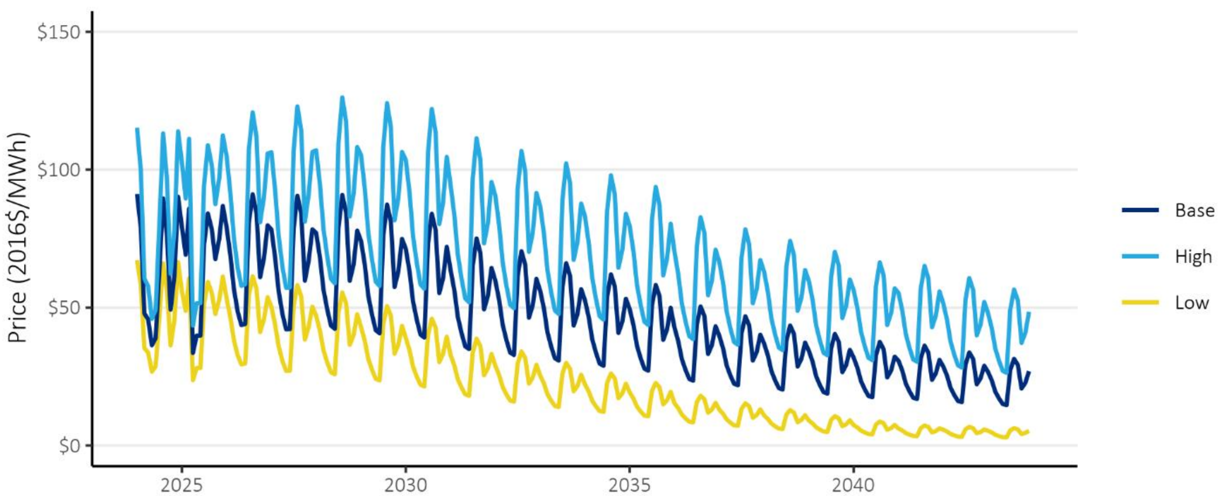



Figure 26: Comparison of Off-Peak Price Scenarios




## Deferred Transmission and Distribution Capacity Costs

Unlike supply-side resources, energy efficiency does not require transmission and distribution infrastructure. Instead, it frees up capacity in these systems by reducing the peak demands and over time can help defer 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 uses the values developed by the Council through that process: $3.54 and $7.82 per kW-year (in 2016 dollars) for transmission and distribution capacity, respectively. These values are slightly higher than the values used in the Inland Power's 2021 CPA and reflect small updates to the Council's values as they finalized the 2021 Power Plan.

The values for deferred transmission and distribution capacity are applied to demand savings coincident with the timing of the respective transmission and distribution system peaks. These values were used in all scenarios of the 2023 CPA.

## Deferred Generation Capacity Costs

Similar to the transmission and distribution systems discussed above, acquiring energy efficiency resources can also help defer or eliminate the costs of new generation resources built or acquired to meet peak demands for electricity. While there is currently no organized capacity market in the Northwest, Inland Power does pay a demand charge to BPA based on its monthly peak demand. These charges effectively function as a generation capacity value for Inland Power.

Lighthouse followed a similar methodology as what was used in Inland Power's previous CPAs to convert the monthly BPA demand charges to an annual generation capacity value. Using assumptions about energy efficiency capacity contributions by month, BPA's proposed 2024-25 monthly demand charges were scaled and added to calculate an annual value.

In the base case, Lighthouse assumed that these demand charges would increase by 2% each year and calculated a 20-year levelized value of This resulted in a base case value of $76/kW-year, a decrease from the $86/kW-year used in the 2021 CPA.

For the low case, little price escalation was assumed, resulting in a value of $64/kW-year. In the high scenario, Lighthouse used Council's 2021 Power Plan value, which is $123/kW-year. 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, energy efficiency measures 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 damages from increased flood risk, and changes in energy system costs, including increases in the costs of cooling and decreases in heating costs.[11] 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. These values were used in all scenarios of the CPA.

To implement a cost of carbon emissions, additional assumptions must be made about the intensity of carbon emissions for every unit of energy generated. This assessment uses an updated forecast of marginal emissions rates developed by the Council in 2022. The values from this analysis are used for years before 2030. Beginning in 2030, the marginal emissions rate is set to zero to reflect that CETA requires carbon-neutral energy. The Council's updated values generally follow those used in the 2021 Power Plan and the Inland Power's 2021 CPA, but are now available on a more granular basis, reflecting variations by month and on- and off-peak periods.

[11] https://www.epa.gov/sites/production/files/2016-12/documents/social_cost_of_carbon_fact_sheet.pdf. Accessed January 21, 2021.

## Renewable Portfolio Standard Compliance Costs

The renewable portfolio standard established under Washington's EIA requires that utilities source 15% of retail sales from renewable resources throughout the study period of this CPA. 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) through 2044.

Energy efficiency can reduce the cost of complying with these requirements by reducing Inland Power's overall load. In 2024, a reduction in load of 100 MWh through energy efficiency would reduce the number of RECs required for compliance by 15. This equates to a value of 15% of the cost of a REC for every megawatt-hour of energy savings. 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.

Lighthouse developed a forecast of REC prices based on input from several 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 Inland Power's 2017 and 2019 CPAs and is similar to the process followed by the Council. A scenario analysis is used to account for uncertainty, where present, in avoided cost values. The variation in energy and capacity avoided cost inputs covers a range of possible outcomes and the sensitivity of the cost-effective energy efficiency potential is identified by comparing the outcomes of each scenario. In selecting its biennial target based on this range of outcomes, Inland Power 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 14 summarizes the avoided cost assumptions used in each of the scenarios in this CPA.

**Table 14: Avoided Cost Assumptions by Scenario**

| | | Low Scenario | Base Scenario | High Scenario |
|---|---|---|---|---|
| Energy Values | **Avoided Energy Costs (20-Year Levelized Price, 2016$)** | Market Forecast minus 20%-80% ($28) | Market Forecast ($52) | Market Forecast plus 20%-80% ($76) |
| | **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 | $3.54/kW-year |
| | **Generation Capacity (2016$)** | $64/kW-year | $76/kW-year | $123/kW-year |
| | **Implied Risk Adder (2016$)** | -$24/MWh<br>-$10/kW-year | N/A | $24/MWh<br>$47/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 Inland Power. Lighthouse customized these measures to make them specific to Inland Power's service territory and updated many with new information available from the RTF. 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 15: 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 |
| | Refrigerator | 2021 Power Plan |
| 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 |
| | Central Air Conditioner | 2021 Power Plan |
| | 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 16: 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 |
| | 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 |
| | Energy Management | 2021 Power Plan |
| | Fans | 2021 Power Plan |
| | Heat Pumps | 2021 Power Plan |
| | Package Terminal Heat Pumps | 2021 Power Plan |
| | 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 |
| 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 17: 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 18: 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 19: Agricultural End Uses and Measures

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

# Appendix VI: Energy Efficiency Potential by End Use

Table 20: Residential Potential by End Use (MWh)

| End Use | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| Appliances | 814 | 2,216 | 10,406 | 34,746 |
| Cooking | 3 | 11 | 111 | 595 |
| Electronics | 171 | 494 | 2,647 | 3,732 |
| EV Supply Equipment | - | - | - | - |
| HVAC | 1,187 | 3,860 | 21,380 | 47,597 |
| Lighting | 88 | 236 | 1,358 | 5,495 |
| Motors | - | - | - | - |
| Water Heat | 843 | 2,405 | 11,527 | 26,114 |
| Whole Home | 6 | 19 | 124 | 205 |
| **Total** | **3,112** | **9,241** | **47,552** | **118,483** |

Table 21: Commercial Potential by End Use (MWh)

| End Use | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| Compressed Air | 2 | 8 | 91 | 440 |
| Electronics | 26 | 102 | 1,114 | 2,554 |
| Food Preparation | 3 | 14 | 158 | 847 |
| HVAC | 311 | 850 | 4,383 | 14,369 |
| Lighting | 601 | 1,834 | 9,677 | 25,280 |
| Motors/Drives | 22 | 77 | 646 | 2,186 |
| Process Loads | 96 | 316 | 2,110 | 4,004 |
| Refrigeration | 135 | 466 | 3,682 | 10,304 |
| Water Heating | 5 | 18 | 207 | 1,113 |
| **Total** | **1,201** | **3,685** | **22,070** | **61,097** |

Table 22: Industrial Potential by End Use (MWh)

| End Use | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| All Electric | 44 | 149 | 1,122 | 2,318 |
| Compressed Air | 5 | 18 | 189 | 933 |
| Fans and Blowers | 4 | 14 | 148 | 785 |
| HVAC | 2 | 5 | 40 | 83 |
| Lighting | 27 | 91 | 685 | 1,414 |
| Low Temp Refrigeration | 1 | 2 | 19 | 62 |
| Material Handling | 0 | 1 | 11 | 73 |
| Material Processing | 0 | 2 | 22 | 139 |
| Med Temp Refrigeration | 13 | 44 | 344 | 825 |
| Melting and Casting | - | - | - | - |
| Other | - | - | - | - |
| Other Motors | 0 | 1 | 8 | 48 |
| Pollution Control | 0 | 0 | 1 | 4 |
| Pumps | 6 | 23 | 241 | 1,128 |
| **Total** | **101** | **351** | **2,829** | **7,813** |

Table 23: Utility Distribution System Potential by End Use (MWh)

| End Use | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| LDC with no VVO | 71 | 233 | 1,551 | 2,940 |
| LDC with VVO & AMI | 518 | 1,701 | 11,340 | 21,493 |
| **Total** | **588** | **1,934** | **12,891** | **24,433** |

Table 24: Agricultural Potential by End Use (MWh)

| End Use | 2-Year | 4-Year | 10-Year | 20-Year |
|---|---|---|---|---|
| Irrigation | 71 | 227 | 1,422 | 2,526 |
| Lighting | 48 | 110 | 344 | 504 |
| Process Heating | 0 | 1 | 2 | 2 |
| Refrigeration | - | - | - | - |
| Ventilation | - | - | - | - |
| **Total** | **119** | **337** | **1,768** | **3,032** |

# Appendix VII: Ramp Rate Alignment Documentation

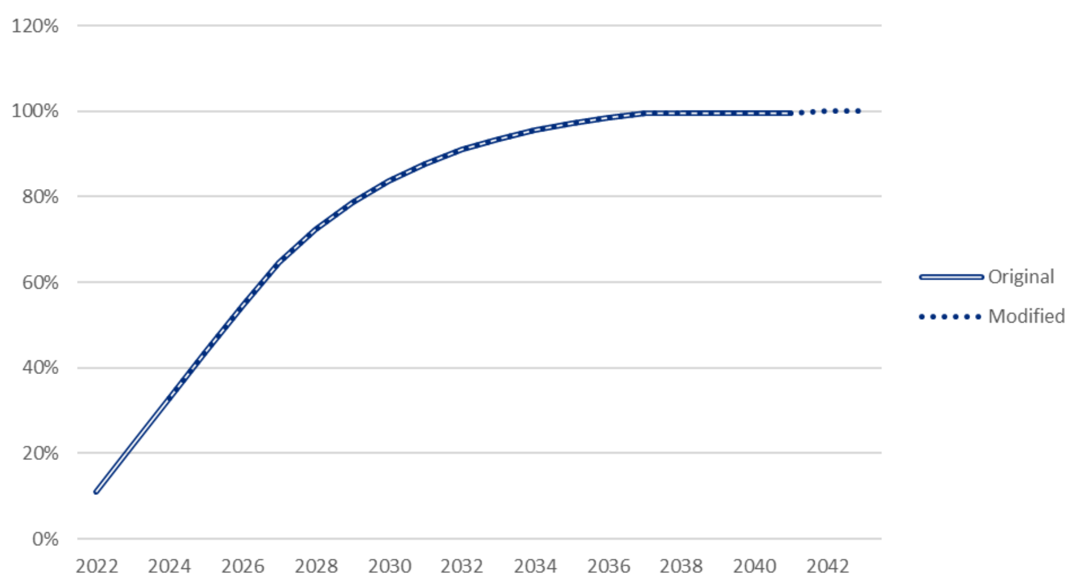
This appendix documents how Lighthouse adjusted the ramp rates from the 2021 Power Plan to be applicable to the 2024-43 time period of this CPA and then selected appropriate adjusted ramp rates to align the near-term potential quantified in Inland Power & Light's (Inland Power) 2023 CPA with its recent energy efficiency achievements. Aligning the potential with recent achievements provides the best way to ensure that the near-term potential is feasible for Inland Power's programs as energy efficiency programs take time to ramp up and are subject to local and dynamic market conditions.

## Ramp Rate Adjustments

The CPA model used for this assessment uses the ramp rates developed by the Northwest Power and Conservation Council for the 2021 Power Plan. The 2021 Power Plan, however, covers an earlier time period and so the ramp rates require adjustment to correspond to the 2024-43 time period of this CPA.

There are two different types of ramp rates, which correspond with the two types of measure under consideration. For lost opportunity measures that are associated with equipment replacement cycles or new construction, the ramp rate values reflect the amount of energy efficiency potential captured among the equipment being purchased in a given year. These ramp rates typically approach 100% in the later years and were adjusted to cover the timeline of the CPA by simply extending the final value of the ramp rate an additional two years. Figure 27 shows how one lost opportunity ramp rate was modified to cover the 2024-43 timeline of this CPA. The original ramp rate reaches 100% at approximately 2037 and the modified ramp rate simply extends this trend for another two years.

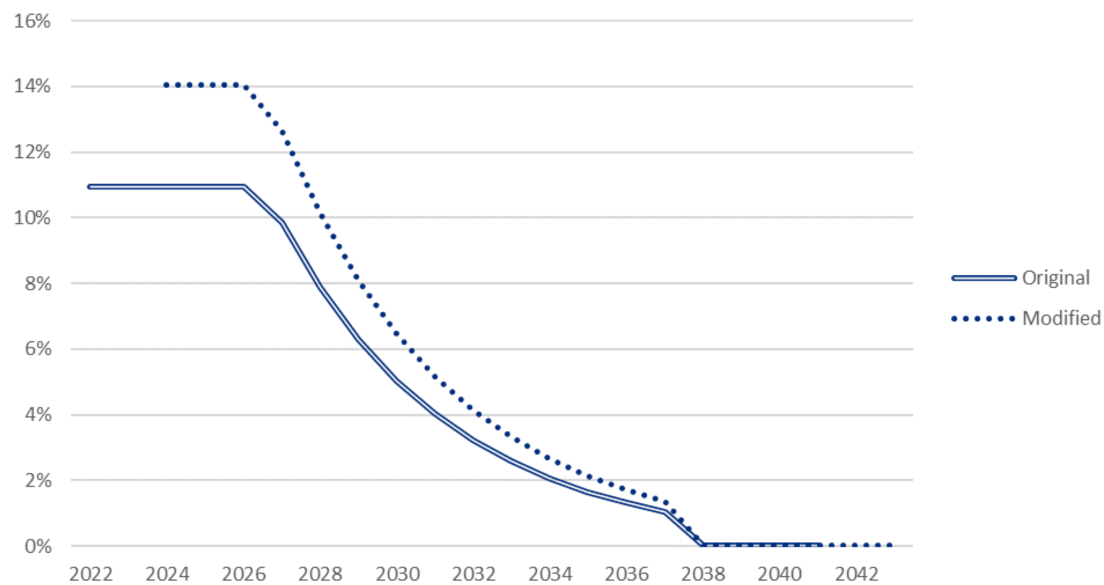
Figure 27: Lost Opportunity Ramp Rate Adjustment




For retrofit measures, the ramp rate values reflect the portion of the total available potential that is achieved in a given year. Because retrofit measures can be achieved in any year, the ramp rate values typically sum to 100% over a 20-year time period. To adjust the ramp rates for retrofit measures, Lighthouse assumed that the potential associated with the first two years of the 2021 Power Plan had been achieved and the remaining potential was distributed across the 18 remaining years of the original

2021 Power Plan timeline, in proportion to the original ramp rate projection. This results in higher ramp rate values relative to the original 2021 Power Plan, but equivalent amounts of potential after program achievements have been accounted for. Figure 28 shows the original and modified versions of one retrofit measure ramp rate.

Figure 28: Retrofit Ramp Rate Adjustment




For this ramp rate, nearly 100% of the remaining potential is captured by 2038 in both the original and modified versions of the ramp rate.

## Ramp Rate Alignment Process

Inland Power provided program achievement data for 2021-22, which Lighthouse summarized by sector and end use. Lighthouse also summarized the residential program achievements by high-level measure categories.

Inland Power also receives credit for savings from market transformation that the Northwest Energy Efficiency Alliance (NEEA) estimates has occurred in Inland Power's service territory. These savings were allocated to customer sectors based on the historical makeup of the savings but could not be allocated within end uses or measure categories. Because of this, in the tables below, NEEA's historical savings are included on a designated row, but future potential is not distinguished between NEEA and Inland Power programs. For example, Lighthouse has no way to determine the future split of savings from ductless heat pumps or heat pump water heaters between Inland Power programs and NEEA market transformation savings.

Lighthouse has a general sense of NEEA's initiatives, however, and can therefore identify the end uses or measures where NEEA's market transformation initiatives may contribute additional savings. These are noted in the discussion below.

Lighthouse compared the recent savings from Inland Power's programs and NEEA's market transformation initiatives with the cost-effective energy efficiency potential identified in the 2023 CPA. Lighthouse started with the ramp rates that were assigned to each measure in the 2021 Power Plan and compared the resulting cost-effective potential in the first few years of the assessment with Inland Power's recent programmatic achievements. Lighthouse then made changes to the ramp rate assignments for each measure to accelerate or decelerate the pace of savings acquisition to align with recent programmatic achievements. In areas where there were no recent program achievements, Lighthouse typically assigns a ramp rate that is slower than the applicable 2021 Power Plan ramp rate unless one is already assigned. This accounts for the fact that a program may need to start from scratch and build momentum over several years.

NEEA resets the baseline against which it quantifies its market transformation savings with every new Power Plan. This happened in 2022 with the publication of the 2021 Power Plan. For consistency in projecting future savings, Lighthouse assumed a similar level of NEEA savings in 2021 as in 2022. This level of savings best represents the expected level of savings going forward with the 2021 Power Plan baseline.

The following tables show how Inland Power's recent achievements compare to the potential after Lighthouse adjusted the ramp rates to align. Color scaling has been applied to highlight the larger values. Discussion follows each table with additional detail.

### *Residential*

The table below shows how residential potential was aligned with recent achievements by measure category.

Table 25: Alignment of Residential Program History and Potential by Measure Category (MWh)

| | | Program History | | CPA Cost-Effective Potential | | |
|---|---|---|---|---|---|---|
| End Use | Category | 2021 | 2022 | 2024 | 2025 | 2026 |
| Appliances | Air Cleaner | - | - | 12 | 19 | 25 |
| Appliances | Clothes Washer | 9 | 6 | 115 | 160 | 200 |
| Appliances | Dryer | 3 | 2 | 94 | 145 | 205 |
| Appliances | Freezer | - | - | 29 | 39 | 49 |
| Appliances | Refrigerator | - | - | 84 | 116 | 145 |
| Cooking | Microwave | - | - | 1 | 1 | 2 |
| Cooking | Oven | - | - | 0 | 0 | 1 |
| Electronics | Advanced Power Strips | 10 | 87 | - | - | - |
| Electronics | Laptop | - | - | 1 | 1 | 2 |
| Electronics | TV | - | - | 68 | 101 | 138 |
| HVAC | ASHP | 227 | 244 | 19 | 25 | 26 |
| HVAC | Central AC | - | - | 1 | 2 | 4 |
| HVAC | Circulator | - | - | 0 | 1 | 1 |
| HVAC | Circulator Controls | - | - | 0 | 0 | 0 |
| HVAC | DHP | 153 | 71 | 128 | 223 | 345 |
| HVAC | Duct Sealing | - | - | 61 | 106 | 177 |
| HVAC | GSHP | 10 | 11 | - | - | - |
| HVAC | Thermostat | 247 | 2,509 | 118 | 231 | 384 |
| HVAC | Weatherization | 128 | 81 | 125 | 147 | 171 |
| Lighting | Lighting | - | - | 38 | 51 | 65 |
| Water Heat | Aerators | 6 | - | - | - | - |
| Water Heat | Circulator | - | - | 0 | 0 | 1 |
| Water Heat | Circulator Controls | - | - | 0 | 1 | 1 |
| Water Heat | Dishwasher | - | - | 4 | 5 | 6 |
| Water Heat | HPWH | 74 | 44 | 315 | 480 | 638 |
| Water Heat | TSRV | 37 | - | 14 | 24 | 38 |
| Whole Home | Behavior | - | - | 2 | 4 | 6 |
| NEEA | NEEA | 677 | 677 | *n/a* | *n/a* | *n/a* |
| | **Total** | **1,581** | **3,732** | **1,229** | **1,883** | **2,629** |

*Note: For clarity, 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 & Cooking*

While there are relatively little recent program achievements in these end uses, NEEA has a Retail Product Portfolio initiative that includes appliances and electronics, which contributes savings in these end uses. The ramp rate assignments for these measures were mostly left at the default 2021 Power Plan assignments. Only the ramp rate for clothes dryers was slowed, as this category includes heat pump dryers that have gained a limited market share to date.

### *Electronics*

In this category, Inland Power has been providing incentives for advanced power strips, but this measure was removed from the CPA after being deactivated by the RTF due to uncertainty on the savings. The remaining potential is available through TVs and laptop computers. The potential from TVs will likely be achieved through NEEA's Retail Product Portfolio, similar to the appliance end use discussed above. Lighthouse slowed the ramp rate for laptops since there is no current program or NEEA initiative that would address this category of measures.

### *HVAC*

In the HVAC category, as with Inland Power's 2021 CPA, only certain applications of air-source heat pumps (ASHP) were cost-effective, limiting the ability to closely match program achievement and potential. However, the tax credits and incentives provided for heat pumps through the federal Inflation Reduction Act have the potential to make these measures cost-effective, especially the more generous incentives provided to income-qualified households. The measures in this category were accelerated to align with recent program activity as much as possible.

The potential with ductless heat pumps (DHP) was left at the default 2021 Plan ramp rates, as this is another area where NEEA initiatives contribute to Inland Power's savings. Weatherization measures were given slower ramp rates.

Inland Power had extra funding available for smart thermostats in 2022 due to a BPA administrative error, so the potential was slowed to align with the level of program achievement from 2021.

### *Lighting*

The lighting end use is now subject to Washington state standards that took effect in 2020 covering many screw-in lamps. While there is potential that remains 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 program history and future potential in the water heating category is primarily savings from heat pump water heaters. The potential for heat pump water heaters was left with the default 2021 Plan ramp rates. While this results in potential that is slightly higher than recent program achievement, this is another area where NEEA has a market transformation initiative which contributes additional savings.

Washington's HB 1444 specified standards for showerheads and aerators, so there is no longer potential in these categories. Lighthouse applied slower ramp rates to the thermostatic restrictor valve and other measures in this end use.

Table 26 below summarizes the residential measure category results in Table 25 by end use.

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

| | Program History | | CPA Cost-Effective Potential | | |
|---|---|---|---|---|---|
| End Use | 2021 | 2022 | 2024 | 2025 | 2026 |
| Appliances | 12 | 8 | 335 | 479 | 625 |
| Cooking | - | - | 1 | 2 | 3 |
| Electronics | 10 | 87 | 68 | 102 | 140 |
| EVSE | - | - | - | - | - |
| HVAC | 819 | 2,981 | 452 | 735 | 1,108 |
| Lighting | - | - | 38 | 51 | 65 |
| Motors | - | - | - | - | - |
| Water Heat | 118 | 44 | 333 | 510 | 684 |
| Whole Home | - | - | 2 | 4 | 6 |
| NEEA | 677 | 677 | *n/a* | *n/a* | *n/a* |
| **Total** | **1,635** | **3,797** | **1,229** | **1,883** | **2,629** |

### *Commercial*

In the commercial sector, most of the potential is in the lighting end use. Lighthouse applied slightly slower ramp rates to these measures.

NEEA's market transformation work in the commercial sector largely impacts the HVAC end use. Potential in this end use was aligned to the combination of Inland Power's commercial HVAC savings and NEEA's market transformation savings.

Inland Power's program achievements outside of the lighting and HVAC end uses are limited. Accordingly, Lighthouse applied slower ramp rates to the measures in these end uses across the commercial sector. These end uses have smaller amounts of potential and limited traction in current programs.

Table 27 below shows the alignment of program history and potential in the commercial sector.

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

| | Program History | | CPA Cost-Effective Potential | | |
|---|---|---|---|---|---|
| End Use | 2021 | 2022 | 2024 | 2025 | 2026 |
| Compressed Air | - | - | 1 | 1 | 2 |
| Electronics | - | - | 9 | 17 | 29 |
| Food Preparation | - | - | 1 | 2 | 4 |
| HVAC | 4 | 4 | 134 | 178 | 236 |
| Lighting | 3,554 | 390 | 234 | 367 | 522 |
| Motors/Drives | - | - | 8 | 14 | 22 |
| Process Loads | - | - | 37 | 59 | 90 |
| Refrigeration | - | - | 50 | 85 | 133 |
| Water Heat | - | - | 2 | 3 | 5 |
| NEEA | 178 | 178 | *n/a* | *n/a* | *n/a* |
| **Total** | **3,737** | **572** | **475** | **726** | **1,044** |

## *Industrial*

Inland Power's industrial sector is relatively small. Loads related to indoor agriculture operations comprise more than 40% of all industrial loads. Inland Power's programs have little traction in the industrial sector, and some projects may be categorized under the commercial schedule. Going forward, Inland Power expects this to continue, with little movement in the sector. Accordingly, ramp rates across the industrial sector were slowed from the 2021 Plan defaults. NEEA's initiatives contribute some savings in this category, but the amount is much smaller than other sectors.

Table 28 shows the alignment of industrial potential and recent program history by end use.

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

| | Program History | | CPA Cost-Effective Potential | | |
|---|---|---|---|---|---|
| End Use | 2021 | 2022 | 2024 | 2025 | 2026 |
| Energy Management | - | - | 16 | 27 | 43 |
| Compressed Air | - | - | 2 | 3 | 5 |
| Fans and Blowers | 37 | - | 1 | 2 | 4 |
| HVAC | - | - | 1 | 1 | 2 |
| Lighting | - | - | 10 | 17 | 26 |
| Motors | - | - | 0 | 0 | 0 |
| Refrigeration | - | - | 5 | 8 | 13 |
| Process | - | - | 0 | 0 | 1 |
| Pumps | - | - | 2 | 4 | 7 |
| Other | - | - | 0 | 0 | 0 |
| NEEA | 3 | 3 | *n/a* | *n/a* | *n/a* |
| **Total** | **40** | **3** | **37** | **63** | **100** |

## *Agricultural*

Inland Power's potential in the agricultural sector is largely in the irrigation and lighting end uses. While Inland Power's programs have also achieved recent savings from potato storage facilities, these measures were not included in this CPA. The savings potential in the irrigation end use was slowed to align with Inland Power's limited savings. Savings in the lighting end use were left at the default 2021 Power Plan ramp rates since these measures may be coming in through Inland Power's commercial program.

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

| | Program History | | CPA Cost-Effective Potential | | |
|---|---|---|---|---|---|
| End Use | 2021 | 2022 | 2024 | 2025 | 2026 |
| Irrigation | 83 | - | 27 | 43 | 65 |
| Lighting | - | - | 22 | 26 | 29 |
| Process Heating | - | - | 0 | 0 | 0 |
| Refrigeration | - | - | - | - | - |
| Ventilation | - | - | - | - | - |
| **Total** | **83** | **-** | **49** | **70** | **94** |

### *Utility Distribution System*

No changes were made to the default ramp rate assigned in the 2021 Power Plan, which assumes a slow implementation of distribution system efficiency measures. Inland Power did recently complete a reconductoring project, but these projects are not included in the CPA and therefore were not included as part of the program history.

Table 30: Alignment of Distribution System Program History and Potential by End Use (MWh)

| | Program History | | CPA Cost-Effective Potential | | |
|---|---|---|---|---|---|
| End Use | 2021 | 2022 | 2024 | 2025 | 2026 |
| Distribution System | - | - | 224 | 364 | 553 |