

2025 Electric Integrated Resource Plan

Appendix C – AEG Conservation and Demand Response Potential Assessments



AEG

AVISTA ELECTRIC CONSERVATION POTENTIAL ASSESSMENT FOR 2026-2045



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1 | Introduction

In May 2023, Avista Corporation (Avista) engaged Applied Energy Group (AEG) to conduct a Conservation Potential Assessment (CPA) for its Washington and Idaho service areas. AEG first performed an electric CPA for Avista in 2013; since then, AEG has performed both electric and natural gas CPAs for Avista's subsequent planning cycles. The CPA is a 20-year study of electric and natural gas conservation potential, performed in accordance with Washington Initiative 937 and associated Washington Administrative Code provisions. This study provides data on conservation resources to support the development of Avista's 2025 Integrated Resource Plan (IRP). For reporting purposes, the potential results are separated by fuel. This report documents the electric CPA.

Notable updates from prior CPAs include:

- The analysis base year was updated to incorporate the full calendar year of data for 2021.
- For the residential sector, the study still incorporates Avista's GenPOP residential saturation survey from 2012, which provides a more localized look at Avista's customers than regional surveys. The survey provided the foundation for the base year market characterization and energy market profiles. The Northwest Energy Efficiency Alliance's (NEEA's) 2016 Residential Building Stock Assessment II (RBSA) supplemented the GenPOP survey to account for trends in the intervening years.
 - Note that the 2022 RBSA was published in April 2024, too late in the study process to be integrated into the baseline
- The list of energy conservation measures was updated with research from the Regional Technical Forum (RTF). In particular, light-emitting diode (LED) lamps continue to drop in price and provide a significant opportunity for savings, even accounting for RTF market transformation assumptions.
- The study incorporates updated forecasting assumptions that align with the most recent Avista load forecast.
- A new Department of Energy (DOE) Heat Pump Water Heater (HPWH) standard, making residential HPWHs baseline in 2029, was published on April 30th. Ordinarily, forecast assumptions would have been frozen by that point in the study process, but given the impact on both baseline and major savings measures within the CPA, it was incorporated into the forecast and models rerun to account for its impact.
- Solar and EV projections from the DER study in Washington were incorporated into Baseline forecasts.
 - Solar and EV projections for Idaho were provided by Avista

Enhancement retained from the previous CPA include:

- Analysis of economic potential was excluded from this study. Avista will screen for cost-effective opportunities directly within the IRP model. As such, economic potential and achievable potential have been replaced by an Achievable Technical Potential case.
- In addition to analyzing annual energy savings, the study also estimated the opportunity for reduction of summer and winter peak demand. This involved a full characterization by sector, segment, and end use of peak demand in the base year.
- The residential segmentation differentiates low income customers from others, with unique market characterization, building shell and usage characteristics.

- NEEA’s 2019 Commercial Building Stock Assessment (CBSA) was used for characterization of the Commercial sector
- The industrial sector, while relatively small for Avista’s territory, separates the pumping and general manufacturing segments for a better understanding of available potential than prior studies.
- Measure characterizations continue to use data from the Northwest Power and Conservation Council’s 2021 Power Plan where this is the most current source, including measure data, adoption rates, and updated measure applicability.

Summary of Report Contents

The report is divided into the following chapters, summarizing the approach, assumptions, and results of the electric CPA.

- **Chapter 2 – Energy Efficiency Analysis Approach and Data Development.** A detailed description of AEG’s approach to estimating the energy efficiency potential and documentation of data sources used.
- **Chapter 3 – Energy Efficiency Market Characterization** *presents* how Avista’s customers use electricity today and what equipment is currently being used.
- **Chapter 4 – Energy Efficiency Baseline Projection** *presents the baseline end-use projections developed for each sector and state, as well as a summary.*
- **Chapter 5 – Conservation Potential.** Energy efficiency potential results for each state across all sectors and separately for each sector.
- **Chapter 6 – Demand Response Potential.** *Demand response potential results for each state across all sectors and separately for each sector.*
- **Appendices A through D** *provide backup detail on market profiles, market adoption (ramp) rates, measure data, and demand response.*

There are three types of tables presented in the report to easily distinguish between the types of data presented. There is one type of table for each: general Avista data, Washington-specific data, and Idaho-specific data.

Abbreviations and Acronyms

Table 1-1 provides a list of abbreviations and acronyms used in this report, along with an explanation.

Table 1-1 Explanation of Abbreviations and Acronyms

Acronym	Explanation
A/C	Air Conditioning
AEG	Applied Energy Group
AEO	EIA's Annual Energy Outlook forecast
AMI	Advanced Metering Infrastructure
BEST	AEG's Building Energy Simulation Tool
BYOT	Bring Your Own Thermostat
C&I	Commercial and Industrial
CBSA	NEEA's Commercial Building Stock Assessment
CPA	Conservation Potential Assessment
DEER	California Database for Energy Efficient Resources
DEEM	AEG's Database of Energy Efficiency Measures
DLC	Direct Load Control
DR	Demand Response
DSM	Demand Side Management
EIA	U.S. Energy Information Administration
EPRI	Electric Power Research Institute
EUI	Energy Use Index
EVSE	Electric Vehicle Supply Equipment
HVAC	Heating Ventilation and Air Conditioning
IFSA	NEEA's Industrial Facilities Site Assessment
IRP	Integrated Resource Plan
LCOE	Levelized cost of energy
LED	Light Emitting Diode Lamp
LoadMAP	AEG's Load Management Analysis and Planning™ tool
MW	Megawatt
MWh	Megawatt Hour
NEEA	Northwest Energy Efficiency Alliance
NREL	National Renewable Energy Laboratory
NWPCC	Northwest Power and Conservation Council
O&M	Operations and Maintenance
PTR	Peak Time Rebate
RTF	NWPCC's Regional Technical Forum
RBSA	NEEA's Residential Building Stock Assessment
TOU	Time-of-Use
UEC	Unit Energy Consumption
VPP	Variable Peak Pricing

2 | Energy Efficiency Analysis Approach and Development

This section describes the analysis approach taken and the data sources used to develop the energy efficiency potential estimates. The demand response analysis discussion can be found in 6 |

Overview of Analysis Approach

To perform the potential analysis, AEG used a bottom-up approach following the major steps listed below. These steps are described in more detail throughout this section.

1. Perform a market characterization to describe sector-level electricity use for the residential, commercial, and industrial sectors for the base year 2021.
2. Develop a baseline projection of energy consumption and peak demand by sector, segment, and end use for 2021 through 2045.
3. Define and characterize several hundred conservation measures to be applied to all sectors, segments, and end uses.
4. Estimate Technical and Achievable Technical Potential at the measure level in terms of energy and peak demand impacts from conservation measures for 2026-2045.

LoadMAP Model

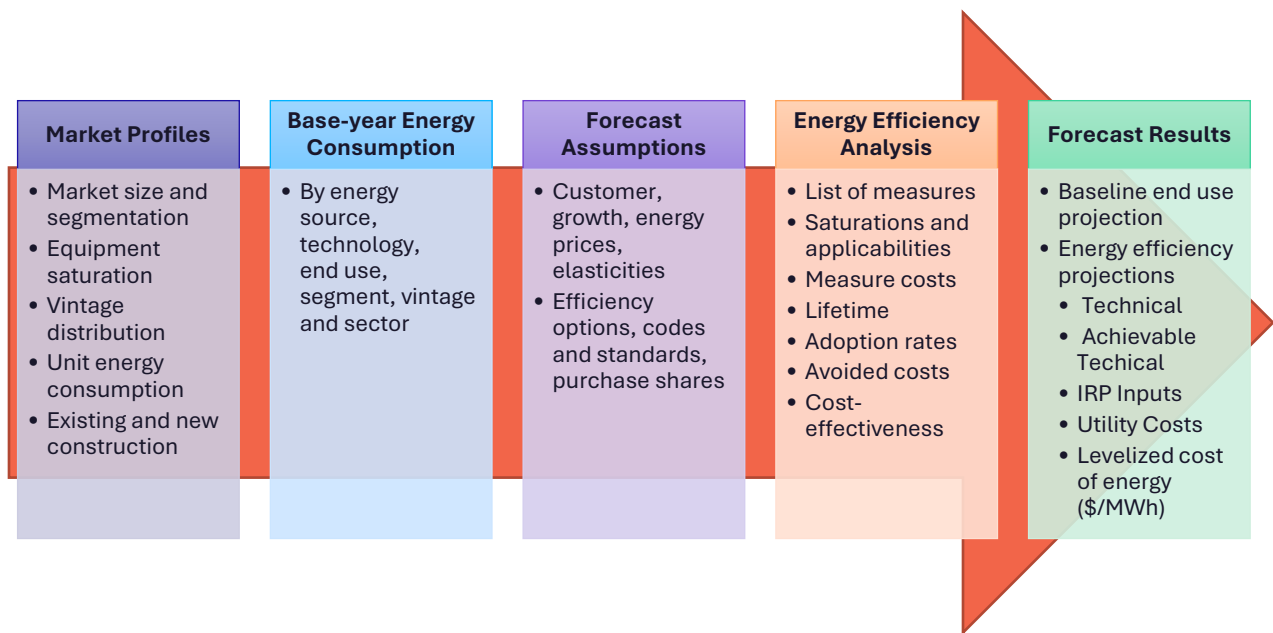
AEG used its Load Management Analysis and Planning tool (LoadMAP™) version 5.0 to develop both the baseline projection and the estimates of potential. AEG developed LoadMAP in 2007 and has enhanced it over time, using it for the Electric Power Research Institute (EPRI) National Potential Study and numerous utility-specific forecasting and potential studies since that time. Built in Excel, the LoadMAP framework (see Figure 2-1) is both accessible and transparent and has the following key features:

- Embodies the basic principles of rigorous end-use models (such as EPRI's REEPS and COMMEND) but in a more simplified, accessible form.
- Includes stock-accounting algorithms that treat older, less efficient appliance/equipment stock separately from newer, more efficient equipment. Equipment is replaced according to the measure life and appliance vintage distributions defined by the user.
- Balances the competing needs of simplicity and robustness. This is done by incorporating important modeling details related to equipment saturations, efficiencies, vintage, and the like, where market data are available, and treats end uses separately to account for varying importance and availability of data resources.
- Isolates new construction from existing equipment and buildings and treats purchase decisions for new construction and existing buildings separately.
- Uses a simple logic for appliance and equipment decisions. Other models available for this purpose embody complex decision-choice algorithms or diffusion assumptions. The model parameters tend to be difficult to estimate or observe, and sometimes produce anomalous results that require calibration or even overriding. The LoadMAP approach allows the user to drive the appliance and equipment choices year by year directly in the model. This flexible approach allows users to import the results from diffusion models or to input individual assumptions. The framework also facilitates sensitivity analysis.
- Includes appliance and equipment models customized by end use. For example, the logic for lighting is distinct from refrigerators and freezers.

- Can accommodate various levels of segmentation. Analysis can be performed at the sector level (e.g., total residential) or for customized segments within sectors (e.g., housing type or income level).
- Can incorporate conservation measures, demand-response options, combined heat and power, distributed generation options, and fuel switching.

Consistent with the segmentation scheme and market profiles described below, LoadMAP provides projections of baseline energy use by sector, segment, end use, and technology for existing and new buildings. It provides forecasts of total energy use and energy efficiency savings associated with the various types of potential.

Figure 2-1 LoadMAP Analysis Framework



Definitions of Potential

AEG’s approach for this study adheres to the approaches and conventions outlined in the National Action Plan for Energy Efficiency’s Guide for Conducting Potential Studies and is consistent with the methodology used by the Northwest Power and Conservation Council to develop its regional power plans. The guide represents the most credible and comprehensive industry practice for specifying conservation potential. Two types of potential were developed as part of this effort:

- **Technical Potential** is the theoretical upper limit of conservation potential. It assumes that customers adopt all feasible efficient measures regardless of their cost. At the time of existing equipment failure, customers replace their equipment with the most efficient option available. In new construction, customers and developers choose the efficient equipment option relative to applicable codes and standards. Non-equipment measures, which may be realistically installed apart from equipment replacements, are implemented according to ramp rates developed by the NWPCC for its 2021 Power Plan, applied to 100% of the applicable market. This case is provided primarily for planning and informational purposes.
- **Achievable Technical Potential** refines Technical Potential by applying market adoption rates that account for market barriers, customer awareness and attitudes, program maturity, and

other factors that may affect market penetration of energy efficiency measures. AEG used achievability assumptions from the NWPC's 2021 Power Plan, adjusted for Avista's recent program accomplishments, as the customer adoption rates for this study. For the achievable technical case, ramp rates are applied to between 85% - 100% of the applicable market, per NWPC methodology. This achievability factor represents potential that all available mechanisms, including utility programs, updated codes and standards, and market transformation, can reasonably acquire. Thus, the market applicability assumptions utilized in this study include savings outside of utility programs. The market adoption factors can be found in Appendix B.

Market Characterization

To estimate the savings potential from energy efficient measures, it is necessary to understand how much energy is used today and what equipment is currently being used. The characterization begins with a segmentation of Avista's electricity footprint to quantify energy use by sector, segment, end-use application, and the current set of technologies used. To complete this step, AEG relied on information from Avista, NEEA, and secondary sources, as necessary.

Segmentation for Modeling Purposes

The market assessment first defined the market segments (building types, end uses, and other dimensions) that are relevant in the Avista service territory. The segmentation scheme for this project is presented in Table 2-1.

Table 2-1 Overview of Avista Analysis Segmentation Scheme

Dimension	Segmentation Variable	Description
1	Sector	Residential, commercial, industrial
2	Segment	Residential: single family, multifamily, manufactured home, differentiated by income level Commercial: small office, large office, restaurant, retail, grocery, college, school, health, lodging, warehouse, and miscellaneous Industrial: total
3	Vintage	Existing and new construction
4	End uses	Cooling, lighting, water heat, motors, etc. (as appropriate by sector)
5	Appliances/end uses and technologies	Technologies such as lamp type, air conditioning equipment, motors by application, etc.
6	Equipment efficiency levels for new purchases	Baseline and higher-efficiency options as appropriate for each technology

With the segmentation scheme defined, AEG then performed a high-level market characterization of electricity sales in the base year to allocate sales to each customer segment. AEG used Avista data and secondary sources to allocate energy use and customers to the various sectors and segments such that the total customer count, energy consumption, and peak demand matched the Avista system totals from billing data. This information provided control totals at a sector level for calibrating LoadMAP to known data for the base year.

Market Profiles

The next step was to develop market profiles for each sector, customer segment, end use, and technology. The market profiles provide the foundation for the development of the baseline projection and the potential estimates. A market profile includes the following elements:

- **Market size** is a representation of the number of customers in the segment. For the residential sector, it is the number of households. In the commercial sector, it is floor space measured in square feet. For the industrial sector, it is overall electricity use.
- **Saturations** define the fraction of homes or square feet with the various technologies (e.g., homes with electric space heating).
- **UEC (unit energy consumption) or EUI (energy use index)** describes the amount of energy consumed in 2021 by a specific technology in buildings that have the technology. UECs are expressed in kWh/household for the residential sector, and EUIs are expressed in kWh/square foot for the commercial sector.
- **Annual Energy Intensity** for the residential sector represents the average energy use for the technology across all homes in 2021 and is the product of the saturation and UEC. The commercial sector represents the average use for the technology across all floor space in 2021 and is the product of the saturation and EUI.
- **Annual Usage** is the annual energy use by an end-use technology in the segment. It is the product of the market size and intensity and is quantified in GWh.
- **Peak Demand** for each technology, summer peak and winter peak, is calculated using peak fractions of annual energy use from AEG's load shape library and Avista system peak data.

The market characterization is presented in Chapter 3, and market profiles are presented in Appendix A.

Baseline Projection

The next step was to develop the baseline projection of annual electricity use and peak demand for 2021 through 2045 by customer segment and end use without new utility programs. The savings from past programs are embedded in the forecast, but the baseline projection assumes that those past programs cease to exist in the future. Possible savings from future programs are captured by the potential estimates. The projection includes the impacts of known codes and standards, which will unfold over the study timeframe. All such mandates that were defined as of January 2024 are included in the baseline¹.

The baseline projection is the foundation for the analysis of savings from future conservation efforts as well as the metric against which potential savings are measured. Although AEG's baseline projection aligns closely with Avista's, it is not Avista's official load forecast.

Inputs to the baseline projection include:

- Current economic growth forecasts (i.e., customer growth, income growth)
- Electricity price forecasts
- Trends in fuel shares and equipment saturations
- Existing and approved changes to building codes and equipment standards
- Avista's internally developed sector-level projections for electricity sales

AEG also developed a baseline projection for summer and winter peaks by applying peak fractions from the market profiles to the annual energy forecast in each year. The baseline projection is presented in Chapter 4.

¹ The April 2024 federal heat pump water heater standard was also included as an exception to this cutoff point

Conservation Measure Analysis

This section describes the framework used to assess conservation measures' savings, costs, and other attributes. These characteristics form the basis for measure-level cost-effectiveness analyses and for determining measure savings. For all measures, AEG assembled information to reflect equipment performance, incremental costs, and equipment lifetimes. We used this information along with the 2021 Power Plan's updated ramp rates to identify achievable technical measure potential.

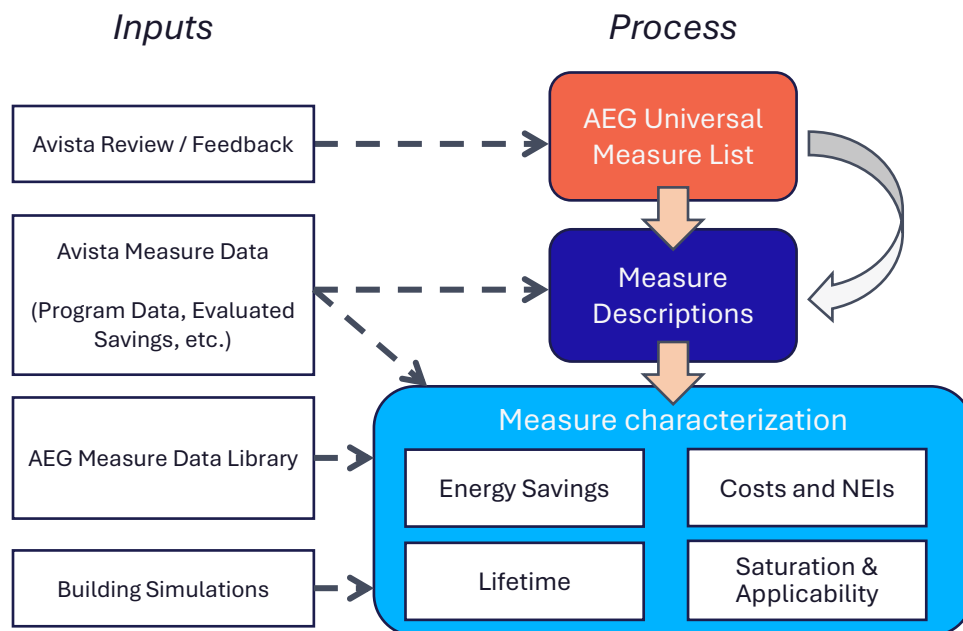
Conservation Measures

Figure 2-2 outlines the framework for conservation measure analysis. The framework involves identifying the list of measures to include in the analysis, determining their applicability to each sector and segment, fully characterizing each measure, and calculating the levelized cost of conserved energy (LCOE). Potential measures include the replacement of a unit that has failed or is at the end of its useful life with an efficient unit, retrofit, or early replacement of equipment, improvements to the building envelope, the application of controls to optimize energy use, and other actions resulting in improved energy efficiency.

AEG compiled a robust list of conservation measures for each customer sector, drawing upon Avista's measure database, the RTF, and the 2021 Power Plan deemed measures database, as well as a variety of secondary sources. This universal list of conservation measures covers all major types of end-use equipment, as well as devices and actions to reduce energy consumption.

Since an economic screen was not performed in this study, we calculated the LCOE for each measure evaluated. This value, expressed in dollars per megawatt hour (\$/MWh) saved, can be used by Avista's IRP model to evaluate measure economics. To calculate a measure's LCOE, first-year measure costs, annual non-energy impacts, and annual operations and maintenance (O&M) costs are levelized over a measure's lifetime, then divided by the first-year savings in MWh. Note that while non-energy benefits are typically included in the numerator of a traditional Total Resource Cost economic screen, the LCOE benefits have not been monetized. Therefore, these benefits are instead subtracted from the cost portion of the test. These non-energy benefits are not included in the Utility Cost Test used in Idaho.

Figure 2-2 Approach for Conservation Measure Assessment



The selected measures are categorized into the two following types according to the LoadMAP taxonomy:

- **Equipment measures** are efficient energy-consuming pieces of equipment that save energy by providing the same service with a lower energy requirement than a standard unit. An example is an ENERGY STAR refrigerator that replaces a standard efficiency refrigerator. For equipment measures, many efficiency levels may be available for a given technology, ranging from the baseline unit (often determined by code or standard) up to the most efficient product commercially available. For instance, in the case of central air conditioners, this list begins with the current federal standard SEER 14 unit and spans a broad spectrum up to a maximum efficiency of a SEER 24 unit. The 2021 Power Plan’s “Lost Opportunity” ramp rates are primarily applied to equipment measures.
- **Non-equipment measures** save energy by reducing the need for delivered energy but do not involve replacement or purchase of major end-use equipment (such as a refrigerator or central air conditioner). An example would be a programmable thermostat that is pre-set to run heating and cooling systems only when people are home. Non-equipment measures can apply to more than one end use. For instance, the addition of wall insulation will affect the energy use of both space heating and cooling. The 2021 Power Plan’s “Retrofit” ramp rates are primarily applied to non-equipment measures. Non-equipment measures typically fall into one of the following categories:
 - Building shell (windows, insulation, roofing material)
 - Equipment controls (thermostat, compressor staging, and controls)
 - Equipment maintenance (cleaning filters, changing setpoints)
 - Whole-building design (building orientation, advanced new construction designs)
 - Lighting retrofits (assumed to be implemented alongside new LEDs at the equipment’s normal end of life)

- o Displacement measures (ceiling fan to reduce the use of central air conditioners)
- o Commissioning and retrocommissioning (initial or ongoing monitoring of building energy systems to optimize energy use)

We developed a preliminary list of conservation measures, which was distributed to the Avista project team for review. The list was finalized after incorporating comments. Next, the project team characterized measure savings, incremental cost, service life, and other performance factors, drawing upon data from the Avista measure database, the 2021 Power Plan, the RTF deemed measure workbooks, simulation modeling, and other well-vetted sources as required. Measure data can be found in Appendix C. Table 2-2 summarizes the number of measures evaluated for each segment within each sector.

Table 2-2 Number of Measures Evaluated

Sector	Total Measures	Measure Permutations w/ 2 Vintages	Measure Permutations w/ Segments
Residential	107	214	1,284
Commercial	137	274	3,014
Industrial	74	148	296
Total Measures Evaluated	318	636	4,594

Data Development

This section details the data sources used in this study, followed by a discussion of how these sources were applied. In general, data sources were applied in the following order: Avista data, Northwest regional data, and well-vetted national or other regional secondary sources.

Avista Data

Our highest priority data sources for this study were those that were specific to Avista.

- **Customer Data:** Avista provided billing data for the development of customer counts and energy use for each sector. We also used the results of the Avista GenPOP survey, a residential saturation survey.
- **Load Forecasts:** Avista provided an economic growth forecast by sector; electric load forecast; peak-demand forecasts at the sector level; and retail electricity price history and forecasts.
- **Economic Information:** Avista provided a discount rate, line loss factor, and retail prices for both electricity and natural gas to inform the customer choice model. Avoided costs for the TRC perspective were provided based on the previous IRP only for use in benchmarking; potential was not screened for cost effectiveness by AEG.
- **Program Data:** Avista provided information about past and current programs, including program descriptions, goals, and achievements to date.

Northwest Energy Efficiency Alliance Data

The NEEA conducts research for the Northwest region. The following studies were particularly useful:

- RBSA II, [Single-Family Homes Report 2016-2017](#).
- RBSA II, [Manufactured Homes Report 2016-2017](#).
- RBSA II, [Multifamily Buildings Report 2016-2017](#).

- [2019 Commercial Building Stock Assessment \(CBSA\)](#), May 21, 2020.
- [2014 Industrial Facilities Site Assessment \(IFSA\)](#), December 29, 2014.

Northwest Power and Conservation Council Data

Several sources of data were used to characterize the conservation measures. We used the following regional data sources and supplemented them with AEG's data sources to fill in any gaps.

- [RTF Deemed Measures](#). The NWPCC RTF maintains databases of deemed measure savings data.
- [NWPCC 2021 Power Plan Conservation Supply Curve Workbooks](#). To develop its 2021 Power Plan, the Council used workbooks with detailed information about measures.
- [NWPCC, MC and Loadshape File](#), September 29, 2016. The Council's load shape library was utilized to convert CPA results into hourly conservation impacts for use in Avista's IRP process.

AEG Data

AEG maintains several databases and modeling tools that we use for forecasting and potential studies. Relevant data from these tools have been incorporated into the analysis and deliverables for this study.

- **AEG Energy Market Profiles:** AEG maintains regional profiles of end-use consumption. The profiles include market size, fuel shares, unit consumption estimates, annual energy use by fuel (electricity and natural gas), customer segment, and end use for ten (10) regions in the U.S. The U.S. Energy Information Administration (EIA) surveys (RECS, CBECS, and MECS), as well as state-level statistics and local customer research provide the foundation for these regional profiles.
- **Building Energy Simulation Tool (BEST):** AEG's BEST is a derivative of the DOE 2.2 building simulation model, used to estimate base-year UECs and EUIs, as well as measure savings for the HVAC-related measures.
- **AEG's Database of Energy Efficiency Measures (DEEM):** AEG maintains an extensive database of measure data, drawing upon reliable sources, including the California Database for Energy Efficient Resources (DEER), the EIA Technology Forecast Updates – Residential and Commercial Building Technologies – Reference Case, RS Means cost data, and Grainger Catalog Cost data.
- **Recent studies:** AEG has conducted numerous studies of energy efficiency potential in the last five years. We checked our input assumptions and analysis results against the results from these other studies, which include but are not limited to Tacoma Power, Idaho Power, and PacifiCorp.

Other Secondary Data and Reports

Finally, a variety of secondary data sources and reports were used for this study. The main sources include:

- **Annual Energy Outlook (AEO):** Conducted each year by the U.S. EIA, the AEO presents yearly projections and analysis of energy topics. For this study, we used data from the 2023 AEO.
- **Local Weather Data:** Weather from National Oceanic and Atmospheric Administration's National Climatic Data Center for Spokane, Washington, was used as the basis for building simulations.

- **EPRI End-Use Models (REEPS and COMMEND):** These models provide the default elasticities we apply to electricity prices, household income, home size, and heating and cooling.
- **DEER:** The California Energy Commission and California Public Utilities Commission sponsor this database, which is designed to provide well-documented estimates of energy and peak demand savings values, measure costs, and effective useful life for the state of California. We used the DEER database to cross-check the measure savings we developed using BEST and DEEM.
- **NREL End-Use Load Profiles.** Load shapes specific to Avista’s geographic region were used to calculate hourly profiles of the end use projection and hourly savings inputs for the IRP. Load shapes were collected at the sector, segment and technology level where available.
- **Other relevant regional sources:** These include reports from the Consortium for Energy Efficiency, the Environmental Protection Agency, and the American Council for an Energy-Efficient Economy.

Data Application

We now discuss how the data sources described above were used for each step of the study.

Data Application for Market Characterization

To construct the high-level market characterization of electricity use and households/floor space for each sector, we used Avista billing data and customer surveys to estimate energy use.

- **Residential Segments.** To distinguish low-income households within each housing segment, AEG cross referenced geographic data from Avista’s customer database with data from the US Census American Community Survey to estimate the presence of low-income households within Avista’s service territory. “Low Income” was defined by household size. In Washington the threshold is 80% of Area Median Income, and in Idaho it is 200% of the Federal Poverty Level. Data from NEEA’s Residential Building Stock Assessment (RBSA II, 2016) was used to differentiate energy characteristics of low-income households, including differences in building shells, energy use per customer, and presence of energy-using equipment.
- **C&I Segments.** Customers and sales were allocated to building type based on intensity and floor space data from the 2019 Commercial Building Stock Assessment (CBSA) by state, with some adjustments between the C&I sectors to better group energy use by facility type and predominate end uses.

Data Application for Market Profiles

The specific data elements for the market profiles, together with the key data sources, are shown in Table 2-3. To develop the market profiles for each segment, AEG performed the following steps:

1. Developed control totals for each segment. These include market size, segment-level annual electricity use, and annual intensity.
2. Used the Avista GenPOP Survey; NEEA’s RBSA, CBSA, and IFSA; and AEG’s Energy Market Profiles database to develop existing appliance saturations, appliance and equipment characteristics, and building characteristics.
3. Ensured calibration to control totals for annual electricity sales in each sector and segment.
4. Compared and cross-checked with other recent AEG studies.
5. Worked with Avista staff to vet the data against their knowledge and experience.

Table 2-3 Data Applied for the Market Profiles

Model Inputs	Description	Key Sources
Market size	Base-year residential dwellings, commercial floor space, and industrial employment	Avista billing data Avista GenPOP Survey NEEA RBSA and CBSA AEO 2023
Annual intensity	Residential: Annual use per household Commercial: Annual use per square foot	Avista billing data US DOE RECS and CBECs data NEEA RBSA and CBSA AEO 2023 Other recent studies
Appliance/equipment saturations	Fraction of dwellings with an appliance/technology Percentage of C&I floor space/employment with equipment/technology	Avista GenPOP Survey NEEA RBSA and CBSA AEG's Energy Market Profiles
UEC/EUI for each end-use technology	UEC: Annual electricity use in homes and buildings that have the technology EUI: Annual electricity use per square foot/employee for a technology in floor space that has the technology	NWPCC RTF and 2021 Power Plan and RTF Building simulations US RECS and CBECs data EIA Technical Data
Appliance/equipment age distribution	Age distribution for each technology	RTF and NWPCC 2021 Power Plan data NEEA regional survey data Utility saturation surveys Recent AEG studies
Efficiency options for each technology	List of available efficiency options and annual energy use for each technology	AEG DEEM AEO 2023 RTF and NWPCC 2021 Plan data US EIA Tech Data sheets
Peak factors	Share of technology energy use that occurs during the peak hour	NREL and AEG simulation load shapes

Data Application for Baseline Projection

Table 2-4 summarizes the LoadMAP model inputs required for the baseline projection. These inputs are required for each segment within each sector, as well as for new construction and existing dwellings/buildings.

Table 2-4 Data Needs for Baseline Projection and Potentials Estimation in LoadMAP

Model Inputs	Description	Key Sources
Customer growth forecasts	Forecasts of new construction in residential, commercial, and industrial sectors	Avista short term load forecast AEO 2023 economic growth forecast
Equipment purchase shares for baseline projection	For each equipment/technology, purchase shares for each efficiency level; specified separately for existing equipment replacement and new construction	Shipments data from AEO and ENERGY STAR AEO 2023 regional forecast assumptions ² Appliance/efficiency standards analysis Avista program results and evaluation reports
Utilization model parameters	Price elasticities, elasticities for other variables (income, weather)	EPRI's REEPS and COMMEND models Avista short-term forecast calibration AEO 2023

Table 2-5 Residential Electric Equipment Standards

End Use	Technology	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Cooling	Central AC	SEER 13.0	SEER 14.0								
	Room AC	CEER 10.9				CEER 16.0					
Cool/Heating	Heat Pumps	SEER 14.0 / HSPF 7.7	SEER 15.0 / HSPF 8.8 SEER2 14.3 / HSPF2 7.5								
Water Heating	Water Heater ≤55Gal	UEF 0.92								CCE 2.0 (NEEA Tier 1)	
	Water Heater >55Gal	CCE 2.0 (NEEA Tier 1)									
Lighting	General Service	EISA Tier 1 (18.6 lm/W)	EISA Tier 2 (45.0 lm/W)								
	Linear Fluorescent	T8-F32 (80.0 lm/W system)									
Appliances	Refrigerator/Freezer	2014 Standard								2029 Standard	
	Clothes Washer	IMEF 1.71 / IWF 5.6									
	Clothes Dryer	UCEF 2.29									
	Microwave	2016 Standard				2026 Standard					
	Stove/Oven	Typical								2028 Standard	
	Air Purifier	1.5 CADR/W	1.9 CADR/W	2.4 CADR/W							
	Dehumidifier	2016 Standard									
	Miscellaneous	Furnace Fans	ECM								

Table 2-6 Commercial and Industrial Electric Equipment Standards

End Use	Technology	2022	2023	2024	2025	2026	2027
Cooling	Air-Cooled Chiller	COP 4.10 (IPLV 14.0)					
	Water-Cooled Chiller	COP 7.03 (0.5 kW/ton)					
	RTUs	IEER 12.9	IEER 14.8				
	PTAC	EER 10.4					
Cool/Heating	Heat Pump	IEER 12.8 / COP 3.3	IEER 14.1 / COP 3.4				
	PTHP	EER 10.4/COP 3.1					
Ventilation	All	Constant Air Volume/Variable Air Volume					
Lighting	General Service	EISA Compliant (19.8 lm/W)	EISA Compliant (45.0 lm/W)				
	Linear Lighting	T8 - F32 (82.5 lm/W system)					
	High Bay	High-Intensity Discharge (56.0 lm/W)					
Refrigeration	Walk-In	2020 Standard					
	Reach-In / Glass Door / Open Display	2017 Standard					
	Vending Machine	2019 Standard					
Food Service	Pre-Rinse Spray Valve	1.0 GPM					
Motors	All	NEMA Premium					

Conservation Measure Data Application

Table 2-7 details the energy efficiency data inputs to the LoadMAP model, describes each input, and identifies the key sources used in the analysis.

Table 2-7 Data Needs for Measure Characteristics in LoadMAP

Model Inputs	Description	Key Sources
Energy Impacts	The annual reduction in consumption attributable to each specific measure. Savings were developed as a percentage of the energy end use that the measure affects.	Avista measure data NWPCC workbooks, RTF NWPCC 2021 Plan conservation workbooks AEO 2023 EIA Technical Data Other secondary sources
Peak Demand Impacts	Savings during the peak demand periods are specified for each electric measure. These impacts relate to the energy savings and depend on the extent to which each measure is coincident with the system peak.	Avista measure data Building Simulations RTF workbooks NREL End-Use Load Profiles
Costs	Equipment Measures: Includes the full cost of purchasing and installing the equipment on a per-household, per-square-foot, per employee or per service point basis for the residential, commercial, and industrial sectors, respectively. Non-equipment measures: Existing buildings – full installed cost. New Construction - the costs may be either the full cost of the measure, or as appropriate, it may be the incremental cost of upgrading from a standard level to a higher efficiency level.	Avista measure data NWPCC workbooks, RTF NWPCC 2021 Plan conservation workbooks AEO 2023 Other secondary sources
Measure Lifetimes	Estimates derived from the technical data and secondary data sources that support the measure demand and energy savings analysis.	Avista measure data NWPCC workbooks, RTF NWPCC 2021 Plan conservation workbooks AEO 2023 Other secondary sources
Applicability	Estimate of the percentage of dwellings in the residential sector, square feet in the commercial sector, or employees in the industrial sector where the measure is applicable and where it is technically feasible to implement.	Avista measure data NWPCC workbooks, RTF NWPCC 2021 Plan conservation workbooks Other secondary sources
On Market and Off Market Availability	Expressed as years for equipment measures to reflect when the equipment technology is available or no longer available in the market.	AEG appliance standards and building codes analysis

Data Application for Achievable Technical Potential

To estimate Achievable Technical Potential, two sets of parameters are needed to represent customer decision-making behavior with respect to energy-efficiency choices.

- Technical diffusion curves for non-equipment measures.** Equipment measures are installed when existing units fail. Non-equipment measures do not have this natural periodicity, so rather than installing all available non-equipment measures in the first year of the projection (instantaneous potential), they are phased in according to adoption schedules that generally align with the diffusion of similar equipment measures. Like the 2022 CPA, we applied the “Retrofit” ramp rates from the 2021 Power Plan directly as diffusion curves. For technical potential, these rates summed up to 100% by the 20th year for all measures.

- **Adoption rates.** Customer adoption rates or take rates are applied to technical potential to estimate Achievable Technical Potential. For equipment measures, the Council’s “Lost Opportunity” ramp rates were applied to technical potential with a maximum achievability of 85%-100%, depending on the measure. For non-equipment measures, the Council’s “Retrofit” ramp rates have already been applied to calculate technical diffusion. In this case, we multiply each of these by 85% (for most measures) to calculate Achievable Technical Potential. Adoption rates are presented in Appendix B.

3 | Energy Efficiency Market Characterization

This chapter presents how Avista’s customers in Washington and Idaho use electricity in 2021, the base year of the study. We begin with a high-level summary of energy use by state and then delve into each sector.

Energy Use Summary

Total electricity use for Avista in 2021 was 8,028 GWh, 5,306 GWh in Washington, and 2,722 GWh in Idaho. The residential sector accounts for around 50% of annual energy use in both states, followed by commercial at around 40% of annual energy use. For winter peak demand, the total system peak in 2021 was 1,471 MW: 988 MW in Washington and 483 MW in Idaho. In both states, the residential sector represents the largest share of the winter peak.

Figure 3-1 Sector-Level Electricity Use in Base Year 2021, Washington

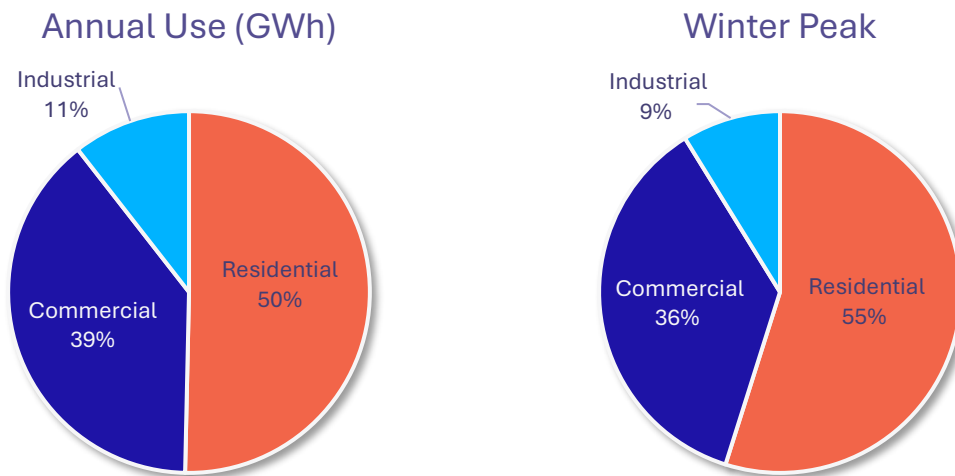


Table 3-1 Avista Sector Control Totals (2021), Washington

Sector	Energy Use (GWh)	% of Energy Total	Winter Peak (MW)
Residential	2,671	50%	656
Commercial	2,075	39%	276
Industrial	559	11%	56
Total	5,306	100%	988

Figure 3-2 Sector-Level Electricity Use in Base Year 2021, Idaho

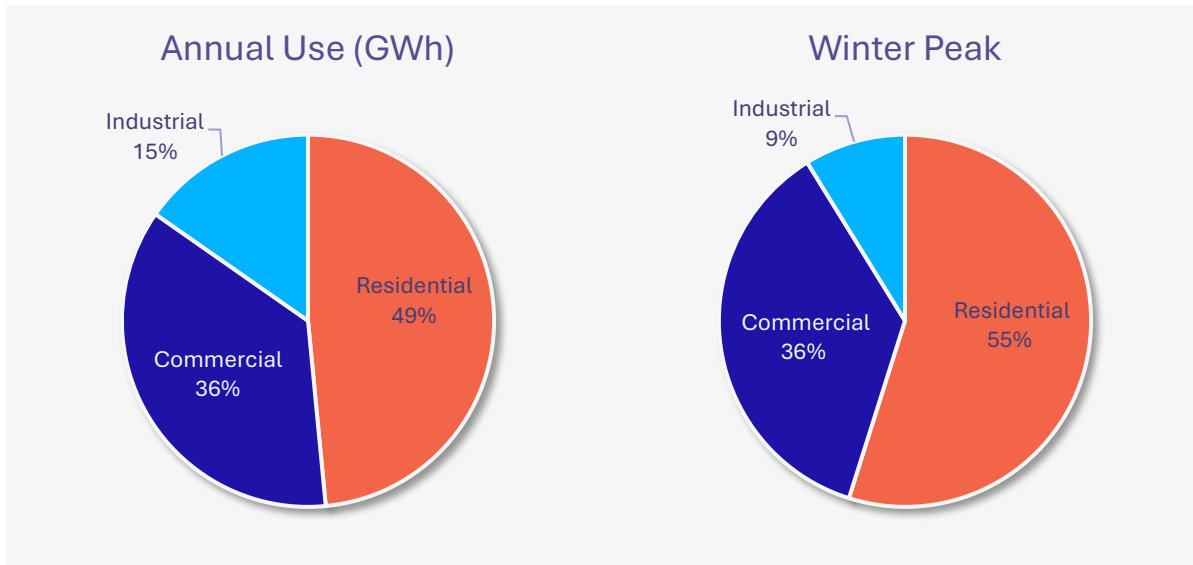


Table 3-2 Avista Sector Control Totals (2021), Idaho

Sector	Energy Use (GWh)	% of Energy Total	Winter Peak (MW)
Residential	1,320	48%	314
Commercial	986	36%	125
Industrial	416	15%	44
Total	2,722	100%	483

Residential Sector

The total number of households and electricity sales were obtained from Avista’s customer database. In 2021, Avista provided electric service to 234,506 households in Washington; those households used a total of 2,671 GWh with a winter peak demand of 656 MW. The average use per household at 11,391 kWh is about average compared to other regions of the country. In 2021, Avista provided electric service to 120,131 households in Idaho; those households used a total of 1,320 GWh with winter peak demand of 314 MW. The average use per household was 10,986 kWh. Table 3-3 and Table 3-4 show the total number of households and electricity sales in the six residential segments for each state.

Table 3-3 Base Year Electric Consumption Summary (Control Totals), Washington

Segment	Electric Use (GWh)	Customers	Annual Use/Customer (kWh/HH)	% of Annual Use
Single Family	1,300	97,304	13,362	49%
Multi-Family	95	12,712	7,459	4%
Mobile Home	155	8,704	17,754	6%
LI - Single Family	790	62,690	12,605	30%
LI - Multi-Family	220	45,261	4,856	8%
LI - Mobile Home	112	7,836	14,248	4%
Total	2,671	234,506	11,391	100%

Table 3-4 Base Year Electric Consumption Summary (Control Totals), Idaho

Segment	Electric Use (GWh)	Customers	Annual Use/Customer (kWh/HH)	% of Annual Use
Single Family	934	79,840	11,698	71%
Multi-Family	77	13,065	5,859	6%
Mobile Home	115	8,275	13,906	9%
LI - Single Family	119	9,913	11,956	9%
LI - Multi-Family	47	6,890	6,849	4%
LI - Mobile Home	28	2,148	13,265	2%
Total	1,320	120,131	10,986	100%

Figure 3-3 and Figure 3-4 show the distribution of annual electricity use by end use for all customers in Washington and Idaho, respectively. Two main electricity end uses —space heating and miscellaneous— account for approximately 50% of total usage. Miscellaneous includes furnace fans, pool pumps, electric vehicles, and other “plug” loads (all other usages, such as hair dryers, power tools, coffee makers, etc.). The figures show estimates of winter peak demand by end use. As expected, space heating is the largest contributor to winter peak demand, followed by miscellaneous, water heating, and lighting.

Figure 3-5 and Figure 3-6 present the electricity intensities by end use and housing type for Washington and Idaho, respectively. Mobile homes have the highest use per customer at 17,754 kWh/year in Washington and 13,906 kWh/year in Idaho.

Figure 3-3 Residential Electricity Use and Winter Peak Demand by End Use, Washington

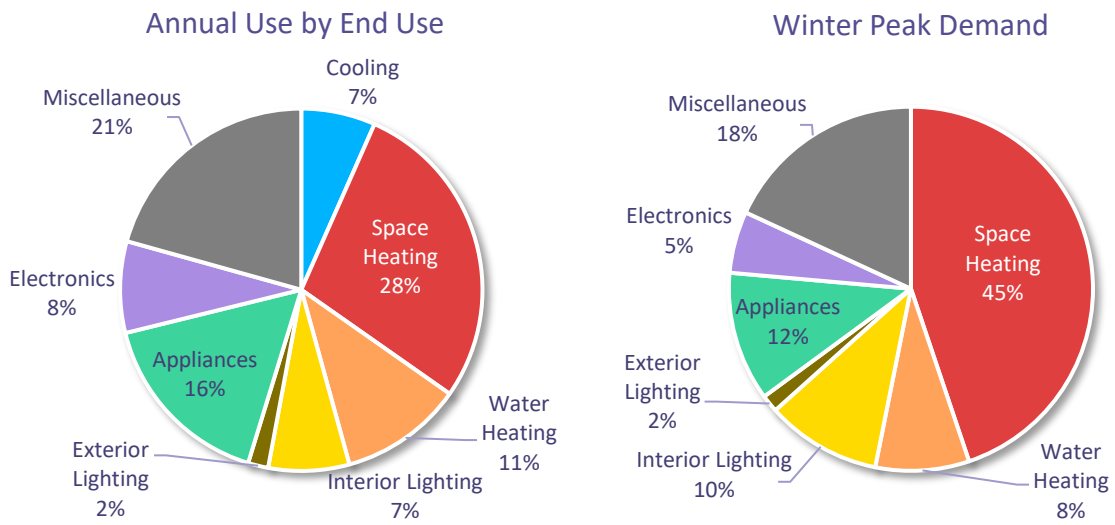


Figure 3-4 Residential Electricity Use and Winter Peak Demand by End Use, Idaho

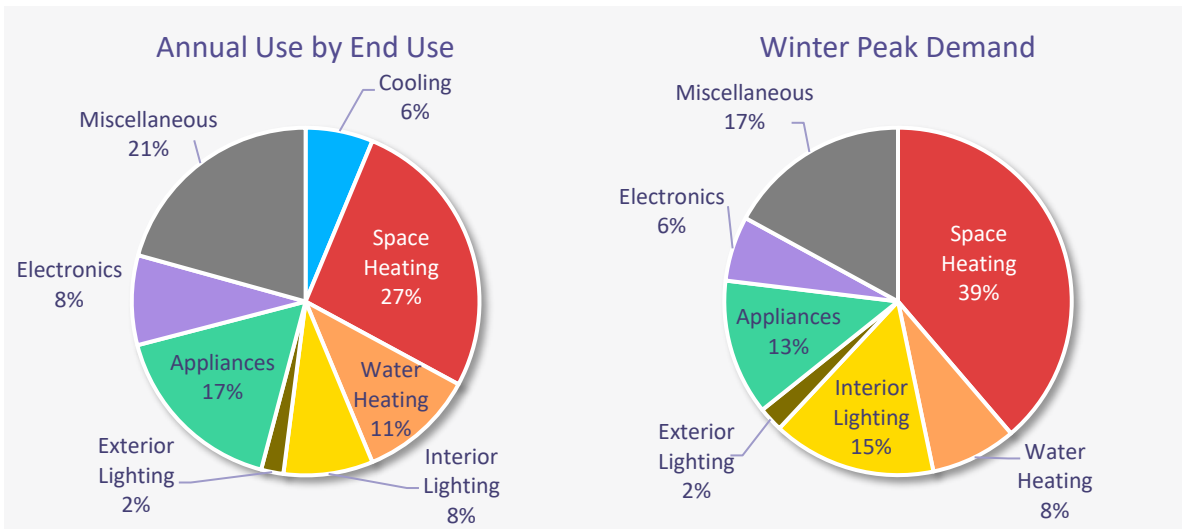


Figure 3-5 Residential Intensity by End Use and Segment, Washington

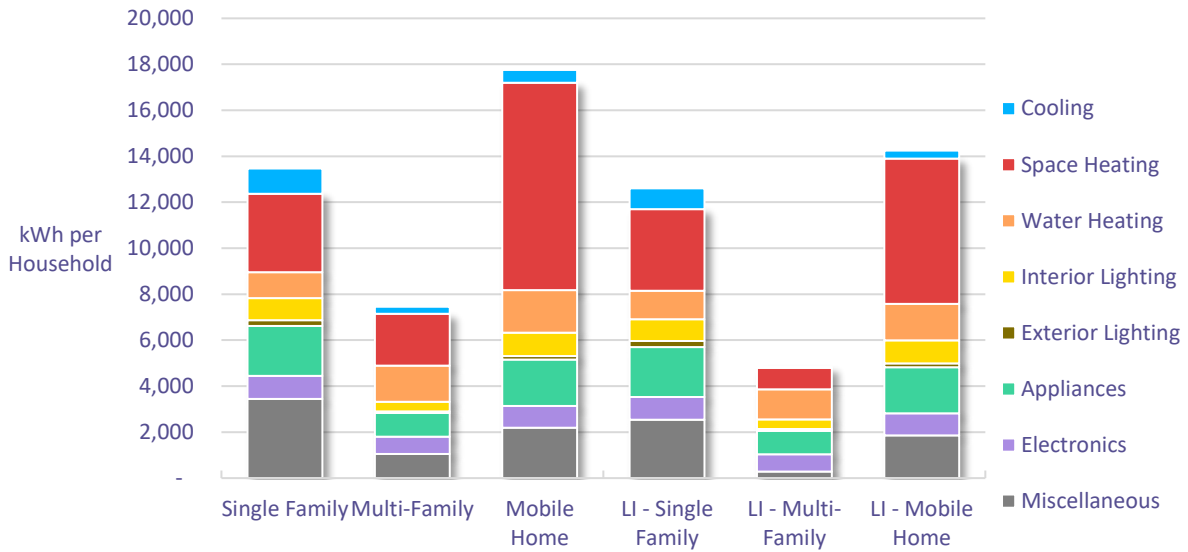
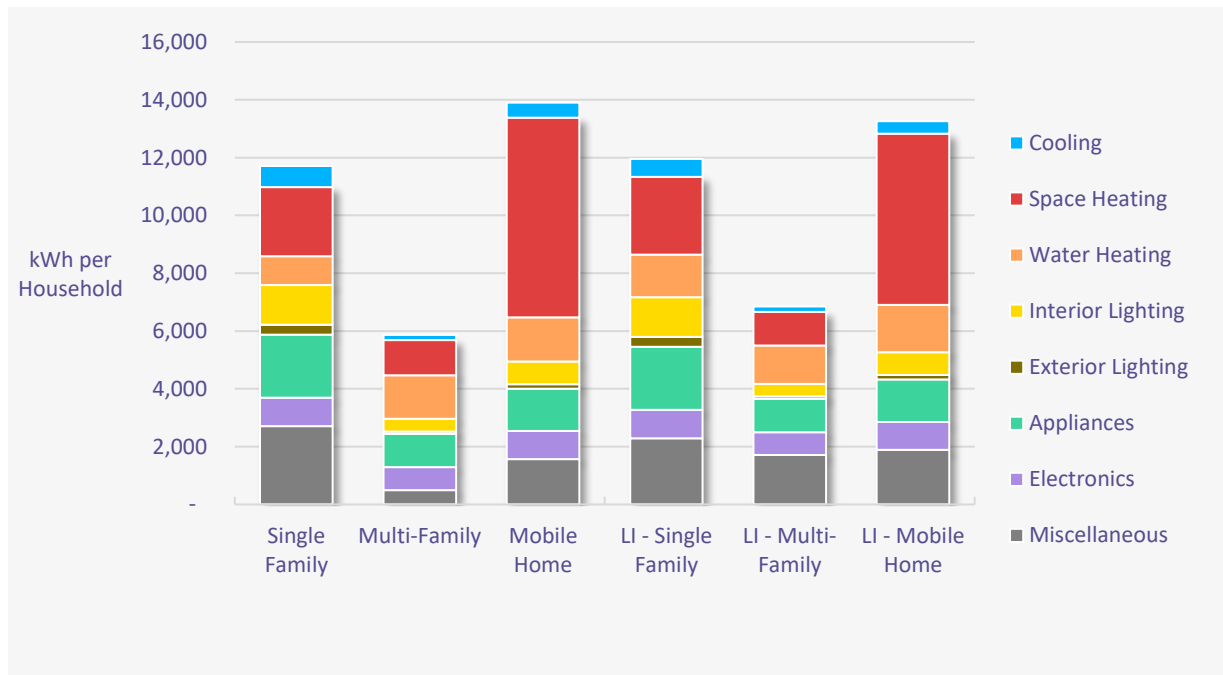


Figure 3-6 Residential Intensity by End Use and Segment, Idaho



Commercial Sector

The total electric energy consumed by commercial customers in 2021 was 2,075 GWh in Washington and 986 GWh in Idaho. Avista billing data, CBSA, and secondary data were used to allocate this energy usage to building type segments and to develop estimates of energy intensity (annual kWh/square foot). Using the electricity use and intensity estimates, AEG inferred floor space (the

unit of analysis in LoadMAP for the commercial sector). The average building intensities by segment are based on regional information from the CBSA; therefore, the intensity is the same in both states. However, the overall end-use mix is different due to the different mix of building types.

Table 3-5 Base Year Electric Consumption Summary (Control Totals), Washington

Segment	Electric Use (GWh)	Floor Space (million sqft)	Intensity (kWh/Sqft)	% of Annual Use
Large Office	162	6	25.9	8%
Small Office	192	14	14.0	9%
Retail	460	39	11.9	22%
Restaurant	263	6	46.0	13%
Grocery	127	4	28.2	6%
College	116	8	15.3	6%
School	191	19	9.9	9%
Health	54	3	17.6	3%
Lodging	200	11	18.3	10%
Warehouse	145	24	6.1	7%
Miscellaneous	166	18	9.4	8%
Total	2,075	151	13.7	100%

Table 3-6 Base Year Electric Consumption Summary (Control Totals), Idaho

Segment	Electric Use (GWh)	Floor Space (million sqft)	Intensity (kWh/Sqft)	% of Annual Use
Large Office	125	5	25.9	13%
Small Office	39	3	14.0	4%
Retail	218	18	11.9	22%
Restaurant	152	3	45.9	15%
Grocery	143	5	28.2	14%
College	58	4	15.3	6%
School	11	1	9.9	1%
Health	4	0	17.7	0%
Lodging	85	5	18.3	9%
Warehouse	35	6	6.1	4%
Miscellaneous	115	12	9.4	12%
Total	986	62	15.8	100%

Figure 3-7 and Figure 3-8 show the distribution of annual electricity consumption and winter peak demand by end use across all commercial buildings in Washington and Idaho, respectively. Electric usage is dominated by lighting and ventilation, which comprise nearly 40% of annual electricity usage. Lighting and ventilation also make up the largest portions of winter peak; however, electric space heating represents a greater part of the peak than it does annual energy.

Figure 3-7 Commercial Electricity Use and Winter Peak Demand by End Use, Washington

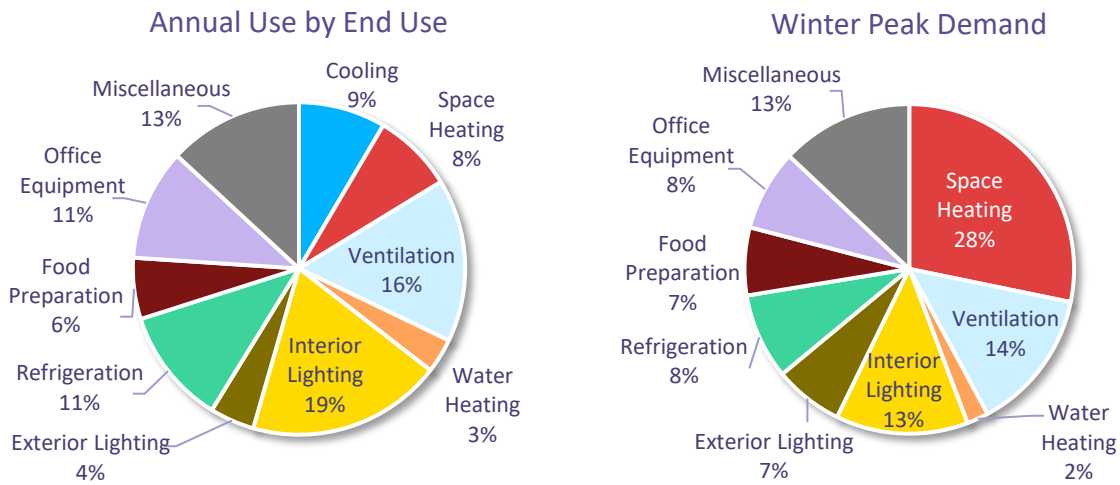


Figure 3-8 Commercial Electricity Use and Winter Peak Demand by End Use, Idaho

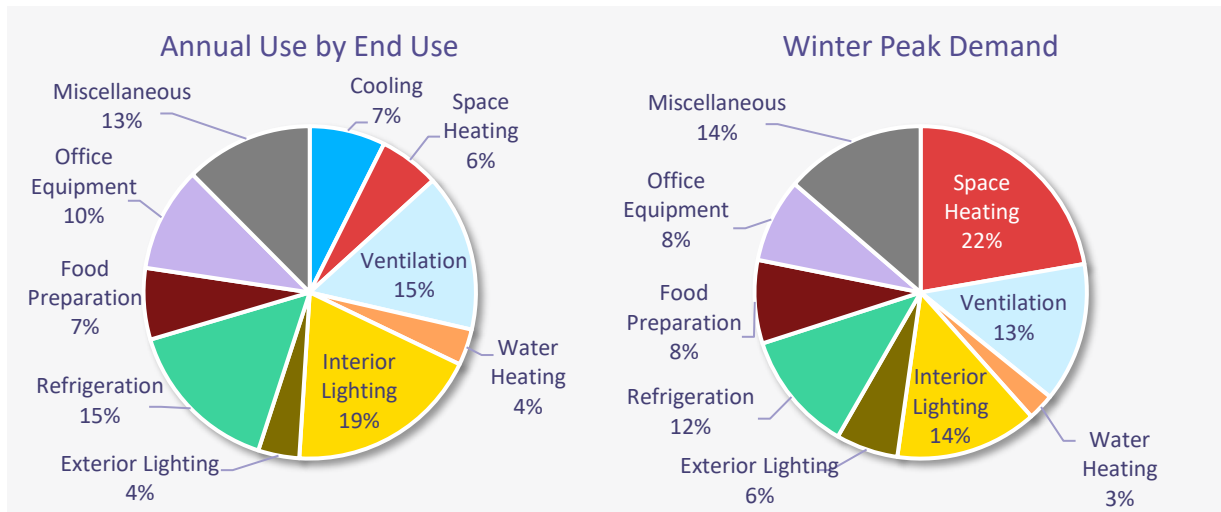


Figure 3-9 and Figure 3-10 present the electricity intensity in kWh per square foot by end use and segment for Washington and Idaho, respectively. In Washington, retail, restaurant, lodging, and small office buildings use the most electricity in the service territory. For Idaho, retail, restaurant, and grocery buildings use the most electricity in the service territory. HVAC and lighting are the major end uses across most segments, aside from large offices and grocery, where office equipment and refrigeration equipment, respectively, are highly concentrated.

Figure 3-9 Commercial Electric Intensity by End Use and Segment, Washington

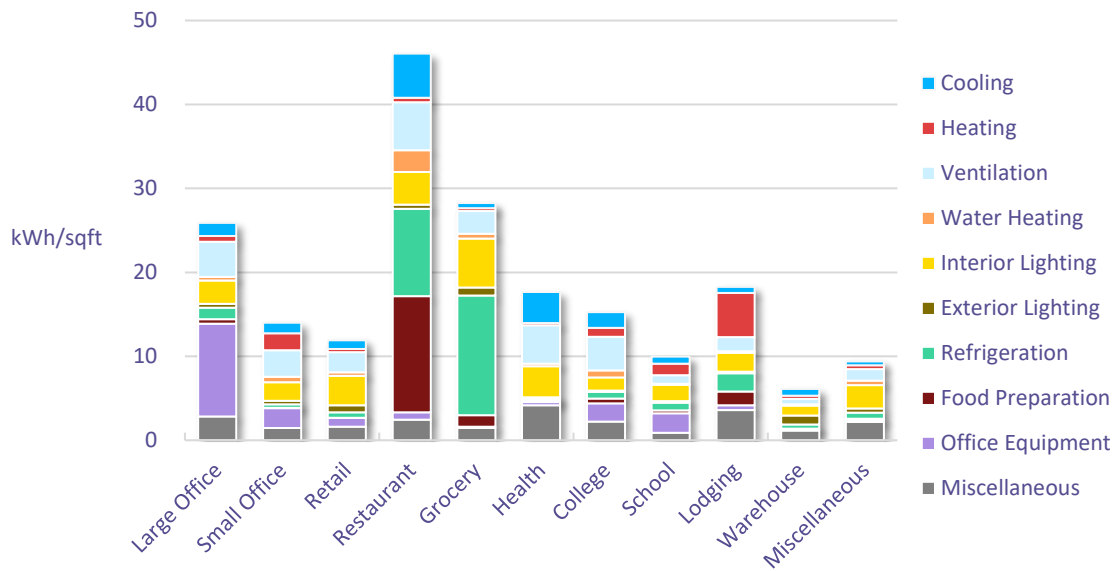
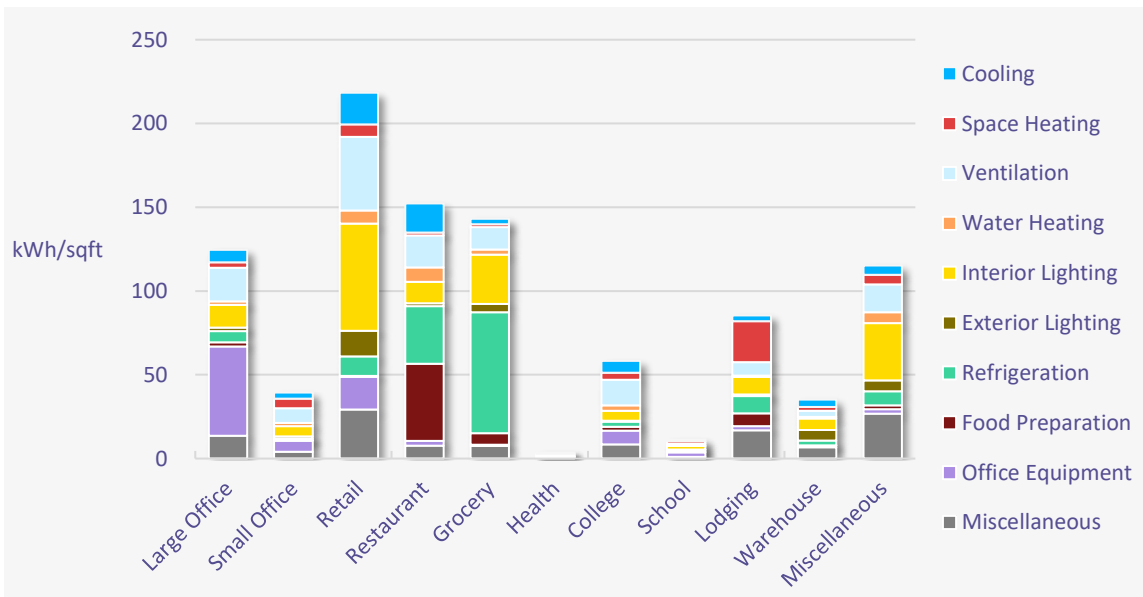


Figure 3-10 Commercial Electric Intensity by End Use and Segment, Idaho



Industrial Sector

The total electricity used by Avista’s industrial customers in 2021 was 976 GWh, 559 GWh in Washington, and 416 GWh in Idaho. Avista billing data and load forecast, NEEA’s IFSA, and secondary sources were used to develop estimates of energy intensity (annual kWh/employee). We infer the number of employees (the unit of analysis in LoadMAP for the industrial sector) using the electricity use and intensity estimates.

Table 3-7 Base Year Electric Consumption Summary (Control Totals), Washington

Segment	Electric Sales (GWh)
Industrial	438
Pumping	122
Total	559

Table 3-8 Base Year Electric Consumption Summary (Control Totals), Idaho

Segment	Electric Sales (GWh)
Industrial	352
Pumping	64
Total	416

Figure 3-11 and Figure 3-12 show the distribution of annual electricity consumption and winter peak demand by end use for all industrial customers in Washington and Idaho, respectively. Motors are the largest overall end use, accounting for over 50% of energy use. Note that motors include a wide range of industrial equipment, such as air compressors and refrigeration compressors, pumps, conveyor motors, and fans. The process end use accounts for over 15% of annual energy use, which includes heating, cooling, refrigeration, and electro-chemical processes.

Figure 3-11 Industrial Electricity Use and Winter Peak Demand by End Use, All Industries, Washington

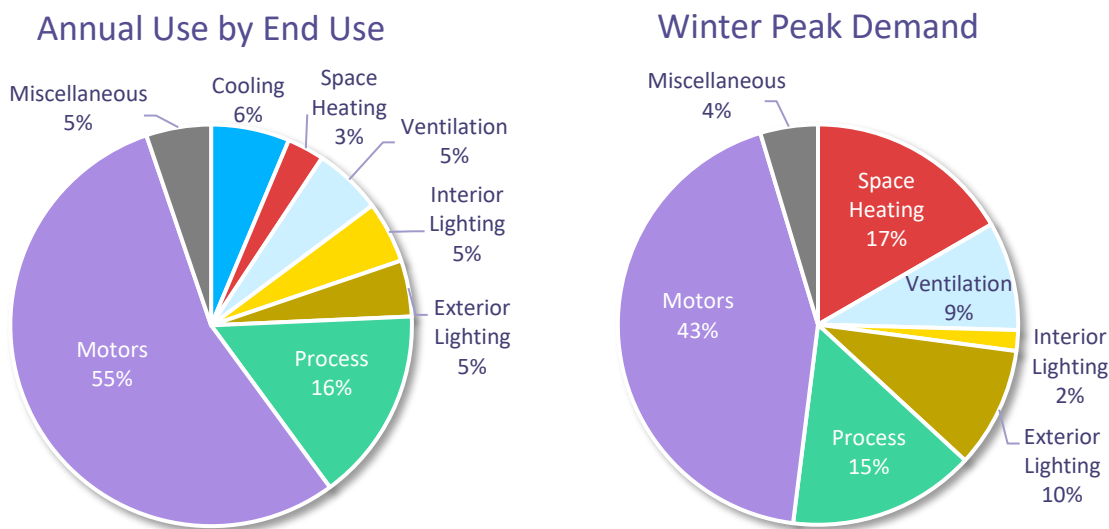
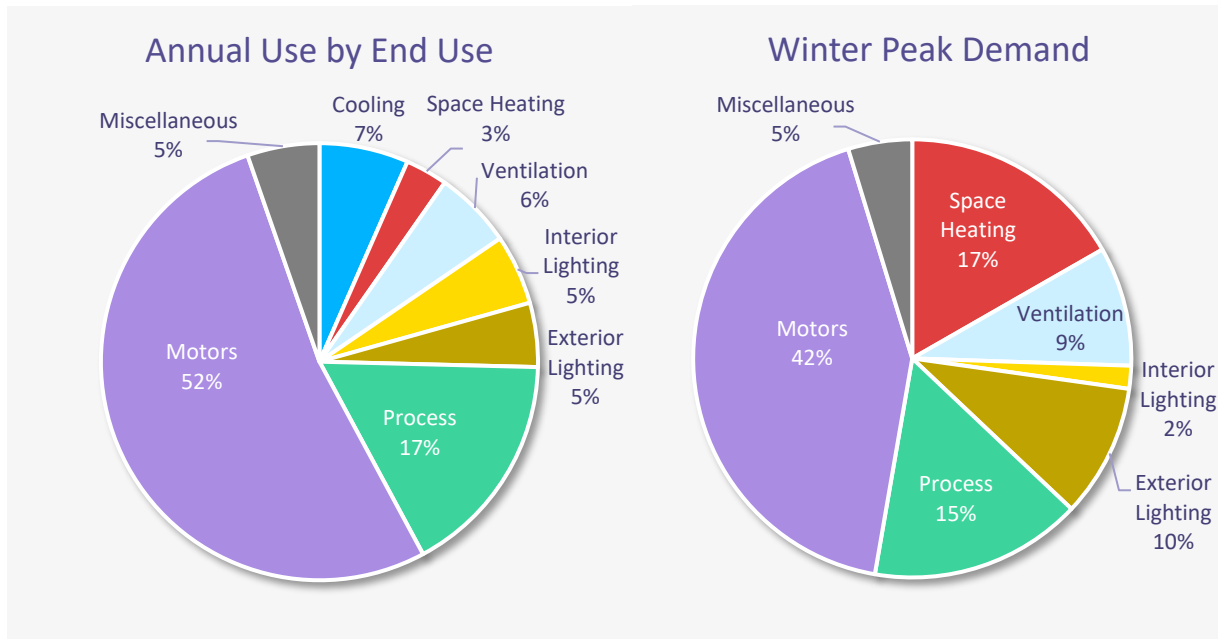


Figure 3-12 Industrial Electricity Use and Winter Peak Demand by End Use, All Industries, Idaho



4 | Baseline Projection

Prior to developing estimates of energy efficiency potential, AEG developed a baseline end use projection to quantify the likely future consumption in the absence of any future conservation programs. The baseline projection is the foundation for the analysis of savings from future conservation efforts as well as the metric against which potential savings are measured.

The baseline projection quantifies electricity consumption for each sector, customer segment, end use and technology. The end use forecast includes the relatively certain impacts of codes and standards that will unfold over the study timeframe; all such mandates that were defined as of January 2024 are included.

Other inputs to the projection include: economic growth forecasts (i.e., customer growth, income growth), electricity price forecasts, trends in fuel shares and equipment saturations, and Avista's internally developed sector-level projections for electricity sales.

The baseline also includes projected naturally occurring energy efficiency during the potential forecast period. AEG's LoadMAP efficiency choice model uses energy and cost data as well as current purchase trends to evaluate technologies and predict future purchase shares. AEG also modeled the adoption of electrification measures of natural gas customers and included the future effects of this additional electric equipment stock in Avista's territory. These purchase data all feed into the stock accounting algorithm to predict and track equipment stock and energy usage for each market segment.

AEG then calculated hourly profiles of the end use projection using a combination of region-specific load shapes from the National Renewable Energy Laboratory's (NREL) end use load profiles, Avista's load research data and engineering simulations. Shapes were collected at the sector, segment, end use or technology level where available. These load shapes were then customized to Avista's seasonal loads and normalized so the value for each hour represents 1/8760th of the year. The energy from baseline projection for each end use and technology was applied to each shape to compute hourly profiles.

This chapter presents the baseline projections developed for each sector and state (as well as a summary), which include projections of annual use in GWh. Annual energy use for 2021 reflects weather-normalized values, while future years of energy use and peak demand reflect normal weather, as defined by Avista.

Residential Sector Baseline Projections

Table 4-1 and Table 4-2 present the baseline projection for electricity by end use for the residential sector in Washington and Idaho, respectively. Overall, in Washington, residential use increases from 2,671 GWh in 2021 to 3,670 GWh in 2045, an increase of 37.4%. Residential use in Idaho increases from 1,320 GWh in 2021 to 1,763 GWh in 2045, an increase of 33.6%. This reflects substantial customer growth in both states. Figure 4-1 and Figure 4-3 display the graphical representation of the baseline projection in each state.

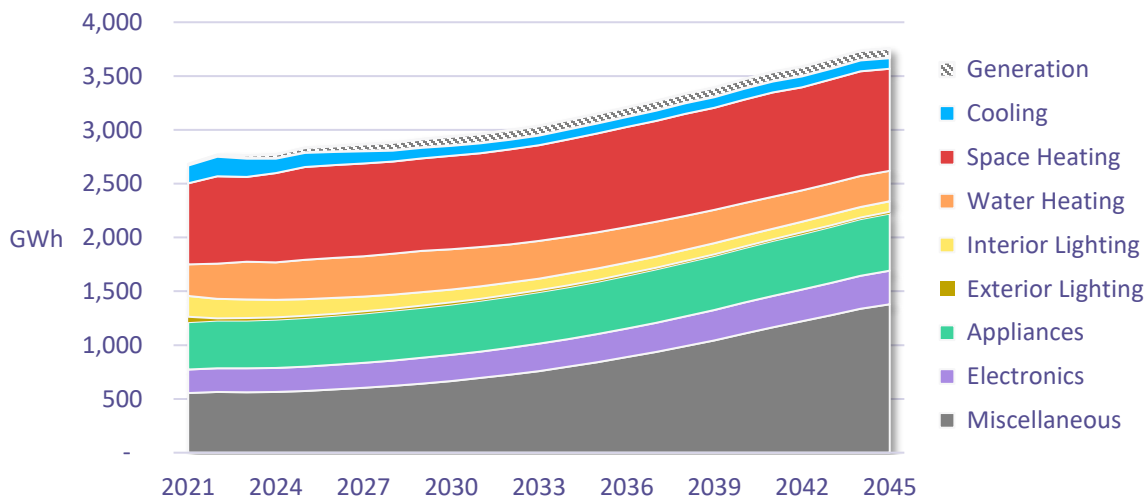
Figure 4-2 and Figure 4-4 present the baseline projection of annual electricity use per household in each state. Growth in use per household and across the sector is a net effect of several factors:

- Lighting continues to decline throughout the forecast period as the impacts of EISA continue transformation of the lighting market into LED
- The federal water heater standard update effective 2029 causes a sharp decline in water heating usage after that point, such that by 2045, total residential water heating loads are lower than 2021 values, despite saturation growth from new construction and electrification
- Space heating sees an increase as new construction is assumed to be heated in the majority by electric heat pumps, in compliance with Washington state energy code³
- In the later years of the forecast, expected impacts of electric vehicles increase dramatically, drawing on research done separately by Cadeo in a concurrent study for Avista⁴

Table 4-1 Residential Baseline Sales Projection by End Use (GWh), Washington

End Use	2021	2023	2025	2030	2040	2045	% Change
Cooling	178	200	178	178	190	188	5.9%
Space Heating	753	789	861	869	961	948	25.8%
Water Heating	294	351	367	374	303	285	-3.3%
Interior Lighting	193	173	155	120	101	98	-49.1%
Exterior Lighting	48	21	20	19	15	15	-68.6%
Appliances	440	446	452	469	507	531	20.6%
Electronics	219	222	227	242	286	312	42.5%
Miscellaneous	554	561	573	667	1,107	1,379	148.8%
Generation	(10)	(29)	(43)	(83)	(87)	(87)	791.0%
Total	2,671	2,734	2,790	2,855	3,383	3,670	37.4%

Figure 4-1 Residential Baseline Projection by End Use, Washington



³ There are some circumstances where it is possible under the code credit system to reach compliance with high efficiency gas systems, particularly as backup units, however this baseline assumes >90% of new construction will be all-electric as the simplest path to compliance

⁴ See *Distributed Energy Resources Potential Study*, Prepared for Avista Utilities by Applied Energy Group, Inc., Cadeo Group, and Verdant Associates. June 17, 2024

Figure 4-2 Residential Baseline Projection by End Use - Annual Per Household, Washington

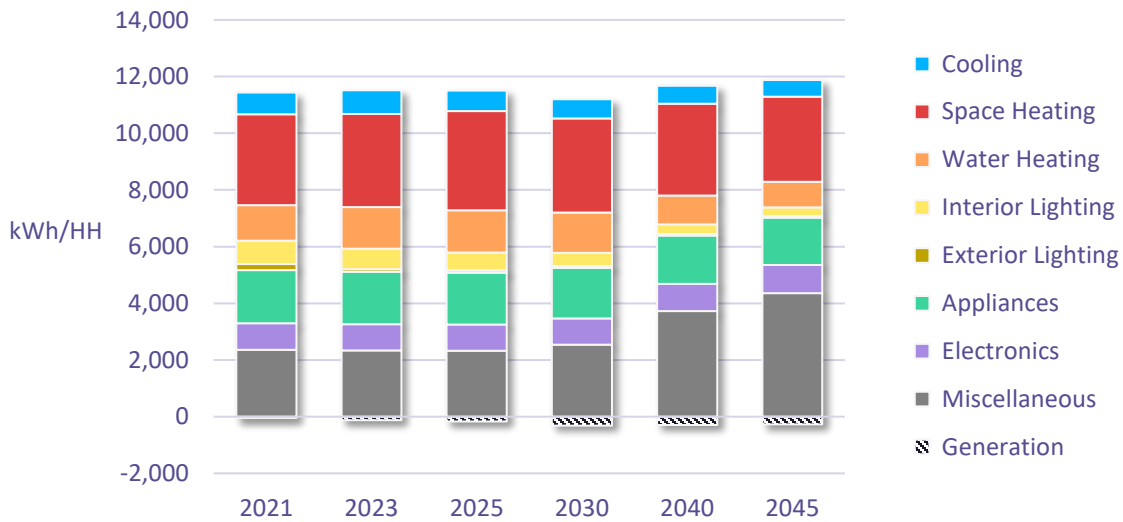


Table 4-2 Residential Baseline Sales Projection by End Use (GWh), Idaho

End Use	2021	2023	2025	2030	2040	2045	% Change
Cooling	73	78	71	71	76	78	5.9%
Space Heating	312	369	406	420	509	540	73.2%
Water Heating	139	171	182	187	138	120	-14.0%
Interior Lighting	139	126	112	88	76	76	-45.6%
Exterior Lighting	35	16	15	15	13	13	-62.4%
Appliances	234	237	240	248	274	292	25.0%
Electronics	115	117	120	129	156	172	49.9%
Miscellaneous	274	277	280	297	419	512	87.0%
Generation	(1)	(5)	(6)	(9)	(24)	(40)	5019.1%
Total	1,320	1,387	1,420	1,447	1,637	1,763	33.6%

Figure 4-3 Residential Baseline Projection by End Use, Idaho

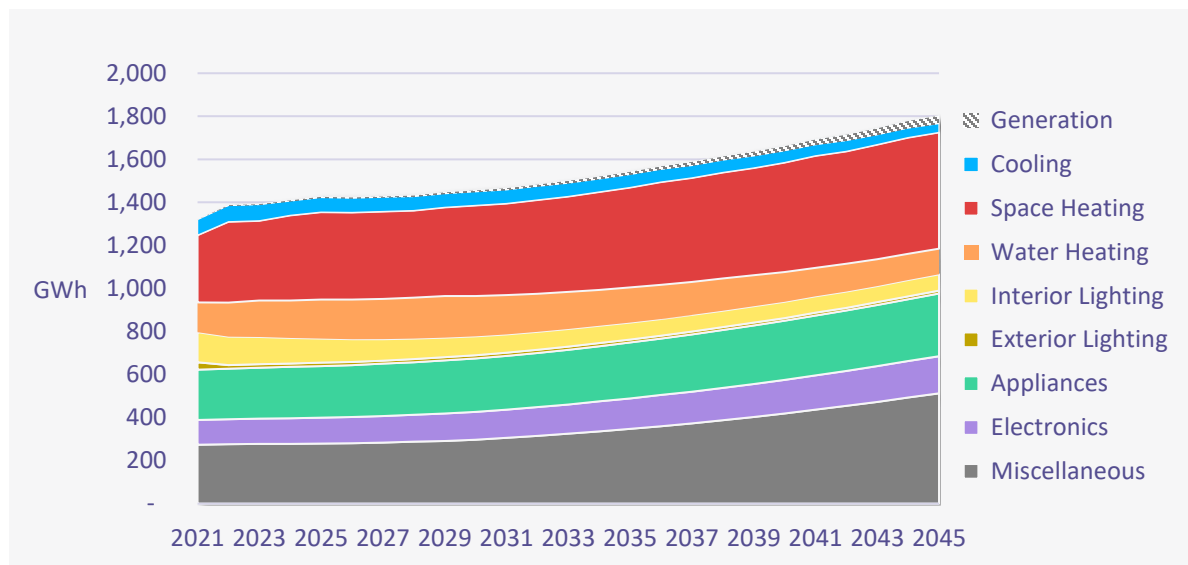
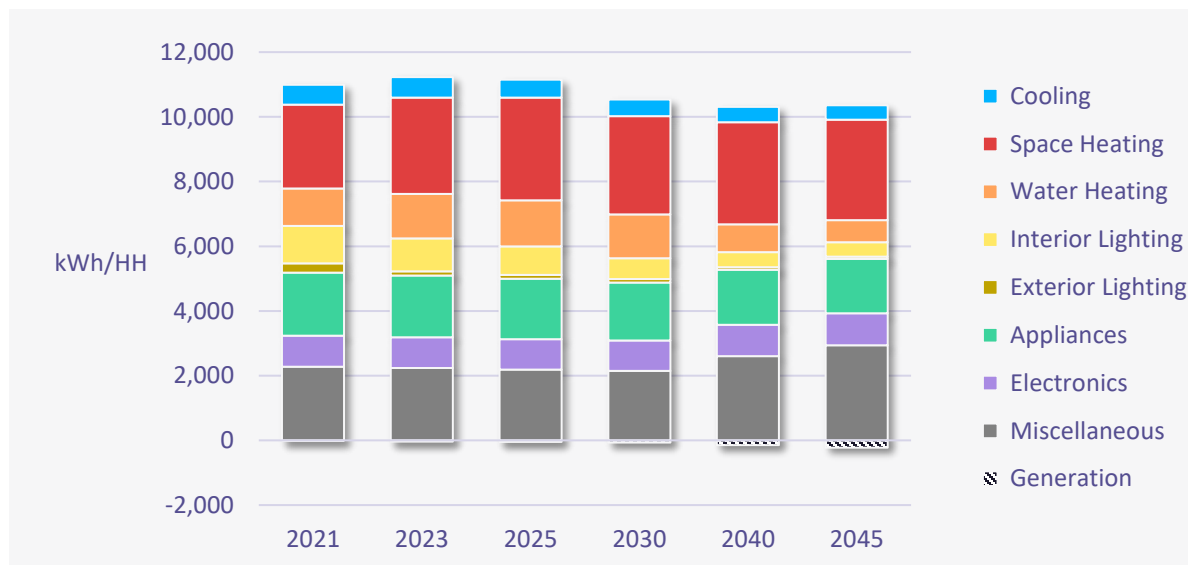


Figure 4-4 Residential Baseline Projection by End Use - Annual Per Household, Idaho



Commercial Sector Baseline Projections

In Washington, annual electricity use in the commercial sector grows during the overall forecast horizon, starting at 2,075 GWh in 2021, and increasing to 3,034 in 2045, an increase of 46%. In Idaho, annual electricity use will grow from 986 GWh in 2021 to 1,240 GWh in 2045, an increase of 25.7%.

Table 4-3 Commercial Baseline Sales Projection by End Use (GWh), Washington

End Use	2021	2023	2025	2030	2040	2045	% Change
Cooling	176	149	128	133	142	143	-18.6%
Space Heating	162	184	189	191	198	199	22.4%
Ventilation	329	328	302	281	258	251	-23.6%
Water Heating	70	78	81	97	126	136	94.1%
Interior Lighting	394	394	388	371	351	347	-11.9%
Exterior Lighting	90	89	86	77	71	70	-22.9%
Refrigeration	235	239	242	250	267	276	17.7%
Food Preparation	124	124	122	118	124	129	3.9%
Office Equipment	225	221	213	208	218	223	-0.9%
Miscellaneous	273	283	302	388	908	1,280	369.6%
Generation	(2)	(7)	(7)	(10)	(15)	(20)	713.5%
Total	2,075	2,082	2,046	2,103	2,648	3,034	46.2%

Table 4-4 Commercial Baseline Sales Projection by End Use (GWh), Idaho

End Use	2021	2023	2025	2030	2040	2045	% Change
Cooling	73	58	58	63	72	76	4.0%
Space Heating	58	71	83	86	95	99	70.9%
Ventilation	151	152	163	159	159	163	7.3%
Water Heating	35	38	44	52	68	74	113.8%
Interior Lighting	186	191	190	188	189	194	3.9%
Exterior Lighting	40	40	39	36	35	36	-9.6%
Refrigeration	152	158	163	174	199	214	40.4%
Food Preparation	69	69	67	64	63	63	-8.0%
Office Equipment	101	101	98	98	109	115	14.4%
Miscellaneous	123	128	131	140	171	210	70.9%
Generation	(1)	(1)	(1)	(1)	(2)	(3)	274.6%
Total	986	1,004	1,035	1,058	1,158	1,240	25.7%

Figure 4-5 Commercial Baseline Projection by End Use, Washington

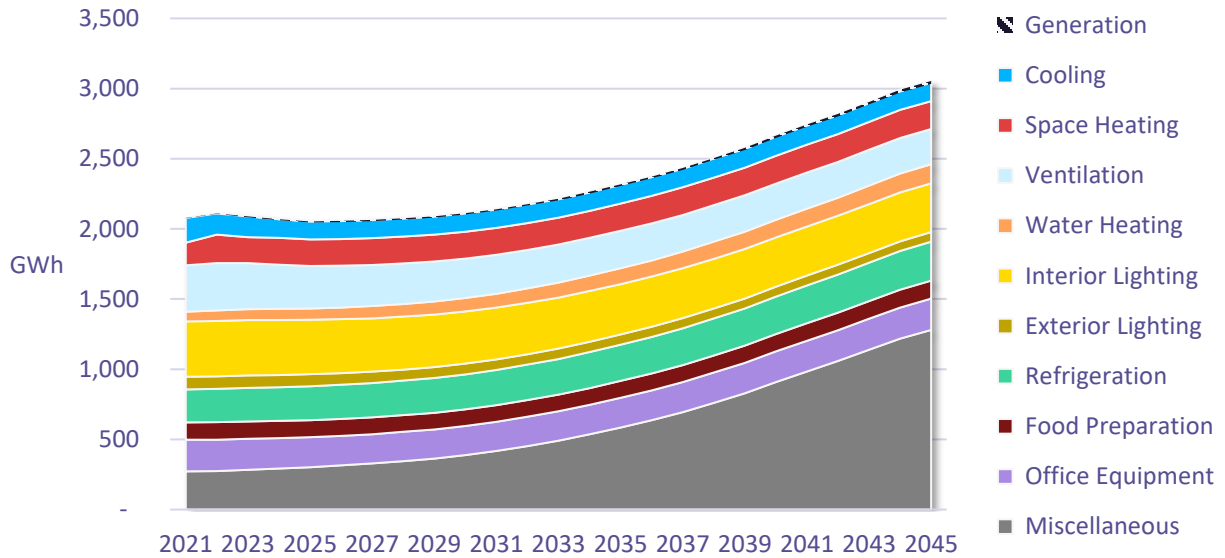


Figure 4-6 Commercial Baseline Sales Projection by End Use – Annual Use per Square Foot, Washington

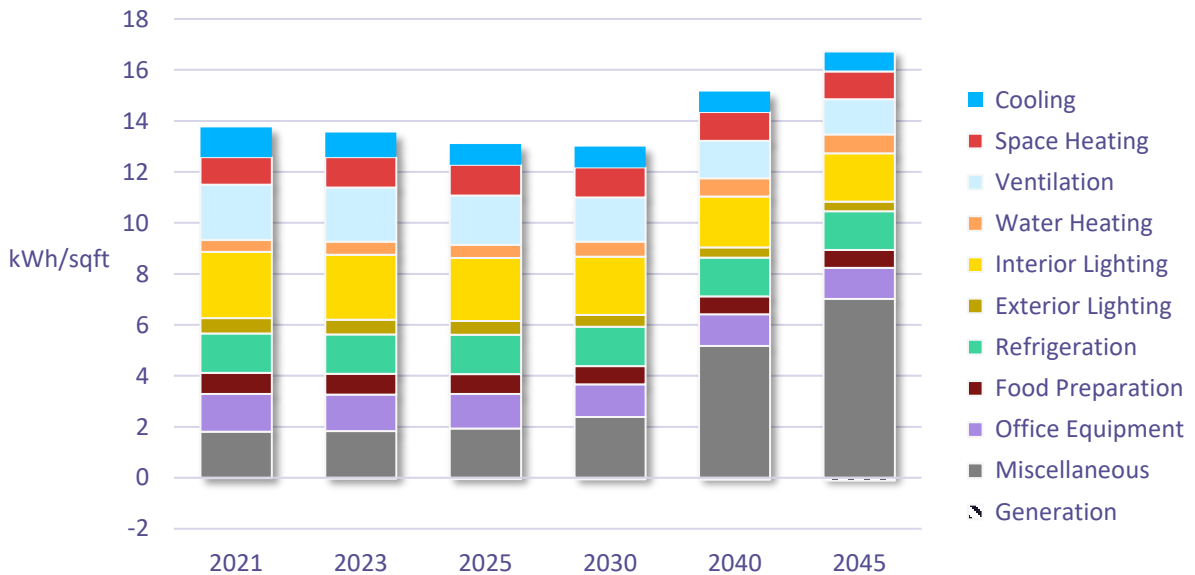


Figure 4-7 Commercial Baseline Projection by End Use, Idaho

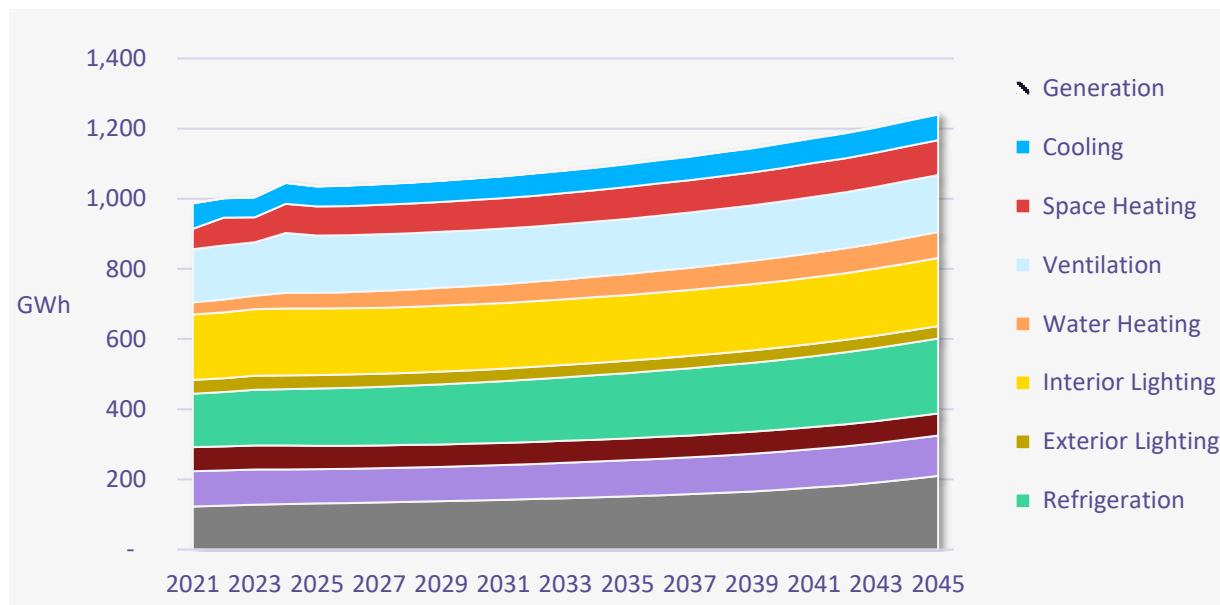
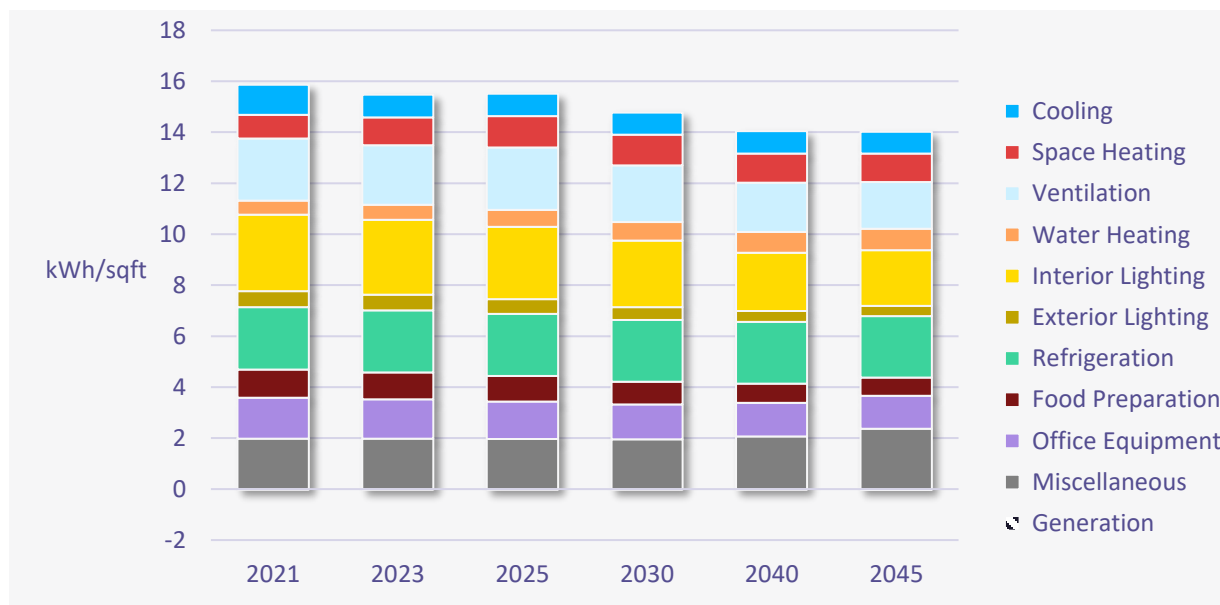


Figure 4-8 Commercial Baseline Sales Projection by End Use – Annual Use per Square Foot, Idaho



Industrial Sector Baseline Projections

Annual industrial use declined through the forecast horizon, consistent with trends from Avista’s industrial load forecast. Overall, in Washington, industrial annual electricity use decreases from 559 GWh in 2021 to 478 GWh in 2045. In Idaho, annual electricity use drops from 416 GWh in 2021 to 309 GWh in 2045.

Table 4-5 Industrial Baseline Projection by End Use (GWh), Washington

End Use	2021	2023	2025	2030	2040	2045	% Change
Cooling	35	35	35	33	29	28	-20.6%
Space Heating	17	17	16	15	14	13	-22.7%
Ventilation	31	31	29	26	21	20	-35.7%
Interior Lighting	28	29	27	24	21	19	-30.0%
Exterior Lighting	25	26	24	20	16	14	-43.2%
Process	87	93	92	88	81	78	-11.0%
Motors	307	314	311	302	287	280	-8.7%
Miscellaneous	29	31	30	29	27	26	-10.8%
Total	559	575	565	536	495	478	-14.5%

Table 4-6 Industrial Baseline Projection by End Use (GWh), Idaho

End Use	2021	2023	2025	2030	2040	2045	% Change
Cooling	27	23	22	21	18	17	-39.5%
Space Heating	13	13	13	13	11	10	-19.6%
Ventilation	24	23	22	19	15	14	-42.3%
Interior Lighting	22	21	21	18	14	13	-39.0%
Exterior Lighting	20	19	18	15	11	10	-50.1%
Process	70	69	70	66	58	54	-22.8%
Motors	219	213	214	203	183	174	-20.5%
Miscellaneous	22	22	22	21	18	17	-22.8%
Total	416	403	403	375	328	309	-25.9%

Figure 4-9 Industrial Baseline Projection by End Use (GWh), Washington

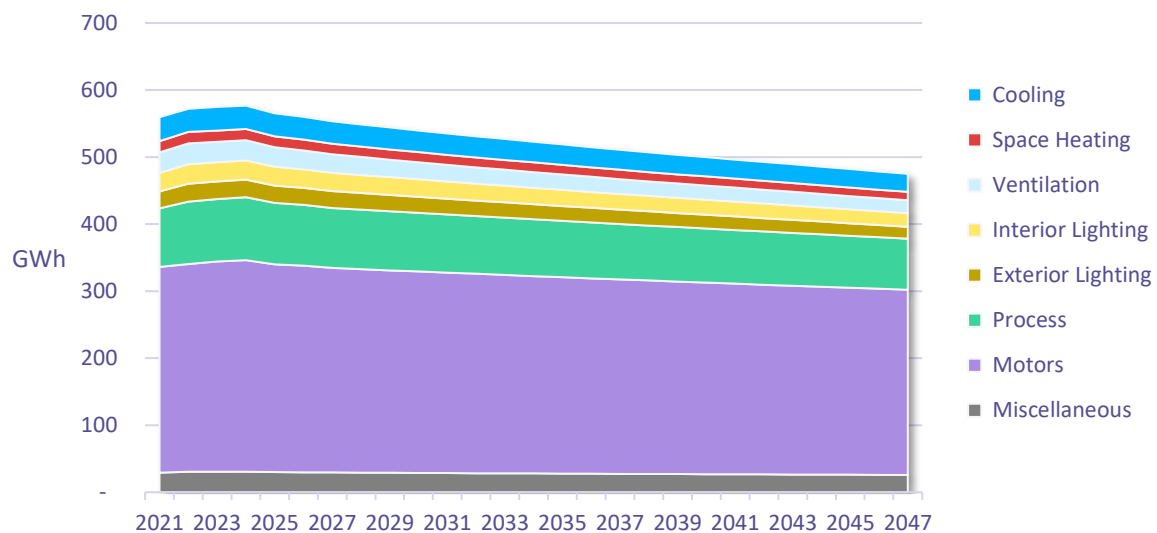


Figure 4-10 Industrial Baseline Sales Projection by End Use – Annual Use per Employee, Washington

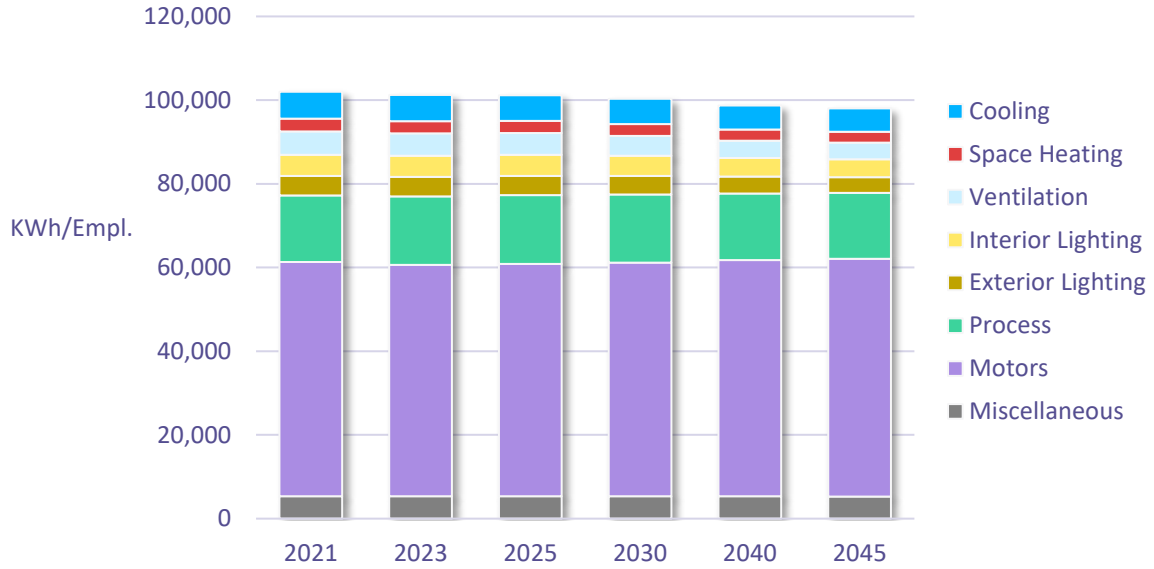


Figure 4-11 Industrial Baseline Projection by End Use (GWh), Idaho

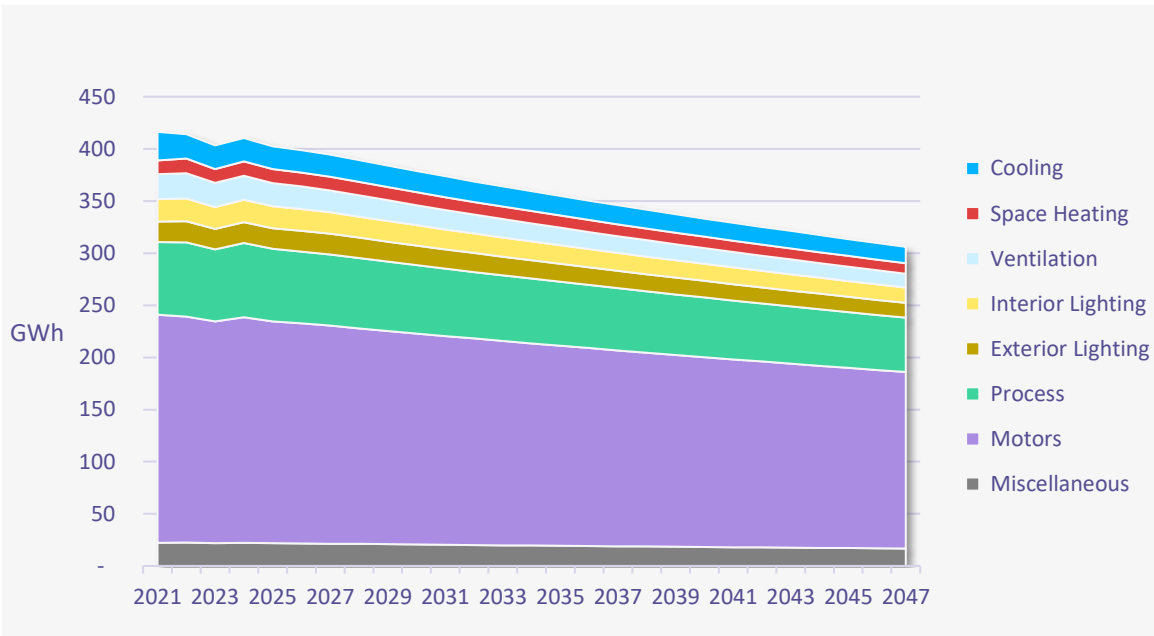
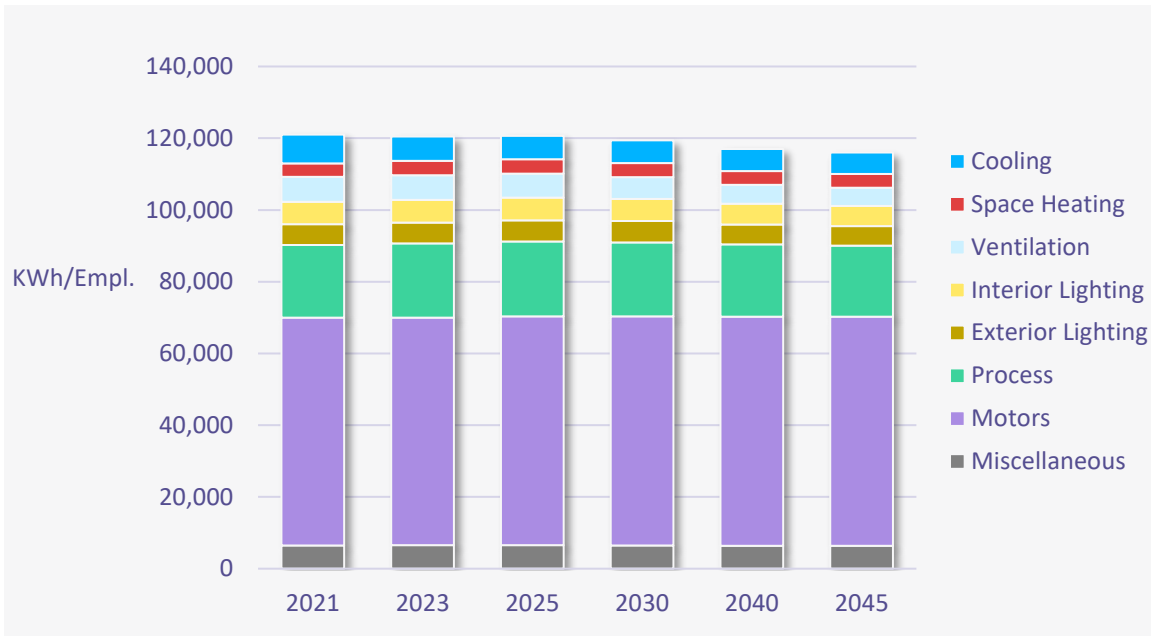


Figure 4-12 Industrial Baseline Sales Projection by End Use – Annual Use per Employee, Idaho



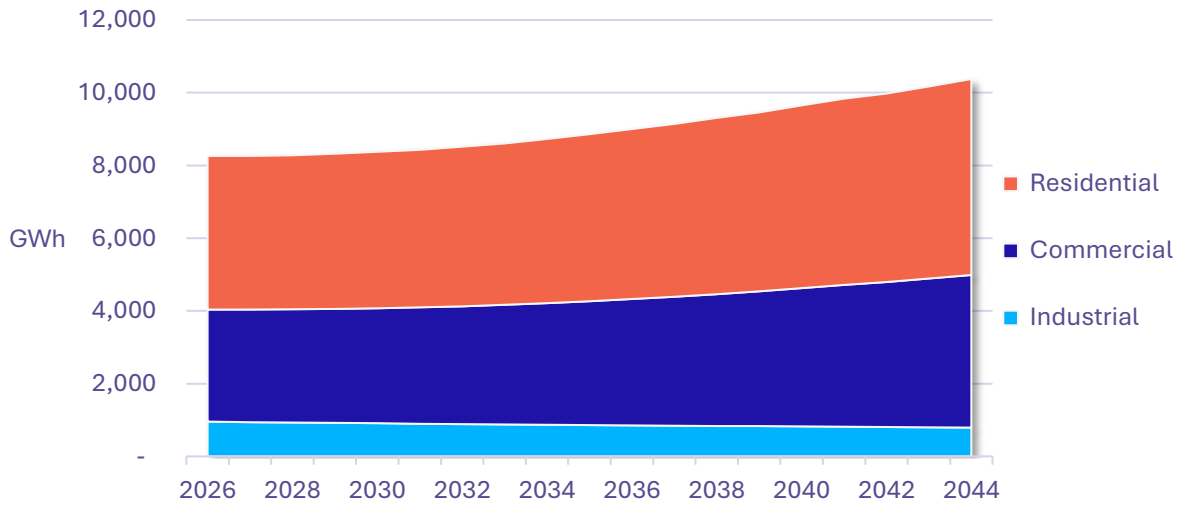
Summary of Baseline Projections Across Sectors and States

Table 4-7 and Figure 4-13 provide a summary of the baseline projection for annual use by sector for the entire Avista electric service territory. Overall, the projection shows steady growth in electricity use, driven primarily by customer growth forecasts.

Table 4-7 Baseline Projection Summary (GWh), Washington and Idaho Combined

End Use	2021	2023	2025	2030	2040	2045	% Change
Residential	3,991	4,121	4,210	4,302	5,020	5,432	36.1%
Commercial	3,062	3,086	3,081	3,161	3,806	4,274	39.6%
Industrial	976	978	968	911	823	787	-19.3%
Total	8,028	8,185	8,259	8,374	9,649	10,493	30.7%

Figure 4-13 Baseline Projection Summary (GWh), Washington and Idaho Combined



5 | Conservation Potential

This chapter presents conservation potential results, beginning with a summary of annual energy savings across all three sectors, followed by detailed savings for each sector. Potential is presented for annual energy savings (GWh and aMW) as well as the winter peak demand savings (MW) for selected years. Note that all savings are presented at the customer meter (i.e., excluding line losses).

Overall Summary of Energy Efficiency Potential

Summary of Annual Energy Savings

Table 5-1 and Table 5-2 summarize the energy efficiency potential for each state relative to the baseline projection. Potential as a percent of the baseline projection in each state is shown graphically in Figure 5-1 and Figure 5-2.

- **Technical Potential** reflects the adoption of all conservation measures regardless of cost-effectiveness.
 - For Washington, first-year savings are 136 GWh or 2.5% of the baseline projection. Cumulative savings in 2045 are 2,047 GWh or 28.5% of the baseline.
 - For Idaho, first-year savings are 67 GWh or 2.4% of the baseline projection. Cumulative savings in 2045 are 960 GWh or 29% of the baseline.
- **Achievable Technical Potential** modifies Technical Potential by accounting for assumed customer adoption.
 - In Washington, first-year savings potential is 60 GWh or 1.1% of the baseline. In 2045, cumulative achievable technical savings reach 1,519 GWh or 21.2% of the baseline projection. Achievable Technical Potential is approximately 56% of Technical Potential in Washington throughout the forecast horizon.
 - For Idaho, first-year savings are 31 GWh or 1.1% of the baseline, and by 2045, cumulative achievable technical savings will reach 692 GWh, or 20.9% of the baseline. In Idaho, Achievable Technical Potential reflects 57% of Technical Potential throughout the forecast horizon.

Table 5-1 Summary of Energy Efficiency Potential, Washington

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	5,406	5,410	5,422	5,495	5,882	7,182
Potential Forecasts (GWh)						
Achievable Technical Potential	5,346	5,282	5,216	5,111	4,976	5,663
Technical Potential	5,270	5,135	5,001	4,820	4,512	5,135
Cumulative Savings (GWh)						
Achievable Technical Potential	60	128	206	383	906	1,519
Technical Potential	136	275	421	675	1,370	2,047
Cumulative Savings (aMWh)						
Achievable Technical Potential	7	15	24	44	103	173
Technical Potential	16	31	48	77	156	234
Energy Savings (% of Baseline)						
Achievable Technical Potential	1.1%	2.4%	3.8%	7.0%	15.4%	21.2%
Technical Potential	2.5%	5.1%	7.8%	12.3%	23.3%	28.5%

Table 5-2 Summary of Energy Efficiency Potential, Idaho

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	2,851	2,854	2,857	2,879	2,975	3,311
Potential Forecasts (GWh)						
Achievable Technical Potential	2,820	2,787	2,749	2,683	2,528	2,620
Technical Potential	2,784	2,718	2,647	2,546	2,312	2,352
Cumulative Savings (GWh)						
Achievable Technical Potential	31	67	107	196	447	692
Technical Potential	67	136	209	333	664	960
Cumulative Savings (mMWh)						
Achievable Technical Potential	4	8	12	22	51	79
Technical Potential	8	16	24	38	76	110
Energy Savings (% of Baseline)						
Achievable Technical Potential	1.1%	2.3%	3.8%	6.8%	15.0%	20.9%
Technical Potential	2.4%	4.8%	7.3%	11.6%	22.3%	29.0%

Figure 5-1 Cumulative Energy Efficiency Potential as a % of Baseline Projection, Washington

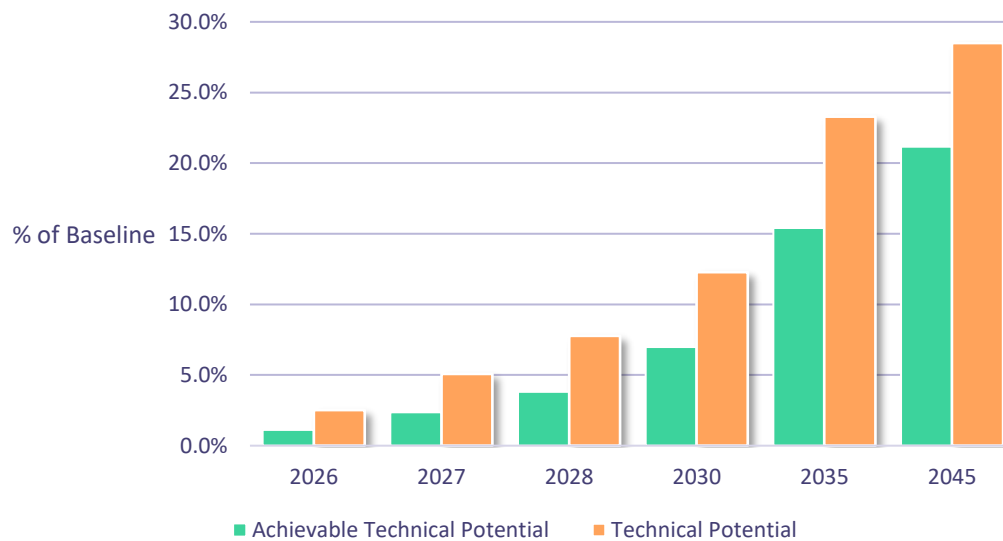
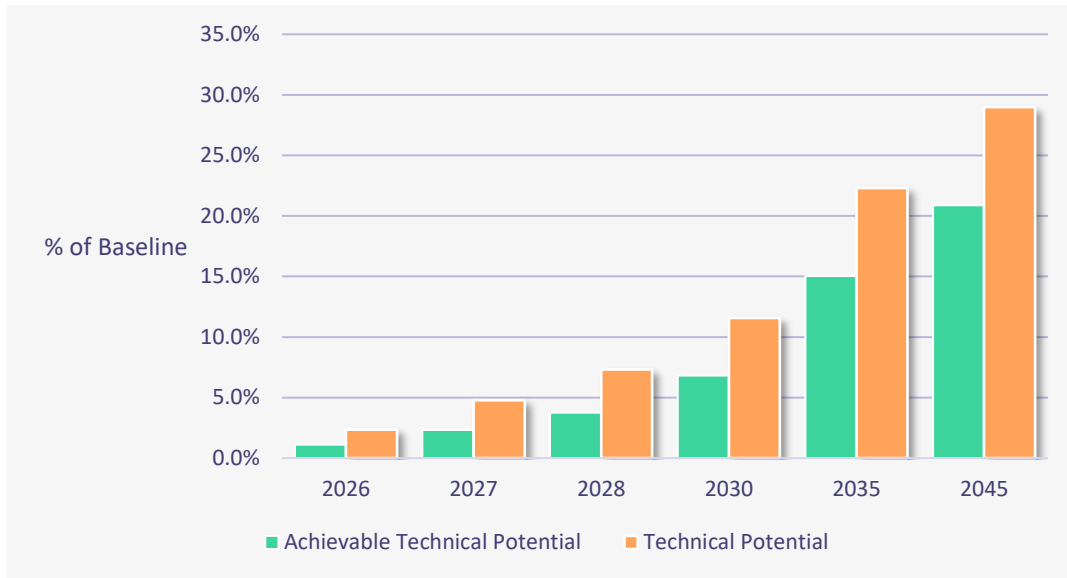


Figure 5-2 Cumulative Energy Efficiency Potential as a % of Baseline Projection, Idaho



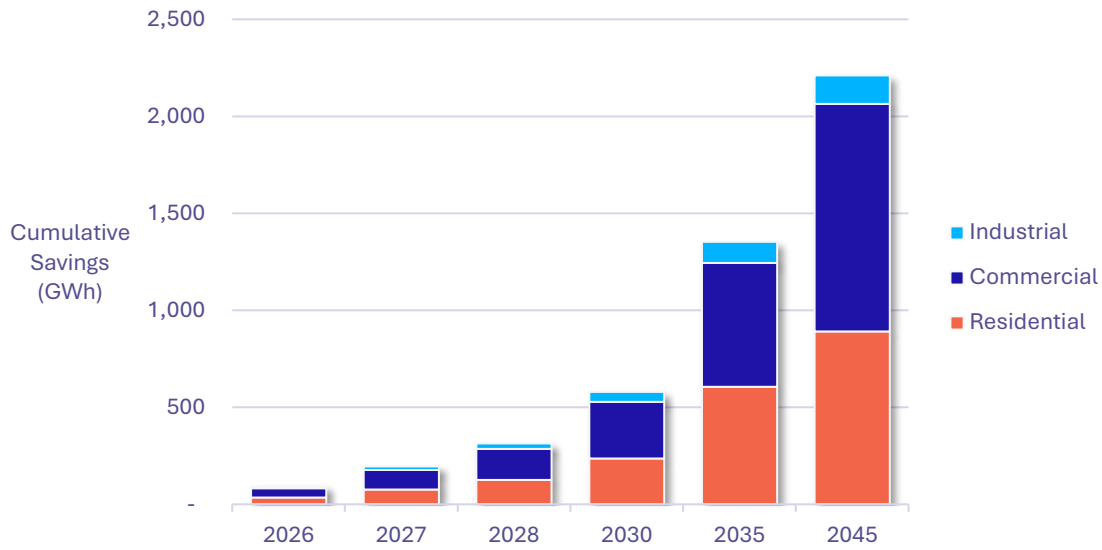
Summary of Conservation Potential by Sector

Table 5-3 and Figure 5-3 summarize the Achievable Technical Potential by sector for both states combined. As shown, the commercial sector represents the largest share of Achievable Technical Potential in the early years, with the residential sector representing larger potential over the longer term.

Table 5-3 Achievable Technical Conservation Potential by Sector, Washington and Idaho Combined

Sector	2026	2027	2028	2030	2035	2045
Cumulative Savings (GWh)						
Residential	35	76	125	235	605	891
Commercial	48	101	160	294	639	1,173
Industrial	8	18	28	51	109	146
Total	91	194	313	579	1,353	2,211
Cumulative Savings (aMW)						
Residential	4	9	14	27	69	102
Commercial	6	12	18	34	73	134
Industrial	1	2	3	6	12	17
Total	10	22	36	66	154	252

Figure 5-3 Achievable Technical Conservation Potential by Sector, Washington and Idaho Combined



Residential Conservation Potential

Table 5-4 and Table 5-5 present state-specific estimates of conservation potential for the residential sector in terms of annual energy savings. In Washington, residential Achievable Technical Potential in 2026 is 23 GWh or 0.8% of the baseline projection. By 2045, cumulative Achievable Technical Potential reaches 616 GWh or 16.8% of the baseline projection. In Idaho, 2026 Achievable Technical Potential is 12 GWh or 0.8% of the baseline, and by 2045 cumulative Achievable Technical potential reaches 274 GWh or 15.6% of the baseline.

Figure 5-4 and Figure 5-5 show potential as a percent of the baseline projection in each state.

Table 5-4 Residential Conservation Potential, Washington

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	2,798	2,804	2,810	2,855	3,063	3,669
Cumulative Savings (GWh)						
Technical Achievable Potential	23	50	83	158	414	616
Technical Potential	66	135	210	323	714	1,003
Energy Savings (% of Baseline)						
Technical Achievable Potential	0.8%	1.8%	3.0%	5.5%	13.5%	16.8%
Technical Potential	2.3%	4.8%	7.5%	11.3%	23.3%	27.3%
Cumulative Savings (aMW)						
Technical Achievable Potential	2.6	5.7	9.5	18.0	47.3	70.4
Technical Potential	7.5	15.4	23.9	36.8	81.6	114.5

Table 5-5 Residential Conservation Potential, Idaho

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	1,417	1,421	1,424	1,447	1,527	1,763
Cumulative Savings (GWh)						
Technical Achievable Potential	12	26	42	78	191	274
Technical Potential	30	63	98	146	321	459
Energy Savings (% of Baseline)						
Technical Achievable Potential	0.8%	1.8%	3.0%	5.4%	12.5%	15.6%
Technical Potential	2.1%	4.4%	6.9%	10.1%	21.0%	26.0%
Cumulative Savings (aMW)						
Technical Achievable Potential	1.3	2.9	4.8	8.9	21.8	31.3
Technical Potential	3.4	7.2	11.1	16.7	36.6	52.4

Figure 5-4 Residential Cumulative Conservation Potential, Washington

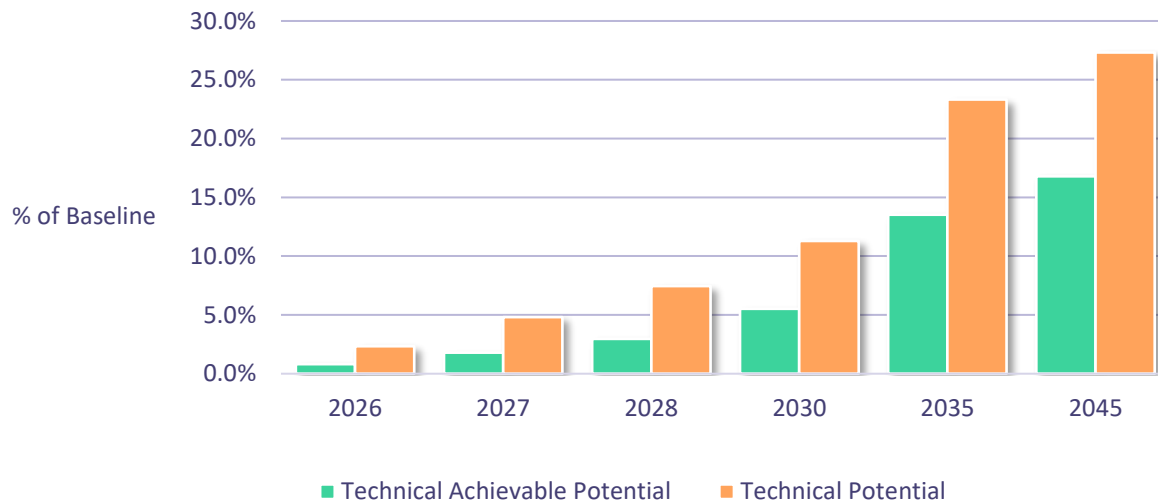


Figure 5-5 Residential Cumulative Conservation Potential, Idaho

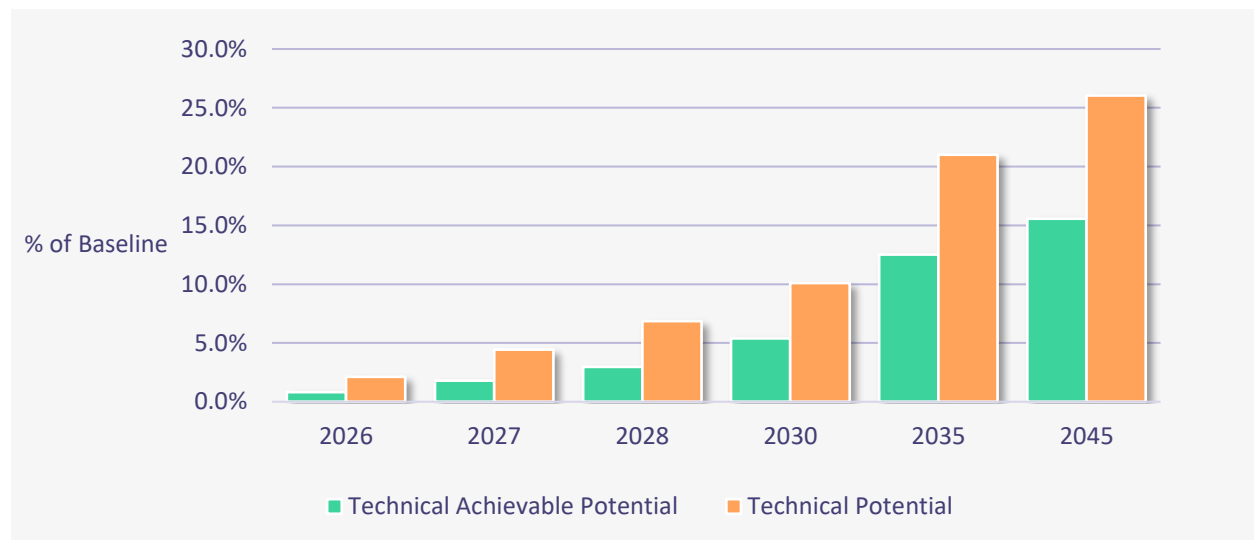


Figure 5-6 presents the cumulative residential Achievable Technical Potential by end use in Washington. Space heating and water heating account for a substantial portion of the savings throughout the forecast horizon. Weatherization, HVAC, and heat pump water heaters account for a large portion of potential over the 20-year study period. LED lighting, while still present, is reduced in comparison to prior studies, as RTF market baseline assumptions and the Washington state lighting standard have moved a substantial amount of potential from those technologies into the baseline projection.

Figure 5-6 Residential Cumulative Achievable Technical Potential by End Use, Washington

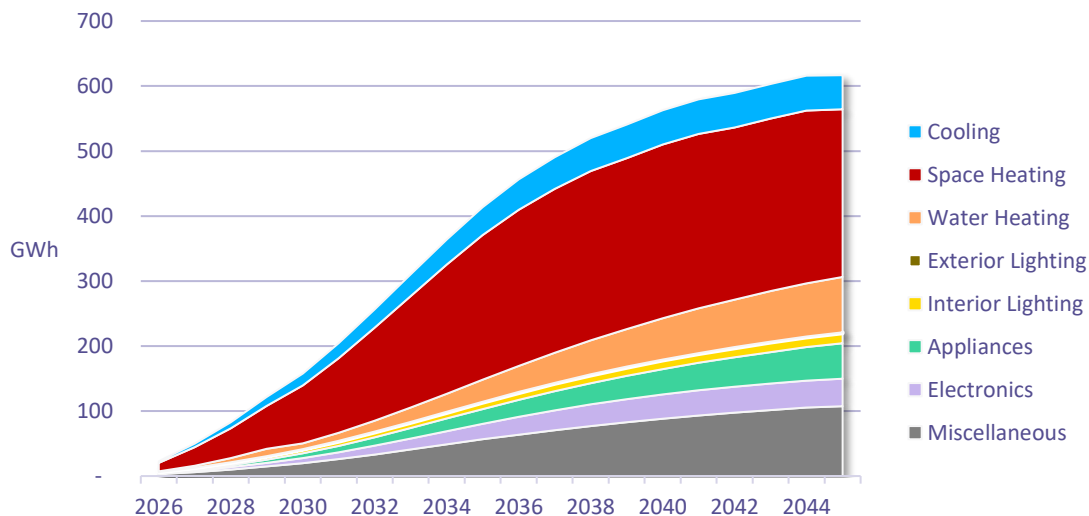


Table 5-6 identifies the top 20 residential measures from the perspective of cumulative Achievable Technical Potential for Washington in 2045, the final year of the planning horizon. The top three measures include high-efficiency windows, high-efficiency heat pump water heaters (above the new federal standard after 2030), and level 2 electric vehicles. Note that achievable technical savings do not screen for cost-effectiveness, and some measures are expected to be screened out during the IRP process.

Table 5-6 Residential Top 20 Measures in 2045, Washington

Rank	Residential Measure	2045 Cumulative Savings (MWh)	% of Total
1	Windows - High Efficiency (ENERGY STAR 7.0)	66,944	10.9%
2	Water Heater (<= 55 Gal) - NEEA Tier 5 Heat Pump (CCE 3.5)	54,778	8.9%
3	Electric Vehicles - Level 2	42,321	6.9%
4	Ducting - Repair and Sealing	24,439	4.0%
5	Windows - High Efficiency (Triple Pane)	22,645	3.7%
6	Insulation - Wall Sheathing	20,502	3.3%
7	Home Energy Reports	19,089	3.1%
8	Clothes Dryer - UCEF 2.62/CEF 3.93 - ENERGY STAR 1.1	18,893	3.1%
9	Building Shell - Air Sealing (Infiltration Control)	18,579	3.0%
10	Insulation - Ducting	17,897	2.9%
11	Engine Block Heater Controls	16,557	2.7%
12	Air-Source Heat Pump - SEER 16.0 / HSPF 9.2	15,952	2.6%
13	TVs - ENERGY STAR (9.0)	15,752	2.6%
14	Advanced New Construction Designs	15,209	2.5%
15	HVAC - Maintenance and Tune-Up	14,512	2.4%
16	Clothes Washer - CEE Tier 2	12,695	2.1%
17	Insulation - Floor Upgrade - R-30	12,541	2.0%
18	Ducting - Repair and Sealing - Aerosol	12,110	2.0%
19	Home Energy Management System (HEMS)	10,789	1.7%
20	Water Heater - Drainwater Heat Recovery	10,187	1.7%
Total of Top 20 Measures		442,389	71.7%
Total Cumulative Savings		616,674	100.0%

Figure 5-7 presents the cumulative residential Achievable Technical Potential by end use in Idaho. Results are similar to Washington, where the majority of the savings come from space heating and water heating measures.

Figure 5-7 Residential Cumulative Achievable Technical Potential by End Use, Idaho

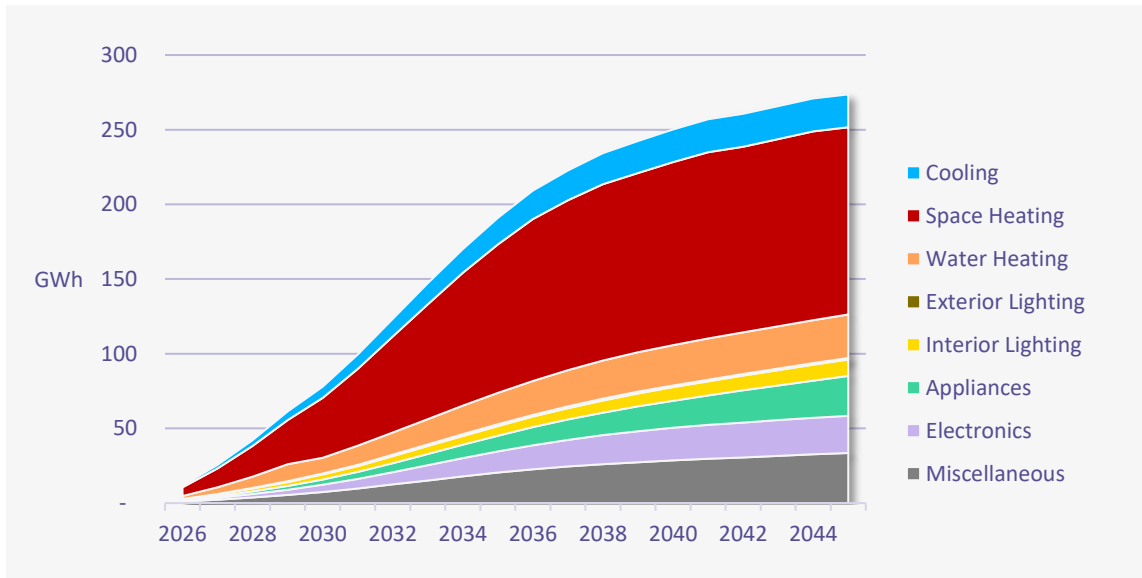


Table 5-7 shows the top residential measures for Idaho by 2045. The top three measures include two types of high-efficiency windows, as well as advanced new home construction designs. Note that Achievable Technical Potential is not screened for cost-effectiveness, and some measures are expected to be screened out during the IRP process.

Table 5-7 Residential Top Measures in 2045, Idaho

Rank	Residential Measure	2045 Cumulative Savings (MWh)	% of Total
1	Windows - High Efficiency (ENERGY STAR 7.0)	21,294	7.8%
2	Advanced New Construction Designs	13,714	5.0%
3	Windows - High Efficiency (Triple Pane)	12,602	4.6%
4	Engine Block Heater Controls	10,799	3.9%
5	Ducting - Repair and Sealing	9,508	3.5%
6	Insulation - Wall Sheathing - R-19	9,377	3.4%
7	Electric Vehicles - Level 2	9,173	3.4%
8	TVs - ENERGY STAR (9.0)	8,885	3.2%
9	Clothes Washer - CEE Tier 2	8,375	3.1%
10	Water Heater (<= 55 Gal) - NEEA Tier 5 Heat Pump (CCE 3.5)	7,750	2.8%
11	Insulation - Ducting - R-8 Ducts (Code)	7,458	2.7%
12	Ducting - Repair and Sealing - Aerosol - Aerosol duct sealing	7,026	2.6%
13	Linear Lighting - LED 2035 (152 lm/W system)	6,858	2.5%
14	Home Energy Reports	6,829	2.5%
15	HVAC - Maintenance and Tune-Up	6,715	2.5%
16	Building Shell - Air Sealing (Infiltration Control)	6,650	2.4%
17	Home Energy Management System (HEMS)	6,092	2.2%
18	Air-Source Heat Pump - SEER 16.0 / HSPF 9.2	5,937	2.2%
19	Personal Computers - ENERGY STAR (8.0)	5,624	2.1%
20	Insulation - Ceiling Installation - R-49	5,610	2.1%
Total of Top 20 Measures		176,277	64.4%
Total Cumulative Savings		273,606	100.0%

Commercial Conservation Potential

Table 5-8 and Table 5-9 present state-specific estimates of conservation potential for the commercial sector. For Washington, Achievable Technical Potential is 32 GWh in 2026 or 1.6% of the baseline projection. By 2045, achievable technical savings are 816 GWh or 26.9% of the baseline projection. For Idaho, first-year Achievable Technical Potential is 16 GWh or 1.6% of the baseline, and by 2045, cumulative Achievable Technical Potential reaches 358 GWh or 28.8% of the baseline.

Table 5-8 Commercial Conservation Potential, Washington

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	2,049	2,056	2,066	2,103	2,305	3,034
Cumulative Savings (GWh)						
Technical Achievable Potential	32	68	107	196	428	816
Technical Potential	64	126	190	315	577	938
Energy Savings (% of Baseline)						
Technical Achievable Potential	1.6%	3.3%	5.2%	9.3%	18.6%	26.9%
Technical Potential	3.1%	6.1%	9.2%	15.0%	25.0%	30.9%
Cumulative Savings (aMW)						
Technical Achievable Potential	3.7	7.7	12.2	22.4	48.9	93.1
Technical Potential	7.3	14.4	21.7	36.0	65.9	107.1

Table 5-9 Commercial Conservation Potential, Idaho

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	1,037	1,041	1,046	1,058	1,099	1,240
Cumulative Savings (GWh)						
Technical Achievable Potential	16	34	53	97	211	358
Technical Potential	32	64	96	160	287	428
Energy Savings (% of Baseline)						
Technical Achievable Potential	1.6%	3.2%	5.1%	9.2%	19.2%	28.8%
Technical Potential	3.1%	6.1%	9.2%	15.1%	26.1%	34.5%
Cumulative Savings (aMW)						
Technical Achievable Potential	1.8	3.8	6.1	11.1	24.1	40.8
Technical Potential	3.7	7.3	11.0	18.3	32.8	48.9

Figure 5-8 Commercial Cumulative Conservation Potential, Washington

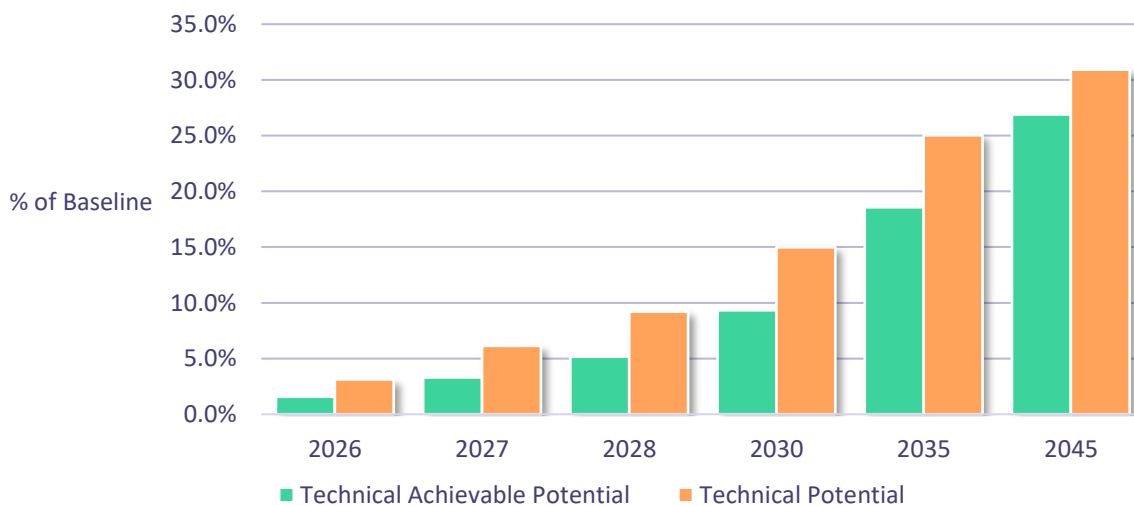


Figure 5-9 Commercial Cumulative Conservation Potential, Idaho

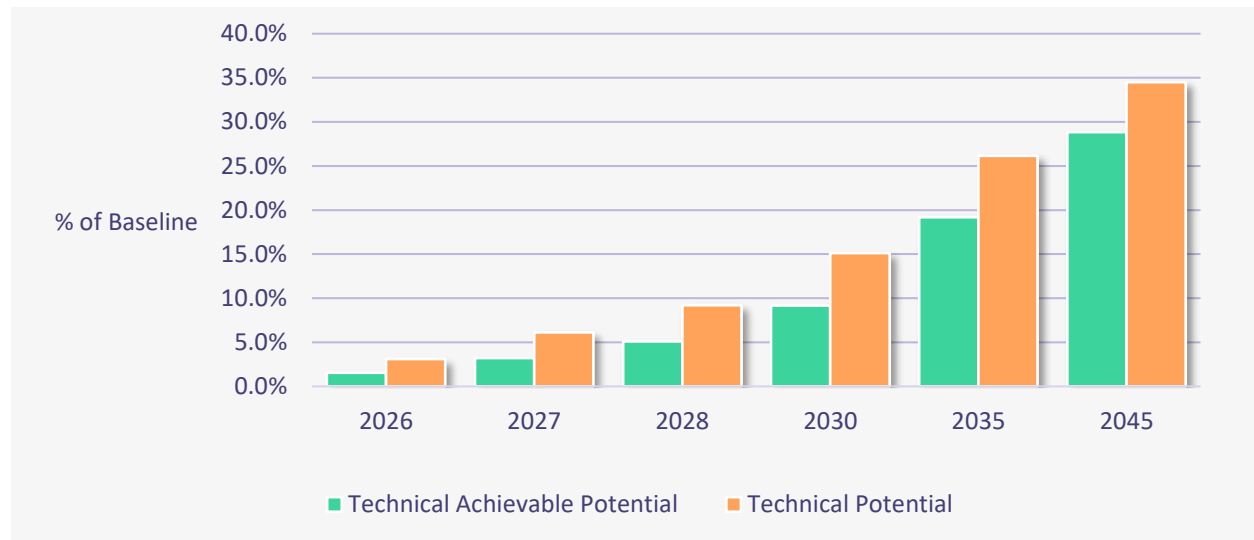


Figure 5-10 presents a forecast of cumulative commercial energy savings by end use in Washington. HVAC end uses (cooling, space heating and ventilation) paired with interior lighting account for a substantial portion of the savings throughout the forecast horizon.

Figure 5-10 Commercial Cumulative Achievable Technical Potential by End Use, Washington

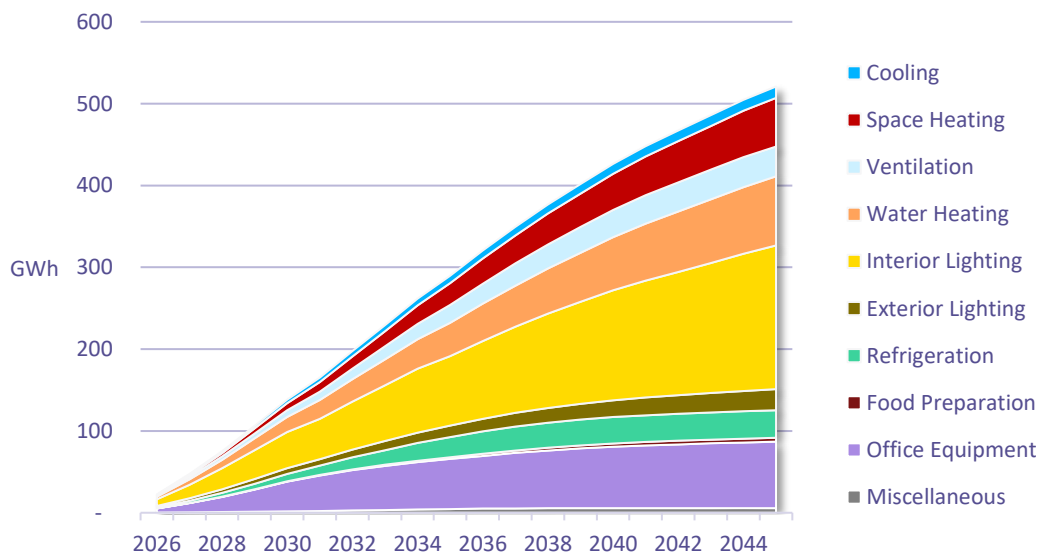


Table 5-10 identifies the top 20 commercial sector measures from the perspective of cumulative energy savings by 2045 in Washington. Electric vehicle chargers and linear lighting are included in the top 3 measures. Although the market has seen significant penetration of LEDs in some applications, newer systems – particularly those with built-in occupancy sensors or other controls – still represent significant savings opportunities. High-efficiency water heaters also contribute a significant portion to the potential.

Table 5-10 Commercial Top 20 Measures in 2045, Washington

Rank	Measure / Technology	2045 Cumulative Savings (MWh)	% of Total
1	Electric Vehicle Chargers - Level 2	156,182	19.3%
2	Linear Lighting - LED 2035 (152 lm/W system)	154,543	19.1%
3	Water Heater - UEF 3.9 - Heat Pump	70,102	8.6%
4	Air-Source Heat Pump - IEER 20.3 / COP 3.7	47,567	5.9%
5	High-Bay Lighting - LED	34,132	4.2%
6	Desktop Computer - ENERGY STAR (8.0)	30,568	3.8%
7	HVAC - Energy Recovery Ventilator	25,087	3.1%
8	Server - ENERGY STAR (4.0)	21,368	2.6%
9	Ventilation - Variable Speed Control	21,259	2.6%
10	Office Equipment - Advanced Power Strips	20,274	2.5%
11	Strategic Energy Management	19,452	2.4%
12	HVAC - Dedicated Outdoor Air System (DOAS)	17,903	2.2%
13	Ductless Mini Split Heat Pump	13,858	1.7%
14	Refrigeration - Economizer Addition	13,660	1.7%
15	Water Heater - Pipe Insulation	12,374	1.5%
16	Lodging - Guest Room Controls	8,534	1.1%
17	Retrocommissioning	7,422	0.9%
18	Water Heater - Solar Systems	6,984	0.9%
19	Laptop - ENERGY STAR (8.0)	5,448	0.7%
20	Windows - Secondary Glazing Systems	5,300	0.7%
Total of Top 20 Measures		692,015	85.4%
Total Cumulative Savings		815,889	100.0%

Figure 5-11 presents a forecast of cumulative commercial energy savings by end use in Idaho. Similar to Washington, HVAC end uses (cooling, space heating, and ventilation) paired with interior lighting account for a substantial portion of the savings throughout the forecast horizon.

Figure 5-11 Commercial Cumulative Achievable Technical Potential by End Use, Idaho

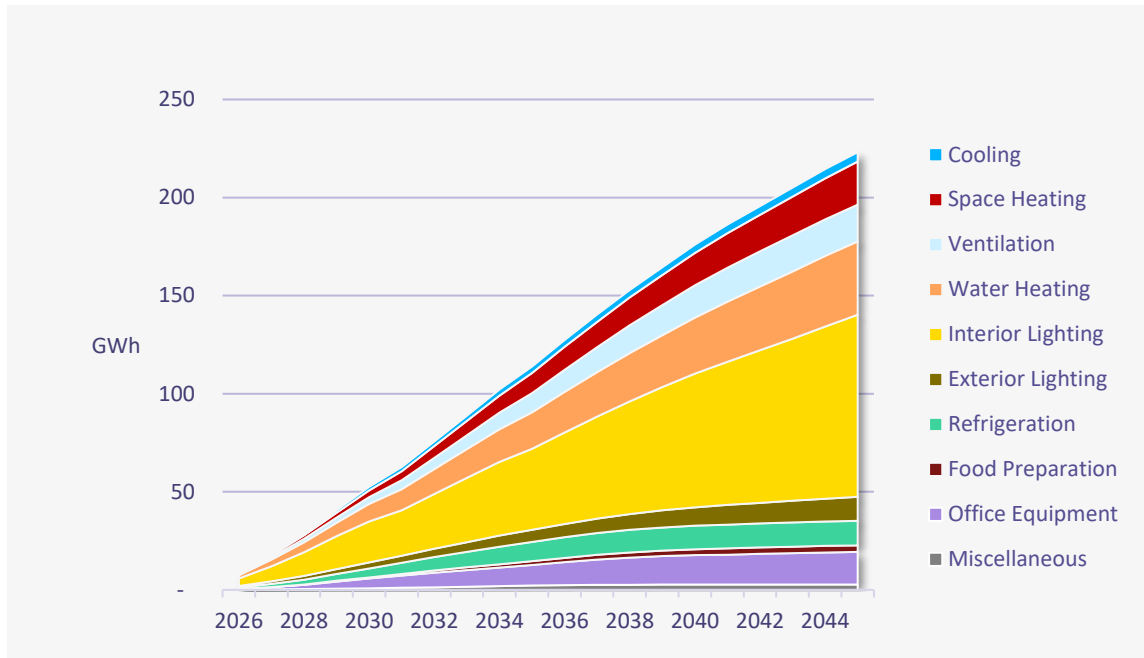


Table 5-11 identifies the top 20 commercial-sector measures from the perspective of cumulative energy savings by 2045 in Idaho. Like Washington, linear lighting is included in the top 3 measures.

Table 5-11 Commercial Top 20 Measures in 2045, Idaho

Rank	Measure / Technology	2045 Cumulative Savings (MWh)	% of Total
1	Linear Lighting - LED	82,600	23.3%
2	Water Heater - UEF 3.9 - Heat Pump	28,926	8.2%
3	Air-Source Heat Pump - IEER 20.3 / COP 3.7	16,968	4.8%
4	High-Bay Lighting - LED 2035	16,934	4.8%
5	HVAC - Energy Recovery Ventilator	13,198	3.7%
6	Server - ENERGY STAR (4.0)	13,146	3.7%
7	HVAC - Dedicated Outdoor Air System (DOAS)	12,901	3.6%
8	Refrigeration - Economizer Addition	12,831	3.6%
9	Ventilation - Variable Speed Control	12,821	3.6%
10	Strategic Energy Management	11,179	3.2%
11	Office Equipment - Advanced Power Strips	11,130	3.1%
12	Electric Vehicle Chargers - Level 2	8,020	2.3%
13	Water Heater - Pipe Insulation	7,328	2.1%
14	Ductless Mini Split Heat Pump	6,943	2.0%
15	Water Heater - Solar Systems	5,032	1.4%
16	Lodging - Guest Room Controls	4,763	1.3%
17	Retrocommissioning	4,445	1.3%
18	Grocery - Display Case - LED Lighting	4,126	1.2%
19	Refrigeration - Floating Head Pressure	3,841	1.1%
20	Refrigeration - High Efficiency Compressor	3,716	1.0%
Total of Top 20 Measures		280,850	79.2%
Total Cumulative Savings		357,589	100.0%

Industrial Conservation Potential

Table 5-12 and Table 5-13 present state-specific estimates for the two levels of conservation potential for the industrial sector. For Washington, Achievable Technical Potential in the first year, 2026, is 5 GWh, or 0.9% of the baseline projection. In 2045, savings reach 87 GWh or 18.1% of the baseline projection. For Idaho, Achievable Technical Potential in the first year is 4 GWh or 0.9% of the baseline projection. In 2045, savings reach 60 GWh or 19.3% of the baseline projection.

Table 5-12 Industrial Conservation Potential, Washington

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	558	551	546	536	514	478
Cumulative Savings (GWh)						
Technical Achievable Potential	5	10	16	29	64	87
Technical Potential	7	14	21	37	79	106
Cumulative Savings (% of Baseline)						
Technical Achievable Potential	0.9%	1.9%	3.0%	5.5%	12.4%	18.1%
Technical Potential	1.2%	2.5%	3.9%	7.0%	15.3%	22.2%
Cumulative Savings (aMW)						
Technical Achievable Potential	0.6	1.2	1.8	3.3	7.3	9.9
Technical Potential	0.8	1.5	2.4	4.3	9.0	12.1

Table 5-13 Industrial Conservation Potential, Idaho

	2026	2027	2028	2030	2035	2045
Baseline Forecast (GWh)	397	392	386	375	350	309
Cumulative Savings (GWh)						
Technical Achievable Potential	4	7	12	21	45	60
Technical Potential	5	10	15	27	56	73
Cumulative Savings (% of Baseline)						
Technical Achievable Potential	0.9%	1.9%	3.0%	5.6%	12.9%	19.3%
Technical Potential	1.2%	2.5%	4.0%	7.2%	15.9%	23.6%
Cumulative Savings (aMW)						
Technical Achievable Potential	0.4	0.8	1.3	2.4	5.2	6.8
Technical Potential	0.5	1.1	1.7	3.1	6.3	8.3

Figure 5-12 Industrial Cumulative Conservation Potential as a % of the Baseline Projection, Washington

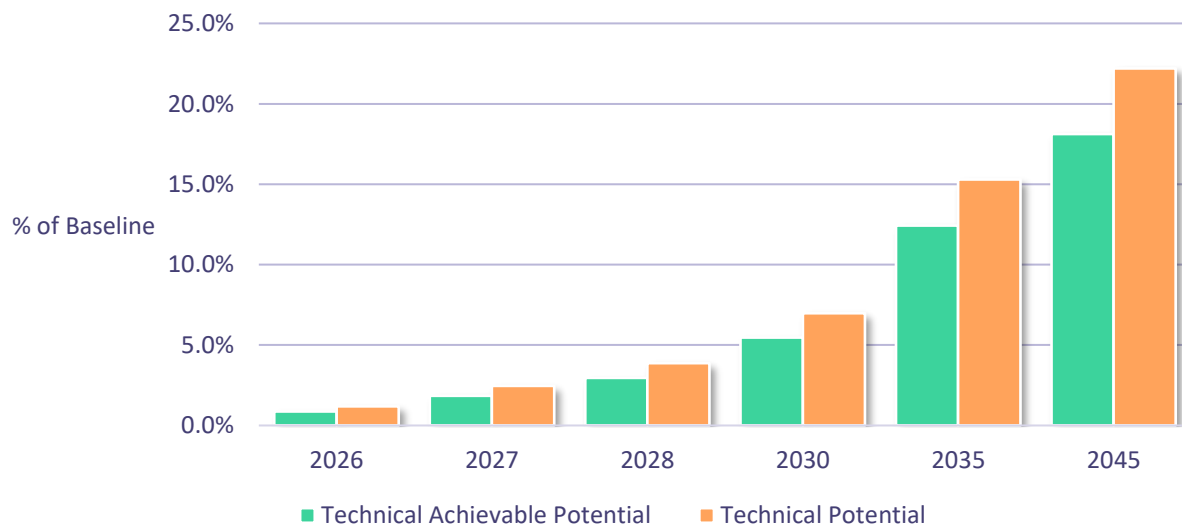


Figure 5-13 Industrial Cumulative Conservation Potential as a % of the Baseline Projection, Idaho

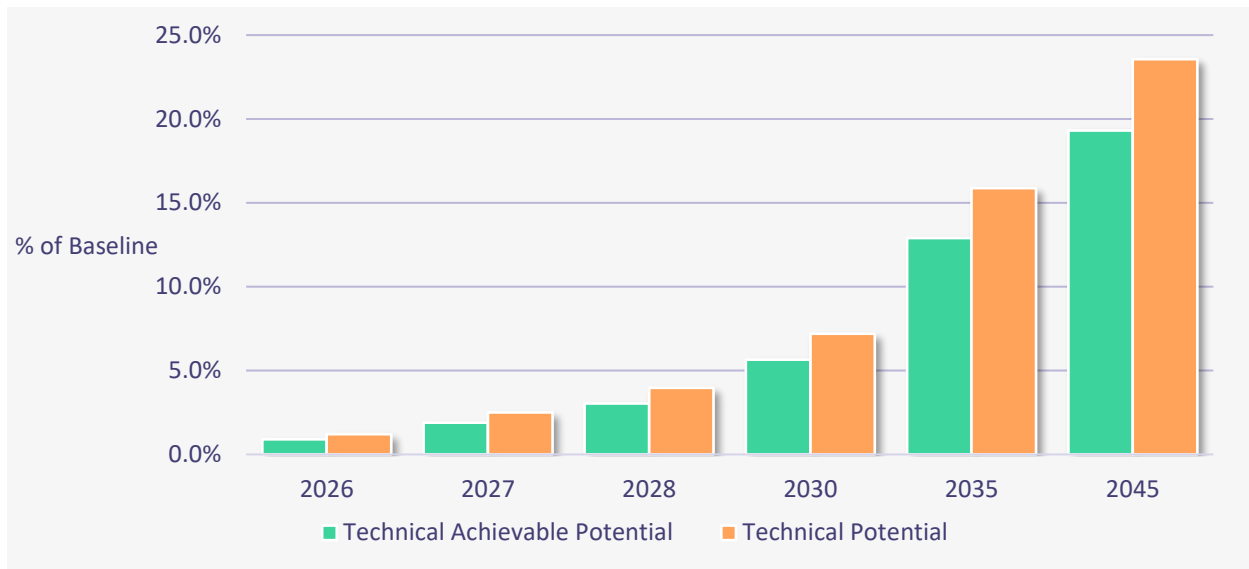


Figure 5-14 presents a forecast of cumulative industrial energy savings by end use in Washington. Motor and process end uses make up most of the savings potential in the study horizon.

Figure 5-14 Industrial Cumulative Achievable Technical Potential by End Use, Washington

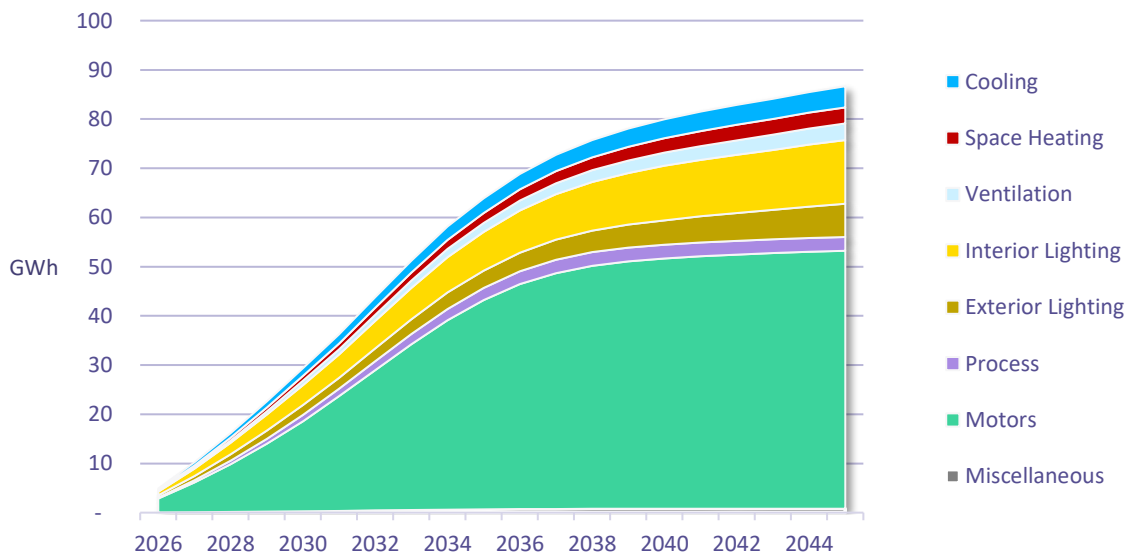


Table 5-14 identifies the top 20 industrial measures from the perspective of cumulative energy savings by 2045. In Washington, the top measure is linear lighting, which includes savings for network embedded controls. The measure with the second highest savings is pumping system optimization, which is the byproduct of the baseline consumption of pumping systems. Installation of advanced-efficiency industrial motors rounds out the top three.

Table 5-14 Industrial Top 20 Measures in 2045, Washington

Rank	Industrial Measure	2045 Cumulative Savings (MWh)	% of Total
1	Linear Lighting - LED	10,688	12.3%
2	Pumping System - System Optimization	8,945	10.3%
3	Advanced Industrial Motors	8,467	9.8%
4	Pumping System - Controls	7,599	8.8%
5	High-Bay Lighting - LED	6,647	7.7%
6	Fan System - Equipment Upgrade	5,073	5.9%
7	Material Handling - Upgrade and Optimization	4,122	4.8%
8	Retrocommissioning	3,976	4.6%
9	Compressed Air - Equipment Upgrade	3,318	3.8%
10	Fan System - Controls	3,214	3.7%
11	Pumping System - Equipment Upgrade	2,919	3.4%
12	Strategic Energy Management	2,705	3.1%
13	Ventilation - Variable Air Volume	2,154	2.5%
14	Compressed Air - End Use Optimization	1,959	2.3%
15	Fan System - Flow Optimization	1,885	2.2%
16	HVAC - Energy Recovery Ventilator	1,538	1.8%
17	Connected Thermostat - ENERGY STAR (1.0)	1,360	1.6%
18	Interior Lighting - Retrofit - Networked Lighting Controls	1,334	1.5%
19	Insulation - Ceiling	1,183	1.4%
20	Compressed Air - System Controls	1,013	1.2%
Total of Top 20 Measures		80,098	92.4%
Total Cumulative Savings		86,661	100.0%

Figure 5-15 presents a forecast of cumulative industrial energy savings by end use in Idaho. Like Washington, the motor and lighting end uses make up most of the savings potential in the study horizon.

Figure 5-15 Industrial Cumulative Achievable Technical Potential by End Use, Idaho

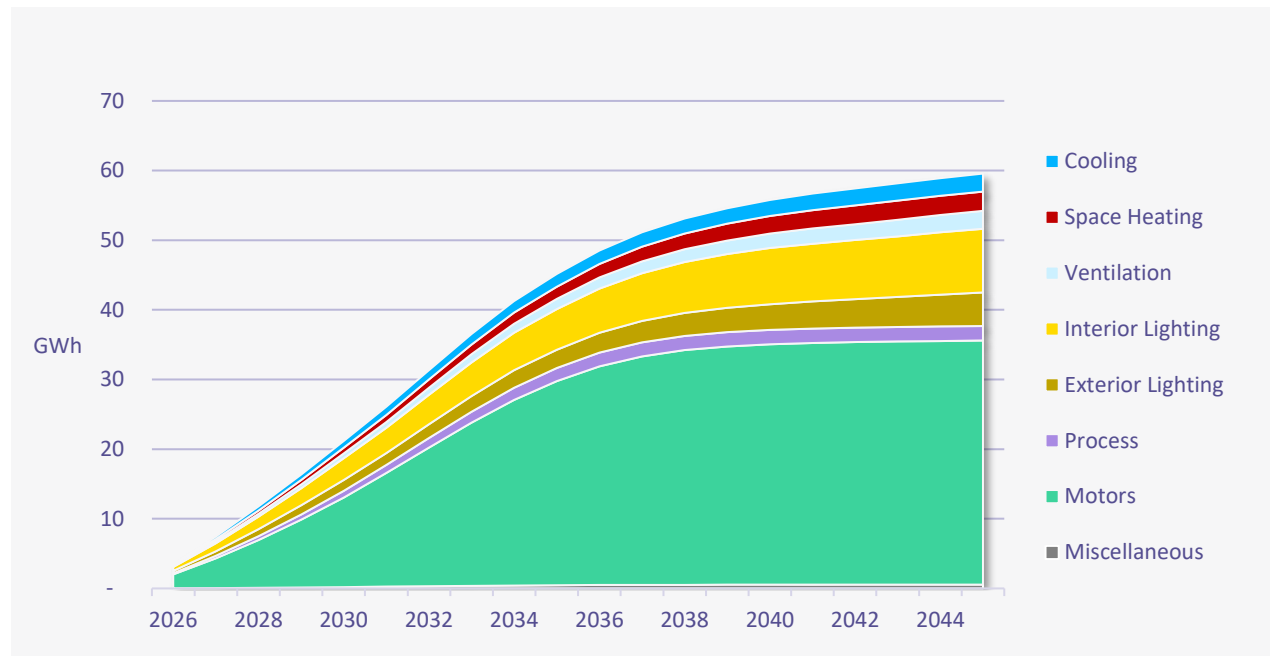


Table 5-15 identifies the top 20 industrial measures from the perspective of cumulative energy savings by 2045 in Idaho. Like Washington, the top three measures are linear lighting, pumping system optimization, and advanced industrial motors.

Table 5-15 Industrial Top 20 Measures in 2045, Idaho

Rank	Industrial Measure	2045 Cumulative Savings (MWh)	% of Total
1	Linear Lighting - LED (152 lm/W system) w/ Controls	7,549	12.7%
2	Advanced Industrial Motors	6,264	10.5%
3	Pumping System - System Optimization	5,114	8.6%
4	High-Bay Lighting - LED (181 lm/W) w/ Controls	4,754	8.0%
5	Pumping System - Controls	4,331	7.3%
6	Fan System - Equipment Upgrade	3,788	6.4%
7	Material Handling - Upgrade and Optimization	3,076	5.2%
8	Retrocommissioning	2,960	5.0%
9	Fan System - Controls	2,384	4.0%
10	Compressed Air - Equipment Upgrade	2,133	3.6%
11	Strategic Energy Management	2,013	3.4%
12	Pumping System - Equipment Upgrade	1,677	2.8%
13	Ventilation - Variable Air Volume	1,638	2.7%
14	Fan System - Flow Optimization	1,385	2.3%
15	Compressed Air - End Use Optimization	1,342	2.3%
16	HVAC - Energy Recovery Ventilator	1,308	2.2%
17	Connected Thermostat - ENERGY STAR (1.0)	1,013	1.7%
18	Interior Lighting - Networked Lighting Controls	912	1.5%
19	Insulation - Ceiling	856	1.4%
20	Compressed Air - System Controls	683	1.1%
	Total of Top 20 Measures	55,178	92.6%
	Total Cumulative Savings	59,568	100.0%

6 | Demand Response Potential

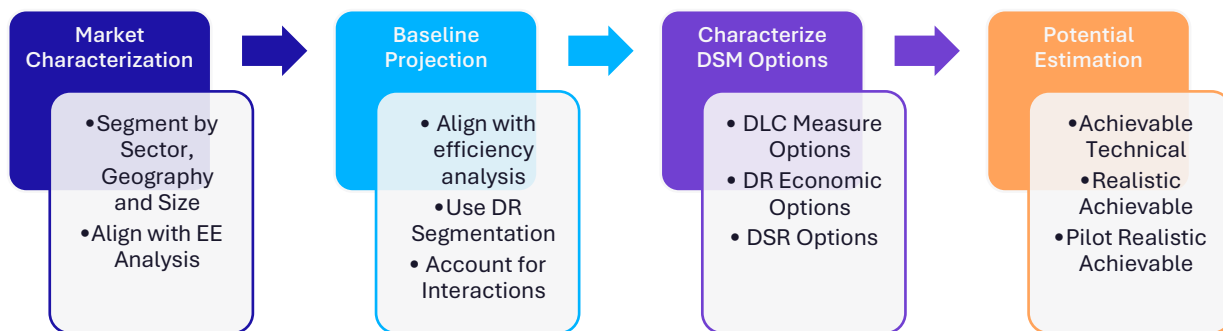
AEG has been working with Avista to estimate demand response (DR) potential since 2014. During that first study, AEG and The Brattle Group assessed winter demand response potential for Avista’s C&I sectors in Washington and Idaho. Since then, AEG has performed five additional DR potential assessments including the current study expanding the scope and making improvements along the way as additional DR programs are run around the country.

The current study provides demand response potential and cost estimates for the 25-year planning horizon (2026-2045) to inform the development of Avista’s 2025 IRP. Through this assessment, AEG sought to develop reliable estimates of the magnitude, timing, and costs of DR resources likely available to Avista over the planning horizon. The analysis focuses on resources assumed achievable during the planning horizon, recognizing known market dynamics that may hinder resource acquisition. DR analysis results will also be incorporated into subsequent DR planning and program development efforts.

Study Approach

Figure 6-1 outlines the analysis approach used to develop potential and cost estimates, with each step described in more detail in the subsections that follow.

Figure 6-1 Demand Response Analysis Approach



AEG estimated demand response potential across the following scenarios:

- **Achievable Technical Potential or Stand Alone.** In this scenario, program options are treated as if they are the only programs running in the Avista territory and are viewed in a vacuum. Potential demand savings cannot be added in this scenario since it does not account for program overlap.
- **Achievable Potential or Integrated.** In this scenario, the program options are treated as if the programs were run simultaneously. To account for participation overlap across programs that make use of the same end-use, a program hierarchy is employed. For programs that affect the same end use, the model selects the most likely program a customer would participate in, and eligible participants were chosen for that program first. The remaining pool of eligible participants will then be available to participate in the secondary program. This scenario allows for potential to be added up as it removes any double counting of savings.

Market Characterization

The first step in the DR analysis was to segment customers by service class and develop characteristics for each segment. The two relevant characteristics for DR potential analysis are end-use saturations of the controllable equipment types in each market segment and coincident peak

demand in the base year. Market characteristics, including equipment saturation and base year peak consumption, are consistent with the energy efficiency analysis (see Chapter 2 for more information on the market profiles).

As in previous studies, AEG used Avista’s rate schedules as the basis for customer segmentation by state and customer class. Table 6-1 summarizes the market segmentation developed for this study.

Table 6-1 Market Segmentation

Market Dimensions	Segmentation Variable	Description
1	State	Idaho Washington
2	Customer Class (by rate schedule)	Residential Service General Service: Rate Schedule 11 Large General Service: Rate Schedule 21 Extra Large General Service: Rate Schedule 25

AEG excluded Avista’s two largest industrial customers from the analysis because they are so large and unique that a segment-based modeling approach is not appropriate. To accurately estimate DR potential for these customers, we would need to develop a detailed understanding of their industrial processes and associated possibilities for load reduction. We would also need to develop specific DR potential estimates for each customer. Avista may wish to engage these large customers directly to gauge interest in participating in DR programs.

Baseline Forecast

Once the customer segments were defined and characterized, AEG developed the baseline projection. Load and consumption characteristics, including customer count and coincident peak demand values, were provided by Avista load forecasts and aligned with the energy efficiency analysis.

Customer Counts

Avista provided actual customer counts by rate schedule for Washington and Idaho over the 2019-2023 timeframe and forecasted customer counts over the 2024-2028 period. AEG used this data to calculate the growth rates by customer class across the final two forecasted years, and projected customer counts through 2045. The average annual customer growth rate for all sectors was 0.6% in Washington and 0.7% in Idaho.

Table 6-2 Baseline Customer Forecast by Customer Class, Washington

State	2026	2027	2028	2035	2045
Residential	250,635	254,016	257,195	281,642	285,319
General Service	24,761	24,975	25,204	26,869	27,116
Large General Service	1,538	1,526	1,514	1,433	1,421
Extra Large General Service	21	21	21	21	21

Table 6-3 Baseline Customer Forecast by Customer Class, Idaho

State	2026	2027	2028	2035	2045
Residential	130,883	132,911	134,923	150,303	152,639
General Service	18,519	18,787	19,056	21,046	21,347
Large General Service	593	567	540	540	540
Extra Large General Service	11	11	11	11	11

Summer and Winter Peak Load Forecasts by State

AEG used the baseline peak demand forecasts developed by the EE team for the DR model. These demand forecasts were produced by state and sector (residential, commercial and industrial) using the coincident summer and winter peaks from annual hourly load shapes by end use. Since demand response programs were modeled by customer service class, AEG used the energy forecasts provided by Avista (by rate schedule) to break out the commercial and industrial demand forecasts into customer class forecasts.

Table 6-4 and Table 6-5 show the summer and winter system peak for selected future years. The Summer and Winter peaks are expected to increase by 23% and 30% respectively between 2026 and 2045.

Table 6-4 Baseline July Summer System Peak Load (MW @Generation) by State

State	2026	2027	2028	2035	2045
Washington	1,234	1,226	1,214	1,357	1,560
Idaho	605	604	592	641	699
Summer Total	1,839	1,829	1,806	1,998	2,258

Table 6-5 Baseline February Winter System Peak Forecast (MW @Generation) by State

State	2026	2027	2028	2035	2045
Washington	1,237	1,248	1,235	1,336	1,662
Idaho	620	625	620	669	760
Winter Total	1,857	1,873	1,855	2,004	2,422

Figure 6-2 shows the state contribution to the estimated system coincident summer peak. In 2026, system peak load for the summer is 1,839 MW at the grid or generator level. Washington contributes 67% to the summer system peak, while Idaho contributes 33%. Summer coincident peak load is expected to grow by an average of 1% annually from 2026-2045.

Figure 6-2 Coincident Peak Load Forecast by State (Summer)

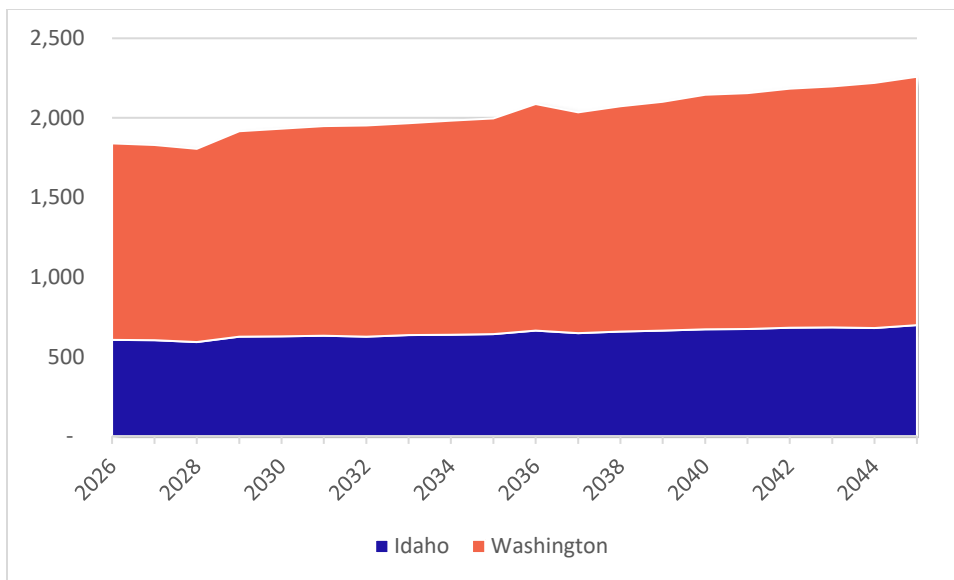
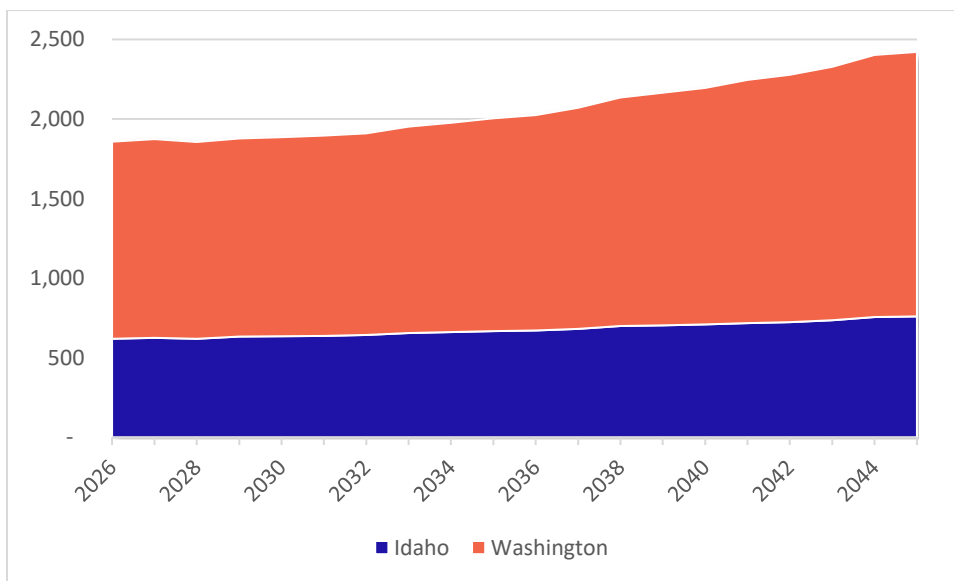


Figure 6-3 shows the state contribution to the estimated system coincident winter peak forecast. In 2026, system peak load for the winter is 1,857 MW at the grid or generator level. The winter system peak is about 1% higher in 2026 than the summer peak. Like in summer, Washington contributes 67% to the winter system peak, while Idaho contributes 33%. Over the study period, winter coincident peak load is expected to grow by an average of 1.3% annually.

Figure 6-3 Coincident Peak Load Forecast by State (Winter)



Characterize Demand Response Program Options

Next, AEG identified and described the viable DR programs for inclusion in the analysis and developed assumptions for key program parameters, including per customer impacts, participation rates, program eligibility, and program costs. AEG considered the characteristics and applicability of a comprehensive list of options available that could be feasibly run in Avista’s territory. Once a list

of DR options was determined, AEG characterized each option. Several options could also have an ancillary component depending on the end use and if they could be used as a fast DR tool.

Each selected option is described briefly below.

Program Descriptions

Direct Load Control of Central Air Conditioners

The Direct Load Control (DLC) of Central Air Conditioners (Central AC) targets Avista's Residential and General Service customers with qualifying equipment in Washington and Idaho. This program directly controls Central AC load in summer through a load control switch placed on a customer's air conditioning unit. During events, the Central AC units are cycled on and off. Participation is expected to be shared with the Smart Thermostats DLC-Cooling program in the integrated scenario since the programs target the same end-use technology.

DLC Smart Thermostats – Heating/Cooling

These programs use the two-way communicating ability of smart thermostats to cycle heating and cooling end uses on and off during events. The programs target Avista's Residential and General Service customers with qualifying equipment in Washington and Idaho. This program was assumed to be Bring Your Own Thermostat (BYOT); therefore, no equipment or installation costs were estimated. The cooling and heating programs are modeled separately because the impact assumptions are quite different; however, the heating program is assumed to piggyback off the cooling program. Therefore, development and administrative costs were estimated only for the cooling program. In addition, the participation in the heating program was a subset of the cooling program participants based on typical heating program participation rates.

CTA-2045 Grid Interactive Water Heater

The CTA-2045 Grid Interactive Water Heater program targets Avista's Residential and General Service customers in Washington. These water heaters contain a communicating module interface and can seamlessly fit into a DR program as these become more prevalent in the Avista territory. Idaho is not mandating this equipment yet; therefore, this program is only modeled for Washington. Water heaters would be completely turned off during the DR event period. Water heaters of all sizes are eligible for control. A \$150 cost to Avista is expected for each module with an additional provisioning cost of \$100 for each customer (since only 20% of customers will need help provisioning, a \$20 average provisioning cost is applied.) To provide additional granularity, AEG broke out the participation in this program across electric resistance and heat pump water heaters in the state of Washington, according to the latest saturation surveys used in the energy efficiency study. Results are presented separately in this study across the two end-use types. This program is planned to be offered in the future (this study assumes a start date of 2026).

DLC Water Heating

Because the Grid Interactive Water Heater program is only available in Washington, the DLC Water Heater program targets Avista's Residential and General Service customers in Idaho. This program directly controls water heating load throughout the year for these customers through a load control switch. Water heaters would be completely turned off during the DR event period. The event period is assumed to be 50 hours during the summer months and another 50 hours during the winter months. Water heaters of all sizes are eligible for control. AEG assumes a \$160 cost to Avista for each switch, a \$200 installation fee, and a permit and license cost of \$100 for residential participants (\$125 for general service participants).

DLC Smart Appliances

The DLC Smart Appliances program uses a wi-fi hub to connect smart wi-fi enabled appliances such as washers, dryers, refrigerators, and water heaters. During events throughout the year, the smart appliances are cycled on and off. The program targets Avista's Residential and General Service customers in Washington and Idaho. A low steady-state participation rate of 5% is assumed for this program.

Third Party Contracts

Third Party Contracts are assumed to be available for Large General Service, and Extra Large General Service customers year-round.⁵ For the Large and Extra Large General Service customers, AEG assumes they will engage in firm curtailment. It is also assumed that participating customers will agree to reduce demand by a specific amount or curtail their consumption to a predefined level at the time of an event. In return, they receive a fixed incentive payment in the form of capacity credits or reservation payments (typically expressed as \$/kW-month or \$/kW-year). Customers are paid to be on call even though actual load curtailments may not occur. The amount of the capacity payment typically varies with the load commitment level. In addition to the fixed capacity payment, participants typically receive a payment for energy reduction during events. Because it is a firm, contractual arrangement for a specific level of load reduction, enrolled loads represent a firm resource and can be counted toward installed capacity requirements. Penalties may be assessed for under-performance or non-performance. Events may be called on a day-of or day-ahead basis as conditions warrant.

This option is typically delivered by load aggregators and is most attractive for customers with a maximum demand greater than 200 kW and flexibility in their operations. Industry experience indicates that aggregation of customers with smaller-sized loads is less attractive financially due to lower economies of scale. In addition, customers with 24x7 operations, continuous processes, or with obligations to continue providing service (such as schools and hospitals) are not often good candidates for this option.

EV V1G Telematics

The EV V1G telematics demand response program is an advanced approach to managing electric vehicle charging that utilizes vehicle telematics systems to control charging based on grid conditions and energy demand. This program leverages the built-in communication systems in EVs to enable direct communication between the vehicle and the utility or grid operator. This eliminates the need for separate charging station hardware to facilitate controlled charging. Avista currently has 98 customers enrolled on this program but is expected to ramp up to 20% of the available EVs in the next five years. AEG assumed 90% of electric vehicle load could be curtailed on this program. Avista requested that this program be viewed as a fully-fledged program starting in 2026 to reflect the technology rollout. Customers are provided a \$350 sign-on incentive with an additional \$5 per month if off-peak charging occurs. AEG used the EV forecast from the 2024 Avista DER study to inform the number of eligible vehicles for this program.

Electric Vehicle Time-of-Use

There is currently an Electric Vehicle Time-of-Use (TOU) program being run in Avista's territory and is offered to General Service and Large General Service customers with EV loads. The forecasted

⁵ General Service customers were removed from this program in this study as their loads are too small to justify the metering and administrative expense by third party aggregator.

potential for the electric vehicle TOU program estimated in this study opens this program to the full fleet of electric vehicles across the General Service and Large General Service classes according to the electric vehicle forecast performed in the 2024 Avista DER study.

Time-of-Use Pricing

The TOU pricing rate is a standard rate structure where rates are lower during off-peak hours and higher during peak hours during the day, incentivizing participants to shift energy use to periods of lower grid stress. For the TOU rate, there are no events called, and the structure does not change during the year. Therefore, it is a good default rate for customers that still offers some load-shifting potential. We assume two scenarios for the TOU rate. An opt-in rate where participants will have to choose to go on the rate and an opt-out rate where participants will automatically be placed on the TOU rate and will need to request a rate change if required. This rate is assumed to be available to Residential and General Service classes. The TOU Opt-in program is planned to be offered as a pilot offering starting in 2024.

Variable Peak Pricing

The Variable Peak Pricing (VPP) rate is composed of significantly higher prices during relatively short critical peak periods on event days to encourage customers to reduce their usage. VPP is usually offered in conjunction with a time-of-use rate, which implies at least three time periods: critical peak, on-peak and off-peak. The customer incentive is a more heavily discounted rate during off-peak hours throughout the year (relative a standard TOU rate). Event days are dispatched on relatively short notice (day ahead or day of), typically for a limited number of days during the year. Over time, event-trigger criteria become well-established so that customers can expect events based on hot weather or other factors. Events can also be called during times of system contingencies or emergencies. In past studies, this rate has been assumed to be offered to all service classes; however, with the addition of Peak Time Rebate this year, VPP will only be considered for large and extra-large Service customers.

Peak Time Rebate

The Peak Time Rebate (PTR) program offers participants an incentive for every kW saved during designated times of high energy demand. Events are called several times per season, and participants are given incentives in the form of \$/kWh saved during the event relative to their baseline usage across previous seasons. The assumptions for this program were based primarily on the results of Portland General Electric's PTR program and are offered to residential and general service customers, as not to overlap with the VPP program.

Ancillary Services

Ancillary services refer to functions that help grid operators maintain a reliable electricity system. Ancillary services maintain the proper flow and direction of electricity, address imbalances between supply and demand, and help the system recover after a power system event. In systems with significant variable renewable energy penetration, additional ancillary services may be required to manage increased variability and uncertainty. In addition, Ancillary Services can provide fast DR response during grid emergencies. AEG assumes ancillary service DR capabilities are available across all sectors. Ancillary Service options can be offered to customers who are already on programs with ancillary capabilities for an additional incentive. For this study, ancillary programs were modeled for several parent programs: Smart Thermostats- Heating/Cooling, DLC Water Heating, CTA-2045 Water Heating, Electric Vehicle Charging, and Battery Energy Storage. Ancillary service results are presented in Appendix D or the Integrated Opt-in scenario.

Thermal Energy Storage

Ice Energy Storage, a type of thermal energy storage, is an emerging technology that is being explored in many peak-shifting applications across the country. This technology involves cooling and freezing water in a storage container so that the energy can be used later for space cooling. More specifically, frozen water takes advantage of the large amount of latent energy associated with the phase change between ice and liquid water, which will absorb or release a large amount of thermal energy while maintaining a constant temperature at the freezing (or melting) point. An ice energy storage unit turns water into ice during off-peak times when price and demand for electricity are low, typically at night. During the day, at peak times, the stored ice is melted to meet all or some of the building's cooling requirements, allowing air conditioners to operate at reduced loads.

Ice energy storage is primarily being used in non-residential buildings and applications, as modeled in this analysis, but may see expansion in the future to encompass smaller, residential systems as well as emerging grid services for peak shaving and renewable integration. Since ice energy storage is used for space cooling, AEG assumes this program would be available during the summer months only.

Battery Energy Storage

This program provides the ability to shift peak loads using stored electrochemical energy. Currently, the main battery storage equipment uses lithium-ion batteries. They are the most cost-effective battery type on the market today. AEG assumes the battery energy storage option will be available for all service classes, with the size and cost of the battery varying depending on the level of demand of the building.

Behavioral DR

Behavioral DR is structured like traditional demand response interventions, but it does not rely on enabling technologies, nor does it offer financial incentives to participants. Participants are notified of an event and simply asked to reduce their consumption during the event window. Generally, notification occurs the day prior to the event and are deployed utilizing a phone call, email, or text message. The next day, customers may receive post-event feedback that includes personalized results and encouragement.

For this analysis, we assumed the Behavioral DR program would be offered as part of a Home Energy Reports program in a typical opt-out scenario. As such, we assume this program would be offered to residential customers only. Avista does not currently have a Home Energy Report program in place. Therefore, the Behavioral program is expected to bear the full cost of the program implementation.

Program Assumptions and Characteristics

The key parameters required to estimate the potential for a DR program are participation rate, per-participant load reduction, and eligibility or end use saturations. The development of these parameters is based on research findings and a review of available information on the topic, including national program survey databases, evaluation studies, program reports, and regulatory filings. AEG's assumptions of these parameters are described below.

Participation Rate Assumptions

Table 6-6 below shows the steady-state participation rate assumptions for each demand side management (DSM) option as well as the basis for the assumptions. Participation for space cooling is split between DLC Central AC and Smart Thermostat options, so in total, they don't exceed 30%.⁶

Table 6-6 DSM Steady-State Participation Rates (Percent of Eligible Customers)

DSM Option	Residential Service	General Service	Large General Service	Extra Large General Service	Basis for Assumption
DLC Central AC	10%	10%	-	-	NWPCC DLC Switch cooling assumption
DLC Smart Thermostats - Heating	5%	3%	-	-	Piggybacks off cooling- Adjusted to reflect realistic participation for space heating
CTA-2045 Grid Interactive Water Heater (ER/HP)	50%	50%	-	-	NWPCC Grid Interactive Water Heater Assumptions- Ten Year Ramp Rate
DLC Water Heating	15%	5%	-	-	Industry experience
DLC Smart Thermostats - Cooling	20%	10%	-	-	NWPCC Smart Thermostat cooling assumption
DLC Smart Appliances	5%	5%	-	-	2017 ISACA IT Risk Reward Barometer – US Consumer Results, October 2017
Third Party Contracts	-	-	15%	15%	Industry Experience
EV V1G Telematics	20%	-	-	-	1/3 of TOU opt-in participation rate (17% lowered to 15% based on Avista decision)
Time-of-Use Opt-in	13%	7%	-	-	Industry experience; Winter impacts ½ of summer impacts.
Time-of-Use Opt-out	20%	20%	-	-	
Electric Vehicle TOU Opt-in	-	20%	10%	-	Based on DTE program achieving 2500 EV enrollments in 3 years, with similar base EV population
Variable Peak Pricing	-	-	25%	25%	OG&E 2019 Smart Hours Study
Peak Time Rebate	15%	15%	-	-	2021 PGE Res Pricing and Behavioral Pilot Flex PTR Evaluation
Thermal Energy Storage	-	0.5%	1.5%	1.5%	Industry Experience
Battery Energy Storage	50%	50%	-	-	Industry Experience
Behavioral	20%	-	-	-	PG&E rollout with six waves (2017)

Load Reduction Assumptions

Table 6-7 presents the per participant load reductions for each DSM option and explains the basis for these assumptions. The load reductions are shown on a kW basis for technology-based options and a percent load reduction otherwise.

⁶ NWPCC assumption of 30% participation for a space cooling DR program.

Table 6-7 DSM Per Participant Impact Assumptions

	Residential Service	General Service	Large General Service	Extra Large General Service	Basis for Assumption
DLC Central AC	0.5 kW	1.25 kW	-	-	NWPCC DLC Switch cooling assumption was close to 1.0 kW reduced to adjust for Avista proposed cycling strategy,
DLC Smart Thermostats - Heating	1.09 kW	1.35 kW	-	-	NWPCC Smart thermostat heating assumption (east)
CTA-2045 Grid Interactive Water Heater (ER/HP)	ER: 0.2-0.4 kW HP: 0.9-0.14 kW	ER: 0.4-0.93 kW HP: 0.23-0.35 kW	-	-	BPA 2018 Peak Mitigation (ER/HP) - derated to align with Wh proportion of peak load from EE study
DLC Water Heating	0.2 kW	0.5 kW			NWPCC Electric Resistance Switch Summer Impact, derated to align with Wh proportion of peak load from EE study
DLC Smart Thermostats - Cooling	0.50 kW	1.25 kW	-	-	NWPCC DLC Switch cooling assumption was close to 1.0 kW reduced to adjust for Avista proposed cycling strategy
DLC Smart Appliances	0.14 kW	0.14 kW	-	-	Ghatikar, Rish. Demand Response Automation in Appliance and Equipment. Lawrence Berkley National Laboratory, 2017.
Third Party Contracts	-		21%	21%	2012 Statewide Load Impact Evaluation of California Aggregator Demand Response Programs Volume 1: Ex post and Ex ante Load Impacts; Christensen Associates Energy Consulting; April 1, 2013
EV V1G Telematics	90% EV	-	-	-	90% of Avista Light-Duty Vehicle Average Load or 0.65 kW
Time-of-Use Opt-in	1.5%-4% (w/s)	0.1%-0.2%			Avista projected impacts per customer (2024); Winter impacts ½ of summer impacts -lowered impacts from 2022
Time-of-Use Opt-out	0.2%-1.5% (w/s)	0.1%-0.2%			
Electric Vehicle TOU Opt-in		100% EV	100% EV		100% of Avista Light-Duty Vehicle Average Load or 0.72 kW GS, 6.67 kW LGS
Variable Peak Pricing	10%	4%	4%	4%	OG&E 2019 Smart Hours Study; Summer Impacts Shown (Winter impacts ¾ summer)
Peak Time Rebate	7.1% (W)	3.6% (W)			PGE Res Pricing and Behavioral Pilot Flex PTR Evaluation 2021: 0.159 or 8.2% in summer, 0.134 or 7.1% in winter
Thermal Energy Storage	8.2% (S)	4.1% (S)	1.5%	1.5%	Industry Experience
Battery Energy Storage	2 kW	2 kW	15 kW	15 kW	NREL 2021: 5 kW battery * 86% round trip efficiency. Xcel Energy CO Renewable Battery Connect: 40% retention
Behavioral	2%	-	-	-	Opower documentation for BDR with Consumers and Detroit Energy

Other Cross-cutting Assumptions

In addition to the above program-specific assumptions, there are three that affect all programs:

- **Discount rate.** A nominal discount rate of 6.51% was used to calculate the net present value of costs over the useful life of each DR program. All cost results are shown in nominal dollars.
- **Line losses.** Avista provided forecasted line loss factors averaging 5.6% which AEG used to convert estimated demand savings at the customer meter level to the generator level. Results in the next section are reported at the generator level.
- **Shifting and saving.** Each program varies in the way energy is shifted or saved throughout the day. For example, customers on the DLC Central AC program are likely to pre-cool their homes prior to the event and turn their AC units back on after the event (snapback effect). The results in this report only show the savings during the event window and not before and after the event.

Integrated DR Potential Results

This section presents analysis results for demand savings and levelized costs for all considered DR programs. In the interest of succinctness, AEG only presents the Integrated TOU Opt-in scenario results in this chapter. The integrated approach represents Realistic Achievable Potential and is the most realistic scenario allowing for multiple DR programs to be run at the same time employing a hierarchy that eliminates double counting of impacts.

All potential results represent savings at the generator.

The following sections separate out the integrated potential results for the summer and winter seasons.

Summary TOU Opt-in Scenario

Table 6-8, Table 6-9, and Figure 6-4 show the total summer and winter demand savings for selected years. These savings represent integrated savings from all available DR options in Avista’s Washington and Idaho service territories.

- **Summer TOU Opt-In Scenario:** Total potential savings are expected to increase from 16 MW in 2026 to 184 MW by 2045. The percentage of system peak increases from 0.8% in 2026 to 8.2% by 2045.
- **Winter TOU Opt-In Scenario:** The total potential savings are expected to increase from 11 MW in 2026 to 155 MW by 2045. The percentage of system peak goes from 0.6% in 2026 to 6.5% by 2045.

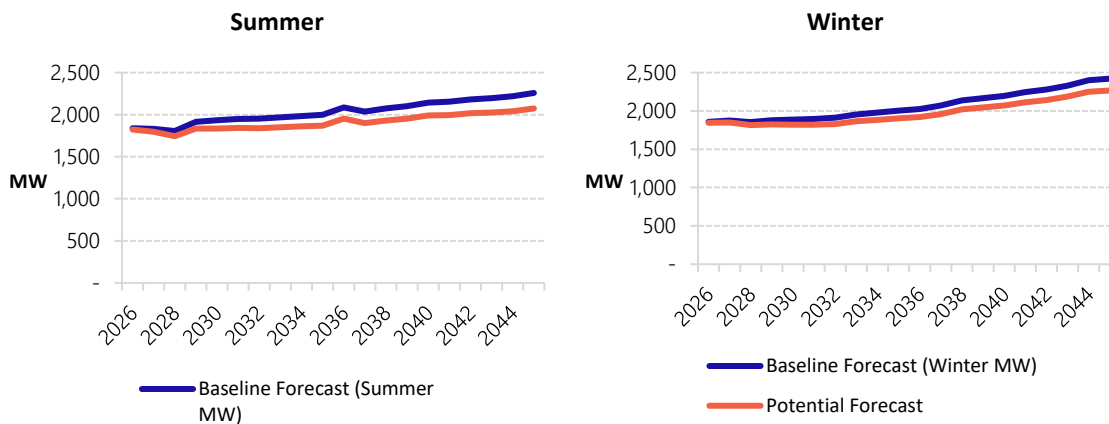
Table 6-8 Summary of Integrated TOU Opt-in Potential (MW @ Generator), Summer

	2026	2027	2028	2035	2045
Baseline Forecast (Summer MW)	1,839	1,829	1,806	1,998	2,258
Achievable Potential (MW)	15.6	33.7	61.6	127.7	184.2
Achievable Potential (% of baseline)	0.9%	1.9%	3.5%	6.5%	8.3%
Potential Forecast	1,823	1,796	1,744	1,870	2,074

Table 6-9 Summary of Integrated TOU Opt-in Potential (MW @ Generator), Winter

	2026	2027	2028	2035	2045
Baseline Forecast (Winter MW)	1,857	1,873	1,855	2,004	2,422
Achievable Potential (MW)	11.1	23.0	39.1	100.5	154.8
Achievable Potential (% of baseline)	0.6%	1.3%	2.2%	5.1%	6.5%
Potential Forecast	1,846	1,850	1,816	1,904	2,267

Figure 6-4 Summary of Integrated TOU Opt-In Potential (MW @ Generator)



Summer Opt-in TOU Scenario

Key findings from the summer integrated Opt-in TOU scenario include:

- The EV V1G Telematics Program has the highest potential savings with 47.1 MW by 2045.
- DLC Smart Thermostats (33.4 MW) and Third Party Contracts (26.6 MW) have the next-highest potential savings, respectively.
- Most of the DR potential in both Washington and Idaho comes from the residential customer class.

Potential by DSM Option

Figure 6-5 and Table 6-10 show the summer demand savings from individual DR options. The savings represent integrated savings from all available DR options in Avista’s Washington and Idaho service territories. Total potential savings as a percentage of summer peak are expected to increase from 1% in 2026 to 8% by 2045.

Figure 6-5 Summary of Summer Potential by Option – TOU Opt-In (MW @ Generator)

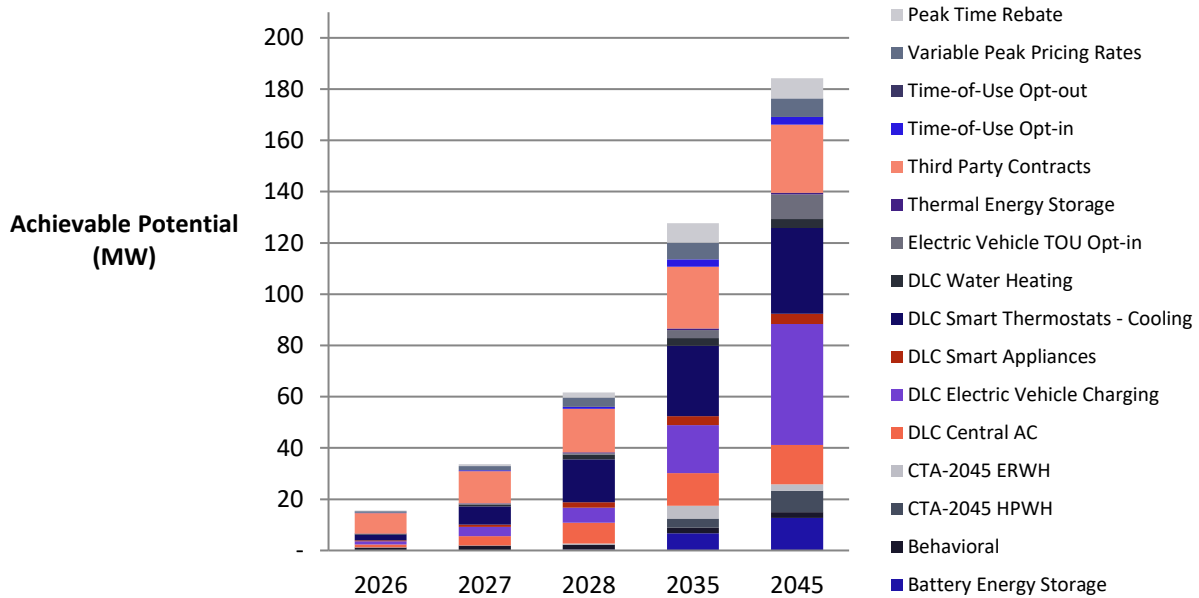


Table 6-10 Summary of Summer Potential by Option – TOU Opt-In (MW @ Generator)

Summer Potential	2026	2027	2028	2035	2045
Baseline Forecast (Summer MW)	1,839	1,829	1,806	1,998	2,258
Achievable Potential (MW)	16	34	62	128	184
Achievable Potential (%)	1%	2%	3%	6%	8%
Battery Energy Storage	0.0	0.1	0.3	6.7	12.7
Behavioral	1.1	1.7	1.9	2.2	2.2
CTA-2045 HPWH	0.0	0.0	0.1	3.5	8.5
CTA-2045 ERWH	0.1	0.2	0.5	4.9	2.4
DLC Central AC	1.2	3.6	8.1	12.8	15.4
EV V1G Telematics	1.2	3.6	5.8	18.8	47.1
DLC Smart Appliances	0.3	0.9	2.2	3.5	4.0
DLC Smart Thermostats - Cooling	2.3	7.0	16.6	27.4	33.4
DLC Smart Thermostats - Heating	-	-	-	-	-
DLC Water Heating	0.3	0.8	1.9	3.0	3.5
Electric Vehicle TOU Opt-in	0.1	0.3	0.6	3.1	9.6
Thermal Energy Storage	0.0	0.1	0.3	0.6	0.6
Third Party Contracts	7.9	12.5	17.0	24.1	26.6
Time-of-Use Opt-in	0.2	0.4	0.8	2.9	3.0
Time-of-Use Opt-out	-	-	-	-	-
Variable Peak Pricing Rates	0.6	1.6	3.6	6.5	7.2
Peak Time Rebate	0.3	0.7	1.9	7.6	7.9

Potential by Sector and Segment

Table 6-11 and Table 6-12 show the total summer demand savings by class for Washington and Idaho, respectively. Washington is projected to save 144 MW (9.2% of summer peak demand) by 2045, while Idaho is projected to save 40 MW (5.7% of summer peak demand) by 2045.

Table 6-11 Summer Potential by Class – TOU Opt-In (MW @ Generator), Washington

	2026	2027	2028	2035	2045
Baseline Forecast (Summer MW)	1,234	1,226	1,214	1,357	1,560
Achievable Potential (MW)	14	29	48	95	144
Residential	5.0	13.5	27.0	61.3	99.1
General Service	0.4	1.0	2.3	9.9	15.2
Large General Service	5.1	8.4	11.0	15.5	21.2
Extra Large General Service	3.4	5.6	7.5	8.2	8.5

Table 6-12 Summer Potential by Class – TOU Opt-In (MW @ Generator), Idaho

	2026	2027	2028	2035	2045
Baseline Forecast (Summer MW)	605	604	592	641	699
Achievable Potential (MW)	2	5	14	33	40
Residential	1.5	4.4	10.4	21.1	25.7
General Service	0.1	0.4	0.9	3.5	5.6
Large General Service	0.0	0.0	0.0	4.4	5.3
Extra Large General Service	0.1	0.3	2.4	3.9	3.6

Figure 6-6 Summer Potential by Class – TOU Opt-In (MW @ Generator), Washington

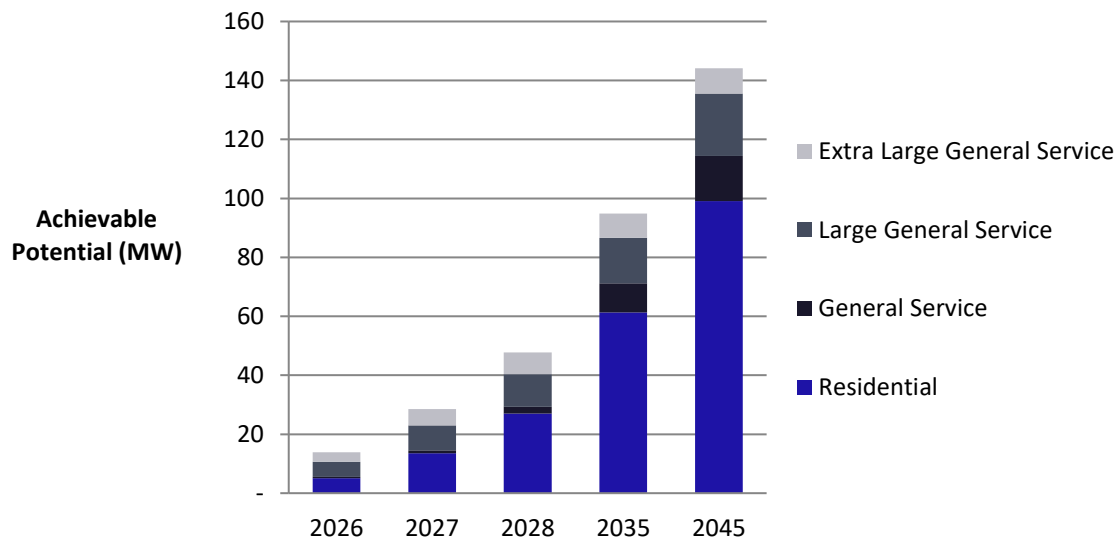
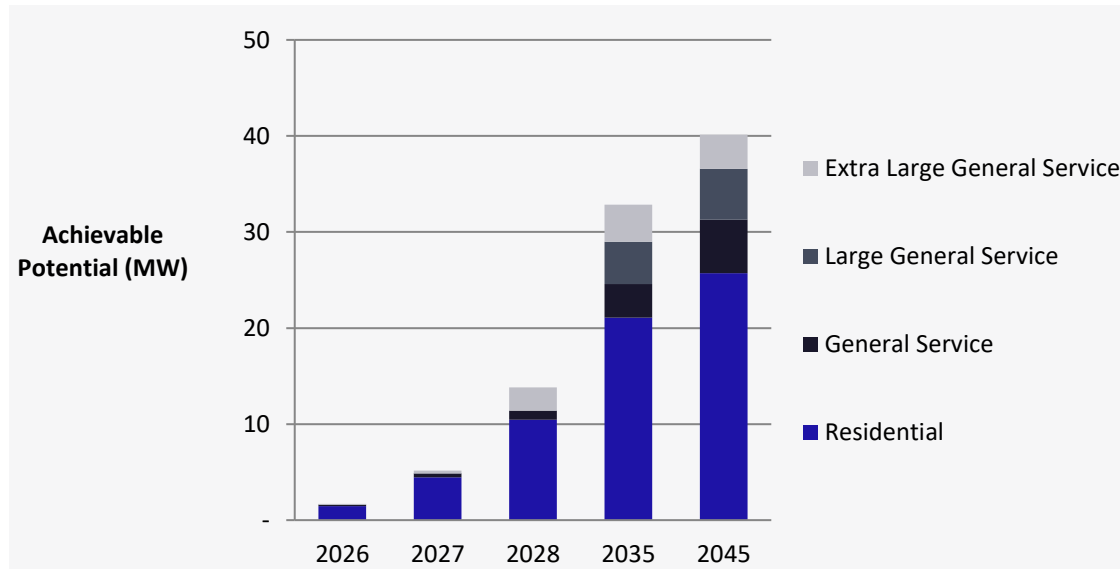


Figure 6-7 Summer Potential by Class – TOU Opt-In (MW @Generator), Idaho



Winter Opt-in TOU Scenario

Key findings from the winter integrated Opt-in TOU scenario include:

- The highest potential options are V1G Telematics (47.1 MW by 2045) and Third-Party Contracts (21.0 MW by 2045).
- DLC Smart Thermostats have much lower potential savings for heating (14.6 MW by 2045) than cooling as the heating program is expected to piggyback off the cooling program and be a subset of the cooling participants.

In previous studies, Variable Peak Pricing has shown high potential savings in both summer and winter seasons. However, since Variable Peak Pricing is only being considered for large and extra-large customer classes in this study, the potential is much lower (5.7 MW by 2045)⁷.

Potential by DSM Option

Figure 6-8 and Table 6-16 presents the levelized costs per kW of equivalent generation capacity over 2026-2035 for Washington and Idaho. The ten-year net present value (NPV) MW potential by program is also shown for reference in the first two columns. Some options are only available in summer or winter, such as Thermal Energy Storage, Smart Thermostat programs, and DLC Cooling.

Key findings include:

- The Battery Energy Storage option is one of the least expensive programs per kW saved at \$34.9 and \$35.9/kW-year for winter and summer seasons over the first ten years of the program. This is a dramatic shift from previous studies. A big contributor to this change is the addition of the battery storage forecast that was performed for the Avista DER study. This along with the assumption that this would be a BYOD program added savings potential and reduced costs.
- The Third Party Contracts option delivers the highest savings (96 MW and 137 MW in winter and summer respectively) by 2035 at approximately \$108.5/kW-year cost in winter and \$75.5/kW-year cost in summer. Capacity-based and energy-based payments to the third-party constitutes the major cost component for this option. All O&M and administrative costs are expected to be incurred by the representative third-party contractor.

⁷ The PTR Program is modeled to target residential and general service customers

- The Variable Peak Pricing option has the lowest levelized cost among all the DR options. It delivers 22.7 MW of winter savings and 32.9 MW of summer savings by 2035 at \$28.1/kW-year system-wide and 18.68 MW of summer savings at \$19.4/kW-year system-wide. Enabling technology purchase and installation costs for enhancing customer response is a large part of deployment costs.

Table 6-16 show the total winter demand savings from individual DR options for selected years. These savings represent integrated savings from all available DR options in Avista’s Washington and Idaho service territories. The total potential savings in the Winter TOU Opt-in scenario are expected to increase from 11 MW in 2026 to 155 MW by 2045. The respective increase in the percentage of system peak goes from 1% in 2026 to 7% by 2045.

Figure 6-8 Summary of Winter Potential by Option – TOU Opt-In (MW @ Generator)

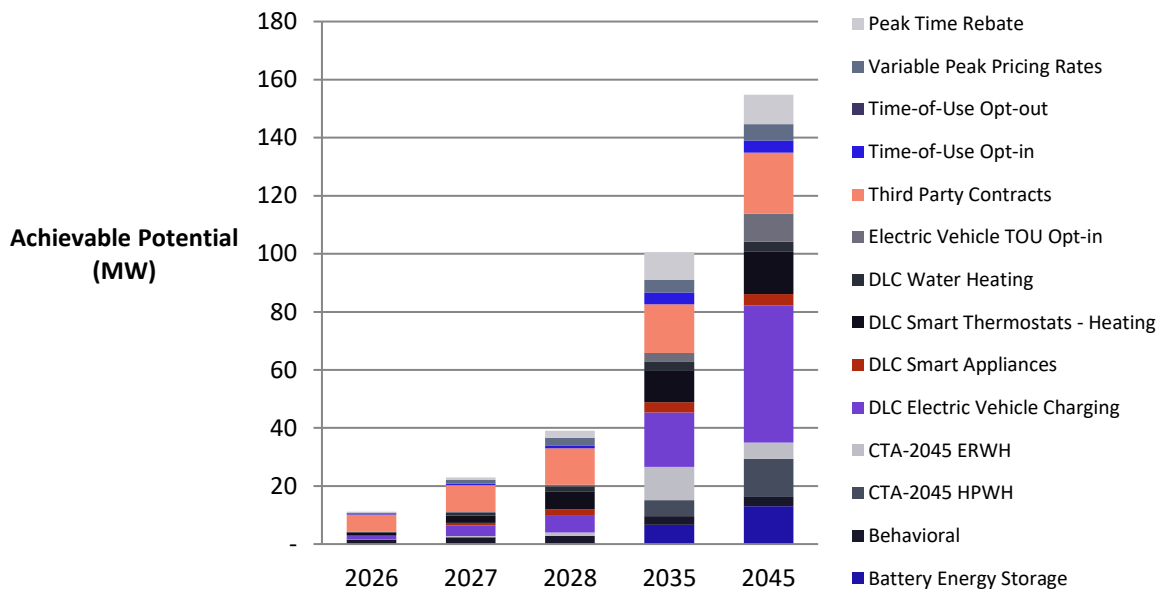


Table 6-13 Summary of Winter Potential by Option – TOU Opt-In (MW @ Generator)

Winter Potential	2026	2027	2028	2035	2045
Baseline Forecast (Winter MW)	1,819	1,835	1,817	1,963	2,375
Achievable Potential (MW)	11	23	39	101	155
Achievable Potential (%)	1%	1%	2%	5%	7%
Battery Energy Storage	0.0	0.1	0.2	6.6	13.0
Behavioral	1.4	2.2	2.5	3.0	3.2
CTA-2045 HPWH	0.0	0.0	0.1	5.5	13.2
CTA-2045 ERWH	0.1	0.5	1.1	11.4	5.6
DLC Central AC	-	-	-	-	-
EV V1G Telematics	1.2	3.6	5.8	18.8	47.1
DLC Smart Appliances	0.3	0.9	2.2	3.5	4.0
DLC Smart Thermostats - Cooling	-	-	-	-	-
DLC Smart Thermostats - Heating	0.8	2.5	6.0	10.9	14.6
DLC Water Heating	0.3	0.8	1.9	3.0	3.5
Electric Vehicle TOU Opt-in	0.1	0.3	0.6	3.1	9.6
Thermal Energy Storage	-	-	-	-	-
Third Party Contracts	5.8	9.3	12.6	16.8	21.0
Time-of-Use Opt-in	0.2	0.6	1.0	4.0	4.2
Time-of-Use Opt-out	-	-	-	-	-
Variable Peak Pricing Rates	0.4	1.2	2.6	4.5	5.7
Peak Time Rebate	0.3	0.9	2.4	9.4	10.1

Potential by Sector and Segment

Table 6-14 and Table 6-15 show the total winter demand savings by class for Washington and Idaho, respectively. Washington is projected to save 128 MW (7.7% of winter system peak demand) by 2045, while Idaho is projected to save 27 MW (3.5% of winter system peak demand) by 2045.

Table 6-14 Winter Potential by Class – TOU Opt-In (MW @Generator), Washington

	2026	2027	2028	2035	2045
Baseline Forecast (Winter MW)	1,237	1,248	1,235	1,336	1,662
Achievable Potential (MW)	10	21	33	79	128
Residential	3.9	9.8	17.6	53.1	87.6
General Service	0.3	0.6	1.3	9.8	15.6
Large General Service	3.9	6.5	8.6	11.3	18.6
Extra Large General Service	2.3	3.8	5.1	5.2	6.2

Table 6-15 Winter Potential by Class – TOU Opt-In (MW @Generator), Idaho

	2026	2027	2028	2035	2045
Baseline Forecast (Winter MW)	620	625	620	669	760
Achievable Potential (MW)	1	2	6	21	27
Residential	0.6	1.9	4.4	13.3	16.8
General Service	0.0	0.2	0.4	2.0	3.6
Large General Service	0.0	0.0	0.0	3.3	4.1
Extra Large General Service	0.1	0.2	1.6	2.5	2.3

Figure 6-9 Winter Potential by Class – TOU Opt-In (MW @Generator), Washington

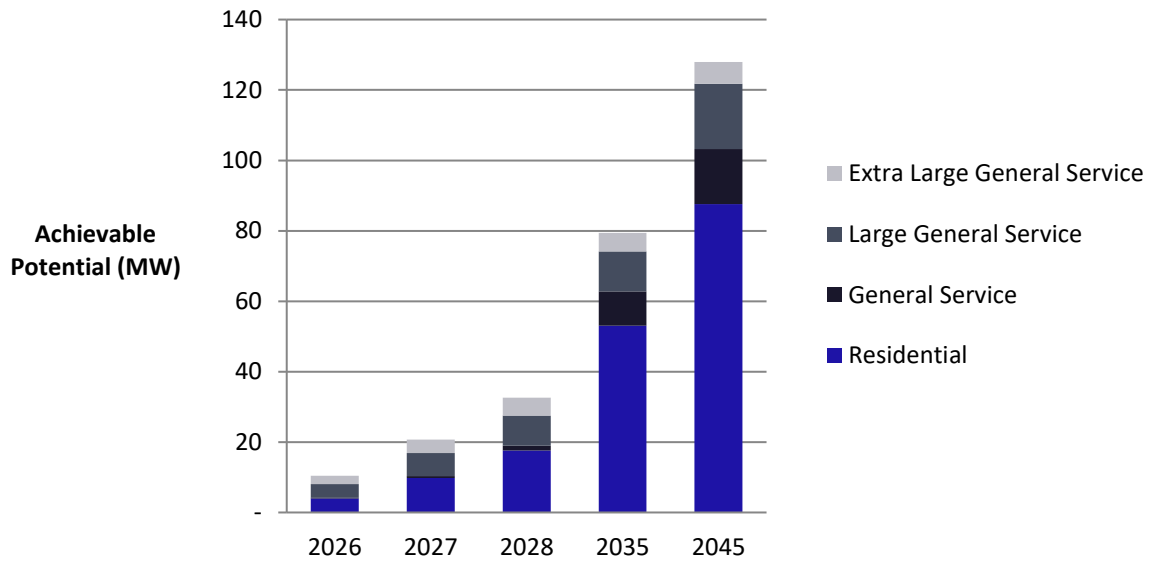
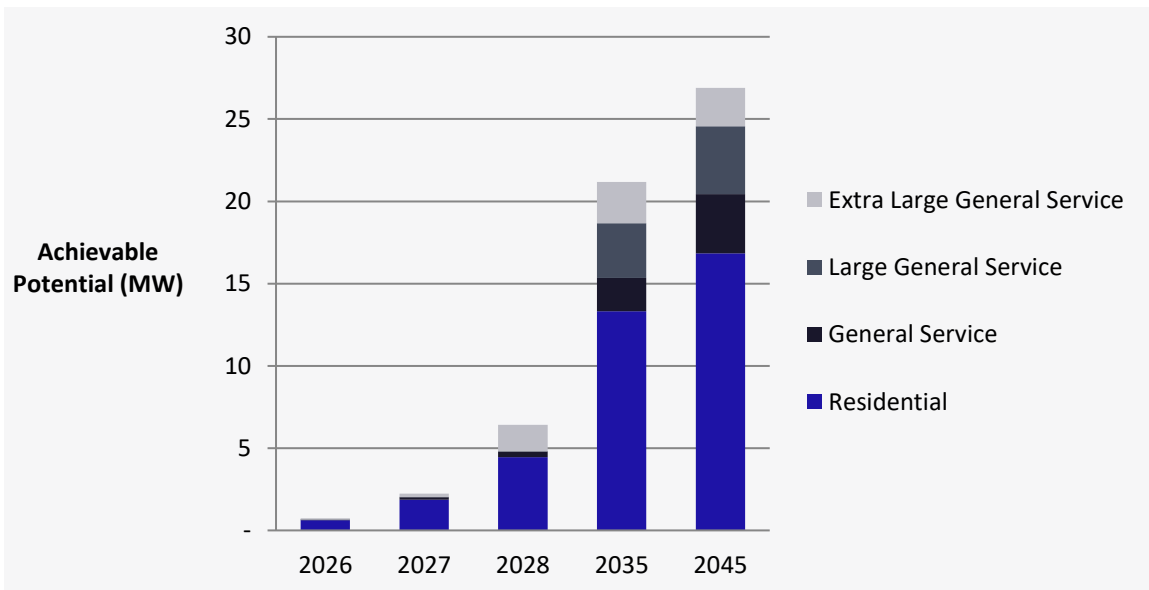


Figure 6-10 Winter Potential by Class – TOU Opt-In (MW @Generator), Idaho



Levelized Costs

Table 6-16 presents the levelized costs per kW of equivalent generation capacity over 2026-2035 for Washington and Idaho. The ten-year net present value (NPV) MW potential by program is also shown for reference in the first two columns. Some options are only available in summer or winter, such as Thermal Energy Storage, Smart Thermostat programs, and DLC Cooling.

Key findings include:

- The Battery Energy Storage option is one of the least expensive programs per kW saved at \$34.9 and \$35.9/kW-year for winter and summer seasons over the first ten years of the program. This is a dramatic shift from previous studies. A big contributor to this change is the change is the addition of the battery storage forecast that was performed for the Avista DER study. This along with the assumption that this would be a BYOD program added savings potential and reduced costs.
- The Third Party Contracts option delivers the highest savings (96 MW and 137 MW in winter and summer respectively) by 2035 at approximately \$108.5/kW-year cost in winter and \$75.5/kW-year cost in summer. Capacity-based and energy-based payments to the third-party constitutes the major cost component for this option. All O&M and administrative costs are expected to be incurred by the representative third-party contractor.
- The Variable Peak Pricing option has the lowest levelized cost among all the DR options. It delivers 22.7 MW of winter savings and 32.9 MW of summer savings by 2035 at \$28.1/kW-year system-wide and 18.68 MW of summer savings at \$19.4/kW-year system-wide. Enabling technology purchase and installation costs for enhancing customer response is a large part of deployment costs.

Table 6-16 Levelized Program Costs and Potential (TOU Opt-In)

DSM Option	NPV Winter Potential MW	NPV Summer Potential MW	Winter Levelized Costs	Summer Levelized Costs
Battery Energy Storage	19.52	18.51	\$34.06	\$35.93
Behavioral	19.31	14.45	\$111.56	\$149.13
DLC Central AC		64.72		\$162.56
EV V1G Telematics	64.90	64.90	\$414.85	\$414.85
DLC Smart Appliances	17.79	17.79	\$415.98	\$415.98
DLC Smart Thermostats - Cooling		136.67		\$362.76
DLC Smart Thermostats - Heating	51.56		\$25.90	
DLC Water Heating	15.23	15.23	\$632.73	\$632.73
CTA-2045 ERWH	29.98	12.97	\$181.26	\$419.16
CTA-2045 HPWH	9.14	5.87	\$748.50	\$1,164.34
Thermal Energy Storage		3.05		\$913.92
Third Party Contracts	95.49	137.17	\$108.49	\$75.53
Time-of-Use Opt-in	18.52	13.87	\$215.37	\$287.62
Time-of-Use Opt-out				
Electric Vehicle TOU Opt-in	9.12	9.12	\$69.45	\$69.45
Variable Peak Pricing Rates	22.71	32.91	\$28.11	\$19.40
Peak Time Rebate	42.75	34.91	\$84.63	\$103.64

A |

MARKET PROFILES

This appendix presents the market profiles for each sector and segment for Washington and Idaho, in the embedded spreadsheet.



Avista 2024 - Electric
Market Profiles.xlsx

B |

MARKET ADOPTION (RAMP) RATES

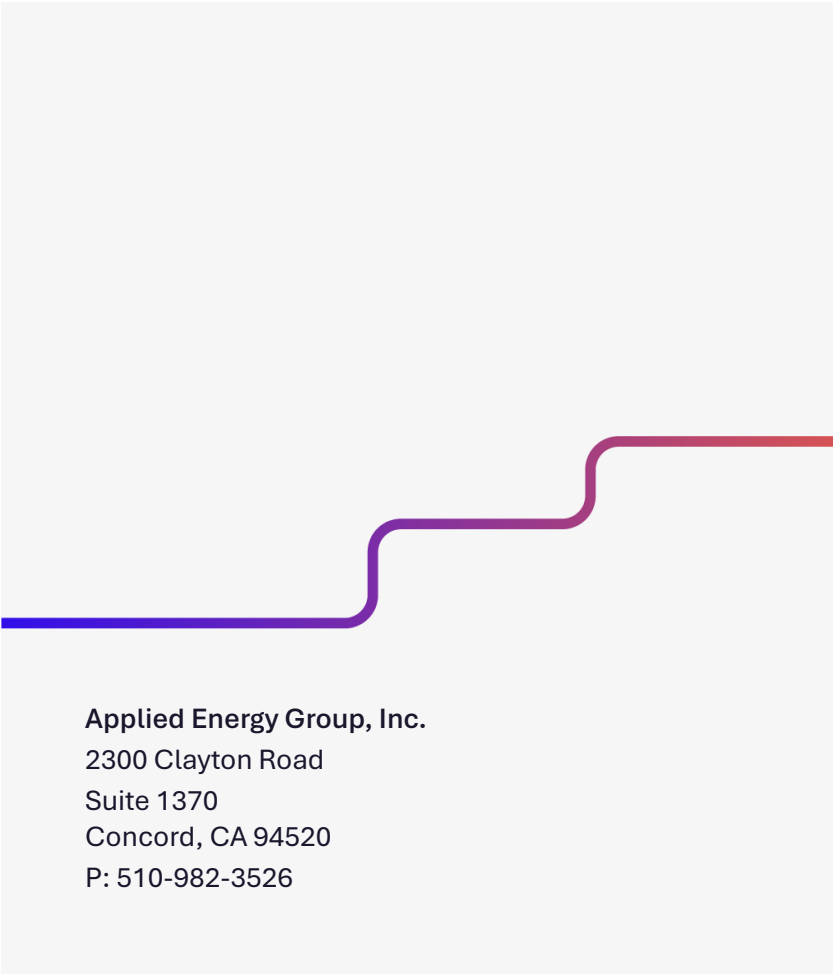
This appendix presents the Power Council's 2021 Power Plan ramp rates we applied to technical potential to estimate Technical Achievable Potential. Table B - 1 Measure Ramp Rates Used in CPA

Ramp Rate	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041
LO12Med	11%	22%	33%	44%	55%	65%	72%	79%	84%	88%	91%	94%	96%	97%	99%	100%	100%	100%	100%	100%
LO5Med	4%	10%	16%	24%	32%	42%	53%	64%	75%	84%	91%	96%	99%	100%	100%	100%	100%	100%	100%	100%
LO1Slow	1%	1%	2%	3%	5%	9%	13%	19%	26%	34%	43%	53%	63%	72%	81%	87%	92%	96%	98%	100%
LO50Fast	45%	66%	80%	89%	95%	98%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
LO20Fast	22%	38%	48%	57%	64%	70%	76%	80%	84%	88%	90%	92%	94%	95%	96%	97%	98%	98%	99%	100%
LOEven20	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%
LO3Slow	1%	1%	3%	6%	11%	18%	26%	36%	46%	57%	67%	76%	83%	88%	92%	95%	97%	98%	99%	100%
LO80Fast	76%	83%	88%	92%	95%	97%	98%	99%	99%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Retro12Med	11%	11%	11%	11%	11%	10%	8%	6%	5%	4%	3%	3%	2%	2%	1%	1%	0%	0%	0%	0%
Retro5Med	4%	5%	6%	8%	9%	10%	11%	11%	11%	9%	7%	5%	3%	1%	1%	0%	0%	0%	0%	0%
Retro1Slow	0%	1%	1%	1%	2%	3%	4%	6%	7%	8%	9%	10%	10%	9%	8%	7%	5%	4%	2%	2%
Retro50Fast	45%	21%	14%	9%	6%	3%	1%	1%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Retro20Fast	22%	16%	11%	8%	7%	6%	5%	5%	4%	3%	3%	2%	2%	1%	1%	1%	1%	1%	1%	0%
RetroEven20	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%	5%
Retro3Slow	1%	1%	2%	3%	5%	7%	8%	10%	11%	11%	10%	9%	7%	6%	4%	3%	2%	1%	1%	1%

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MEASURE DATA

Measure level assumptions and data are available in the “Avista 2024 DSM Potential Study Measure Assumptions” workbook provided to Avista alongside this file.



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