

# AVISTA NATURAL GAS CONSERVATION POTENTIAL ASSESSMENT FOR 2026-2045



Prepared for: Avista Corporation

By: Applied Energy Group, Inc., proudly part of ICF

Date: February 28, 2025

Key Contact: Andy Hudson | Phone # 510-982-3526

This work was performed by

Applied Energy Group, Inc. (AEG) 2300 Clayton Road, Suite 1370

Concord, CA 94520

Project Director: E. Morris Project Manager: A. Hudson

Project Team: K. Walter F. Nguyen

T. Williams C.Lee

L. Tang

# **Contents**

1   Introduction	8
Summary of Report Contents	8
Abbreviations and Acronyms	9
2   Energy Efficiency Analysis Approach and Development	11
Overview of Analysis Approach	
Data Development	18
Data Application	20
3   Energy Efficiency Market Characterization	26
Energy Use Summary	26
Residential Sector	27
Commercial Sector	
Industrial Sector	38
4   Baseline Projection	41
Overall Baseline Projection	41
Residential Sector	43
Commercial Sector	
Industrial Sector	47
5   Conservation Potential	49
Washington Overall Energy Efficiency Potential	49
Idaho Overall Energy Efficiency Potential	51
6   Sector-Level Energy Efficiency Potential	53
Residential Sector	53
Commercial Sector	57
Industrial Sector	63
7   Demand Response Potential	69
Study Approach	
Market Characterization	
Baseline Forecast	
Characterize Demand Response Program Options	
DR Potential Results	
A   Oregon Low-Income Conservation Potential	A-1
B   Natural Gas Transportation Customer Conservation Potential	B-1
C  MARKET PROFILES	C-1
D   MARKET ADOPTION (RAMP) Rates	D-1
E   Measure Data	E-1

# **List of Figures**

-	adMAP Analysis Framework	
• .	proach for Conservation Measure Assessment	
Figure 3-1	Avista Sector-Level Natural Gas Use (2021)	
Figure 3-2	Residential Natural Gas Use by Segment, Washington, 2021	
Figure 3-3	Residential Natural Gas Use by End Use, Washington, 2021	
Figure 3-4	Residential Energy Intensity by End Use and Segment, Washington, 2021	
Figure 3-5	Residential Natural Gas Use by Segment, Idaho, 2021	30
Figure 3-6	Residential Natural Gas Use by End Use, Idaho, 2021	30
Figure 3-7	Residential Energy Intensity by End Use and Segment, Idaho, 2021 (Annual Therms/HH)	31
Figure 3-8	Commercial Natural Gas Use by Segment, Washington, 2021	33
Figure 3-9	Commercial Sector Natural Gas Use by End Use, Washington, 2021	33
Figure 3-10	Commercial Energy Usage Intensity by End Use and Segment, Washington, 2021	34
Figure 3-11	Commercial Natural Gas Use by Segment, Idaho, 2021	36
Figure 3-12	Commercial Sector Natural Gas Use by End Use, Idaho, 2021	36
Figure 3-13	Commercial Energy Usage Intensity by End Use and Segment, Idaho, 2021	37
Figure 3-14	Industrial Natural Gas Use by End Use, Washington, 2021	38
Figure 3-15	Industrial Natural Gas Use by End Use, Idaho, 2021	39
Figure 4-1	Baseline Projection Summary by Sector, Washington	
Figure 4-2	Baseline Projection Summary by Sector, Idaho	43
Figure 4-3	Residential Baseline Projection by End Use, Washington	
Figure 4-4	Residential Baseline Projection by End Use, Idaho	
Figure 4-5	Commercial Baseline Projection by End Use, Washington	
Figure 4-6	Commercial Baseline Projection by End Use, Idaho	
Figure 4-7	Industrial Baseline Projection by End Use, Washington	
Figure 4-8	Industrial Baseline Projection by End Use, Idaho	
Figure 5-1	Cumulative Energy Efficiency Potential as % of Baseline Projection, Washington	
Figure 5-2	Baseline Projection and Energy Efficiency Forecasts, Washington	
Figure 5-3	Cumulative Energy Efficiency Potential as % of Baseline Projection, Idaho	
Figure 5-4	Baseline Projection and Energy Efficiency Forecasts, Idaho	
Figure 6-1	Cumulative Residential Potential as % of Baseline Projection, Washington	
Figure 6-2	Residential TRC Achievable Economic Potential – Cumulative Savings by End Use, Washington	
Figure 6-3	Cumulative Residential Potential as % of Baseline Projection, Idaho	
Figure 6-4	Residential UCT Achievable Economic Potential – Cumulative Savings by End Use, Idaho	
Figure 6-5	Cumulative Commercial Potential as % of Baseline Projection, Washington	
Figure 6-6	Commercial TRC Achievable Economic Potential – Cumulative Savings by End Use, Washing	
0	59	,
Figure 6-7		61
Figure 6-8	Commercial UCT Achievable Economic Potential – Cumulative Savings by End Use, Idaho	
Figure 6-9	Cumulative Industrial Potential as % of Baseline Projection, Washington	
Figure 6-10	Industrial TRC Achievable Economic Potential – Cumulative Savings by End Use, Washington.	
Figure 6-11	Cumulative Industrial Potential as % of Baseline Projection, Idaho	
Figure 6-12	Industrial UCT Achievable Economic Potential – Cumulative Savings by End Use, Idaho	
-	emand Response Analysis Approach	
	pincident Peak Load Forecast by State (Winter)	
-	immary of Integrated Potential (Dtherms @ Generator)	
	immary of Potential by Option – (Dtherms @ Generator)	
	otential by Sector – Dtherms @Generator, Washington	
_	stential by Sector – Dtherms @Generator, Idaho	
_	stential by Sector – Dtherms @Generator, Oregon	

Appendix Figure A-1	Income Group Map	A-4
Appendix Figure A-2	Cumulative Energy Efficiency Potential as % of Baseline Projection	A-5
Appendix Figure A-3	Achievable Economic Potential, 2045	A-5
Appendix Figure A-4	Cumulative TRC Achievable Economic Potential by End Use	A-6
Appendix Figure B-1	Reference Case Cumulative Potential, Washington	B-4
Appendix Figure B-2	Reference Case Cumulative Potential, Oregon	B-4
Appendix Figure B-3	Commercial Achievable Economic Potential by Market Segment, 2045	B-5
Appendix Figure B-4	Commercial Achievable Economic Potential by End Use, 2045	B-5
Appendix Figure B-5	Cumulative Achievable Economic Commercial Potential by End Use, Oregon	B-6
Appendix Figure B-6	Cumulative Achievable Economic Commercial Potential by End Use, Washington	B-6
Appendix Figure B-7	Industrial Achievable Economic Potential by End Use, 2045	B-7
Appendix Figure B-8	Cumulative Achievable Economic Industrial Potential by End Use, Oregon	B-7
Appendix Figure B-9	Cumulative Achievable Economic Industrial Potential by End Use, Washington	B-8

# **List of Tables**

Table 1-1	Explanation of Abbreviations and Acronyms	.10
Table 2-1 Ov	verview of Avista Analysis Segmentation Scheme	.14
	ımber of Measures Evaluated	
	ata Applied for the Market Profiles	
	ata Needs for Baseline Projection and Potentials Estimation in LoadMAP	
Table 2-5 Re	sidential Natural Gas Equipment Standards	.23
Table 2-6 Co	ommercial and Industrial Natural Gas Equipment Standards	.23
Table 2-7 Da	ata Needs for Measure Characteristics in LoadMAP	.24
Table 3-1	Residential Sector Control Totals, 2021	.26
Table 3-2	Residential Sector Control Totals, Washington, 2021	
Table 3-3	Average Market Profile for the Residential Sector, Washington, 2021	
Table 3-4	Residential Sector Control Totals, Idaho, 2021	
Table 3-5	Average Market Profile for the Residential Sector, Idaho 2021	
Table 3-6	Commercial Sector Control Totals, Washington, 2021	
Table 3-7	Average Market Profile for the Commercial Sector, Washington, 2021	
Table 3-8	Commercial Sector Control Totals, Idaho, 2021	
Table 3-9	Average Market Profile for the Commercial Sector, Idaho, 2021	
Table 3-10	Industrial Sector Control Totals, 2021	
Table 3-11	Average Natural Gas Market Profile for the Industrial Sector, Washington, 2021	
Table 3-12	Average Natural Gas Market Profile for the Industrial Sector, Idaho, 2021	
Table 4-1	Baseline Projection Summary by Sector, Washington (dtherms)	
Table 4-2	Baseline Projection Summary by Sector, Idaho (dtherms)	
Table 4-3	Residential Baseline Projection by End Use, Washington (dtherms)	
Table 4-4	Residential Baseline Projection by End Use, Idaho (dtherms)	
Table 4-5	Commercial Baseline Projection by End Use, Washington (dtherms)	
Table 4-6	Commercial Baseline Projection by End Use, Idaho (dtherms)	.46
Table 4-7	Industrial Baseline Projection by End Use, Washington (dtherms)	.47
Table 4-8	Industrial Baseline Projection by End Use, Idaho (dtherms)	.48
Table 5-1	Summary of Energy Efficiency Potential, Washington	.50
Table 5-2	Summary of Energy Efficiency Potential, Idaho	.51
Table 6-1	Residential Energy Conservation Potential Summary, Washington	
Table 6-2	Residential Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Washington	.54
Table 6-3	Residential Energy Conservation Potential Summary, Idaho	.55
Table 6-4	Residential Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Idaho	.57
Table 6-5	Commercial Energy Conservation Potential Summary, Washington	.58
Table 6-6	Commercial Top Measures in 2023 and 2035, TRC Achievable Economic Potential, Washington	.60
Table 6-7	Commercial Energy Conservation Potential Summary, Idaho	.61
Table 6-8	Commercial Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Idaho	.63
Table 6-9	Industrial Energy Conservation Potential Summary, Washington	.64
Table 6-10	Industrial Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Washington	.66
Table 6-11	Industrial Energy Conservation Potential Summary, Idaho	.67
Table 6-12	Industrial Top Measures in 2026 and 2045, UCT Achievable Economic Potential, Idaho	.68
Table 7-1 Ma	arket Segmentation	.70
Table 7-2 Ba	seline Customer Forecast by Customer Class, Washington	.71
Table 7-3 Ba	seline Customer Forecast by Customer Class, Idaho	.71
Table 7-4 Ba	seline Customer Forecast by Customer Class, Oregon	.71
	seline February Winter System Peak Forecast (Dth @Generation) by State	
	SM Steady-State Participation Rates (Percent of Eligible Customers)	
	SM Per Participant Impact Assumptions	
	ımmary of Integrated Potential (Dtherms @ Generator)	
	ımmary of Potential by Option – (Dtherms @ Generator)	

Table 7-10 Potential	by Sector – Dtherms @Generator, Washington	77
Table 7-11 Potential	by Sector – Dtherms @Generator, Idaho	77
Table 7-12 Potential	by Sector – Dtherms @Generator, Oregon	77
Table 7-13 Levelized	Program Costs and Potential	79
Appendix Table A-1	Summary of Energy Efficiency Potential	A-1
Appendix Table A-2	Key Data Source Summary	A-3
Appendix Table A-3	Customer Counts and Energy Consumption by Dwelling Type and Income Level,	2021 A-4
Appendix Table A-4	Top Measures in 2026 and 2036, Achievable Economic Potential	A-6
Appendix Table B-1	Summary Potential Results – Reference Case, Washington	B-2
Appendix Table B-2	Summary Potential Results – Reference Case, Oregon	B-2
Appendix Table B-3	Key Data Source Summary	B-3

# 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 natural gas CPA.

Notable updates from prior CPAs include:

- 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.
  - o 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). Connected Thermostats were removed from potential in all states due to the intention of the RTF to sunset that measure at the end of 2025.
- The study incorporates updated forecasting assumptions that align with the most recent Avista load forecast.
- Updated information from the US Energy Information Administrations Residential and Commercial Building Energy Consumption Surveys (RECS 2020 and CBECS 2018, both datasets released in 2022-2023) was used to supplement base year characterization of residential and commercial customers

Enhancement retained from the previous CPA include:

- The residential segmentation differentiates low-income customers from others, with unique market characterization, building shell and usage characteristics.
- For the commercial sector, the analysis was performed for the major building types in the service territory. Results from NEEA's 2019 Commercial Building Stock Assessment (CBSA), including hospital and university data, provided useful information for this analysis. 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 natural gas 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 Sector-Level Energy Efficiency Potential. Summary of energy efficiency potential for each market sector within Avista's service territory for both Washington and Idaho. This chapter includes a detailed breakdown of potential by measure type, vintage, market segment, end use, and state.
- Chapter 7 Demand Response Potential. Natural gas demand response potential results for each state across all sectors and separately for each sector.

#### Volume 2, Appendices

- The appendices for this report are provided in separate spreadsheets accompanying the delivery of this report and consist of the following:
- Oregon Low-Income Conservation Potential. Memo describing methodology and results of this
  additional study.
- Natural Gas Transportation Customer Conservation Potential. Memo describing methodology and results of this additional study.
- Market Profiles. Detailed market profiles for each market segment. Includes equipment saturation, unit energy consumption or energy usage index, energy intensity, and total consumption.
- Market Adoption Rates. Documentation of the ramp rates used in this analysis. These were adapted from the 2021 Power Plan electrical power conservation supply curve workbooks for the estimation of achievable natural gas potential.
- Measure Data. List of measures and input assumptions, along with baseline definitions and efficiency options by market sector analyzed.

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 1-1Explanation of Abbreviations and Acronyms

Acronym	Explanation
ACS	U.S. Census American Community Study
AEG	Applied Energy Group
AEO	EIA's Annual Energy Outlook
BEST	AEG's Building Energy Simulation Tool
C&I	Commercial and Industrial
CBSA	NEEA's Commercial Building Stock Assessment
COMMEND	EPRI's Commercial End-Use Planning System
CPA	Conservation Potential Assessment
DEEM	AEG's Database of Energy Efficiency Measures
DEER	California Database for Energy Efficient Resources
DR	Demand Response
DSM	Demand Side Management
EIA	Energy Information Administration
EPRI	Electric Power Research Institute
EUI	Energy Use Index
HDD	Heating Degree Day
HVAC	Heating Ventilation and Air Conditioning
IFSA	NEEA's Industrial Facilities Site Assessment
IRP	Integrated Resource Plan
LoadMAP	AEG's Load Management Analysis and Planning™ tool
NEEA	Northwest Energy Efficiency Alliance
NWPCC	Northwest Power and Conservation Council
O&M	Operations and Maintenance
RBSA	NEEA's Residential Building Stock Assessment
REEPS	EPRI's Residential End-Use Energy Planning System
RTF	NWPCC's Regional Technical Forum
TRC	Total Resource Cost test
TRM	Technical Reference Manual
UCT	Utility Cost Test
UEC	Unit Energy Consumption
WSEC	2015 Washington State Energy Code
Acronym	Explanation
ACS	U.S. Census American Community Study
AEG	Applied Energy Group
AEO	EIA's Annual Energy Outlook

# 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 7 |

### **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. The market characterization included extensive use of Avista data and other secondary data sources from NEEA and the Energy Information Administration (EIA).
- 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, achievable technical, and achievable economic energy savings at the measure level for 2026 through 2045. Achievable economic potential was assessed using the Utility Cost Test (UCT) test for Avista's Idaho territory and the Total Resource Cost (TRC) test for Avista's Washington territory. Comparison with NWPCC Methodology

It is important to note that electricity is the primary focus of the regionwide potential assessed in the NWPCC's Plans. Natural gas impacts are typically assessed when they overlap with electricity measures (e.g., gas water heating impacts in an electrically heated "Built Green Washington" home). Although Avista is a dual-fuel utility, this study focuses on natural gas measures and programs, which exhibit noticeable differences from electric programs, notably regarding avoided costs. To account for this, AEG sometimes adapted NWPCC methodologies rather than using them directly from the source. This adaptation is especially relevant in the development of ramp rates when achievability was determined not to be applicable to a specific natural gas measure or program.

A primary objective of the study was to estimate natural gas potential consistent with the NWPCC's analytical methodologies and procedures for electric utilities. While developing Avista's 2025 - 2045 CPA, AEG relied on an approach vetted and adapted through the successful completion of CPAs referencing the NWPCC's Fifth, Sixth, Seventh, and now 2021 Power Plans. Among other aspects, this approach involves using consistent:

- Data sources: Avista surveys, regional surveys, market research, and assumptions
- Measures and assumptions: Avista TRM, 2021 Power Plan supply curves and RTF work products
- Potential factors: 2021 Power Plan ramp rates
- Levels of potential: technical, achievable technical, and achievable economic
- Cost-effectiveness approaches: assessed potential under the UCT for Idaho and TRC for Washington, including non-energy impacts (and non-gas energy impacts), which may be quantified and monetized, as well as operations and maintenance (O&M) impacts within the TRC.
- Conservation credit: applied NWPCC 10% conservation credit to avoided energy costs in Washington for energy benefits. This is incorporated into the TRC calculation.

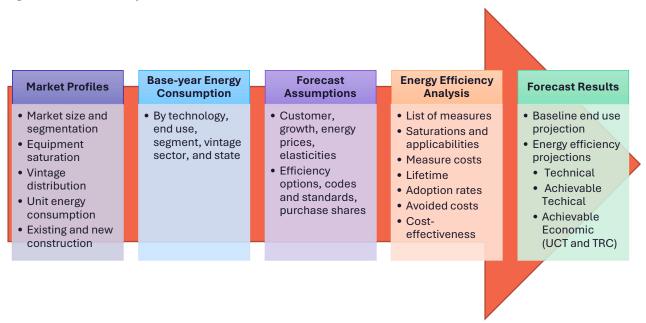
#### LoadMAP Model

AEG used its Load Management Analysis and Planning tool (LoadMAP<sup>™</sup>) 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. This is especially relevant in the state of
  Washington where the 2015 Washington State Energy Code (WSEC) substantially enhances the
  efficiency of the new construction market.
- 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 water heating is distinct from furnaces and fireplaces.
- 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, state, or income level).
- Natively outputs model results in a detailed line-by-line summary file, allowing for review of input assumptions, cost-effectiveness results, and potential estimates at a granular level. Also allows for the development of IRP supply curves, both at the achievable technical and achievable economic potential levels.
- 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 NWPCC'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 NWPCC 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 D.
- UCT Achievable Economic Potential further refines achievable technical potential by applying a
  cost-effectiveness screen. The UCT test assesses cost-effectiveness from the utility's perspective.
  This test compares lifetime energy benefits to the costs of delivering the measure through a utility
  program, excluding monetized non-energy impacts. The costs are the incentive, as a percent of the

- incremental cost of the given measure, relative to the relevant baseline (e.g., the federal standard for lost opportunity and no action for retrofits), plus any administrative costs that are incurred by the program to deliver and implement the measure. If the benefits outweigh the costs (that is, if the UCT ratio is greater than 1.0), a given measure is included in the economic potential.
- TRC Achievable Economic Potential also refines achievable technical potential through cost-effectiveness analysis. The TRC test assesses cost-effectiveness from a combined utility and participant perspective. As such, this test includes the full cost of the measure and non-energy impacts realized by the customer (if quantifiable and monetized). AEG also assessed the impacts of non-gas savings following the NWPCC methodology. For the assessment, AEG used a calibration credit for space heating equipment consumption to account for secondary heating equipment present in an average home as well as other electric end-use impacts, such as cooling and interior lighting (as applicable), on a measure-by-measure basis.

#### **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.

T-1-1-01	O	· A · - + - A I.	 tation 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	Heating, secondary heating, water heating, food preparation, process, and miscellaneous (as appropriate by sector)
5	Appliances/end uses and technologies	Technologies such as furnaces, water heaters, and process heating by application, etc.
6	Equipment efficiency levels fo new purchases	r Baseline and higher-efficiency options as appropriate for each technology

With the segmentation scheme defined, AEG then performed a high-level market characterization of natural gas 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, and energy consumption 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 the number of employees.
- **Saturations** define the fraction of homes or square feet with the various technologies (e.g., homes with electric space heating).
  - o Conditioned space accounts for the fraction of each building that is conditioned by the end use, applying to cooling and heating end uses.
  - o The whole-building approach measures shares of space in a building with an end use regardless of the portion of each building served by the end use. Examples are commercial refrigeration, food service, and domestic water heating and appliances.
  - o The 100% saturation approach applies to end uses generally present in every building or home and are set to 100% in the base year.
- **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 therms/household for the residential sector, and EUIs are expressed in therms/square foot for the commercial sector, or therms/employee for the industrial 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 and industrial sectors represent the average use for the technology across all floor space or employees 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 therms or dtherms.

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

#### **Baseline Projection**

The next step was to develop the baseline projection of annual natural gas use for 2021 through 2045 by customer segment and end use in the absence of new utility energy efficiency 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 baseline.

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:

- Avista's official forecast (Heating Degree Days base 65°F (HDD65)), calibrated to actual sales
- Current economic growth forecasts (i.e., customer growth, income growth, changes in weather (HDD65 normalization)))
- Natural gas 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 natural gas sales

The baseline projection is presented in Chapter 4.

#### **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 combined with Avista's avoided cost data to inform the economic screens that Leadetermine economically feasible measures.

#### **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. 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. Avista provided feedback during each step to ensure measure assumptions and results lined up with programmatic experience.

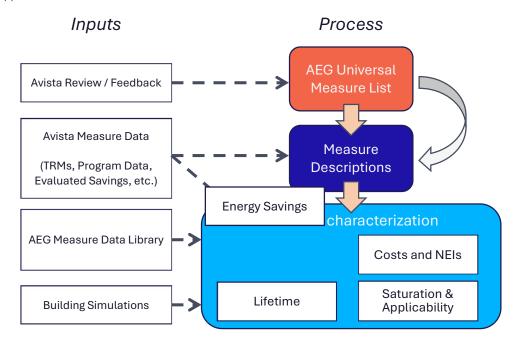


Figure 2-2 Approach for Conservation Measure Assessment

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® residential water heater (UEF 0.64) that replaces a standard efficiency water heater (UEF 0.58). 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. These measures are applied on a stock-turnover basis and are generally referred to as lost opportunity measures by the NWPCC because once a purchase decision is made, there will not be another opportunity to improve the efficiency of the equipment until its effective useful life is reached. 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 furnace or water heater). An example would be a programmable thermostat that is pre-set to run heating systems only when people are home. Non-equipment measures can apply to more than one end use or fuel type. 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:
  - o Building shell (windows, insulation, roofing material)
  - o Equipment controls (thermostat, water heater setback)
  - o Equipment maintenance (cleaning filters, changing setpoints)
  - o Whole-building design (building orientation, advanced new construction designs)
  - 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, non-energy impacts, 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. Following the measure characterization, we performed an economic screening of each measure, which serves as the basis for developing the economic and achievable potential scenarios. 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/ All Segments & States
Residential	64	128	1,536
Commercial	76	152	3,040
Industrial	43	86	172
Total Measures Evaluated	183	366	4,748

#### **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. Data were adapted to local conditions, for example, by using local sources for measure data and local weather for building simulations.

#### 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 forecasts, by sector and state, of energy consumption, customer counts, weather actuals for 2021, as well as weather-normal HDD65.
- **Economic Information:** Avista provided a discount rate as well as avoided cost forecasts consistent with those utilized in the IRP.
- Program Data: Avista provided information about past and current programs, including program
  descriptions, goals, and achievements to date.
- **Avista TRM:** Avista provided energy conservation measure assumptions within current programs. We utilized this as a primary source of measure information, supplemented secondary data.

#### Northwest Energy Efficiency Alliance Data

The NEEA conducts research for the Northwest region. The NEEA surveys were used extensively to develop base saturation and applicability assumptions for many of the non-equipment measures within the study. The following studies were particularly useful:

- RBSA II, Single-Family Homes Report 2016-2017.
- RBSA II, <u>Manufactured Homes Report 2016-2017</u>.

- RBSA II, <u>Multifamily Buildings Report 2016-2017</u>.
- 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 statelevel 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, both within the region and across the country. We checked our input assumptions and
  analysis results against the results from these other studies both within the region and across the
  country.

#### 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.
- EIA Survey Data (RECS, CBECS, MECS): Used to supplement end use saturations and consumption where more local data was not available. This study used data from the 2020 RECS, 2018 CBECS, and 2018 MECS, which are the most recent data sets available.
- Local Weather Data: Weather from National Oceanic and Atmospheric Administration's National Climatic Data Center for Spokane, Washington and Coure d'Alene in Idaho were used as the basis for building simulations.
- 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. When using data from outside the region, especially weather-sensitive data, AEG adapted assumptions for use within Avista's territory.

## **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 natural gas consumption and market size units (households for residential, floor space for commercial, and employees for industrial), we primarily used Avista's billing data as well as secondary data from AEG's Energy Market Profiles database.

- 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 natural gas use, and annual intensity. Control totals were based on Avista's actual sales and customer-level information found in Avista's customer billing database.
- 5. Developed existing appliance saturations and the energy characteristics of appliances, equipment, and buildings using equipment flags within Avista's billing data; NEEA's RBSA, CBSA, and IFSA; U.S. EIA's surveys and AEO; and the American Community Survey.
- 6. Ensured calibration to control totals for annual natural gas sales in each sector and segment.
- 7. Compared and cross-checked with other recent AEG studies.
- 8. 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 Industrial: Annual use per employee	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, CBSA, and IFSA ACS AEG's Energy Market Profiles
UEC/EUI for each end- use technology	UEC: Annual natural gas use in homes and buildings that have the technology EUI: Annual natural gas use per square foot/employee for a technology in floor space that has the technology	HVAC uses: BEST simulations using prototypes developed for Avista Engineering analysis RTF workbooks if applicable AEO 2023 Recent AEG studies
Appliance/equipment age distribution	Age distribution for each technology	RBSA, CBSA, and recent AEG studies
Efficiency options for each technology	List of available efficiency options and annual energy use for each technology	Avista current program offerings AEO 2023 RTF and NWPCC 2021 Plan data

## **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 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 <sup>1</sup> 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

<sup>&</sup>lt;sup>1</sup> We developed baseline purchase decisions using the EIA's AEO report, which utilizes the National Energy Modeling System to produce a self-consistent supply and demand economic model. We calibrated equipment purchase options to match distributions/allocations of efficiency levels to manufacturer shipment data for recent years.

Table 2-5 Residential Natural Gas Equipment Standards

End-Use	Technology	2021	2022	2023	2024	2025
Space Heating	Furnace – Direct Fuel		AFUE 80%		AFUE	90%
	Boiler – Direct Fuel			AFUE 80%		
Secondary Heating	Fireplace		N/A			
Water Heating	Water Heater <= 55 gal.			UEF 0.58		
	Water Heater > 55 gal.	UEF 0.76				
Annlianasa	Clothes Dryer			CEF 3.30		
Appliances	Stove/Oven	N/A				
Miscellaneous	Pool Heater			TE 0.82		
	Miscellaneous			N/A		

Table 2-6 Commercial and Industrial Natural Gas Equipment Standards

End-Use	Technology	2021		2022	2023	2024	2025	
Space Heating	Furnace			AFUE 80% / TE 0.80			TE 0.90	
	Boiler		Average around AFUE 80% / TE 0.80 (varies by size)					
	Unit Heater		Standard (intermittent ignition and power venting or automatic flue damper)					
Water Heater	Water Heating		TE 0.80					
Food	Fryer	N/A	ENERGY STAR 3.0					
Preparation	Steamer	N/A	ENERGY STAR 1.2					
Miscellaneous	Pool Heater		TE 0.82					

#### **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 2021 Plan  conservation workbooks  RTF workbooks  AEG BEST  Other secondary sources
Costs	Equipment Measures: Includes the full cost of purchasing and installing the equipment on a per-household, persquare-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, the incremental cost of upgrading from a standard level to a higher efficiency level.	Avista measure data NWPCC 2021 Plan conservation workbooks, RTF 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 2021 Plan  conservation workbooks , RTF  AEO 2023  AEG DEEM  DEER  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.	RBSA, CBSA WSEC for limitations on new construction NWPCC 2021 Plan conservation workbooks RTF 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 Cost-effectiveness Screening**

All cost and benefit values were analyzed as real dollars, converted from nominal provided by Avista. We applied Avista's long-term discount rate of 4.29% excluding inflation. LoadMAP is configured to vary this by market sector (e.g., residential and commercial) if Avista develops alternative values in the future.

#### **Estimates of Customer Adoption**

 Two parameters are needed to estimate the timing and rate of customer adoption in the potential forecasts. 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 Technical Achievable 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 D.

# 3 | Energy Efficiency Market Characterization

This chapter presents how Avista's customers in Washington and Idaho use natural gas 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.

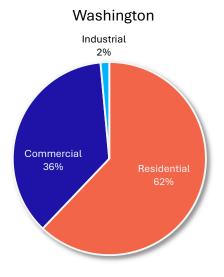
## **Energy Use Summary**

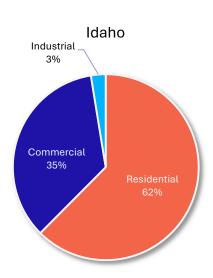
Avista's total natural gas consumption for the residential, commercial, and industrial sectors in 2021 was 27,285,801 dtherms (dtherms or dth); 18,288,700 dtherms in Washington and 8,997,101 dtherms in Idaho. As shown in Table 3-1 and , the residential sector accounts for the largest share of annual energy use at 62%, followed by the commercial sector at approximately 35%.

Table 3-1 Residential Sector Control Totals, 2021

	Wasl	hington	ldaho		
Sector	Natural Gas Usage (Dth)	% of Annual Use	Natural Gas Usage (Dth)	% of Annual Use	
Residential	11,356,811	62.1%	5,617,143	62.4%	
Commercial	6,665,122	36.4%	3,149,752	35.0%	
Industrial	266,766	1.5%	230,206	2.6%	
Total	18,288,700	100%	8,997,101	100%	

Figure 3-1 Avista Sector-Level Natural Gas Use (2021)





#### **Residential Sector**

#### **Washington Characterization**

The total number of households and natural gas sales for the service territory were obtained from Avista's actual sales. In 2021, there were 157,808 households in the state of Washington that used a total of 11,356,811 dtherms, resulting in an average use per household of 720 therms per year. Table 3-2 and Figure 3-2 shows the total number of households and natural gas sales in the six residential segments for each state. These values represent weather actuals for 2021 and were adjusted within LoadMAP to normal weather using heating degree day, base 65°F, using data provided by Avista.

Table 3-2 Residential Sector Control Totals, Washington, 2021

Segment	Households	Natural Gas Use (dtherms)	Annual Use/Customer (therms/HH)
Single Family	84,836	7,324,885	863
Multi-Family	8,705	431,675	496
Mobile Home	5,136	305,566	595
Low Income - Single Family	39,810	2,481,707	623
Low Income – Multi-Family	15,263	546,435	358
Low Income – Mobile Home	4,057	266,544	657
Total	157,808	11,356,811	720

Figure 3-2 Residential Natural Gas Use by Segment, Washington, 2021

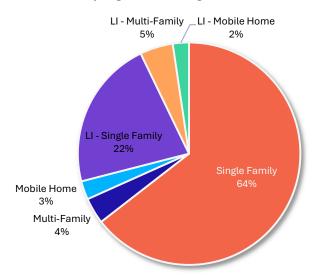


Figure 3-3 and Table 3-3 show the distribution of annual natural gas consumption by end use for an average residential household. Space heating comprises most of the load at 83%, followed by water heating at 12%. Appliances, secondary heating, and miscellaneous loads make up the remaining portion (5%) of the total load.

The market profiles provide the foundation for development of the baseline projection and the potential estimates. The average market profile for the residential sector is presented in Table 3-3.

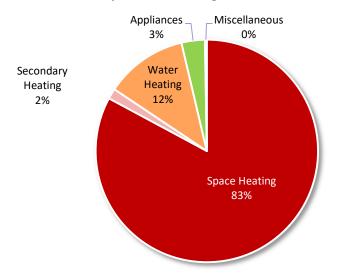


Figure 3-3 Residential Natural Gas Use by End Use, Washington, 2021

Table 3-3 Average Market Profile for the Residential Sector, Washington, 2021

End Use	Technology	Saturation	UEC (therms)	Intensity (therms/HH)	Usage (dtherms)
	Furnace - Direct Fuel	84.8%	685	581	9,175,585
Space Heating	Boiler - Direct Fuel	2.4%	628	15	233,076
Secondary Heating	Fireplace	5.1%	216	11	172,769
Water Heating	Water Heater (<= 55 Gal)	55.1%	156	86	1,356,503
Water Heating	Water Heater (>55 Gal)	0.0%	148	0	457
Appliances	Clothes Dryer	28.4%	23	6	101,141
Appliances	Stove/Oven	58.6%	31	18	286,622
Minarillana	Pool Heater	0.9%	106	1	15,120
Miscellaneous	Miscellaneous	100%	1	1	15,539
Total				720	11,356,811

Figure 3-4 presents average natural gas intensities by end use and housing type. Single family homes consume substantially more energy in space heating because single family homes are larger and more walls are exposed to the outside environment, compared to multifamily dwellings with many shared walls. Additional exposed walls increase heat transfer, resulting in greater heating loads. Water heating consumption is also higher in single family homes due to a greater number of occupants.

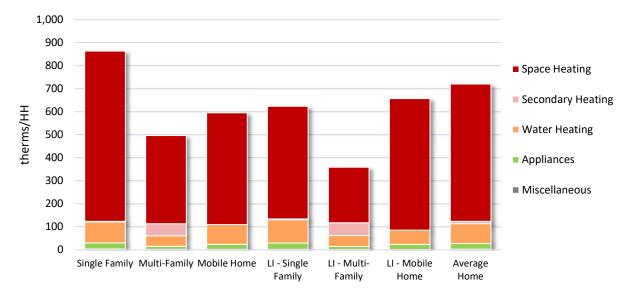


Figure 3-4 Residential Energy Intensity by End Use and Segment, Washington, 2021

#### **Idaho Characterization**

In 2021, there were 80,127 households in Avista's Idaho territory that used a total of 5,617,143 dtherms, resulting in an average use per household of 701 therms per year. Table 3-4 and Figure 3-5 shows the total number of households and natural gas sales in the six residential segments for each state.

Table 3-4 Residential Sector Control Totals, Idaho, 2021

Segment	Households	Natural Gas Use (dtherms)	Annual Use/Customer (therms/HH)
Single Family	55,954	4,471,261	799
Multi-Family	8,690	379,050	436
Mobile Home	5,585	261,344	468
Low Income – Single Family	6,505	377,733	581
Low Income – Multi-Family	2,685	85,112	317
Low Income – Mobile Home	708	42,642	603
Total	80,127	5,617,143	701

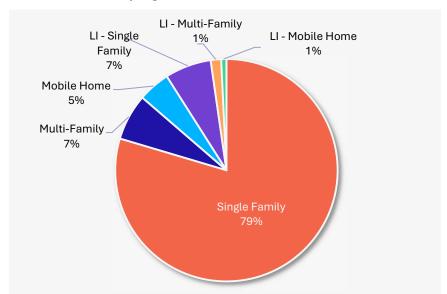


Figure 3-5 Residential Natural Gas Use by Segment, Idaho, 2021

Figure 3-6 and Table 3-5 show the distribution of annual natural gas consumption by end use for an average residential household. Space heating comprises most of the load at 84%, followed by water heating at 12%. Appliances, secondary heating, and miscellaneous loads make up the remaining portion (4%) of the total load.



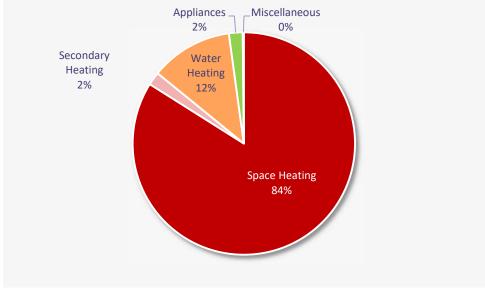
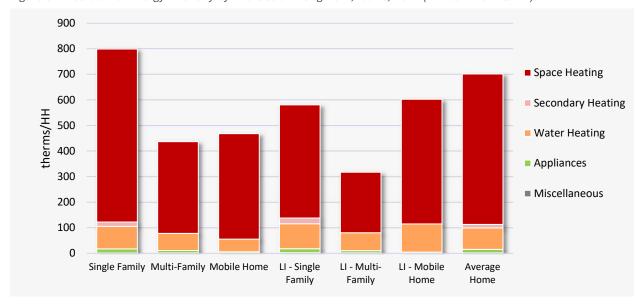


Table 3-5 Average Market Profile for the Residential Sector, Idaho 2021

End Use	Technology	Saturation	UEC (therms)	Intensity (therms/HH)	Usage (dtherms)
On a salla ating	Furnace - Direct Fuel	88.0%	669	589	4,715,719
Space Heating	Boiler - Direct Fuel	0.0%	-	-	-
Secondary Heating	Fireplace	6.0%	225	14	108,339
\Make u l le etie «	Water Heater (<= 55 Gal)	50.9%	152	77	618,978
Water Heating	Water Heater (>55 Gal)	4.3%	151	7	52,229
Analianaaa	Clothes Dryer	16.2%	22	4	28,672
Appliances	Stove/Oven	34.7%	30	11	84,402
Miscellaneous	Pool Heater	0.3%	106	0	2,848
	Miscellaneous	100%	1	1	5,958
Total				701	5,617,143

Figure 3-7 presents average natural gas intensities by end use and housing type. Single family homes consume substantially more energy in space heating. Water heating consumption is higher in single family homes as well, due to a greater number of occupants, which increases the demand for hot water.

Figure 3-7 Residential Energy Intensity by End Use and Segment, Idaho, 2021 (Annual Therms/HH)



#### **Commercial Sector**

#### **Washington Characterization**

The total natural gas consumed by commercial customers in Avista's Washington service area in 2021 was 6,665,122 dtherm. The total number of non-residential accounts and natural gas sales for the Washington service territory were obtained from Avista's customer account database. AEG separated the commercial and industrial accounts by analyzing the SIC codes and rate codes assigned in the billing system. Energy use from accounts where the customer type could not be identified were distributed proportionally to all C&I segments. Once the billing data was analyzed, the final segment control totals were derived by distributing the total 2021 non-residential load to the sectors and segments according to the proportions in the billing data.

Table 3-6 shows the final allocation of energy to each segment in the commercial sector, as well as the energy intensity on a square-foot basis. Intensities for each segment were derived from a combination of the 2021 CBSA and equipment saturations extracted from Avista's database.

Table 3-6 Commercial Sector Control Totals, Washington, 2021

Segment	Description	Intensity (therms/Sq Ft)	Natural Gas Use (dtherms)
Office	Traditional office-based businesses including finance, insurance, law, government buildings, etc.	0.53	536,771
Restaurant	Sit-down, fast food, coffee shop, food service, etc.	2.60	747,786
Retail	Department stores, services, boutiques, strip malls etc.	0.79	1,547,664
Grocery	Supermarkets, convenience stores, market, etc.	0.55	125,630
School	Day care, pre-school, elementary, secondary schools	0.28	187,678
College	College, university, trade schools, etc.	0.59	182,118
Health	Health practitioner office, hospital, urgent care centers, etc.	0.99	243,745
Lodging	Hotel, motel, bed and breakfast, etc.	0.67	370,063
Warehouse	Large storage facility, refrigerated/unrefrigerated warehouse	0.57	688,567
Miscellaneous	Catchall for buildings not included in other segments, includes churches, recreational facilities, public assembly, correctional facilities, etc.	0.95	2,035,100
Total		0.78	6,665,122

Figure 3-8 shows the distribution of annual natural gas consumption by segment across all commercial buildings. The three segments with the highest natural gas usage in 2021 are miscellaneous (30%), retail (23%), and restaurant (11%).

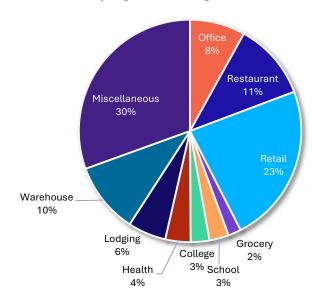


Figure 3-8 Commercial Natural Gas Use by Segment, Washington, 2021

Figure 3-9 shows the distribution of natural gas consumption by end use for the entire commercial sector. Space heating is the largest end use, followed by water heating and food preparation. The miscellaneous end use is quite small, as expected.

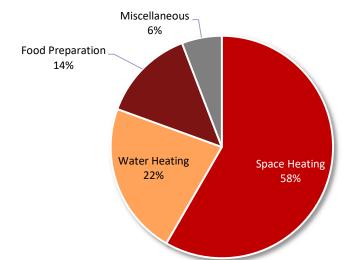


Figure 3-9 Commercial Sector Natural Gas Use by End Use, Washington, 2021

Figure 3-10 presents average natural gas intensities by end use and segment. In Washington, restaurants use the most natural gas in the service territory. Avista customer account data informed the market profile by providing information on saturation of key equipment types. Secondary data was used to develop estimates of energy intensity and square footage and fill in saturations for any equipment types not included in the database.

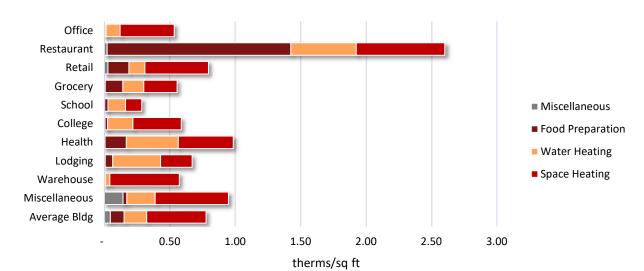


Figure 3-10 Commercial Energy Usage Intensity by End Use and Segment, Washington, 2021

Table 3-7 shows the average market profile for the commercial sector as a whole, representing a composite of all segments and buildings.

Table 3-7 Average Market Profile for the Commercial Sector, Washington, 2021

End Use	Technology	Saturation	EUI (therms/ Sq Ft)	Intensity (therms/Sq Ft)	Usage (dtherms)
	Furnace	52.4%	0.55	0.29	2,485,626
Space Heating	Boiler	21.9%	0.66	0.15	1,247,409
	Unit Heater	5.9%	0.31	0.02	156,793
Water Heating	Water Heater	58.7%	0.29	0.17	1,481,152
	Oven	11.3%	0.08	0.01	73,181
	Conveyor Oven	5.6%	0.13	0.01	62,609
	Double Rack Oven	5.6%	0.20	0.01	95,114
	Fryer	8.0%	0.44	0.04	300,472
Food Preparation	Broiler	13.3%	0.12	0.02	133,574
·	Griddle	17.5%	0.08	0.01	118,981
	Range	17.8%	0.07	0.01	113,457
	Steamer	1.9%	0.07	0.00	10,828
	Commercial Food Prep Other	0.2%	0.02	0.00	221
Miscellaneous	Pool Heater	1.0%	0.06	0.00	5,419
	Miscellaneous	100%	0.04	0.04	383,287
Total				0.78	6,665,122

#### **Idaho Characterization**

The total natural gas consumed by commercial customers in Avista's Idaho service area in 2021 was 3,149,752 dtherm. Table 3-8 shows the final allocation of energy to each segment in the commercial sector, as well as the energy intensity on a square-foot basis. Intensities for each segment were derived from a combination of the 2021 CBSA and equipment saturations extracted from Avista's database.

Table 3-8 Commercial Sector Control Totals, Idaho, 2021

Segment	Description	Intensity (therms/Sq Ft)	Natural Gas Use (dtherms)
Office	Traditional office-based businesses including finance, insurance, law, government buildings, etc.	0.53	226,954
Restaurant	Sit-down, fast food, coffee shop, food service, etc.	2.60	139,154
Retail	Department stores, services, boutiques, strip malls etc.	0.79	959,894
Grocery	Supermarkets, convenience stores, market, etc.	0.55	58,138
School	Day care, pre-school, elementary, secondary schools	0.28	184,533
College	College, university, trade schools, etc.	0.59	179,370
Health	Health practitioner office, hospital, urgent care centers, etc.	1.01	102,436
Lodging	Hotel, motel, bed and breakfast, etc.	0.67	170,255
Warehouse	Large storage facility, refrigerated/unrefrigerated warehouse	0.57	334,864
Miscellaneous	Catchall for buildings not included in other segments, includes churches, recreational facilities, public assembly, correctional facilities, etc.	0.95	794,154
Total		0.70	3,149,752

Figure 3-11 shows the distribution of annual natural gas consumption by segment across all commercial buildings. The three segments with the highest natural gas usage in 2021 are retail (31%), miscellaneous (25%), and warehouse (11%).

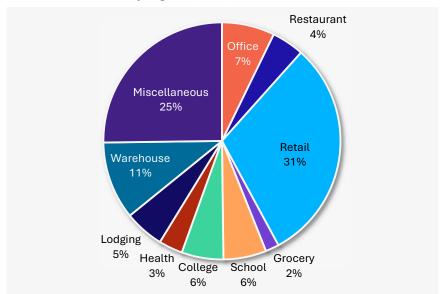


Figure 3-11 Commercial Natural Gas Use by Segment, Idaho, 2021

Figure 3-12 shows the distribution of natural gas consumption by end use for the entire commercial sector. Space heating is the largest end use, followed by water heating and food preparation. The miscellaneous end use is quite small, as expected.

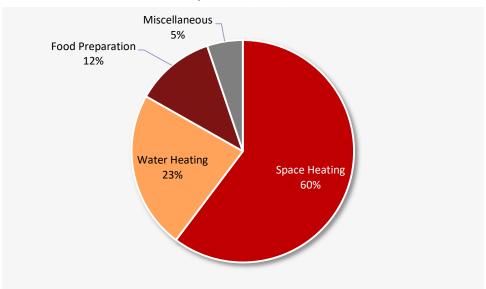


Figure 3-12 Commercial Sector Natural Gas Use by End Use, Idaho, 2021

Figure 3-13 presents average natural gas intensities by end use and segment. In Idaho, restaurants use the most natural gas in the service territory. Avista customer account data informed the market profile by providing information on saturation of key equipment types. Secondary data was used to develop estimates of energy intensity and square footage and fill in saturations for any equipment types not included in the database.

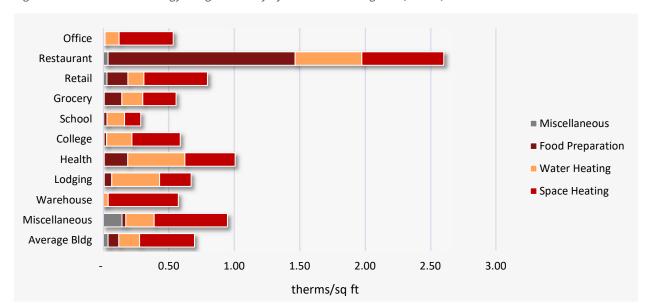


Figure 3-13 Commercial Energy Usage Intensity by End Use and Segment, Idaho, 2021

Table 3-9 shows the average market profile for the commercial sector as a whole, representing a composite of all segments and buildings.

Table 3-9 Average Market Profile for the Commercial Sector, Idaho, 2021

End Use	Technology	Saturatio n	EUI (therms/ Sq Ft)	Intensity (therms/Sq Ft)	Usage (dtherms)
	Furnace	50.1%	0.53	0.26	1,194,251
Space Heating	Boiler	24.5%	0.56	0.14	621,861
	Unit Heater	6.2%	0.29	0.02	81,760
Water Heating	Water Heater	60.5%	0.26	0.16	722,590
	Oven	9.7%	0.09	0.01	40,281
	Conveyor Oven	4.8%	0.16	0.01	34,461
	Double Rack Oven	4.8%	0.24	0.01	52,353
	Fryer	6.8%	0.44	0.03	134,342
Food Preparation	Broiler	11.1%	0.07	0.01	33,837
	Griddle	15.2%	0.05	0.01	33,185
	Range	16.0%	0.05	0.01	32,941
	Steamer	2.6%	0.04	00.0	4,364
	Commercial Food Prep Other	0.3%	0.01	0.00	118
Missallanasys	Pool Heater	0.9%	0.05	0.00	2,146
Miscellaneous	Miscellaneous	100%	0.04	0.04	161,261
Total				0.70	3,149,752

#### **Industrial Sector**

Table 3-10 Industrial Sector Control Totals, 2021

Segment	Intensity (therms/employee)	Natural Gas Usage (dtherms)
Washington Industrial	1,699	266,766
Idaho Industrial	2,327	230,206

# **Washington Characterization**

The total natural gas consumed by industrial customers in Avista's Washington service area in 2021 was 266,766 dtherms. Like in the commercial sector, customer account data was used to allocate usage among segments. Energy intensity was derived from AEG's Energy Market Profiles database. Most industrial measures are installed through custom programs, where the unit of measure is not as necessary to estimate potential.

Figure 3-14 shows the distribution of annual natural gas consumption by end use for all industrial customers. Two major sources were used to develop this consumption profile. The first was AEG's analysis of warehouse usage as part of the commercial sector. We begin with this prototype as a starting point to represent non-process loads. We then added in process loads using our Energy Market Profiles database, which summarizes usage by end use and process type.

Figure 3-14 Industrial Natural Gas Use by End Use, Washington, 2021

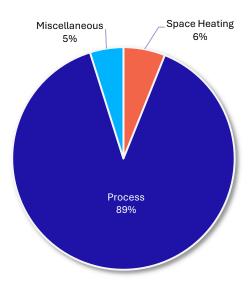


Table 3-11 shows the composite market profile for the Washington industrial sector. Process cooling is very small and represents niche technologies such as gas-driven absorption chillers.

Table 3-11 Average Natural Gas Market Profile for the Industrial Sector, Washington, 2021

End Use	Technology	Saturation	EUI (therms/ Sq Ft)	Intensity (therms/ Sq Ft)	Usage (dtherms)
Space Heating	Furnace	32.3%	103.12	33.3	5,230

Total				1.699.1	266,766
Miscellaneous	Miscellaneous	100%	82.61	82.6	12,971
	Other Process	100%	70.14	70.1	11,012
FIOCESS	Process Cooling	100%	6.65	6.7	1,045
Process	Process Heating	100%	686.11	686.1	107,725
	Process Boiler	100%	750.42	750.4	117,823
	Unit Heater	16.2%	103.12	16.7	2,615
	Boiler	51.5%	103.12	53.2	8,346

#### **Idaho Characterization**

The total natural gas consumed by industrial customers in Avista's Idaho service area in 2021 was 230,206 dtherms. Figure 3-15 shows the distribution of annual natural gas consumption by end use for all industrial customers. Two major sources were used to develop this consumption profile. The first was AEG's analysis of warehouse usage as part of the commercial sector. We begin with this prototype as a starting point to represent non-process loads. We then added in process loads using our Energy Market Profiles database, which summarizes usage by end use and process type.



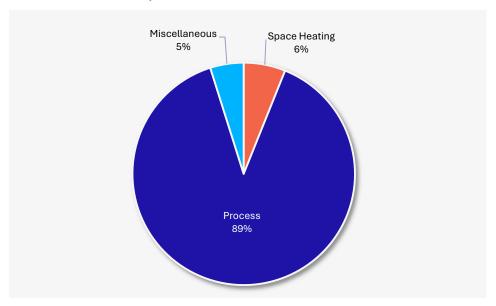


Table 3-12 shows the composite market profile for the industrial sector. Process cooling is very small and represents technologies such as gas-driven absorption chillers.

Table 3-12 Average Natural Gas Market Profile for the Industrial Sector, Idaho, 2021

End Use	Technology	Saturation	EUI (therms/ Sq Ft)	Intensity (therms/ Sq Ft)	Usage (dtherms)
Space Heating	Furnace	32.3%	141.24	45.6	4,513

Total				2.327.0	230,206
Miscellaneous	Miscellaneous	100.0%	113.14	113.1	11,193
	Other Process	100.0%	96.06	96.1	9,503
FIOCESS	Process Cooling	100.0%	9.11	9.1	901
Process	Process Heating	100.0%	939.70	939.7	92,961
	Process Boiler	100.0%	1,027.79	1,027.8	101,675
	Unit Heater	16.2%	141.24	22.8	2,257
	Boiler	51.5%	141.24	72.8	7,203

# 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 natural gas 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:

- 2021 energy consumption based on the market profiles
- Economic growth forecasts (i.e., customer growth, income growth)
- Natural gas price forecasts, trends in fuel shares and equipment saturations, and
- Appliance/equipment standards and building codes and purchase decisions
- Avista's internally developed sector-level projections for natural gas 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 reduction of natural gas 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 1/8760<sup>th</sup> 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 dtherms. Annual energy use for 2021 reflects weather-normalized values, while future years of energy use reflect normal weather, as defined by Avista.

# **Overall Baseline Projection**

#### Washington

Table 4-1 and Figure 4-1 summarize the baseline projection for annual use by sector for Avista's Washington service territory. The forecast shows annual decreases, driven by fuel switching efforts and legislation in the residential and commercial sectors.

Table 4-1 Baseline Projection Summary by Sector, Washington (dtherms)

Sector	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Residential	11,356,811	11,630,212	12,159,351	12,236,470	11,179,884	9,890,243	-12.91%
Commercial	6,665,122	7,218,289	7,667,169	7,663,059	6,384,073	5,059,004	-24.10%
Industrial	266,766	252,241	281,169	287,631	287,771	286,099	7.25%
Total	18,288,700	19,100,743	20,107,689	20,187,160	17,851,728	15,235,347	-16.70%

Figure 4-1 Baseline Projection Summary by Sector, Washington



#### Idaho

Table 4-2 and Figure 4-2 summarize the baseline projection for annual use by sector for Avista's Idaho service territory. The forecast shows modest annual growth, driven by the residential and commercial sectors.

Table 4-2 Baseline Projection Summary by Sector, Idaho (dtherms)

Sector	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Residential	5,617,143	5,981,078	6,072,239	6,315,645	7,069,672	7,295,165	29.87%
Commercial	3,149,752	3,415,640	3,595,593	3,562,749	3,758,630	4,144,068	31.57%
Industrial	230,206	182,526	181,383	188,351	185,889	183,603	-20.24%
Total	8,997,101	9,579,244	9,849,215	10,066,745	11,014,191	11,622,835	29.18%



Figure 4-2 Baseline Projection Summary by Sector, Idaho

#### **Residential Sector**

## **Washington Projection**

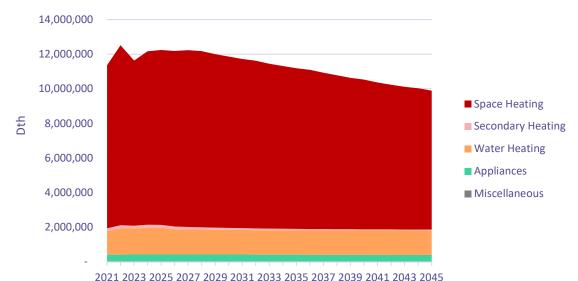
Table 4-3 and Figure 4-3 present the baseline projection for natural gas at the end-use level for the residential sector. Overall, residential use decreases from 11,356,811 dtherms in 2021 to 9,890,243 dtherms in 2045 (-12.91%). Factors affecting growth include codes and standards affecting the installation of new gas equipment, as well as a decrease in equipment consumption due to standards and naturally occurring efficiency.

We model gas-fired fireplaces as secondary heating. These consume energy and may heat a space but are rarely used as the primary heating technology. As such, they are estimated to be more aesthetic and less weather-dependent. This end use grows faster than others since new homes are more likely to install a unit, increasing fireplace stock. Miscellaneous is a very small end use, including technologies with low penetration, such as gas barbeques.

Table 4-3 Residential Baseline Projection by End Use, Washington (dtherms)

End Use	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Space Heating	9,408,661	9,539,528	10,012,135	10,099,097	9,272,544	8,017,334	-14.79%
Miscellaneous	30,658	31,268	31,334	31,348	31,309	31,262	1.97%
Appliances	387,763	393,126	394,321	395,192	383,108	370,660	-4.41%
Secondary Heating	172,769	169,949	172,549	163,178	88,431	49,878	-71.13%
Water Heating	1,356,961	1,496,342	1,549,013	1,547,656	1,404,491	1,421,109	4.73%
Total	11,356,811	11,630,212	12,159,351	12,236,470	11,179,884	9,890,243	-12.91%

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



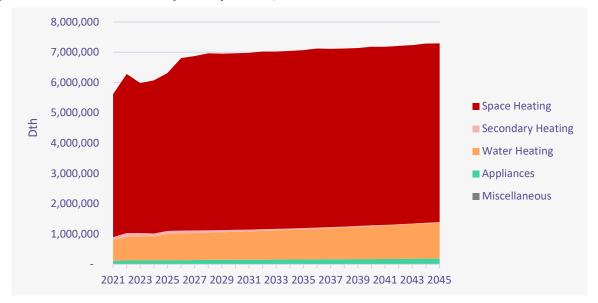
## **Idaho Projection**

Table 4-4 and Figure 4-4 present the baseline projection for natural gas at the end-use level for the residential sector. Overall, residential use increases from 5,617,143 dtherms in 2021 to 7,295,165 dtherms in 2045, an increase of 29.87%. Avista's customers in the Idaho territory are not affected by the same codes as those in Washington, and therefore are not restricted in the installation of new gas equipment.

Table 4-4 Residential Baseline Projection by End Use, Idaho (dtherms)

End Use	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Space Heating	4,715,719	4,948,665	5,055,098	5,213,185	5,871,465	5,901,498	25.15%
Miscellaneous	8,806	9,192	9,363	9,531	11,197	13,144	49.27%
Appliances	113,073	119,819	122,972	126,121	150,686	179,644	58.87%
Secondary Heating	108,339	105,374	97,544	97,482	41,789	17,210	-84.11%
Water Heating	671,206	798,028	787,262	869,327	994,535	1,183,668	76.35%
Total	5,617,143	5,981,078	6,072,239	6,315,645	7,069,672	7,295,165	29.87%

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



#### Commercial Sector

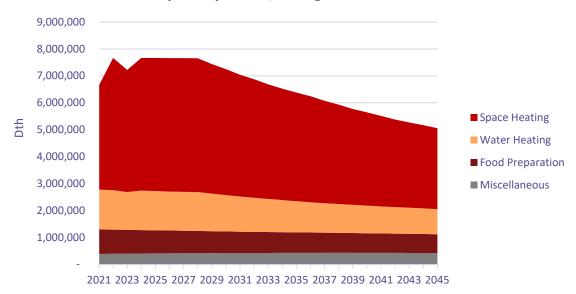
## **Washington Projection**

Annual natural gas use in the commercial sector decreases 24.10% during the overall forecast horizon, starting at 6,665,122 dtherms in 2021, and decreasing to 5,059,004 dtherms in 2045. Table 4-5 and Figure 4-5 present the baseline projection at the end-use level for the commercial sector, as a whole. Similar to the residential sector, consumption is decreasing due to more stringent building codes affecting the installation of new gas equipment.

Table 4-5 Commercial Baseline Projection by End Use, Washington (dtherms)

Sector	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Space Heating	3,886,828	4,531,546	4,927,924	4,941,394	4,034,863	3,004,776	-22.69%
Water Heating	388,706	401,637	405,668	409,277	427,854	424,294	9.16%
Appliances	1,481,152	1,401,713	1,462,912	1,454,023	1,158,843	933,066	-37.00%
Miscellaneous	908,437	883,393	870,665	858,365	762,512	696,868	-23.29%
Total	6,665,122	7,218,289	7,667,169	7,663,059	6,384,073	5,059,004	-24.10%

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



#### **Idaho Projection**

Annual natural gas use in the Idaho commercial sector grows 31.57% during the forecast horizon, starting at 3,149,752 dtherms in 2021, and increasing to 4,144,068 dtherms in 2045. Table 4-6 and Figure 4-6 present the baseline projection at the end-use level for the commercial sector. Similar to the residential sector, market size is increasing and usage per square foot is decreasing slightly.

Table 4-6 Commercial Baseline Projection by End Use, Idaho (dtherms)

End Use	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Space Heating	1,897,872	2,130,579	2,292,981	2,262,225	2,359,571	2,551,388	34.43%
Miscellaneous	163,408	168,369	170,932	173,502	201,461	234,025	43.22%
Water Heating	722,590	739,547	749,078	739,042	751,584	845,247	16.97%
Food Preparation	365,882	377,145	382,602	387,980	446,014	513,408	40.32%
Total	3,149,752	3,415,640	3,595,593	3,562,749	3,758,630	4,144,068	31.57%

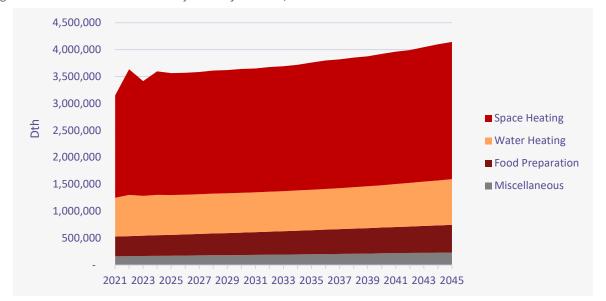


Figure 4-6 Commercial Baseline Projection by End Use, Idaho

## **Industrial Sector**

## **Washington Projection**

Industrial sector usage increases throughout the planning horizon. Table 4-7 and Figure 4-7 present the projection at the end-use level. Overall, industrial annual natural gas use increases from 266,766 dtherms in 2021 to 286,099 dtherms in 2045, an increase of 7.25%.

Table 4-7 Industrial Baseline Projection by End Use, Washington (dtherms)

End Use	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Space Heating	16,191	17,429	20,527	21,389	19,525	17,853	10.26%
Miscellaneous	12,971	13,957	14,216	14,376	14,485	14,485	11.67%
Process	237,604	220,855	246,427	251,865	253,761	253,761	6.80%
Total	266,766	252,241	281,169	287,631	287,771	286,099	7.25%

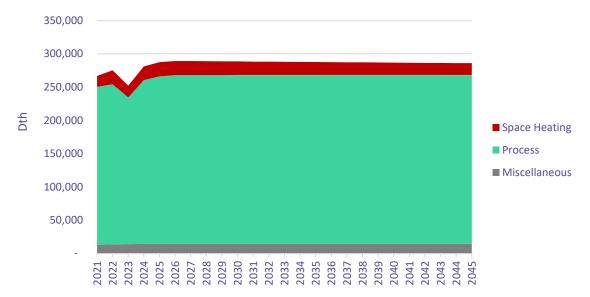


Figure 4-7 Industrial Baseline Projection by End Use, Washington

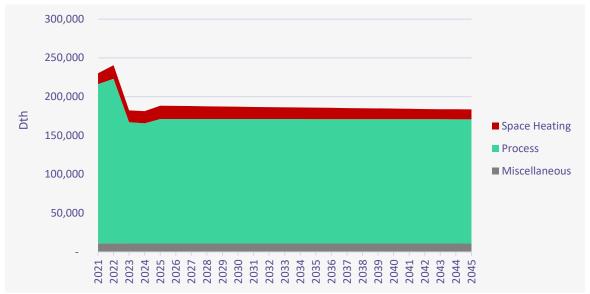
# **Idaho Projection**

Industrial annual natural gas use decreases from 230,206 dtherms in 2021 to 183,603 dtherms in 2045, a decrease of 20.24%. Table 4-8 and Figure 4-8 present the projection at the end-use level.

Table 4-8 Industrial Baseline Projection by End Use, Idaho (dtherms)

End Use	2021	2023	2024	2025	2035	2045	% Change ('21-'45)
Space Heating	13,972	15,279	15,631	16,971	14,716	12,666	-9.35%
Miscellaneous	11,193	10,845	10,849	10,847	10,834	10,819	-3.34%
Process	205,041	156,403	154,903	160,533	160,339	160,117	-21.91%
Total	230,206	182,526	181,383	188,351	185,889	183,603	-20.24%

Figure 4-8 Industrial Baseline Projection by End Use, Idaho



# 5 | Conservation Potential

This chapter presents the conservation potential across all sectors for Avista's Washington and Idaho territories. Conservation potential includes every measure considered in the measure list, regardless of delivery mechanism (program implementation, etc.). Year-by-year annual energy savings are available in the LoadMAP model and measure assumption summary, provided to Avista at the conclusion of the study. Please note that all savings are at the customer site.

# **Washington Overall Energy Efficiency Potential**

Table 5-1 and Figure 5-1 summarize the conservation savings in terms of annual energy use for all measures for four levels of potential relative to the baseline projection. Figure 5-2 displays the cumulative energy conservation forecasts, which reflect the effects of persistent savings in prior years and new savings.

- Technical Potential reflects the adoption of all conservation measures regardless of costeffectiveness. Efficient equipment makes up all lost opportunity installations and all retrofit measures are installed, regardless of achievability. First-year savings are 420,042 dtherms, or 2.1% of the baseline projection. Cumulative savings in 2045 are 5,974,486 dtherms, or 39.2% of the baseline.
- Achievable Technical Potential refines Technical Potential by applying market adoption rates to
  each measure. The market adoption rates estimate the percentage of customers who would be
  likely to select each measure given market barriers, customer awareness and attitudes, program
  maturity, and other factors that affect market penetration of conservation measures. First-year
  savings are 245,009 dtherms, or 1.2% of the baseline projection. Cumulative savings in 2045 are
  5,183,435 dtherms, or 34.0% of the baseline.
- TRC Achievable Economic Potential refines Achievable Technical Potential by applying the TRC economic cost-effectiveness screen, which compares lifetime energy benefits to the total customer and utility costs of delivering the measure through a utility program, including monetized non-energy impacts. For the TRC, AEG also applied (1) benefits for non-gas energy savings, such as electric HVAC savings for weatherization, (2) the NWPCC's calibration credit to space heating savings to reflect that additional fuels may be used as a supplemental heat source within an average home, and (3) a 10% conservation credit to avoided costs per the NWPCC methodologies. First-year savings are 71,740 dtherms, or 0.4% of the baseline projection. Cumulative savings in 2045 are 1,601,274 dtherms, or 10.5% of the baseline.

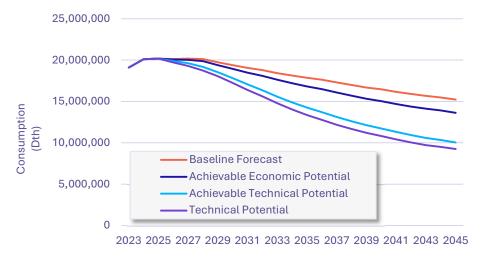
Table 5-1 Summary of Energy Efficiency Potential, Washington

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	20,130,837	20,175,109	19,396,729	17,851,728	15,235,347
Cumulative Savings (dtherms)					
TRC Achievable Economic Potential	71,740	155,226	448,283	1,028,874	1,601,274
Achievable Technical Potential	245,009	560,714	1,575,447	3,599,528	5,183,435
Technical Potential	420,042	884,857	2,154,937	4,498,938	5,974,486
Energy Savings (% of Baseline)					
TRC Achievable Economic Potential	0.4%	0.8%	2.3%	5.8%	10.5%
Achievable Technical Potential	1.2%	2.8%	8.1%	20.2%	34.0%
Technical Potential	2.1%	4.4%	11.1%	25.2%	39.2%

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



Figure 5-2 Baseline Projection and Energy Efficiency Forecasts, Washington



# **Idaho Overall Energy Efficiency Potential**

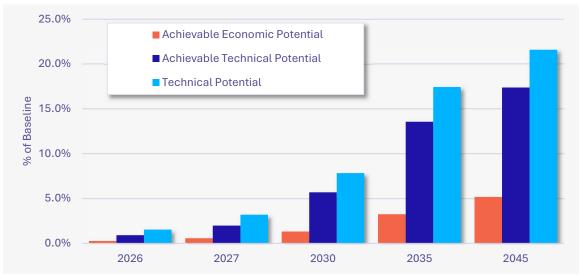
Table 5-2 and Figure 5-3 summarize the conservation savings in terms of annual energy use for all measures for four levels of potential relative to the baseline projection. Figure 5-4 displays the cumulative energy conservation forecasts, which reflect the effects of persistent savings in prior years in addition to new savings.

- *Technical Potential* first-year savings in 2023 are 161,379 dtherms, or 1.5% of the baseline projection. Cumulative savings in 2045 are 2,509,059 dtherms, or 21.6% of the baseline.
- Achievable Technical Potential first-year savings are 95,484 dtherms, or 0.9% of the baseline projection. Cumulative savings in 2045 are 2,019,632 dtherms, or 17.4% of the baseline
- *UCT Achievable Economic Potential* first-year savings are 26,527 dtherms, or 0.2% of the baseline projection. Cumulative savings in 2045 are 600,730 dtherms, or 5.2% of the baseline

Table 5-2 Summary of Energy Efficiency Potential, Idaho

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	10,563,771	10,646,120	10,792,588	11,014,191	11,622,835
Cumulative Savings (dtherms)					
UCT Achievable Economic Potential	26,257	60,181	141,546	355,518	600,730
Achievable Technical Potential	95,484	210,216	613,432	1,493,222	2,019,632
Technical Potential	161,379	338,723	843,810	1,918,908	2,509,059
Energy Savings (% of Baseline)					
UCT Achievable Economic Potential	0.2%	0.6%	1.3%	3.2%	5.2%
Achievable Technical Potential	0.9%	2.0%	5.7%	13.6%	17.4%
Technical Potential	1.5%	3.2%	7.8%	17.4%	21.6%

Figure 5-3 Cumulative Energy Efficiency Potential as % of Baseline Projection, Idaho



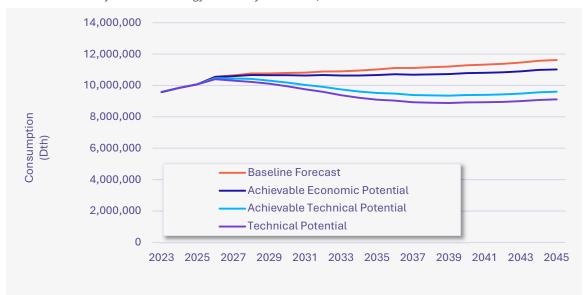


Figure 5-4 Baseline Projection and Energy Efficiency Forecasts, Idaho

# 6 | Sector-Level Energy Efficiency Potential

This chapter provides energy efficiency potential at the sector level.

## **Residential Sector**

## **Washington Potential**

Table 6-1 and Figure 6-1 summarize the energy efficiency potential for the residential sector. In 2026, TRC achievable economic potential is 19,132 dtherms, or 0.2% of the baseline projection. By 2045, cumulative savings are 694,094 dtherms, or 7.0% of the baseline.

Table 6-1 Residential Energy Conservation Potential Summary, Washington

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	12,180,331	12,226,885	11,857,137	11,179,884	9,890,243
Cumulative Savings (dtherms)					
TRC Achievable Economic Potential	19,132	45,189	150,548	424,381	694,094
Achievable Technical Potential	178,769	421,508	1,189,255	2,766,099	3,869,722
Technical Potential	302,288	641,042	1,510,653	3,243,233	4,260,407
Energy Savings (% of Baseline)					
TRC Achievable Economic Potential	0.2%	0.4%	1.3%	3.8%	7.0%
Achievable Technical Potential	1.5%	3.4%	10.0%	24.7%	39.1%
Technical Potential	2.5%	5.2%	12.7%	29.0%	43.1%

Figure 6-1 Cumulative Residential Potential as % of Baseline Projection, Washington

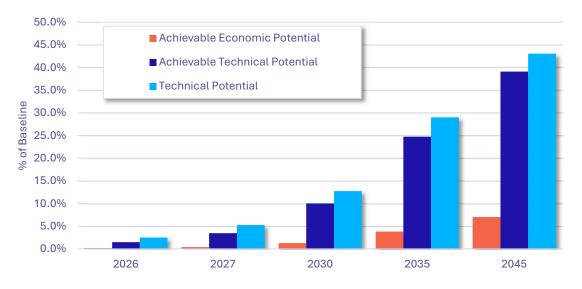


Figure 6-2 presents the forecast of cumulative energy savings by end use. Space heating makes up a majority of potential followed by water heating.

Figure 6-2 Residential TRC Achievable Economic Potential – Cumulative Savings by End Use, Washington

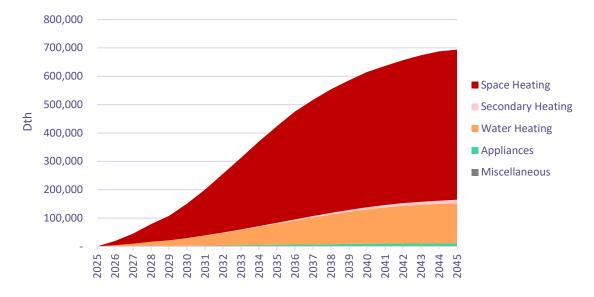


Table 6-2 identifies the top 20 residential measures by cumulative 2026 and 2045 savings. Furnaces, ceiling insulation, clothes washers, and air sealing are the top measures.

Table 6-2 Residential Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Washington

Rank	Measure / Technology	2026 Cumulative dtherms	% of Total	2045 Cumulative dtherms	% of Total
1	Furnace	6,063	31.7%	252,172	36.3%
2	Insulation - Ceiling Installation	4,872	25.5%	85,451	12.3%
3	Clothes Washer - CEE Tier 2	3,131	16.4%	25,511	3.7%
4	Building Shell - Air Sealing (Infiltration Control)	1,063	5.6%	20,339	2.9%
5	Insulation - Ducting	576	3.0%	10,091	1.5%
6	Insulation - Ceiling Upgrade	546	2.9%	9,495	1.4%
7	Stove/Oven	464	2.4%	9,784	1.4%
8	Ducting - Repair and Sealing - Aerosol	419	2.2%	57,284	8.3%
9	Home Energy Management System (HEMS)	410	2.1%	57,291	8.3%
10	Water Heater (<= 55 Gal)	368	1.9%	49,898	7.2%
11	Insulation - Wall Cavity Installation	351	1.8%	4,920	0.7%
12	Insulation - Wall Sheathing	215	1.1%	3,030	0.4%
13	Home Energy Reports	186	1.0%	25,435	3.7%
14	Boiler	119	0.6%	9,082	1.3%
15	Water Heater - Drainwater Heat Recovery	117	0.6%	41,161	5.9%

	Total Savings in Year	19,132	100.0%	694,094	100.0%
	Subtotal	19,118	99.9%	681,694	98.2%
20	Gas Boiler - Pipe Insulation	14	0.1%	83	0.0%
19	Water Heater - Pipe Insulation	21	0.1%	3,388	0.5%
18	Ducting - Repair and Sealing	47	0.2%	6,730	1.0%
17	Windows - Low-e Storm Addition	56	0.3%	792	0.1%
16	Gas Boiler - Thermostatic Radiator Valves	81	0.4%	9,758	1.4%

## **Idaho Potential**

#### Table 6-3 and

Figure 6-3 summarize the energy efficiency potential for the residential sector. In 2026, UCT achievable economic potential is 13,858 dtherms, or 0.2% of the baseline projection. By 2045, cumulative savings are 244,613 dtherms, or 3.4% of the baseline.

Table 6-3 Residential Energy Conservation Potential Summary, Idaho

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	6,806,909	6,872,961	6,966,076	7,069,672	7,295,165
Cumulative Savings (dtherms)					
Achievable Economic UCT Potential	13,858	33,833	63,666	164,876	244,613
Achievable Technical Potential	64,854	146,531	433,389	1,085,990	1,352,671
Technical Potential	101,847	218,656	533,177	1,296,120	1,598,531
Energy Savings (% of Baseline)					
Achievable Economic UCT Potential	0.2%	0.5%	0.9%	2.3%	3.4%
Achievable Technical Potential	1.0%	2.1%	6.2%	15.4%	18.5%
Technical Potential	1.5%	3.2%	7.7%	18.3%	21.9%

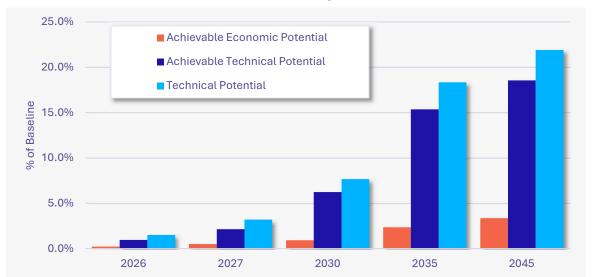


Figure 6-3 Cumulative Residential Potential as % of Baseline Projection, Idaho

Figure 6-4 presents the forecast of cumulative energy savings by end use. Space heating makes up a majority of potential followed by water heating.

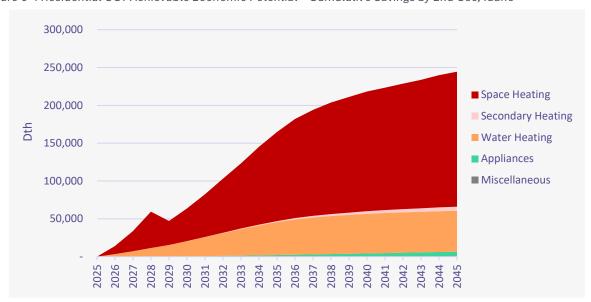


Figure 6-4 Residential UCT Achievable Economic Potential – Cumulative Savings by End Use, Idaho

Table 6-4 identifies the top 20 residential measures by cumulative 2026 and 2045 savings. Furnaces, ceiling insulation, clothes washers, and aerators are the top measures.

Table 6-4 Residential Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Idaho

Rank	Measure / Technology	2026 Cumulative dtherms	% of Total	2045 Cumulative dtherms	% of Total
1	Furnace	5,855	42.2%	44,423	18.2%
2	Insulation - Ceiling Installation	3,663	26.4%	69,252	28.3%
3	Clothes Washer - CEE Tier 2	1,862	13.4%	16,871	6.9%
4	Water Heater - Faucet Aerators	716	5.2%	15,641	6.4%
5	Water Heater - Low-Flow Showerheads	670	4.8%	14,319	5.9%
6	Building Shell - Air Sealing (Infiltration Control)	455	3.3%	9,099	3.7%
7	Insulation - Ceiling Upgrade	279	2.0%	5,437	2.2%
8	ENERGY STAR Home Design	153	1.1%	29,219	11.9%
9	Home Energy Reports	104	0.7%	17,067	7.0%
10	Stove/Oven	62	0.5%	5,586	2.3%
11	Ducting - Repair and Sealing - Aerosol	17	0.1%	2,936	1.2%
12	Water Heater - Pipe Insulation	12	0.1%	2,010	0.8%
13	Fireplace	8	0.1%	5,345	2.2%
14	Circulation Pump - Controls	1	0.0%	404	0.2%
	Subtotal	13,858	100.0%	237,610	97.1%
	Total Savings in Year	13,858	100.0%	244,613	100.0%

# **Commercial Sector**

# **Washington Potential**

Table 6-5 and

Figure 6-5 summarize the energy conservation potential for the commercial sector. In 2026, TRC achievable economic potential is 50,960 dtherms, or 0.7% of the baseline projection. By 2045, cumulative savings are 874,645 dtherms, or 17.3% of the baseline.

Table 6-5 Commercial Energy Conservation Potential Summary, Washington

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	7,661,189	7,659,040	7,250,905	6,384,073	5,059,004
Cumulative Savings (dtherms)					
Achievable Economic TRC Potential	50,960	106,715	289,032	585,542	874,645
Achievable Technical	64,581	135,857	377,308	814,031	1,280,611
Technical Potential	115,750	239,787	633,697	1,232,844	1,675,560
Energy Savings (% of Baseline)					
Achievable Economic TRC Potential	0.7%	1.4%	4.0%	9.2%	17.3%
Achievable Technical	0.8%	1.8%	5.2%	12.8%	25.3%
Technical Potential	1.5%	3.1%	8.7%	19.3%	33.1%

Figure 6-5 Cumulative Commercial Potential as % of Baseline Projection, Washington



Figure 6-6 presents the cumulative forecast of energy savings by end use. Space heating makes up a majority of the potential early, but water heating and food preparation equipment upgrades provide increased savings opportunities in the later years.

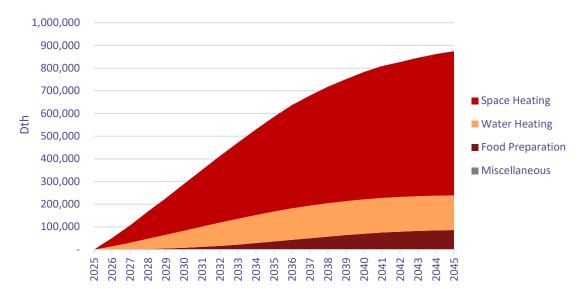


Figure 6-6 Commercial TRC Achievable Economic Potential – Cumulative Savings by End Use, Washington

Table 6-6 identifies the top 20 commercial measures by cumulative savings in 2026 and 2045. Demand Controlled Ventilation and Destratification Fans are the top measures, providing space heating savings, followed by Strategic Energy Management and Retrocommissioning and several HVAC and space heating measures, along with water heater controls.

Table 6-6 Commercial Top Measures in 2023 and 2035, TRC Achievable Economic Potential, Washington

Rank	Measure / Technology	2026 Cumulative dtherms	% of Total	2045 Cumulative dtherms	% of Total
1	Ventilation - Demand Controlled	11,512	22.6%	69,390	7.9%
2	Destratification Fans (HVLS)	6,454	12.7%	76,738	8.8%
3	HVAC - Energy Recovery Ventilator	4,873	9.6%	64,414	7.4%
4	Water Heater - Pipe Insulation	4,861	9.5%	33,466	3.8%
5	Strategic Energy Management	3,286	6.4%	44,680	5.1%
6	Retrocommissioning	3,048	6.0%	44,020	5.0%
7	Commercial Laundry - Ozone Treatment	2,105	4.1%	14,530	1.7%
8	Gas Boiler - Stack Economizer	1,900	3.7%	13,246	1.5%
9	Circulation Pump - Controls	1,469	2.9%	9,691	1.1%
10	Gas Boiler - Thermostatic Radiator Valves	1,149	2.3%	20,529	2.3%
11	Water Heater	1,134	2.2%	44,216	5.1%
12	Gas Boiler - Insulate Steam Lines/Condensate Tank	979	1.9%	12,967	1.5%
13	Gas Boiler - Hot Water Reset	919	1.8%	16,170	1.8%
14	Water Heater - Pre-Rinse Spray Valve	726	1.4%	4,727	0.5%
15	Water Heater - ENERGY STAR Dishwasher (3.0)	606	1.2%	4,162	0.5%
16	Boiler	586	1.1%	21,375	2.4%
17	Gas Boiler - Maintenance	580	1.1%	1,638	0.2%
18	Infiltration Control - Loading Dock Sealing	521	1.0%	5,891	0.7%
19	Gas Boiler - High Turndown Burner	482	0.9%	3,118	0.4%
20	Refrigeration - Heat Recovery	469	0.9%	8,437	1.0%
	Subtotal	47,659	93.5%	513,406	58.7%
	Total Savings in Year	50,960	100.0%	874,645	100.0%

## **Idaho Potential**

## Table 6-7 and

Figure 6-7 summarize the energy conservation potential for the commercial sector. In 2026, UCT achievable economic potential is 11,641 dtherms, or 0.5% of the baseline projection. By 2045, cumulative savings are 575,363 dtherms, or 13.9% of the baseline.

Table 6-7 Commercial Energy Conservation Potential Summary, Idaho

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	3,568,688	3,585,222	3,639,395	3,758,630	4,144,068
Cumulative Savings (dtherms)					
Achievable Economic UCT Potential	11,998	25,531	75,251	183,328	342,501
Achievable Technical	29,850	62,110	175,849	398,037	651,225
Technical Potential	58,576	118,140	305,571	611,862	892,159
Energy Savings (% of Baseline)					
Achievable Economic UCT Potential	0.3%	0.7%	2.1%	4.9%	8.3%
Achievable Technical	0.8%	1.7%	4.8%	10.6%	15.7%
Technical Potential	1.6%	3.3%	8.4%	16.3%	21.5%

Figure 6-7 Cumulative Commercial Potential as % of Baseline Projection, Idaho

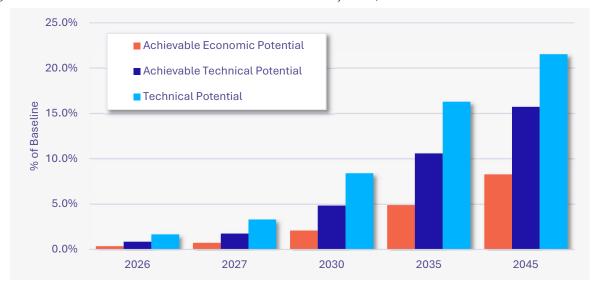


Figure 6-8 presents forecasts of energy savings by end use as a percent of total annual savings and cumulative savings. Space heating makes up a majority of the potential early, but food preparation equipment upgrades provide substantial savings opportunities in the later years.

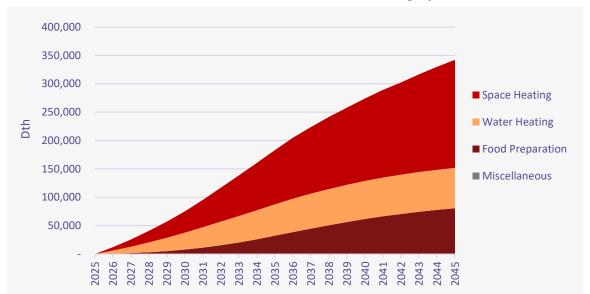


Figure 6-8 Commercial UCT Achievable Economic Potential – Cumulative Savings by End Use, Idaho

Table 6-8 identifies the top 20 commercial measures by cumulative savings in 2026 and 2045. Pipe Insulation is the top measure, followed by HVAC energy recovery ventilator, retrocommissioning, and boiler economizers.

Table 6-8 Commercial Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Idaho

Rank	Measure / Technology	2026 Cumulative dtherms	% of Total	2045 Cumulative dtherms	% of Total
1	Water Heater - Pipe Insulation	2,212	18.4%	16,126	4.7%
2	HVAC - Energy Recovery Ventilator	1,805	15.0%	30,097	8.8%
3	Retrocommissioning	1,300	10.8%	18,855	5.5%
4	Gas Boiler - Stack Economizer	784	6.5%	6,492	1.9%
5	Circulation Pump - Controls	626	5.2%	3,956	1.2%
6	Commercial Laundry - Ozone Treatment	543	4.5%	4,701	1.4%
7	Gas Boiler - Thermostatic Radiator Valves	498	4.1%	10,130	3.0%
8	Water Heater	494	4.1%	26,886	7.8%
9	Boiler	386	3.2%	14,536	4.2%
10	Gas Boiler - Insulate Steam Lines/Condensate Tank	385	3.2%	5,196	1.5%
11	Gas Boiler - Hot Water Reset	371	3.1%	6,684	2.0%
12	Fryer	356	3.0%	37,786	11.0%
13	Water Heater - Pre-Rinse Spray Valve	307	2.6%	2,333	0.7%
14	Strategic Energy Management	276	2.3%	5,001	1.5%
15	Water Heater - ENERGY STAR Dishwasher (3.0)	246	2.0%	1,946	0.6%
16	Refrigeration - Heat Recovery	201	1.7%	4,259	1.2%
17	Water Heater - Solar System	192	1.6%	1,622	0.5%
18	Unit Heater	146	1.2%	18,435	5.4%
19	Water Heater - Low-Flow Showerheads	128	1.1%	1,039	0.3%
20	Water Heater - Faucet Aerators/Low Flow Nozzles	117	1.0%	797	0.2%
	Subtotal	11,374	94.8%	216,877	63.3%
	Total Savings in Year	11,998	100.0%	342,501	100.0%

## **Industrial Sector**

#### **Washington Potential**

Table 6-9 and Figure 6-9 summarize the energy conservation potential for the industrial sector. In 2026, TRC achievable economic potential is 1,649 dtherms, or 0.6% of the baseline projection. By 2045, cumulative savings reach 32,536 dtherms, or 11.4% of the baseline. Industrial potential is a lower percentage of overall baseline compared to the residential and commercial sectors. While large, custom process optimization and controls measures are present in potential, these are not applicable to all processes, which limits potential at the technical level. Additionally, the remaining customers are smaller and tend to have lower process end-use shares, further lowering industrial potential.

Table 6-9 Industrial Energy Conservation Potential Summary, Washington

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	289,317	289,184	288,687	287,771	286,099
Cumulative Savings (dtherms)					
Achievable Economic TRC Potential	1,649	3,322	8,703	18,951	32,536
Achievable Technical	1,659	3,349	8,884	19,399	33,102
Technical Potential	2,004	4,027	10,587	22,861	38,519
Energy Savings (% of Baseline)					
Achievable Economic TRC Potential	0.6%	1.1%	3.0%	6.6%	11.4%
Achievable Technical	0.6%	1.2%	3.1%	6.7%	11.6%
Technical Potential	0.7%	1.4%	3.7%	7.9%	13.5%

Figure 6-9 Cumulative Industrial Potential as % of Baseline Projection, Washington



Figure 6-10 presents the forecast of cumulative energy savings by end use.

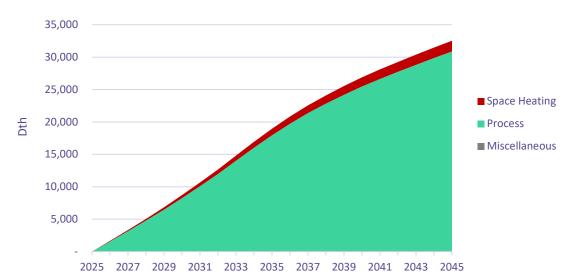


Figure 6-10 Industrial TRC Achievable Economic Potential – Cumulative Savings by End Use, Washington

Table 6-10 identifies the top 20 industrial measures by cumulative 2026 and 2045 savings. Process Heat Recovery and Process Boiler control measures have the largest potential savings.

Table 6-10 Industrial Top Measures in 2026 and 2045, TRC Achievable Economic Potential, Washington

Rank	Measure / Technology	2026 Cumulative dtherms	% of Total	2045 Cumulative dtherms	% of Total
1	Process - Heat Recovery	806	48.9%	15,072	46.3%
2	Process Boiler - Steam Trap Replacement	208	12.6%	3,931	12.1%
3	Retrocommissioning	100	6.1%	1,942	6.0%
4	Strategic Energy Management	95	5.8%	2,145	6.6%
5	Process Boiler - Maintenance	81	4.9%	246	0.8%
6	Process Boiler - Insulate Steam Lines/Condensate Tank	68	4.1%	1,289	4.0%
7	Process Boiler - High Turndown Burner	65	4.0%	585	1.8%
8	Process Boiler - Stack Economizer	57	3.5%	496	1.5%
9	Process - Insulate Heated Process Fluids	54	3.3%	1,078	3.3%
10	Destratification Fans (HVLS)	48	2.9%	749	2.3%
11	Process Boiler - Insulate Hot Water Lines	29	1.7%	541	1.7%
12	Process Boiler - Burner Control Optimization	17	1.0%	2,896	8.9%
13	Ventilation - Demand Controlled	15	0.9%	103	0.3%
14	Unit Heater	5	0.3%	539	1.7%
	Subtotal	1,649	100.0%	31,612	97.2%
	Total Savings in Year	1,649	100.0%	32,536	100.0%

#### **Idaho Potential**

Table 6-11 and Figure 6-11 summarize the energy conservation potential for the industrial sector. In 2026, UCT achievable economic potential is 401 dtherms, or 0.2% of the baseline projection. By 2045, cumulative savings reach 13,615 dtherms, or 7.4% of the baseline. Industrial potential is a lower percentage of overall baseline compared to the residential and commercial sectors. While large, custom process optimization and controls measures are present in potential, these are not applicable to all processes which limits potential at the technical level. Additionally, since the largest customers were excluded from this analysis due to their status as transport-only customers making them ineligible to participate in energy efficiency programs for the utility, the remaining customers are smaller and tend to have lower process end-use shares, further lowering industrial potential.

Table 6-11 Industrial Energy Conservation Potential Summary, Idaho

Scenario	2026	2027	2030	2035	2045	
Baseline Forecast (dtherms)	188,175	187,937	187,118	185,889	183,603	
Cumulative Savings (dtherms)						
Achievable Economic UCT Potential	401	818	2,628	7,313	13,615	
Achievable Technical	779	1,575	4,194	9,195	15,736	
Technical Potential	957	1,926	5,062	10,926	18,369	
Energy Savings (% of Baseline)						
Achievable Economic UCT Potential	0.2%	0.4%	1.4%	3.9%	7.4%	
Achievable Technical	0.4%	0.8%	2.2%	4.9%	8.6%	
Technical Potential	0.5%	1.0%	2.7%	5.9%	10.0%	

Figure 6-11 Cumulative Industrial Potential as % of Baseline Projection, Idaho



Figure 6-12 presents forecasts of energy savings by end use as a percent of total annual savings and cumulative savings.

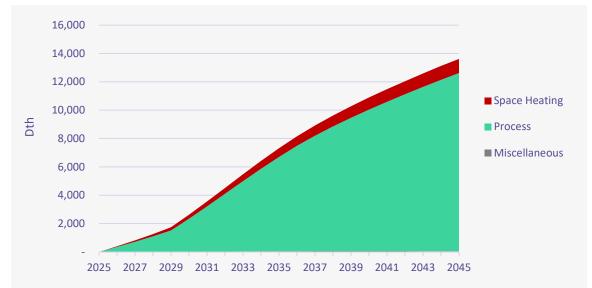


Figure 6-12 Industrial UCT Achievable Economic Potential – Cumulative Savings by End Use, Idaho

Table 6-12 identifies the top 20 industrial measures by cumulative 2026 and 2045 savings.

Table 6-12 Industrial Top Measures in 2026 and 2045, UCT Achievable Economic Potential, Idaho

Rank	Measure / Technology	2026 Cumulative dtherms	% of Total	2045 Cumulative dtherms	% of Total
1	Process Boiler - Steam Trap Replacement	96	24.0%	1,816	13.3%
2	Retrocommissioning	47	11.8%	915	6.7%
3	Strategic Energy Management	45	11.3%	1,012	7.4%
4	Process Boiler - Maintenance	38	9.4%	116	0.8%
5	Process Boiler - Insulate Steam Lines/Condensate Tank	31	7.8%	601	4.4%
6	Process Boiler - High Turndown Burner	30	7.5%	272	2.0%
7	Destratification Fans (HVLS)	28	7.1%	400	2.9%
8	Process Boiler - Stack Economizer	26	6.6%	232	1.7%
9	Process - Insulate Heated Process Fluids	25	6.3%	497	3.7%
10	Process Boiler - Insulate Hot Water Lines	13	3.3%	254	1.9%
11	Ventilation - Demand Controlled	8	2.1%	41	0.3%
12	Process Boiler - Burner Control Optimization	8	1.9%	1,347	9.9%
13	Unit Heater	4	1.0%	417	3.1%
	Subtotal	401	100.0%	7,918	58.2%
	Total Savings in Year	401	100.0%	13,615	100.0%

# 7 | Demand Response Potential

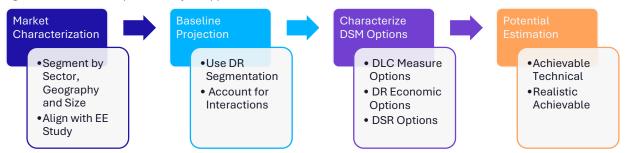
This study is the second time AEG has estimated demand response (DR) potential for natural gas in the Avista territory. Natural gas DR is an emerging market with only a few programs offered in the US. To estimate potential, AEG referenced the most current natural gas DR program data and addressed gaps utilizing information from the electric DR study.

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 7-1 outlines the analysis approach used to develop potential and cost estimates, with each step described in more detail in the subsections that follow.

Figure 7-1 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.
- Realistic 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-

Applied Energy Group, Inc., proudly part of ICF

<sup>&</sup>lt;sup>2</sup> For this study, the participation in the considered programs is not expected to overlap. Therefore, only the Realistic Achievable Potential is shown.

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 7-1 summarizes the market segmentation developed for this study.

Table 7-1 Market Segmentation

Market Dimensions	Segmentation Variable	Description
		Washington
1	State	ldaho
		Oregon
		Residential
2	Customer Class	Commercial
		Industrial

# **Baseline Forecast**

Once the customer segments were defined and characterized, AEG developed the baseline projection. Load and consumption characteristics, including customer counts and peak-hour demand values, were provided by Avista and aligned with the natural gas 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 7-2 Baseline Customer Forecast by Customer Class, Washington

State	2026	2027	2028	2035	2045
Residential	161,986	161,986	161,986	161,986	161,986
Commercial	15,232	15,220	15,208	15,125	15,006
Industrial	90	89	88	82	73

Table 7-3 Baseline Customer Forecast by Customer Class, Idaho

State	2026	2027	2028	2035	2045
Residential	88,643	90,152	91,615	102,964	121,658
Commercial	10,111	10,217	10,318	11,082	12,273
Industrial	67	67	67	67	67

Table 7-4 Baseline Customer Forecast by Customer Class, Oregon

State	2026	2027	2028	2035	2045
Residential	96,198	96,715	97,162	100,930	106,568
Commercial	12,170	12,209	12,242	12,521	12,930
Industrial	25	25	25	25	25

## Winter Peak Load Forecasts by State

Winter peak load forecasts were developed by state and customer class by multiplying the per customer peak-hour demand values by class by the forecasted customer counts. Table 7-5 shows the winter system peak for selected future years. The system peak is expected to increase by 7% between 2026 and 2045.

Table 7-5 Baseline February Winter System Peak Forecast (Dth @Generation) by State

State	2026	2027	2028	2035	2045
Washington	9,217	9,207	9,193	9,094	8,956
Idaho	5,060	5,115	5,185	5,611	6,288
Oregon	4,090	4,107	4,121	4,240	4,416
Grand Total	18,367	18,428	18,500	18,946	19,660

Figure 7-2 shows the contribution to the estimated system coincident winter peak by state. In 2026, system peak load for the winter is 18,367 dtherms at generation. Washington contributes 50% to the winter system peak, while Idaho and Oregon contribute 28% and 22%, respectively. Winter coincident peak load is expected to grow by an average of 0.4% annually from 2026-2045.

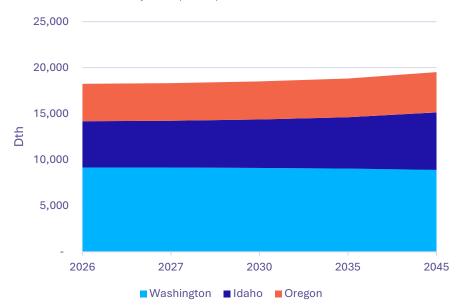


Figure 7-2 Coincident Peak Load Forecast by State (Winter)

# **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.

Each selected option is described briefly below.

#### **Program Descriptions**

#### **DLC Smart Thermostats – Heating**

These programs use the two-way communicating ability of smart thermostats to cycle heating end uses on and off during events. The program targets Avista's Residential and Commercial customers with qualifying equipment in Washington, Idaho, and Oregon. This program is assumed to be a Bring Your Own Thermostat (BYOT) program; therefore, no equipment or installation costs were estimated and is only considered for the residential sector in the state of Washington for this study due to AMI constraints.

#### **Third Party Contracts**

Third Party Contracts are assumed to be available for large commercial and industrial customers and is considered for all three states in the Avista territory for this study. This program is based on a firm curtailment strategy targeting large process and heating loads. It is also assumed that participating customers will agree to reduce demand by a specific amount or curtail 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 \$/therm-month or \$/therm-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 gas 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 high natural gas demand 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.

#### **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. This program is assumed to be offered to residential customers only and is considered for all three states for this study.

#### **Program Assumptions and Characteristics**

The key parameters required to estimate the potential for a DR program are participation rate, perparticipant 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 7-6 below shows the steady-state participation rate assumptions for each demand side management (DSM) option as well as the basis for the assumptions.

Table 7-6 DSM Steady-State Participation Rates (Percent of Eligible Customers)

DSM Option	Residential Service	Commercial Service	Industrial Service	Basis for Assumption
Behavioral	12%		-	PG&E rollout with six waves (2017) - 60% of Electric Behavioral Program Participation
DLC Smart Thermostats - BYOT	9%		-	NWPC Smart Thermostat cooling assumption - 60% of Electric Smart Thermostat Program Participation
Third Party Contracts	-	5%	13%	Industry Experience - 60% of Electric Third Party Contracts Program Participation. Commercial adjusted to reflect challenge of reducing heating loads

#### **Load Reduction Assumptions**

Table 7-7 presents the per participant load reductions for each DSM option and explains the basis for these assumptions.

Table 7-7 DSM Per Participant Impact Assumptions

DSM Option	Residential Service	Commercial Service	Industrial Service	Basis for Assumption
Behavioral	2%		-	PG&E Natural Gas Behavioral DR Pilot rollout with six waves
DLC Smart Thermostats - BYOT	0.8 Therms		-	Con Edison BYOT Smart Thermostat Pilot Program results – average savings per participant
Third Party Contracts	-	8%	8%	De-rated BYOT Residential impact for Third Party accounting for less discretionary load

#### 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.

#### **DR Potential Results**

This section presents analysis results for demand savings and levelized costs for all considered DR programs. As mentioned above, the integrated and stand-alone results are synonymous. Therefore, only one set of results are shown in this section assuming all programs can be run simultaneously.

#### **Summary TOU Opt-in Scenario**

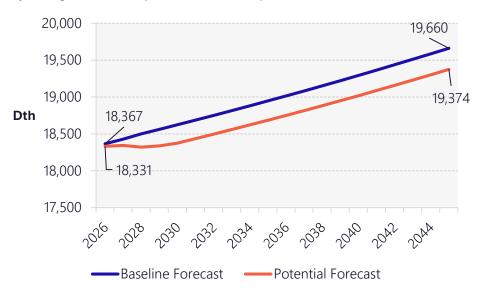
Table 7-8 and Figure 7-3 show the total winter demand savings for selected years. These savings represent integrated savings from all available DR options in Avista's Washington, Idaho, and Oregon service territories.

• The total potential savings are expected to increase from 36 Dth in 2026 to 287 Dth by 2045. The percentage of system peak increases from 0.2% in 2026 to 1.5% by 2045.

Table 7-8 Summary of Integrated Potential (Dtherms @ Generator)

	2026	2027	2028	2035	2045
Baseline Forecast	18,367	18,428	18,500	18,946	19,660
Achievable Potential	36	86	179	262	287
Achievable Potential (% of baseline)	0.2%	0.5%	1.0%	1.4%	1.5%
Potential Forecast	18,331	18,342	18,321	18,684	19,374

Figure 7-3 Summary of Integrated Potential (Dtherms @ Generator)



#### Results

Key findings include:

- The largest potential option is DLC Smart Thermostats BYOT, contributing 236 dtherms by 2045.
- Behavioral and Third Party Contracts program options offer a potential reduction in peak natural gas demand of 30 and 21 dtherms, respectively by 2045.

#### Potential by DSM Option

Figure 7-4 and Table 7-9 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, Idaho, and Oregon service territories. Currently Washington is the only state in the Avista territory with AMI for natural gas customers. Due to the increased effectiveness of a Smart Thermostat program with use of AMI, the DLC Smart Thermostats – BYOT Program is only considered for the state of Washington. Even so, the DLC Smart Thermostats – BYOT Program is projected to save the most of all programs at 236 dtherms by 2045 while the Behavioral DR and Third Party Contracts Programs are projected to reduce peak demand by 30 and 21 dtherms by 2045, respectively.

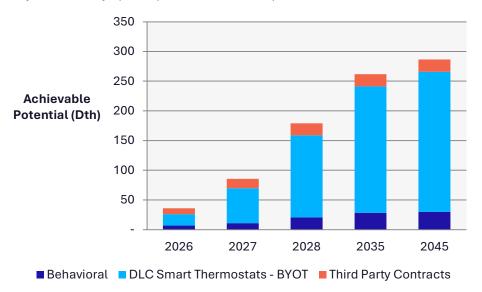


Figure 7-4 Summary of Potential by Option – (Dtherms @ Generator)

Table 7-9 Summary of Potential by Option – (Dtherms @ Generator)

Summer Potential	2026	2027	2028	2035	2045
Baseline Forecast	18,367	18,428	18,500	18,946	19,660
Achievable Potential	36	86	179	262	287
Achievable Potential (%)	0.2%	0.5%	1.0%	1.4%	1.5%
Behavioral	7	11	21	28	30
DLC Smart Thermostats - BYOT	19	59	138	213	236
Third Party Contracts	10	16	20	20	21

#### **Potential by Sector**

Table 7-10, Table 7-11, and Table 7-12 show the total winter demand savings by class for Washington, Idaho, and Oregon respectively. Washington is projected to save 128 dtherms (1.4% of winter system peak demand) by 2045, Idaho is projected to save 94 dtherms (1.5% of winter system peak demand) by 2045, and Oregon is projected to save 64 dtherms (1.5% of winter system peak demand) by 2045.

The residential sector contributes 87% of the total load across all three states while commercial and industrial contribute 15% and 7% respectively. This is due primarily to the low number of industrial natural gas customers in Avista's territory.

Table 7-10 Potential by Sector – Dtherms @Generator, Washington

	2026	2027	2028	2035	2045
Baseline Forecast	9,217	9,207	9,193	9,094	8,956
Achievable Potential (Dth)	22	49	93	125	128
Residential	16.4	40	82	115	118
Commercial	4.9	8	10	10	10
Industrial	0.3	1	1	1	1

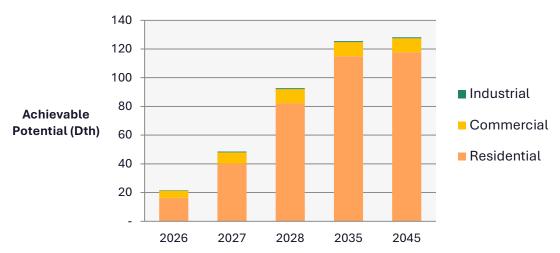
Table 7-11 Potential by Sector – Dtherms @Generator, Idaho

	2026	2027	2028	2035	2045
Baseline Forecast	5,060	5,115	5,185	5,611	6,288
Achievable Potential (Dth)	8	21	50	80	94
Residential	5.5	17	44	74	88
Commercial	2.4	4	5	5	5
Industrial	0.3	1	1	1	1

Table 7-12 Potential by Sector – Dtherms @Generator, Oregon

	2026	2027	2028	2035	2045
Baseline Forecast	4,090	4,107	4,121	4,240	4,416
Achievable Potential (Dth)	6	16	37	57	64
Residential	4.1	12	32	53	60
Commercial	2.0	3	4	4	4
Industrial	0.0	0	0	0	0

Figure 7-5 Potential by Sector – Dtherms @Generator, Washington



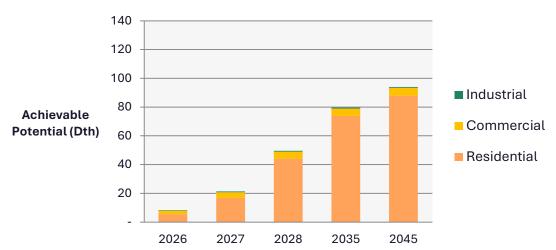
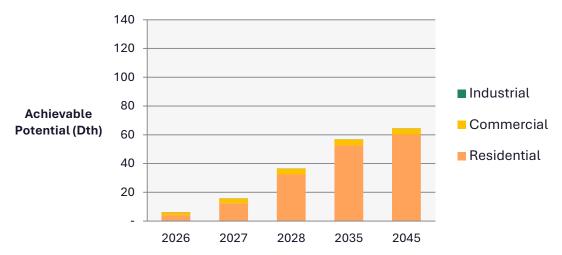


Figure 7-6 Potential by Sector – Dtherms @Generator, Idaho

Figure 7-7 Potential by Sector – Dtherms @Generator, Oregon



#### Levelized Costs

Table 7-13 presents the levelized costs per dekatherm of equivalent generation capacity over 2026-2035 for Washington, Idaho, and Oregon. The ten-year NPV dekatherm potential by program is shown for reference in the first column.

#### Key findings include:

- The Third Party Contracts Program is expected to be the cheapest program to run per dekatherm savings at approximately \$4,429/dekatherm-year. Capacity-based and energy-based payments to the third-party constitutes the major cost component for this option as well as the cost to the vendor for program operation.
- The Behavioral Program has the highest levelized cost among all the DR program over ten years at \$13,790/dekatherm-year system-wide. The main contributors to the high cost compared to low savings are O&M and administrative costs.

Table 7-13 Levelized Program Costs and Potential

Program	NPV Dth Potential	Levelized Costs (\$/Dth)
Behavioral	169.67	\$13,789.84
DLC Smart Thermostats - BYOT	579.18	\$7,821.25
Third Party Contracts	141.71	\$4,429.17

### A | Oregon Low-Income Conservation Potential

#### **Background**

To support initiatives to serve low-income customers and reduce energy burden in its Oregon natural gas service territory, Avista Corporation (Avista) engaged Applied Energy Group (AEG) to assess the energy efficiency potential for Oregon low-income households. This analysis leverages the natural gas conservation potential assessment (CPA) AEG was already performing for Avista's Washington and Idaho service territories, incorporating Oregon-specific data to ensure results are directly applicable to Avista's Oregon low-income customers.

This memo presents a high-level summary of potential results, followed by an overview of AEG's methodology, identification of key data sources, customer segmentation analysis, and more detailed potential results.

#### **Results Summary**

A summary of the energy efficiency potential for Oregon low-income customers is presented in Appendix Table A-1. As shown, achievable and cost-effective energy efficiency potential represents approximately 6% of baseline sales by 2045.

AEG notes the following considerations in reviewing these results:

- The study relied on the best available data from Avista and secondary sources. Sources did not
  include on-site assessments of low-income customer equipment efficiency or practices.
  Therefore, current conditions and remaining opportunities were estimated using information
  about typical characteristics by market segment.
- Achievable economic potential was estimated from the Total Resource Cost (TRC) perspective, consistent with standard cost-effectiveness practices for energy efficiency in Oregon.
- Energy efficiency programs serving low-income customers are often not required to be costeffective. Achievable technical potential provides an estimate of what could be possible if costeffectiveness is not considered.

Appendix Table A-1Summary of Energy Efficiency Potential

Scenario	2026	2027	2030	2035	2045
Baseline Forecast (dtherms)	901,274	904,673	896,310	879,805	856,427
Cumulative Savings (dtherms)					
Achievable Economic TRC Potential	2,068	4,856	14,095	39,976	51,164
Achievable Technical	9,275	20,777	63,138	155,234	189,919
Technical Potential	13,847	29,842	78,653	186,112	221,549
Energy Savings (% of Baseline)					
Achievable Economic TRC Potential	0.2%	0.5%	1.6%	4.5%	6.0%
Achievable Technical	1.0%	2.3%	7.0%	17.6%	22.2%
Technical Potential	1.5%	3.3%	8.8%	21.2%	25.9%

#### Methodology

AEG used a bottom-up approach to perform the potential analysis, following the steps listed:

- Perform a customer segmentation analysis to estimate the number of Avista Oregon residential customers in each housing type and considered low-income, and the energy consumption of each segment.
- 2. Perform a market characterization to describe sector-level natural gas use for residential low-income customers for the base year, 2021. The characterization included extensive use of Avista data and other secondary data sources from Northwest Energy Efficiency Alliance (NEEA) and the Energy Information Administration (EIA).
- 3. Develop a residential baseline projection of energy consumption by segment, end use, and technology for 2026 through 2045.
- 4. Define and characterize energy efficiency measures to be applied to all segments and end uses.
- 5. Estimate technical, achievable technical, and achievable economic energy efficiency potential at the measure level for 2026 through 2045.

#### **Key Data Sources**

AEG used Avista's 2024 Washington and Idaho CPA as the foundation for this assessment. Key updates from the Washington CPA assumptions to reflect the Oregon market and potential included:

- Input and market characterization data were specific to Avista's Oregon low-income customers. The CPA model generally formed the basis for measure cost assumptions and savings estimates.
- With the CPA measure list as the starting point, AEG worked with Avista to identify measures in active programs serving low-income customers, avoiding measures that are inappropriate for these segments due to costs or other concerns.
- The model reflects baseline conditions in alignment with Oregon's state building codes.

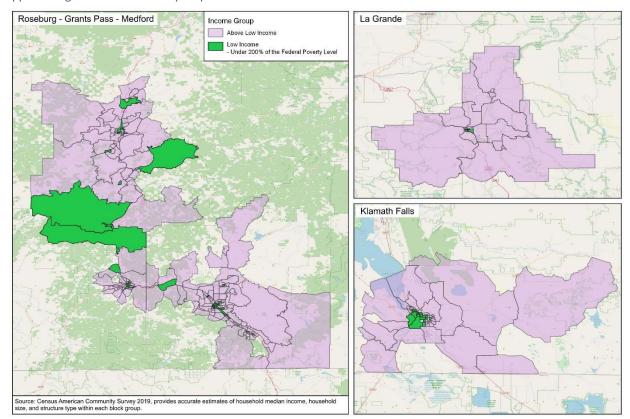
Where data gaps existed in Avista's data, AEG relied on national and regional data sources for assumptions in the potential model. Appendix Table A-2 summarizes key data sources used and how they informed the study.

#### Appendix Table A-2Key Data Source Summary

Data Source	Used For:
Avista Data	Development of customer counts and energy use for each segment type, comparison baseline forecast, customer counts forecast, presence of equipment, end use load distribution, economics inputs, scenario development
US Census American Community Survey (ACS)	Household characteristics in block groups
Northwest Power and Conservation Council's 2021 Power Plan	Technical achievable ramp rate library and study methodology
NEEA's Residential Building Stock Assessment II (RBSA), <u>Single-Family</u> Homes Report 2016-2017	Benchmark equipment saturations, normalized end use and equipment intensity (therms per household)
US Energy Information Administration (EIA) 2015 Residential Energy Consumption Survey (RECS)	Estimated equipment use per unit, end use distribution of natural gas use by segment type, benchmarking equipment presence (saturation)
EIA's 2020 Annual Energy Outlook	Reference baseline purchase assumptions, equipment lifetimes and costs

#### **Customer Segmentation Analysis**

To estimate the number of Avista customers in Oregon to include in the low-income assessment, AEG mapped address data back to corresponding geographic "block groups" in the ACS census data. Each block groups was then processed to analyze average household size and income, producing a distribution of households into income buckets for places where Avista customers reside. The low-income threshold corresponds with 200% of the Federal Poverty Level. The maps in Appendix Figure A-1 shows the distribution of different income groups through Avista's Oregon service territory.



Appendix Figure A-1Income Group Map

Once the percentage of customers in each housing type and income group was known, AEG used RBSA data to investigate differences in energy consumption for each grouping, enabling a comparison of natural gas usage per household across categories. Combining the geographic/demographic analysis with RBSA data on usage differences by income level, AEG was able to produce an expanded residential profile with data-driven variation by income group. Appendix Table A-3 shows the customer energy consumption by income level in the base year, 2021. While AEG fully characterized the residential customer populations, only low-income customers are included in the potential analysis.

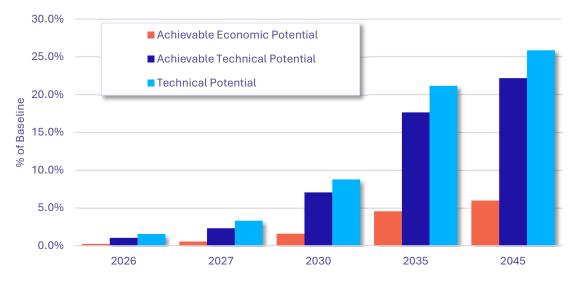
Appendix Table A-3Customer Counts and Energy Consumption by Dwelling Type and Income Level, 2021

Segment	Households	Natural Gas Consumption (Dth)	Intensity (Dth/household)
Single Family - Regular Income	58,913	3,770,739	64,006
Single Family - Low Income	12,289	662,559	53,917
Multi-Family - Regular Income	7,707	183,230	23,774
Multi-Family - Low Income	4,428	88,679	20,026
Mobile Home - Regular Income	7,066	253,416	35,864
Mobile Home - Low Income	2,197	113,191	51,514
Total	92,600	5,071,813	54,771

#### **Potential Results**

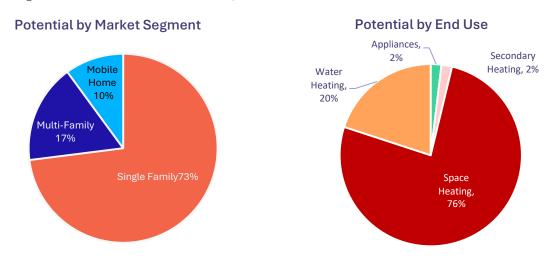
Appendix Figure A-2 presents the annual potential savings relative to the baseline projection. Based on the ramp rates used, a majority of the identified potential is assumed to be acquired over 10 years.



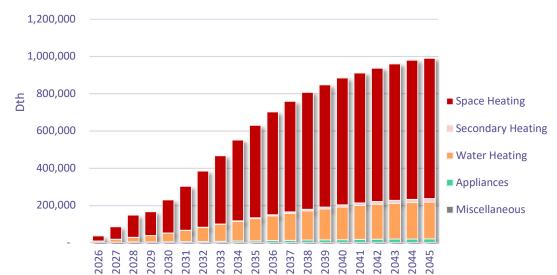


Appendix Figure A-3 presents the percentage of achievable economic potential in 2045 by market segment and end use. Single family dwellings account for 73% of low-income achievable economic potential. Space heating accounts for 76% of low-income achievable economic potential.

Appendix Figure A-3 Achievable Economic Potential, 2045



Appendix Figure A-4 presents a forecast of cumulative achievable economic potential by end use. Space heating accounts for the majority of potential but declines slightly in the mid-2020s due to a future furnace standard.



Appendix Figure A-4 Cumulative TRC Achievable Economic Potential by End Use

Appendix Table A-4 identifies the top measures by cumulative 2026 and 2036 achievable economic potential. Furnaces, insulation, and clothes washers are the top measures.

Appendix Table A-4 Top Measures in 2026 and 2036, Achievable Economic Potential

Rank	Measure/Technology	2026 Cumulative Dth	% of Total	2036 Cumulative Dth	% of Total
1	Furnace	12,297	35.1%	152,477	21.7%
2	Insulation - Ceiling Installation	8,932	25.5%	167,787	23.9%
3	Clothes Washer - CEE Tier 2	4,993	14.2%	40,570	5.8%
4	Building Shell - Air Sealing (Infiltration Control)	1,517	4.3%	32,651	4.7%
5	Insulation - Ceiling Upgrade	1,143	3.3%	21,155	3.0%
6	Water Heater - Faucet Aerators	716	2.0%	14,393	2.1%
7	Insulation - Ducting	683	1.9%	12,115	1.7%
8	Water Heater - Low-Flow Showerheads	670	1.9%	13,209	1.9%
9	Stove/Oven	543	1.5%	8,638	1.2%
10	Ducting - Repair and Sealing - Aerosol	466	1.3%	49,907	7.1%
11	Home Energy Management System (HEMS)	410	1.2%	43,745	6.2%
12	Insulation - Wall Cavity Installation	375	1.1%	6,404	0.9%
13	Water Heater (<= 55 Gal)	368	1.0%	24,632	3.5%
14	Insulation - Wall Cavity Upgrade	365	1.0%	7,027	1.0%
15	Insulation - Wall Sheathing	307	0.9%	5,399	0.8%
	Subtotal	33,785	96%	600,110	86%
	Total Savings in Year	35,058	100.0%	701,329	100.0%

# B | Natural Gas Transportation Customer Conservation Potential

#### **Background**

Avista Corporation (Avista) engaged Applied Energy Group (AEG) to assess the conservation potential at Washington and Oregon natural gas transportation customer<sup>3</sup> facilities to inform the extent to which energy efficiency savings at these facilities could help Avista comply with new regulations. In Washington and Oregon, Avista's transportation customers are currently exempt from funding energy efficiency programs and thus are not eligible to participate in natural gas energy efficiency programs administered by Avista and the Energy Trust of Oregon in Washington and Oregon, respectively.

In Washington, the Washington Utilities and Transportation Commission continues to consider whether pursuing all cost-effective conservation, as required by Initiative 937, requires utilities to fund energy efficiency programs for natural gas transportation customers. In Oregon, Executive Order 20-04, passed in March 2020, limits statewide greenhouse gas emissions from large stationary sources, transportation fuel, and other liquid and gaseous fuels by new goals established by the Oregon Department of Environmental Quality (DEQ). The Climate Protection Program (CPP) formalizes emission reduction requirements for Oregon's natural gas utilities, including the responsibility for on-site emissions of natural gas transportation customers.

The remainder of this memo presents high-level study results, followed by an overview of AEG's methodology, identification of key data sources, potential results, and considerations and recommendations as Avista considers new program options to reach these customers.

#### **Results Summary**

Appendix Table B-1 and Appendix Table B-2 summarize the energy efficiency potential at transportation customer sites in Washington and Oregon, respectively. AEG notes the following considerations in reviewing these results:

- The potential represents expected levels of savings using average assumptions across customers and equipment. However, a small number of customers represent a majority of transportation customer consumption (the top 21% of the largest Washington transportation customers make up roughly 76% of Avista Washington transportation load). Therefore, actual energy efficiency impacts may vary widely depending on whether these large customers choose to participate in potential programs and customer-specific characteristics. As such, these results should be viewed as planning assumptions that are likely to differ in practice.
- The study relied on the best available data from Avista and secondary sources, which did not
  include on-site assessments of transportation customer equipment efficiency or practices.
  Therefore, current conditions and remaining opportunities were estimated using information
  about typical characteristics by market segment (i.e., business or industry type).

.

<sup>&</sup>lt;sup>3</sup> Transportation customers are non-residential natural gas consumers, typically large industrial users, who purchase natural gas from an alternate supplier but use Avista's distribution system to deliver the fuel to their sites.

 Achievable economic potential was estimated from the Total Resource Cost (TRC) perspective, consistent with standard cost-effectiveness practices for energy efficiency in Washington and Oregon.

Appendix Table B-1 Summary Potential Results – Reference Case, Washington

	2026	2027	2030	2035	2045
Baseline Projection (dtherms)	3,178,623	3,163,094	3,117,080	3,062,121	2,992,666
Cumulative Savings (dtherms)					
Achievable Economic Potential	20,752	42,028	110,865	229,109	349,006
Achievable Technical Potential	34,221	66,368	161,137	315,616	462,712
Technical Potential	47,376	91,576	218,534	412,652	585,248
Cumulative Savings (% of Baseline)					
Achievable Economic Potential	0.7%	1.3%	3.6%	7.5%	11.7%
Achievable Technical Potential	1.1%	2.1%	5.2%	10.3%	15.5%
Technical Potential	1.5%	2.9%	7.0%	13.5%	19.6%

Appendix Table B-2 Summary Potential Results – Reference Case, Oregon

	2026	2027	2030	2035	2045
Baseline Projection (dtherms)	2,613,245	2,608,079	2,592,387	2,572,641	2,545,358
Cumulative Savings (dtherms)					
Achievable Economic Potential	12,657	25,566	68,517	151,714	251,405
Achievable Technical Potential	16,434	32,521	83,285	176,741	284,374
Technical Potential	22,040	43,467	109,505	225,146	353,597
Cumulative Savings (% of Baseline)					
Achievable Economic Potential	0.5%	1.0%	2.6%	5.9%	9.9%
Achievable Technical Potential	0.6%	1.2%	3.2%	6.9%	11.2%
Technical Potential	0.8%	1.7%	4.2%	8.8%	13.9%

#### Methodology

AEG used a bottom-up approach to perform the potential analysis, following the steps listed:

- Perform a customer segmentation analysis to estimate the number of Avista Washington and Oregon transportation customers in each market segment and the energy consumption of each segment.
- 2. Perform a market characterization to describe sector-level natural gas use for transportation customers for the base year, 2021. The characterization included extensive use of Avista data and other secondary data sources from the US Energy Information Administration (EIA).
- 3. Develop a baseline projection of energy consumption by segment, end use, and technology for 2026 through 2045.
- 4. Define and characterize energy efficiency measures to be applied to all segments and end uses.
- 5. Estimate technical, achievable technical, and achievable economic potential for 2026 through 2045.

#### **Key Data Sources**

AEG used Avista's 2024 Washington Natural Gas Conservation Potential Assessment (CPA) as the foundation for this assessment. The Washington CPA assessed natural gas energy efficiency potential for Avista's residential, commercial, and industrial sales customers, but excluded transportation customers. Key updates AEG made to Washington CPA assumptions to reflect Washington and Oregon transportation customers, loads, and potential included:

- Input and market characterization data for this analysis were specific to Avista's Washington and Oregon transportation customers, including baseline sales, forecasts, and industry designations. The Washington CPA generally formed the basis for the measure cost assumptions and savings percentage estimates.
- AEG benchmarked the distribution of end use loads with data from the EIA's Commercial Building and Manufacturing Energy Consumption Surveys and discussed notable differences with Avista to ensure that they accurately reflected known aspects of those customers. For example, if a particular manufacturing sector showed a greater proportion of space heating load than expected compared to MECS data, Avista could confirm that their Oregon transportation customers was dominated by a facility with significant conditioned space and whose product line did not require as much natural gas use.
- The assessment leveraged the Washington CPA measure list.

Where data gaps existed in Avista data, AEG relied on national and regional data sources for assumptions in the potential model. Appendix Table B-3 summarizes key data sources used for the analysis and how each informed the study.

Annendix	Table	B-3 Key	/ Data	Source	Summarv

Data Source	Used for
Avista Utility Data	Load segmentation by industry/building type, presence of equipment, end use load distribution, comparison baseline forecast, economics inputs, scenario development
Northwest Power and Conservation Council's 2021 Power Plan	Technical Achievable ramp rate library and study methodology
NEEA's 2019 and 2014 Commercial Building Stock Assessment (CBSA)	Benchmark equipment saturations, normalized end use and equipment intensity (therms per sq.ft)
EIA 2018 Manufacturing Energy Consumption Survey (MECS) and 2018 Commercial Building Energy Consumption Survey (CBECS)	Estimated equipment use per unit, end use distribution of natural gas use by business/industry type, benchmarking equipment presence (saturation)
EIA's 2023 Annual Energy Outlook	Reference baseline purchase assumptions, equipment lifetimes and costs

#### **Potential Results**

AEG developed achievable economic potential based on assumptions regarding the rate at which potential could be acquired. The achievable economic potential started with standard ramp rate assumptions from the Northwest Power and Conservation Council's (Council's) 2021 Power Plan, mapped to natural gas measures.<sup>4</sup>

-

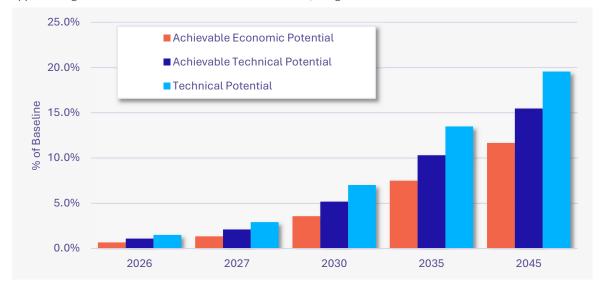
<sup>&</sup>lt;sup>4</sup> The Council's 2021 Power Plan only covers electric measures. To adapt these ramp rates for this natural gas assessment, AEG mapped gas measures to the same or similar electric measure, consistent with the methodology from the Washington Natural Gas CPA.

Appendix Figure B-1 and Appendix Figure B-2 present the cumulative potential savings relative to the baseline projection for select years for each state. Based on the ramp rates used, a majority of the identified potential is assumed to be acquired over the first 10 years of the study period.





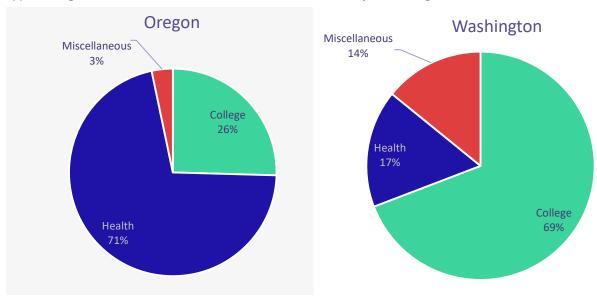
Appendix Figure B-2 Reference Case Cumulative Potential, Oregon



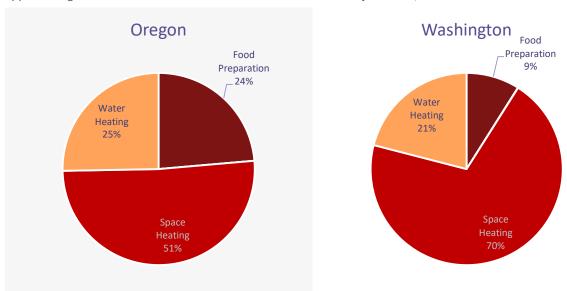
#### **Commercial Potential Results**

Appendix Figure B-3 and Appendix Figure B-4 present the percentage of achievable economic potential 2045 by market segment and end use, respectively. The majority of Avista's commercial transportation customers are Health (71% in Oregon) and College (69% in Washington). Space heating accounts for the largest share of end use potential in both states, representing 51% and 70% of cumulative commercial achievable economic potential in Oregon and Washington, respectively.

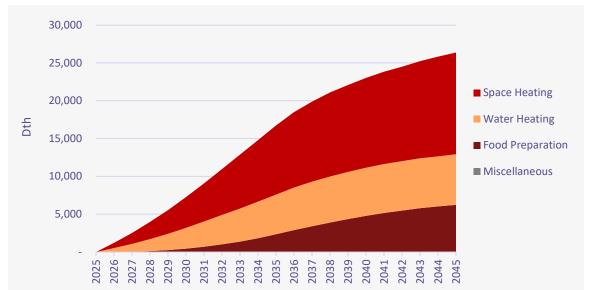
Appendix Figure B-3 Commercial Achievable Economic Potential by Market Segment, 2045



Appendix Figure B-4 Commercial Achievable Economic Potential by End Use, 2045

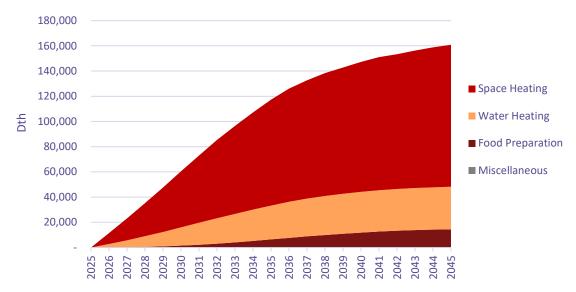


Cumulative commercial achievable economic potential is provided in Appendix Figure B-5 for Oregon and Appendix Figure B-6 for Washington.



Appendix Figure B-5 Cumulative Achievable Economic Commercial Potential by End Use, Oregon

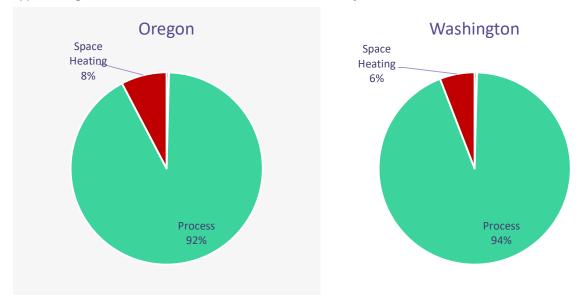




#### **Industrial Potential Results**

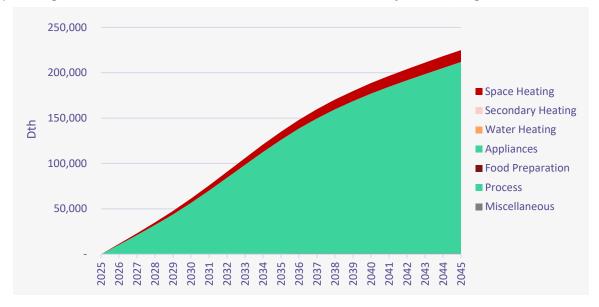
Appendix Figure B-7 presents the cumulative industrial potential in 2045 by end use. Industrial process end use accounts for 94% of Oregon's identified industrial achievable economic potential process and 92% of Washington's identified industrial achievable economic potential.

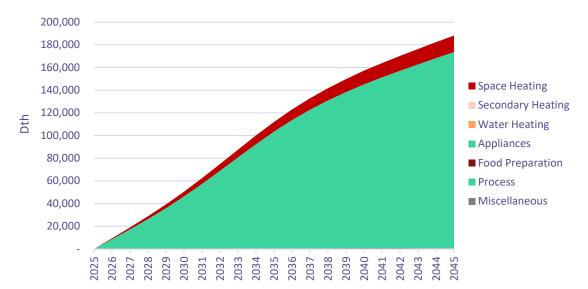




Cumulative industrial achievable economic potential is provided in Appendix Figure B-8 for Oregon and Appendix Figure B-9 for Washington.

Appendix Figure B-8 Cumulative Achievable Economic Industrial Potential by End Use, Oregon





Appendix Figure B-9 Cumulative Achievable Economic Industrial Potential by End Use, Washington

#### **Considerations and Recommendations**

This assessment was a first step in identifying and realizing natural gas energy efficiency (and associated greenhouse gas emissions reductions) within Avista's transportation customer base. While program design is outside the scope of this assessment, AEG notes the following items for Avista as it determines the best way to achieve these savings:

- Many of the inputs into the analysis are averages across market segments based on the best available data sources and may not reflect the available potential at any individual site. To address this, AEG recommends that Avista consider sponsoring audits of specific transportation customer sites to better understand current equipment and practices to refine estimates of available potential for these customers.
- Because a small number of customers account for a large amount of transportation customer consumption, whether these customers choose to participate in future programs will significantly affect the amount of savings that Avista is able to achieve. This uncertainty could increase or decrease acquisition levels relative to the potential identified in this assessment. As Avista considers new program designs for transportation customers, AEG recommends targeted outreach to the largest customers to understand their likelihood of participating in future programs, including to what extent and on what timeline.

# C | MARKET PROFILES

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



Avista 2024 - Natural Gas Market Profiles.xl

## D | 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	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
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%

### E | 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.



