2022 Idaho Annual Conservation Report

July 31, 2023

All forward-looking statements contained in this document are based on underlying assumptions (many of which are based, in turn, upon further assumptions). These statements are subject to a variety of risks, uncertainties, and other factors. Most of these factors are beyond our control and may have a significant effect on our operations, results of operations, financial condition, or cash flows, which could cause actual results to differ materially from those anticipated in our statements.

Such risks, uncertainties, and other factors include, among others, those in our most recent annual report on Form 10-K, or quarterly report on Form 10-Q, filed with the Securities and Exchange Commission. Those reports are available on our website at avistacorp.com.

Bayview, Lake Pend Oreille, Idaho

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES AND SUPPLEMENTS

INTRODUCTION

Spokane River, Post Falls Dam, Idaho

INTRODUCTION

For more than four decades, Avista has served its communities by developing and implementing reliable and cost-effective energy-efficiency programs. This *2022 Annual Conservation Report* provides a summary of the company's efforts to support customer energy needs. Avista's efficiency programs help customers discover innovative ways to conserve energy, live more comfortably, and save money – all while continuing to be a least-cost resource for the company.

Throughout 2022, the lingering effects of COVID-19 continued to impact customers, as well as Avista's electric and natural gas conservation achievements. Customers and contractors alike reported supply chain constraints and labor shortages, both of which affected efficiency project decisions and timelines. As in 2021 and years prior, Avista programs focused on affordability and flexibility so that opportunities remained available to customers who wished to pursue efficiency in their homes or business. Although overall conservation achieved in 2022 continued to be affected by lower participation rates, the company maintained proactive outreach efforts and took steps to ensure customers stayed connected. These efforts are discussed in more detail in this report.

In addition to a portfolio of programs implemented both by the company and third-party contractors, Avista continues to support regional market transformation efforts through the Northwest Energy Efficiency Alliance (NEEA). Reported conservation energy savings, cost-effectiveness, and other related data, however, are specific to local programs unless otherwise noted.

FIGURE 1 – ELECTRIC AND NATURAL GAS SERVICE AREAS

TARIFF RIDER BALANCES

At the start of 2022, the Idaho electric and natural gas (aggregate) tariff rider balances were underfunded by nearly $1.3 million. During the year, approximately $10.4 million in tariff rider revenue was collected to fund energy efficiency, while nearly $6.7 million was expended to operate energy-efficiency programs. The $3.7 million excess of collections over expenditures contributed to a decrease in the underfunded balance of the gas tariff rider and an increase on the overfunded balance of the electric tariff rider. Overall, the overfunded balance across both tariff riders was close to $5 million by year-end.

Table 1 illustrates the 2022 tariff rider activity by fuel type.

TABLE 1 – TARIFF RIDER ACTIVITY

	Electric	Natural Gas	Total
Beginning Balance (Underfunded)/Overfunded	**$ 3,362,295**	**$ (2,067,047)**	**$ 1,295,248**
Energy-Efficiency Funding	$ 8,382,325	$ 1,975,977	$ 10,358,303
Net Funding of Operations	$ 11,744,620	$ (91,069)	$ 11,653,551
Energy-Efficiency Expenditures	$ 4,931,758	$ 1,732,766	$ 6,664,524
Ending Balances (Underfunded)/Overfunded	**$ 6,812,862**	**$ (1,823,835)**	**$ 4,989,027**

IDAHO ACHIEVEMENTS

- ***Electric Conservation:*** For 2022, Avista's electric Energy-Efficiency Program achieved 14,927,335 kWh of conservation from local programs.
- ***Natural Gas Conservation:*** For 2022, Avista's natural gas Energy-Efficiency Program achieved 306,330 therms of conservation from local programs.
- ***NEEA Conservation:*** An additional 5,694 MWh were conserved through the Northwest Energy Efficiency Alliance (NEEA) program, resulting in overall electric savings of 20,621 MWh; an additional 282,088 therms led to an overall natural gas savings of 588,418 therms.

Note: This *Annual Conservation Report* is intended to provide information on Avista's local programs and therefore will consistently refer to the local achievement of 14,927,335 kWh for electric and 306,330 therms for natural gas.

Program Impacts

COVID-19 continued to have multiple and far-reaching impacts on Avista's customers in 2022, although those impacts were significantly different from 2020 and 2021. Lingering barriers prevented certain businesses from fully returning to non-pandemic business practices. Generally, the job market has continued to make a strong recovery following the pandemic, and the region's economy is now experiencing a labor shortage. Contractors have faced increasingly challenging hiring conditions, resulting in longer turnaround times for many efficiency projects. Businesses have also continued to experience increasingly prevalent supply chain problems – further contributing to delays and longer turnaround timelines for efficiency projects – while also navigating higher interest rates, which, in some cases, have caused businesses to delay or cancel planned efficiency projects. Avista continued to help customers navigate these new challenges as they participated in energy-efficiency programs.

Portfolio Trends

Avista's energy savings achieved in 2022 were higher than in 2021 (14,927,336 kWh vs 13,509,604 kWh). This gain was due mainly to savings through the Site-Specific Program, which increased 32 percent between 2021 and 2022 and comprised 48 percent of overall program savings.

TABLE 2 – ELECTRIC ENERGY SAVINGS (KWH)

Customer Segment	2021	2022
Residential (including Low-Income Programs)	1,566,738	1,219,172
Commercial/Industrial	11,942,866	13,708,164
Total	**13,509,604**	**14,927,336**

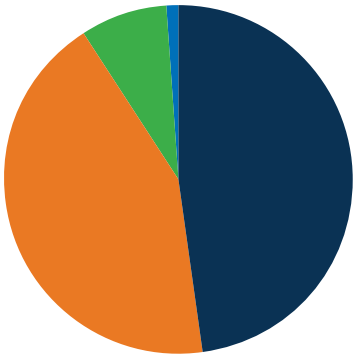
As shown in Table 3, Avista's natural gas portfolio also increased in savings in 2022 compared to the prior year. While residential program savings decreased slightly, commercial/industrial program savings increased by 83 percent.

TABLE 3 – NATURAL GAS ENERGY SAVINGS (THERMS)

Customer Segment	2021	2022
Residential (including Low-Income Programs)	279,274	268,369
Commercial/Industrial	20,726	37,961
Total	**300,000**	**306,330**

Of Avista's overall electric portfolio, the commercial/industrial Prescriptive Lighting and Site-Specific Programs obtained 92 percent of the savings in 2022. All other programs combined achieved the remaining 8 percent (see Figure 2).

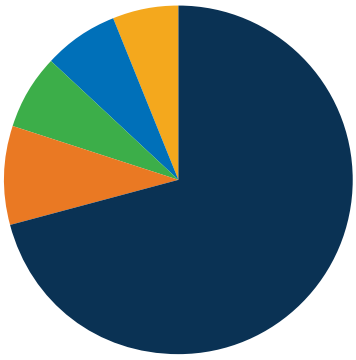
FIGURE 2 – ELECTRIC SAVINGS PORTFOLIO



- **48%** Commercial/Industrial Site-Specific
- **43%** Commercial/Industrial Prescriptive Lighting
- **8%** Residential (including Low-Income)
- **1%** Commercial/Industrial Prescriptive Non-lighting

Of Avista's overall natural gas savings portfolio, residential HVAC Programs obtained 72 percent of the savings in 2022 (see Figure 3).

FIGURE 3 – NATURAL GAS SAVINGS PORTFOLIO



- **71%** Residential HVAC
- **9%** Residential Water Heat
- **7%** Residential Shell
- **7%** Commercial/Industrial Site-Specific
- **6%** All Other Programs

Verified Savings

Avista's targets are set through the *Integrated Resource Plan* (*IRP*) process. Targets for 2022 were 12,725 MWh and 522,441 therms.

For the 2022 electric target, Avista chose to use the conservation potential assessment (CPA) obtained from its 2021 electric *IRP* as the basis for its *Annual Conservation Plan* (*ACP*) savings goals and targets. The company's 2022 conservation acquisition target identified in its *IRP* was 12,725 MWh of qualifying energy efficiency in Idaho.

The 2022 natural gas target of 522,441 therms was identified in the 2021 natural gas *IRP* and was used to establish the targets for each program in the natural gas portfolio.

In 2022, the electric energy-efficiency portfolio achieved first-year annual energy savings of 14,927 MWh (20,621 MWh inclusive of NEEA) and natural gas savings of 306,330 therms (588,418 therms inclusive of NEEA). Based on the target established in the electric and natural gas *IRPs*, Avista achieved 117 percent (162 percent inclusive of NEEA) of the electric savings target and 59 percent (126 percent inclusive of NEEA) of natural gas.

Table 4 shows 2022 savings by fuel and sector. The Idaho electric portfolio achieved an overall 101 percent realization rate.

TABLE 4 – ENERGY EFFICIENCY SAVINGS BY SECTOR – ELECTRIC

Sector	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Commercial/Industrial	13,412,681	13,708,164	102%
Residential	1,276,249	1,133,532	89%
Low-Income	87,986	85,639	97%
Total	**14,776,916**	**14,927,335**	**101%**

The Idaho natural gas portfolio achieved an overall realization rate of 111 percent, as shown in Table 5.

TABLE 5 – ENERGY EFFICIENCY SAVINGS BY SECTOR – NATURAL GAS

Sector	Reported Savings (Therms)	Gross Evaluated Savings (Therms)	Realization Rate
Commercial/Industrial	27,507	37,961	109%
Residential	243,753	266,415	101%
Low-Income	1,942	1,954	138%
Total	**273,202**	**306,330**	**111%**

Expenditures

As part of Avista's annual business planning process, the company sets an expectation for operational planning, pursuing all cost-effective measures under Tariff Schedules 90 and 190. Since customer incentives are the largest component of expenditures, customer demand can easily affect the funding level of the tariff riders. Table 6 provides a detailed comparison of budgeted to actual energy-efficiency expenditures by fuel type.

TABLE 6 – ANNUAL CONSERVATION PLAN BUDGET TO ACTUAL EXPENDITURES COMPARISON

	Electric	Natural Gas
Projected 2022 Expenditures		
Incentives Budget	$ 5,007,009	$ 2,243,064
Non-Incentives and Labor	$ 1,734,268	$ 284,526
NEEA, CPA, EM&V	$ 1,394,232	$ 133,500
Total Budgeted Expenditures	**$ 8,135,509**	**$ 2,661,090**
Actual 2022 Expenditures		
Incentives	$ 3,703,159	$ 1,601,304
Non-Incentives and Labor	$ 1,251,770	$ 248,654
Market Transformation, CPA, EM&V, R&D, Pilot Programs	$ 1,880,512	$ 113,651
Total Actual Expenditures	**$ 6,835,441**	**$ 1,963,608**
Variance	**$ (1,300,068)**	**$ (697,482)**

Table 7 illustrates the top five programs with the highest impact on the expenditure variance.

TABLE 7 – PROGRAMS WITH HIGHEST IMPACT ON EXPENDITURE VARIANCE

Program	Planned	Actual	Variance	Variance Percentage
Residential Prescriptive – Natural Gas	$ 2,108,793	$ 1,361,548	$ 747,244	35%
Residential Multifamily/Small Home Weatherization – Electric	$ 401,487	$ 8,618	$ 392,869	98%
Fuel Conversions	$ 458,695	$ 93,200	$ 365,495	80%
Residential Multifamily/Small Home Weatherization – Natural Gas	$ 361,301	$ 8,618	$ 352,682	98%
Residential Multifamily Direct Install – Electric	$ 327,508	$ 17,528	$ 309,980	95%

EVALUATION APPROACH

Because evaluation is a critical component of any successful energy conservation program, Avista employs evaluation, measurement, and verification (EM&V) protocols to validate and report verified energy savings related to its energy-efficiency measures and programs. Those protocols represent the comprehensive analyses and assessments necessary to supply useful information to both management and stakeholders. (EM&V includes impact and process, and, taken as a whole, is analogous with industry standard terms such as portfolio evaluation or program evaluation.) Avista also incorporates recommendations to improve program performance, enact changes to programs, and make decisions to phase out programs and measures.

Program evaluations are generally conducted by third-party EM&V firms, selected on a biennial basis through a competitive bidding process managed by Avista's supply chain management group. Scope of work for selected evaluators is defined and managed by the company's planning and analytics team. Third-party evaluators provide recommendations pertaining to specific programs and related processes in impact and process evaluation report outputs; Avista tracks those recommendations and uses them to inform the annual business planning process.

For 2022, Avista retained the firm ADM to conduct impact and process evaluations of electric and natural gas programs in the utility's Idaho program portfolio. Evaluations took a portfolio-wide evaluation approach to provide a benchmark to compare against future years. Impact and process evaluations for most programs were also completed at the program level to better define the customer experience and understand realization rates.

Several guiding EM&V documents are maintained and published to support planning and reporting requirements. These include the Avista EM&V framework, an annual EM&V plan, and EM&V contributions within other DSM and Avista corporate publications. Program-specific EM&V plans are created to inform and benefit the demand side management (DSM) activities. These documents are reviewed and updated as necessary to improve the processes and protocols for energy-efficiency measurement, evaluation, and verification.

EM&V efforts are also used to evaluate emerging technologies and applications when considering their inclusion in Avista's energy-efficiency portfolio. In its electric portfolio, the company may spend up to 10 percent of its conservation budget on programs whose savings impacts have not yet been measured if the overall conservation portfolio passes the applicable cost-effectiveness test. These programs may include educational, behavioral change, and other investigatory projects. Specific activities can include product and application document reviews, development of formal evaluation plans, field studies, data collection, statistical analysis, and solicitation of user feedback.

Both Avista and its customers benefit from activities and resources for energy efficiency and conservation. To contribute to regional efforts, Avista participates in the Regional Technical Forum (RTF) – the advisory committee to the Northwest Power and Conservation Council and a primary source of information regarding the standardization of energy savings and measurement processes for electric applications in the Pacific Northwest. One Avista employee has a voting role and a second has a corresponding member role in the forum. The RTF knowledge base provides Avista with energy-efficiency data, metrics, non-energy benefits, and references for inclusion in the company's *Technical Reference Manual* (*TRM*) relating to acquisition planning and reporting. Avista also works with other Northwest utilities and NEEA in a number of pilot projects and subcommittee evaluations; portions of the energy-efficiency savings acquired through the latter's regional programs are attributable to Avista's portfolio.

Evaluation Methodology and Activities

An impact evaluation was performed on each program in the Idaho portfolio that achieved savings in 2022. Evaluators used the following approaches to calculate energy impact as defined by the International Performance Measurement and Verification Protocols (IPMVP)[1] and the Uniform Methods Project (UMP)[2]:

- Simple verification (web-based surveys supplemented with phone surveys)
- Document verification (review project documentation)
- Deemed savings (RTF UES and Avista TRM values)
- Whole facility billing analysis (IPMVP Option C)

Evaluators completed these tasks for each electric and natural gas impact from projects completed in Avista's Idaho service territory.

The EM&V methodologies are program-specific and determined by previous Avista evaluation methodologies, as well as the relative contribution of a given program to the overall energy-efficiency impacts. In addition to drawing on IPMVP, evaluators also reviewed relevant information on infrastructure, framework, and guidelines for EM&V work as defined by several guidelines that were published in recent years. These documents include the following:

- UES Measures from the Northwest Regional Technical Forum[3]
- The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures from the National Renewable Energy Laboratory (NREL) of the U.S. Department of Energy (DOE), April 2013[4]
- International Performance Measurement and Verification Protocol maintained by the Efficiency Valuation Organization (EVO) with sponsorship by the U.S. Department of Energy[5]

Evaluators kept data collection instruments, calculation spreadsheets, and monitored/survey data available for Avista records.

The primary objective of the impact evaluation is to determine ex-post verified net energy savings. This evaluation considers the cyclical feedback loop among program design, implementation, and impact evaluation. Evaluation activities estimate and verify annual energy savings and identify whether a program is meeting its goals. These activities are aimed at providing guidance for continuous program improvement and increased cost effectiveness for future program years.

Evaluators defined three major approaches to determining net savings for Avista's programs:

- A *Deemed Savings* approach uses stipulated savings for energy conservation measures where savings values are well-known and documented. These prescriptive savings may also include an adjustment for certain measures, such as lighting measures in which site operating hours may differ from RTF values.

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1) https://www.nrel.gov/docs/fy02osti/31505.pdf
2) https://www.nrel.gov/docs/fy18osti/70472.pdf
3) https://rtf.nwcouncil.org/measures
4) Notably, The Uniform Methods Project (UMP) includes the following chapters authored by ADM: chapter 9, "Metering Cross-Cutting Protocols," by Dan Mort, and chapter 15, "Commercial New Construction Protocol," by Steven Keates.
5) Core Concepts: International Measurement and Verification Protocol. EVO 100000 – 1:2016, October 2016.

- A *Billing Analysis* approach estimates energy savings by applying a linear regression to utility meter billing data for measured participant energy consumption. Billing analyses include billing data from nonparticipant customers. This approach does not require on-site data collection for model calibration, and it aligns with the IPMVP Option C.
- A *Custom* approach, used for the Site-Specific Program, selects the appropriate IPMVP option to apply to the specific measure or project. As most projects in the program are lighting retrofits, this is typically Option A. However, Options B, C, and D are also employed, depending upon the project. Specific methods are discussed in each site report.

Evaluators accomplished the following quantitative goals as part of the impact evaluation:

- Verified savings with 10 percent precision at the 90 percent confidence level.
- Applied the RTF to verify measure impacts, where appropriate.
- Conducted billing analysis with a suitable comparison group to estimate measure savings, where available data exists.
- Used IPMVP analysis methods for custom projects.

For each program, evaluators calculated adjusted savings for each measure based on the Avista TRM and results from the database review. They calculated verified savings for each measure based on the RTF UES, Avista TRM, or billing analysis in combination with the results from document review. For the HVAC, Water Heating, Fuel-Efficiency, Multifamily/Small Home Weatherization, and Appliances Programs, evaluators also applied in-service rates (ISR) from verification surveys.

Evaluators assigned a level of methodological rigor for each measure and program, based on its contribution to the portfolio savings and availability of data.

They analyzed billing data for all electric measure participants in the HVAC and Low-Income Programs. Billing analysis results determined evaluated savings only for measures where savings could be isolated – that is, where enough participants who installed only that measure could be identified. Program-level realization rates for the HVAC, Water Heating, and Fuel-Efficiency Programs incorporate billing analysis results for some measures.

Impact Evaluation Results, Portfolio

As a result of the impact evaluation performed, the following realization rates were achieved in the Idaho program portfolio:

- ***Electric:*** 101 percent realization rate and 14,927,335 kWh in annual verified savings.
- ***Natural Gas:*** 111 percent realization rate and 306,330 therms in annual gross savings.

COST-EFFECTIVENESS

Before implementing any new program, Avista conducts analyses to determine whether that program is cost-effective both from the company's and from customers' perspectives. Avista uses four metrics to evaluate cost-effectiveness: the utility cost test (UCT), the total resource cost (TRC), the participant cost test (PCT), and the ratepayer impact test (RIM). For Idaho programs, the UCT is the most important. Avista's cost-effectiveness goal for both the electric and natural gas program portfolios is to have a UCT above 1.00, which indicates that the benefits to the utility exceed the costs of implementing the program. In 2022, the UCT benefit/cost ratios were 1.28 for electric and 1.37 for natural gas.

TABLE 8 – ELECTRIC PORTFOLIO COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 17,127,964	$ 9,597,254	1.78
Utility Cost Test (UCT)	$ 6,508,365	$ 5,078,273	1.28
Participant Cost Test (PCT)	$ 15,213,059	$ 8,199,774	1.86
Ratepayer Impact (RIM)	$ 6,466,695	$ 16,610,540	0.39

TABLE 9 – NATURAL GAS PORTFOLIO COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,510,353	$ 3,704,474	0.68
Utility Cost Test (UCT)	$ 2,510,352	$ 1,838,898	1.37
Participant Cost Test (PCT)	$ 6,141,666	$ 3,417,110	1.80
Ratepayer Impact (RIM)	$ 2,470,584	$ 6,429,030	0.38

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COMMERCIAL/INDUSTRIAL SECTOR

Coeur d'Alene, Idaho

COMMERCIAL/INDUSTRIAL SECTOR

Overview

The commercial/industrial energy-efficiency market is served through a combination of prescriptive and site-specific programs. Any savings measure not offered through a prescriptive program path – and/or that does not meet its parameters – is automatically eligible for treatment through the Site-Specific Program path, subject to the criteria for participation in that program.

The prescriptive program paths are selected for simple, straightforward equipment installations that generally have similar operating characteristics (such as lighting, simple HVAC systems, food service equipment, and variable frequency drives).

The Site-Specific Program path is reserved for more unique or complex projects that require custom savings calculations and technical assistance from Avista's energy engineers (such as compressed air, process equipment and controls, and comprehensive lighting retrofits). In certain instances, a performance basis approach is used. Total sector achievements in 2022 are as follows:

- ***857 commercial/industrial electric projects in 2022:*** Total savings of 13,708 MWh.
- ***35 commercial/industrial natural gas projects in 2022:*** Total savings of 37,961 therms.

TABLE 10 – COMMERCIAL/INDUSTRIAL VERIFIED SAVINGS BY PROGRAM

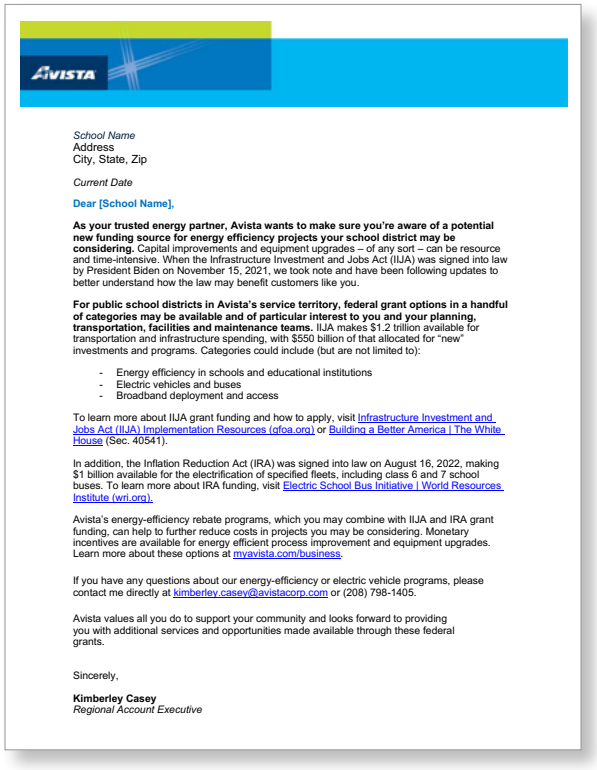
Commercial/Industrial Program	Electric Savings (kWh)	Natural Gas Savings (Therms)
Prescriptive Lighting	6,416,285	–
Natural Gas HVAC	–	5,082
Green Motors	9,822	–
Motor Control HVAC (VFD)	14,308	–
Shell	4,490	260
Food Service Equipment	10,537	12,910
Grocer	36,468	–
Site-Specific	7,216,254	19,709
Commercial/Industrial Total	**13,708,164**	**37,961**

Marketing

Avista revisited its approach to commercial and industrial energy efficiency marketing for 2022. The company's regional account executives manage business customer projects and play a large role in spreading awareness and increasing engagement. This customer segment holds significant energy savings potential. New tactics and refreshed creative were developed to engage this audience and increase program awareness and participation.

Avista purchased business customer lists to enable targeted direct outreach via email, zeroing in on useful information and program promotion for specific business types. A direct email and postal letter were also sent to school districts that may benefit from federal funding through the Infrastructure Investment and Jobs Act or Inflation Reduction Act in combination with Avista's energy-efficiency incentives. A follow-up message was also sent to these recipients in early 2023.

FIGURE 4 – COMMERCIAL/INDUSTRIAL INCREASE ENERGY EFFICIENCY IN YOUR SCHOOLS LETTER



School Name
Address
City, State, Zip

Current Date

Dear [School Name],

As your trusted energy partner, Avista wants to make sure you're aware of a potential new funding source for energy efficiency projects your school district may be considering. Capital improvements and equipment upgrades – of any sort – can be resource and time-intensive. When the Infrastructure Investment and Jobs Act (IIJA) was signed into law by President Biden on November 15, 2021, we took note and have been following updates to better understand how the law may benefit customers like you.

For public school districts in Avista's service territory, federal grant options in a handful of categories may be available and of particular interest to you and your planning, transportation, facilities and maintenance teams. IIJA makes $1.2 trillion available for transportation and infrastructure spending, with $550 billion of that allocated for "new" investments and programs. Categories could include (but are not limited to):

- Energy efficiency in schools and educational institutions
- Electric vehicles and buses
- Broadband deployment and access

To learn more about IIJA grant funding and how to apply, visit Infrastructure Investment and Jobs Act (IIJA) Implementation Resources (gfoa.org) or Building a Better America | The White House (Sec. 40541).

In addition, the Inflation Reduction Act (IRA) was signed into law on August 16, 2022, making $1 billion available for the electrification of specified fleets, including class 6 and 7 school buses. To learn more about IRA funding, visit Electric School Bus Initiative | World Resources Institute (wri.org).

Avista's energy-efficiency rebate programs, which you may combine with IIJA and IRA grant funding, can help to further reduce costs in projects you may be considering. Monetary incentives are available for energy efficient process improvement and equipment upgrades. Learn more about these options at myavista.com/business.

If you have any questions about our energy-efficiency or electric vehicle programs, please contact me directly at kimberley.casey@avistacorp.com or (208) 798-1405.

Avista values all you do to support your community and looks forward to providing you with additional services and opportunities made available through these federal grants.

Sincerely,

Kimberley Casey
Regional Account Executive

FIGURE 5 – COMMERCIAL/INDUSTRIAL AVISTA UTILITIES ENERGY SOLUTIONS EMAIL

Post-COVID, the company revisited in-person outreach in June 2022. Commercial and industrial trade ally vendors and contractors were invited to an energy efficiency program open house, where attendees were greeted by Avista's program managers, energy engineers, and account executives. Energy efficiency rebate programs and services were discussed and shared, with the intention that trade allies would further their participation on their customers' behalf.

Avista partnered with two business customers to develop new a new storytelling case study campaign as well. A rural small business, Harvester Restaurant, shared their success with lighting upgrades. Mead School District, a trusted efficiency partner for Avista, shared about its focus on energy efficiency in its business model and how Avista's rebate programs have helped it achieve operational goals. The campaign ran in the spring, from February to March – across Avista's Idaho and Washington service territory – via broadcast and cable networks, as well as print publications. It ran again in the fall, from September through November, with the addition of digital ads. Prior to the digital launch, average webpage views to the business energy advice webpage that the ads pointed to hovered around 317 per month. Post launch, average page views jumped to an average of over 2,000 per month. The fall campaign topped 5,840,000 impressions.

FIGURE 6 – COMMERCIAL/INDUSTRIAL HARVESTER RESTAURANT PRINT ADVERTORIAL

FIGURE 7 – COMMERCIAL/INDUSTRIAL HARVESTER RESTAURANT BROADCAST

FIGURE 8 – COMMERCIAL/INDUSTRIAL MEAD SCHOOL DISTRICT BROADCAST

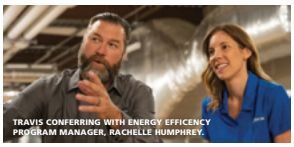
FIGURE 9 – COMMERCIAL/INDUSTRIAL MEAD SCHOOL DISTRICT PRINT ADVERTORIAL

Partnering with Avista to help improve schools.

As director of maintenance and operations for the Mead School District in North Spokane, Travis Bown is responsible for lighting, heating and cooling, ventilation, security systems and other issues that are critical to positive school environments.

For Bown and his team, that's a big job. The Mead School District is one of the fastest-growing school districts in the state of Washington. The district serves over 10,000 students with 15 schools and five support facilities that encompass over 1.5 million square feet of building space and more than 450 acres of grounds.

According to Avista Energy Solutions Engineer Bryce Eschenbacher, Bown is "the consummate idea guy" because he continually strives to find new and better ways to improve school environments. When his ideas involve energy, he relies on Avista for feedback.


TRAVIS CONFERRING WITH ENERGY EFFICENCY PROGRAM MANAGER, RACHELLE HUMPHREY.

Avista Account Executive Kim Vollan adds, "He is really focused on achieving maximum energy efficiency within his budget. The proactive conversations we had also helped him make informed decisions about which of his ideas make sense to leverage elsewhere in the District."

Bown agrees. "Avista does a really great job of vetting a project and telling you what the simple payback will be."

Bown's use of advanced control systems for HVAC and lighting as well as other customization ideas has put him years ahead of meeting Washington State's new clean buildings standards (House bill 1257). Currently, over half of the school district's buildings are in compliance.

In less than six years, Bown has helped complete 203 Mead School District projects with Avista—on everything from LED lighting and custom control systems to energy-saving block heaters for buses with the district's transportation team.

"The upgrades have reduced my operational costs by over $210,000 annually," said Bown, "and that is on top of receiving $392,000 in Avista rebates. As part of my strategic approach, I've now built lighting upgrades into my maintenance plans."

According to Eshenbacher, Bown has also been a big help to Avista over the years.

"He has allowed us to use his buildings as a baseline for energy use to conduct many year-long pilot studies," says Eshenbacher, "including a recent test for an energy-saving boiler additive."

Currently, Avista is measuring the energy-efficiency performance of three new Mead schools—Highland Middle School (via their new Energy Use Index pilot program) and Skyline and Creekside Elementary Schools (via their New Construction Site Specific measures program). The better these schools perform against Avista's models, the more Avista rebates and state grants the district will be eligible to receive.

"What we gain from Travis and what he gains from us make it the perfect partnership," says Vollan.

For more information, visit myavista.com/bizrebates or call (800) 936-6629.

AVISTA

ADVERTISEMENT

FIGURE 10 – COMMERCIAL/INDUSTRIAL MULTIFAMILY DIRECT INSTALL FLYER, COVID-19 TEMPORARY MODIFICATIONS

FREE Energy Conservation Devices for Multifamily Units!

Avista is once again providing energy-saving equipment that can help lower utility bills in multifamily housing:

- **LEDs** provide better lighting and have a longer life while using less energy.
- **FAUCET AERATORS** can save both water and energy in bathroom and kitchen sinks.
- **VENDING MISERS*** can significantly reduce energy consumption for each cold beverage vending machine.

Be sure to get your free† items before the program ends.

Safety Information

Our field installers are taking extra precautions for the safety of all, including:

- **ABIDING** by Avista's latest COVID-19 guidance and requirements.
- **WEARING** masks and/or getting vaccinated, testing daily, and quarantining as necessary.
- **FOLLOWING** all state governmental guidance and requirements.
- **PROVIDING** tenants the opportunity to opt out of the program at any time.

** Covered by a 5-year warranty. Email USA Technologies at customerservice@usatech.com with the model number and a short explanation regarding the unit problem.*

† Free installation based on existing equipment eligible for replacement. If not satisfied, any items can be removed free of charge within 30 days of installation.

AVISTA

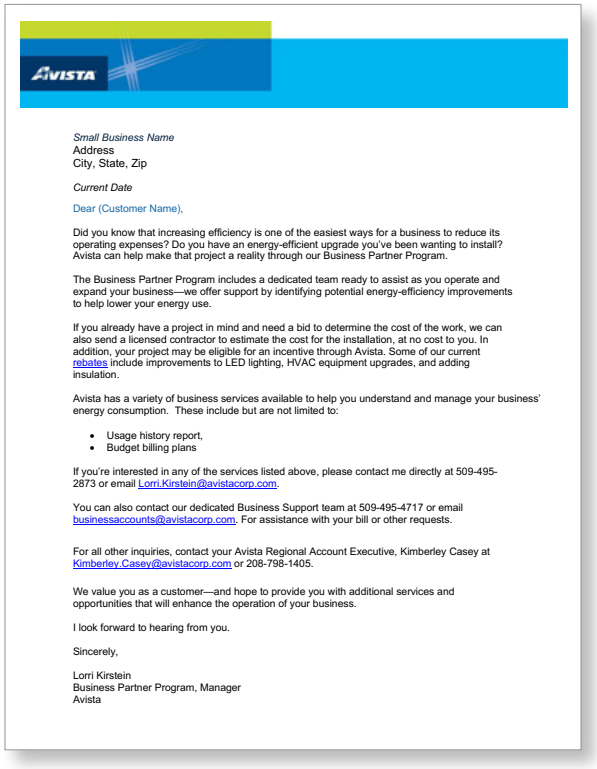
Business Partner Program

The Business Partner Program (BPP) began in fall 2019 as an outreach effort designed to target small business customers in Avista's rural service territories. The BPP brings awareness of Avista's services to rural small business customers in Idaho and Washington, and includes information on energy audits, budget billing plans, energy-efficiency rebates, and, most recently, COVID-19 related information.

In 2022, Avista continued to offer the Trade Ally Bid Program, in which the company arranges for various vendors (e.g., lighting, HVAC, window, and insulation) to provide cost estimates to customers for energy-efficiency upgrades to their facilities.

Avista has collaborated with trade ally partners to help customers identify energy conservation projects by performing audits, walking through the efficiency incentive process, and helping customers obtain bids for projects. The Trade Ally Bid Program has enabled Avista to educate and empower small business customers who may not have the time, budget, or access to contractors to make efficiency improvements. By the end of 2022, the program provided cost estimates to six small business customers in Idaho.

FIGURE 11 – COMMERCIAL/INDUSTRIAL BUSINESS PARTNER PROGRAM LETTER



Small Business Name
Address
City, State, Zip

Current Date

Dear (Customer Name),

Did you know that increasing efficiency is one of the easiest ways for a business to reduce its operating expenses? Do you have an energy-efficient upgrade you've been wanting to install? Avista can help make that project a reality through our Business Partner Program.

The Business Partner Program includes a dedicated team ready to assist as you operate and expand your business—we offer support by identifying potential energy-efficiency improvements to help lower your energy use.

If you already have a project in mind and need a bid to determine the cost of the work, we can also send a licensed contractor to estimate the cost for the installation, at no cost to you. In addition, your project may be eligible for an incentive through Avista. Some of our current rebates include improvements to LED lighting, HVAC equipment upgrades, and adding insulation.

Avista has a variety of business services available to help you understand and manage your business' energy consumption. These include but are not limited to:

- Usage history report,
- Budget billing plans

If you're interested in any of the services listed above, please contact me directly at 509-495-2873 or email Lorri.Kirstein@avistacorp.com.

You can also contact our dedicated Business Support team at 509-495-4717 or email businessaccounts@avistacorp.com. For assistance with your bill or other requests.

For all other inquiries, contact your Avista Regional Account Executive, Kimberley Casey at Kimberley.Casey@avistacorp.com or 208-798-1405.

We value you as a customer—and hope to provide you with additional services and opportunities that will enhance the operation of your business.

I look forward to hearing from you.

Sincerely,

Lorri Kirstein
Business Partner Program, Manager
Avista

Impact Evaluation: Commercial/Industrial Sector

Although some individual project results varied, particularly within the Prescriptive Exterior Lighting Program, the overall commercial/industrial sector performed strongly in 2022 relative to reported savings. Most projects that ADM sampled for the evaluation were well-documented and matched findings from the remote project verifications. Savings realization rates were as follows:

- ***Electric:*** Total verified savings of 13,708 MWh, with a combined realization rate of 102 percent.
- ***Natural Gas:*** Total verified savings of 37,961 therms, with a combined realization rate of 138 percent.

Performance and Savings Goals

The commercial/industrial sector exceeded the combined prescriptive and site-specific program paths' electric goal of 9,643 MWh, with the programs achieving 142 percent of the overall goal. For natural gas programs, the commercial/industrial sector fell short of the annual therm savings goal for combined prescriptive and site-specific programs, achieving 32,879 therms (46 percent of the combined prescriptive and site-specific program paths' natural gas savings goal of 72,243 therms).

Cost-Effectiveness

Tables 11 and 12 show the commercial/industrial sector cost-effectiveness results by fuel type.

TABLE 11 – COMMERCIAL/INDUSTRIAL ELECTRIC COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 14,139,361	$ 7,151,402	1.98
Utility Cost Test (UCT)	$ 5,252,230	$ 3,794,061	1.38
Participant Cost Test (PCT)	$ 12,033,816	$ 6,444,122	1.87
Ratepayer Impact (RIM)	$ 5,252,230	$ 12,741,096	0.41

TABLE 12 – COMMERCIAL/INDUSTRIAL NATURAL GAS COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 225,395	$ 208,108	1.08
Utility Cost Test (UCT)	$ 225,395	$ 196,271	1.15
Participant Cost Test (PCT)	$ 477,453	$ 85,622	5.58
Ratepayer Impact (RIM)	$ 225,395	$ 599,939	0.38

As noted above, the UCT benefit-to-cost ratio for the commercial/industrial sector was 1.15 in 2022. As compared to 2021, the 2022 program had an increase in therm savings and in participation. Because the program's cost-effectiveness is sensitive to participation rates, this increase in savings was enough to move the program from a 0.64 UCT in 2021 to a 1.15 UCT in 2022.

Program-by-Program Summaries

Commercial/Industrial Site-Specific Program

TABLE 13 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM METRICS

Site-Specific Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		31
Overall kWh Savings		7,216,254
Incentive Spend	$	1,561,657
Non-Incentive Utility Costs	$	391,495
Idaho Energy Efficiency Rider Spend	$	1,953,152
Site-Specific Program Summary – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		2
Overall Therm Savings		19,709
Incentive Spend	$	32,395
Non-Incentive Utility Costs	$	62,849
Idaho Energy Efficiency Rider Spend	$	95,244

Description

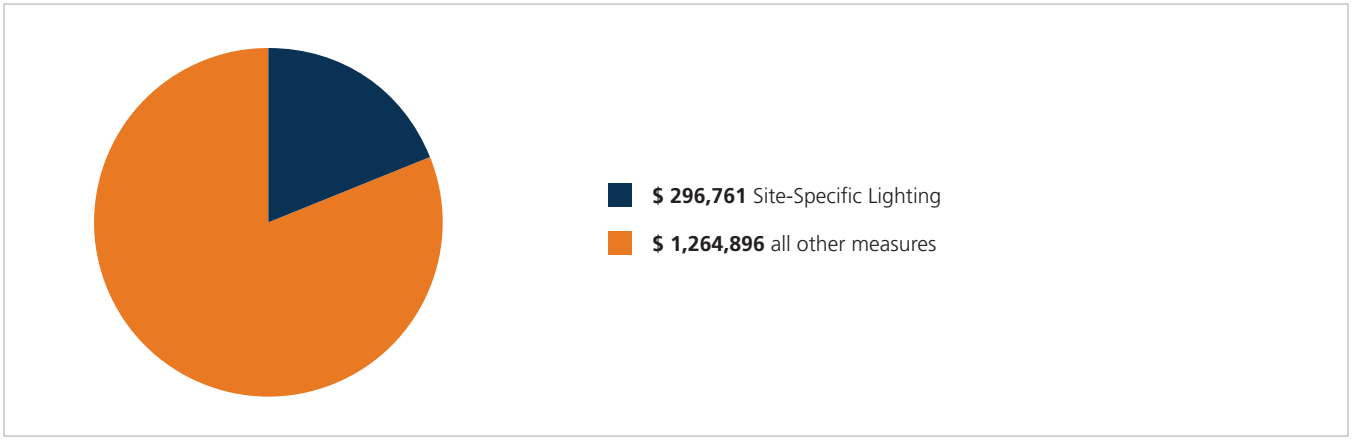
The commercial/industrial energy-efficiency market is delivered through a combination of prescriptive and site-specific offerings. Any measure not offered through a prescriptive program is automatically eligible for treatment through the Site-Specific Program, subject to the criteria for participation in that program. Avista's account executives work with commercial/industrial customers to provide assistance in identifying energy-efficiency opportunities. Customers receive technical assistance in determining potential energy and cost savings as well as identifying and estimating incentives for participation. Site-specific projects include appliances, compressed air, HVAC, industrial process, motors (non-prescriptive), shell, and lighting, with the majority being HVAC, lighting, and shell.

Program Activities

- ***Electric:*** Savings of 7,216,254 kWh, or 48 percent of the overall electric savings. The largest percentage of incentives went to lighting projects (61 percent).
- ***Natural Gas:*** Savings of 19,709 therms.

Measure type and savings are shown in Figure 12.

FIGURE 12 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM INCENTIVE DOLLARS BY MEASURE



Impact Evaluation

Table 14 shows reported and evaluated electric energy savings for Avista's commercial/industrial Site-Specific Program path for the year. The overall Site-Specific Program path had a 104 percent realization rate for electric measures.

TABLE 14 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM IMPACT FINDINGS – ELECTRIC

Program Path	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Site-Specific	6,920,801	7,216,254	104%

Unlike other commercial/industrial programs, completing a census review of all site-specific projects is not feasible. To ensure accurate verified savings estimates, evaluators developed a sample of representative sites to inspect using a stratified random sampling procedure, which is detailed in Appendix A and B. Of 12 projects in the final design sample, evaluators identified minor discrepancies in five, based on information gathered from in-person site visits as well as project documentation review. Table 15 summarizes the reasons for discrepancies between reported and evaluated savings.

TABLE 15 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM EVALUATION SUMMARY OF DISCREPANCIES

Project Type	Number of Occurrences	Savings Impact	Reason(s) for Discrepancy
Site-Specific Lighting	1	↑	Evaluators were unable to fully reconstruct all claimed savings calculations, but it appears that HVAC interactive effects were omitted. These effects were included in verified savings calculations, leading to a slightly high realization rate.
	1	↓	Evaluators were unable to recreate expected savings for (14) 2L F96T12HO-E to (21) 76W LED strips. Verified savings were calculated using actual fixture wattages, verified lighting hours of operation, and deemed HVAC interactive factors specific to the building type and HVAC configuration (Medium Office, ID, >2006 vintage). This resulted in slightly reduced kWh savings.
Replacement of two fixed speed pumps and two VFD controlled pumps	1	↑	The ex-ante assumed only one pump was running and just used north pump data as it was the primary pump during the monitoring period. This assumption is reasonable because the customer reported that only one runs at a time. There were, however, a few instances when the north pump stopped, and the south pump took over and their operation overlapped briefly (which is occasionally expected). Evaluators used the summed percentage amps instead of the north pump percentage amps, which reduced savings slightly (1 percent). The ex-ante also subtracted the standard deviation of the post average power from the overall kW demand reduction, which lowered the realization rate. Evaluators used the average kW values when calculating the kW demand reduction. The kWh realization rate was also affected by the annual operation hours. The ex-ante assumed annual hours of 8,500, but according to the customer on a site visit, the facility has at least one pump running 24 hours a day, seven days a week. Evaluators therefore used 8,760 annual hours, which increased the realization rate by 3 percent.
Replacement of two pulp agitator motors with new VFD controlled motors	1	↑	The ex-ante calculations treated the new agitator as part of the project. The evaluator didn't include the new agitator in the savings calculations since it isn't part of a VFD system upgrade. These changes reduced the overall savings and realization rate. The power factors for the baseline and as-built systems were different in the ex-ante and ex-post analyses. The ex-ante used a 0.772 baseline power factor, based on the assumption that the baseline motor is a DC motor controlled by a DC VFD. The evaluator assumed a constant speed motor baseline with a power factor of 0.85. The ex-ante assumed a 0.98 power factor for the post-install motors, while the evaluator used the motor nameplate power factor. These changes reduced the overall savings and realization rate. The final difference in calculation parameters was the annual hours of operation. The ex-ante assumed 8,500 hours while the evaluator used 8,652 hours, based on the customers' testimony during an on-site visit. This change increased the overall savings and realization rate. The net effect of these discrepancies was essentially balanced, only raising the realization rate by 1 percent.
Older style of log mill line with a new highly efficient log line	1	↑	The ex-ante analysis assumed the 2021 levels of production, while evaluators used an average of the 2018 and 2021 production. Since the 2021 production was higher than 2018 production, the realization rate was high.

In addition to the discrepancies noted previously, ex-ante calculations for all lighting projects assumed an 80 percent chance that lighting would operate during times of peak demand. Evaluators found that multiple projects have lighting fixtures that run continuously, so there is a 100 percent chance of operating during the peak period. The coincidence factor, therefore, was adjusted from 80 to 100 percent for these measures.

For natural gas measures in the Site-Specific Program, evaluators arrived at a realization rate of 213 percent. Because there were only two site-specific gas projects in Idaho in 2022, both were included in the impact evaluation review. Evaluators reviewed all project-related documentation, including spec sheets, building characteristics, calculators, invoices, project photos, and trending data.

TABLE 16 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM IMPACT FINDINGS – NATURAL GAS

Program Path	Reported Savings (Therms)	Evaluated Savings (Therms)	Realization Rate
Site-Specific	9,256	19,709	213%

Of the two projects evaluated, the first, a pool cover install project for a public recreation facility, achieved a realization rate of 100 percent. The second project, a replacement of two inefficient boilers with one efficient boiler, had a realization rate of 284 percent, based on a weather-optimized billing analysis over one year of pre-project billing data and one year of post-project billing data. Measured savings were significantly higher than ex-ante predictions.

Plans for 2023

Avista plans to continue to offer the Site-Specific Program path in Idaho for both electric and natural gas customers in 2023 and will assess the current measurement and verification process to determine whether process improvements need to be made. The company continues to offer the Business Partner Program (BPP), which is designed to reach a larger percentage of small- and medium-sized business customers in our rural service territory, reminding them about the availability of basic scoping energy audits, budget billing plans, and energy-efficiency rebate programs. As part of the BPP, the Trade Ally Bid Program will also continue in 2023. The Trade Ally Bid Program is a collaboration between Avista and its trade ally partners to offer bid assistance for energy-efficiency upgrades.

Commercial/Industrial Prescriptive Lighting Programs

TABLE 17 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM METRICS

Prescriptive Lighting Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		865
Overall kWh Savings		6,416,285
Incentive Spend	$	1,422,501
Non-Incentive Utility Costs	$	356,610
Idaho Energy Efficiency Rider Spend	$	1,779,111

Description

The commercial/industrial Prescriptive Lighting Program is intended to prompt commercial electric customers to increase the energy efficiency of their lighting equipment through direct financial incentives. The program indirectly supports the infrastructure and inventory necessary to ensure that the installation of high-efficiency equipment is a viable option for the customer.

To streamline the process and make it easier for customers and vendors to participate, Avista developed a prescriptive approach in 2004. This program provides for many common retrofits to receive a predetermined incentive amount, which is calculated using a baseline average for existing wattages and the average replacement wattages from the previous year's project data. Energy savings are calculated based on actual customer run times and qualified product lighting data.

This simplified approach makes program participation more accessible, especially for smaller customers and vendors. The measures included in the Prescriptive Lighting Program include fluorescent, incandescent, and HID lamps and fixture retrofits to more energy-efficient LED light sources and controls.

Program Activities

Savings for prescriptive lighting were 6,416,285 kWh, or 51 percent of commercial/industrial electric savings, a slight increase in savings compared to 6,403,076 kWh in 2021.

The increase in exterior lighting projects seen during COVID-19 receded as interior projects, specifically the 4-foot T12/T8 LED lamp replacement measure, achieved a high level of kWh savings in 2022. Although sign lighting, an exterior lighting measure that has generally performed well, saw much lower throughput than in the past, traditionally strong measures continued to achieve a majority of savings again in 2022. Apart from July and September, monthly goals were met and annual savings targets were reached.

FIGURE 13 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM SAVINGS BY MONTH

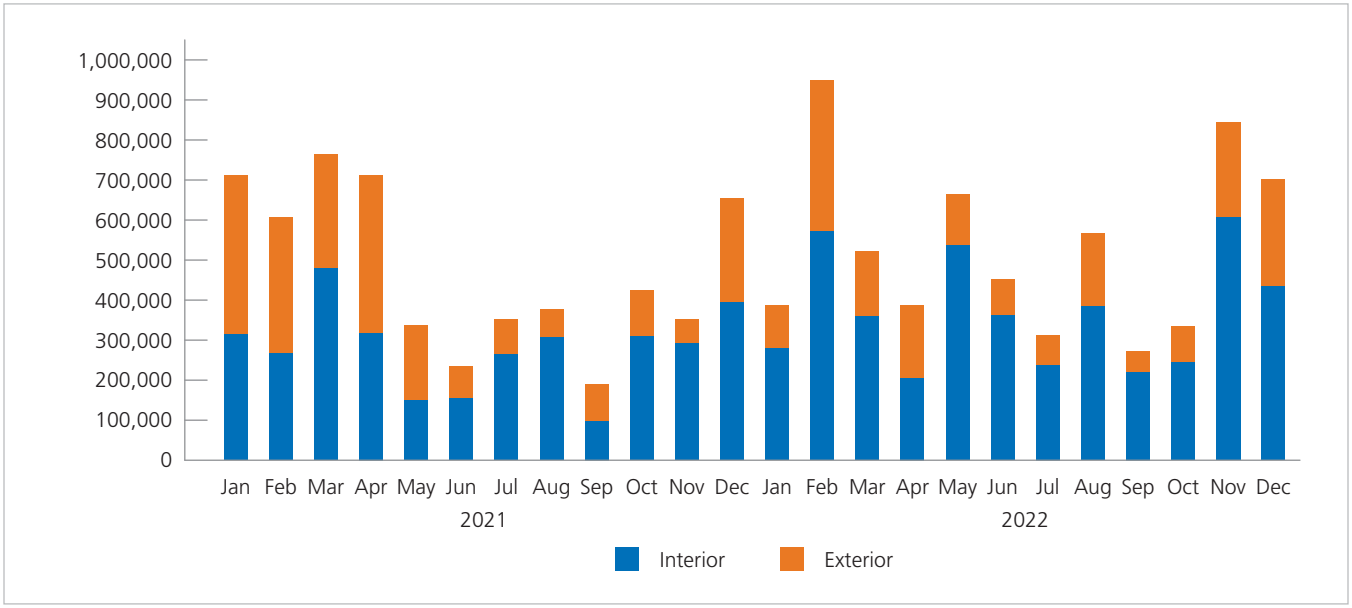


FIGURE 14 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE EXTERIOR LIGHTING PROGRAM KWH SAVINGS BY MEASURE

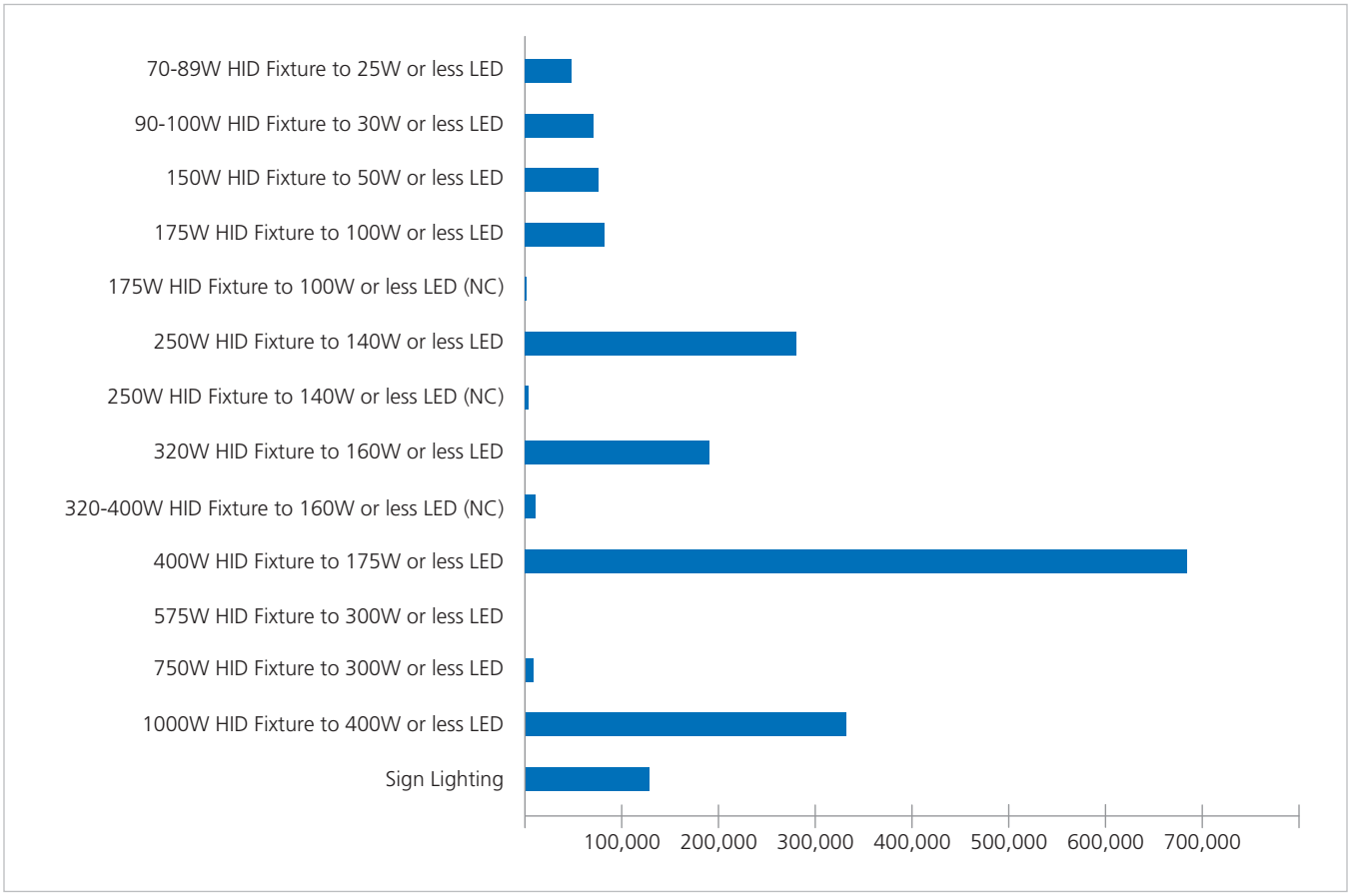
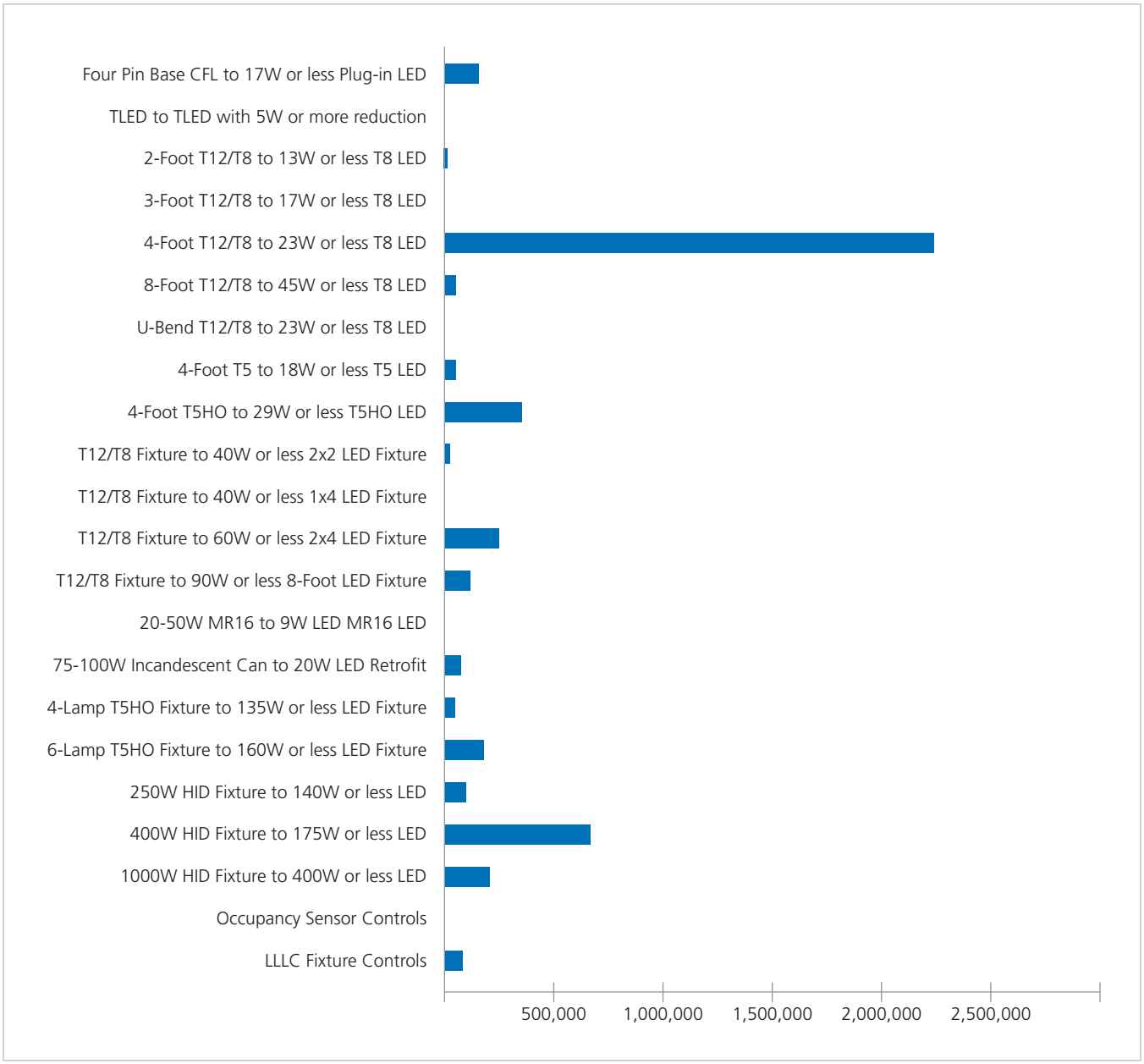


FIGURE 15 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE INTERIOR LIGHTING PROGRAM KWH SAVINGS BY MEASURE



Program Changes

Avista made the following changes to the program in 2022.

TABLE 18 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM CHANGES

2022 Changes to Commercial Lighting Rebates	2021	2022
Exterior Lighting		
Replacement HID Lighting (Pole, Wallpack, or Canopy) Requires at Least 4,288 Hours of Use per Year – Must be DLC or ENERGY STAR-Rated		
70-89W HID Fixture to ≤ 25W LED Fixture or Lamp	$ 70.00	$ 75.00
90-100W HID Fixture to ≤ 30W LED Fixture or Lamp	$ 100.00	$ 100.00
150W HID Fixture to ≤ 50W LED Fixture or Lamp	$ 150.00	$ 160.00
175W HID Fixture to ≤ 100W LED Fixture or Lamp	$ 155.00	$ 160.00
250W HID Fixture to ≤ 140W LED Fixture or Lamp	$ 200.00	$ 200.00
320W HID Fixture to ≤ 160W LED Fixture or Lamp	$ 270.00	$ 250.00
400W HID Fixture to ≤ 175W LED Fixture or Lamp	$ 325.00	$ 330.00
575W HID Fixture to ≤ 300W LED Fixture or Lamp	Site Specific	$ 350.00
750W HID Fixture to ≤ 300W LED Fixture or Lamp	$ 575.00	$ 660.00
1000W HID Fixture to ≤ 400W LED Fixture or Lamp	$ 820.00	$ 825.00
New Construction Fixtures HID Lighting Requires at Least 4,288 Hours of Use per Year – Must be DLC or ENERGY STAR-Rated		
175W Code HID Fixture to ≤ 100W LED Fixture	$ 150.00	$ 150.00
250W Code HID Fixture to ≤ 140W LED Fixture	$ 175.00	$ 195.00
320W Code HID Fixture to ≤ 160W LED Fixture	$ 220.00	$ 220.00
Sign Lighting Retrofit – Requires at Least 4,288 Hours of Use per Year		
T12 to LED Sign Lighting – per square foot	$ 10.00	$ 11.00

2022 Changes to Commercial Lighting Rebates	2021	2022
Interior Lighting		
Replacement Lamps – Must Be DLC-Rated		
T12/T8 Fluorescent to ≤ 13W T8 2-Foot TLED	$ 15.00	$ 7.50
T12/T8 Fluorescent to ≤ 17W T8 3-Foot TLED	$ 15.00	$ 10.00
T12/T8 Fluorescent to ≤ 23W T8 4-Foot TLED	$ 13.50	$ 12.50
T12/T8 Fluorescent to ≤ 45W T8 5-Foot TLED	$ 12.00	$ 23.00
T12/T8 Fluorescent to ≤ 23W T8 U-Bend TLED	$ 16.00	$ 13.50
T5HO Fluorescent to ≤ 29W T5HO 4-Foot TLED	$ 22.00	$ 25.00
T5 Fluorescent to ≤ 18W T5 4-Foot TLED	Site Specific	$ 14.00
T8/T5 TLED to TLED (≥ 5W reduction)	$ 4.00	$ 4.00
Four Pin-Base CFL to Four Pin Plug-in LED	Site Specific	$ 15.00
20-50W MR16 to ≤ 9W MR16 LED	$ 8.50	$ 8.50
Replacement Fixtures – Must Be DLC-Rated		
T12/T8 to ≤ 60W 2X4 LED Fixture	$ 45.00	$ 55.00
T12/T8 to ≤ 40W 2x2 LED Fixture	$ 30.00	$ 30.00
T12/T8 to ≤ 40W 1x4 LED Fixture	$ 30.00	$ 35.00
T12/T8 to ≤ 90W 8-Foot LED	Site Specific	$ 55.00
4-Lamp T5HO Fluorescent to ≤ 135W LED	Site Specific	$ 85.00
6-Lamp T5HO Fluorescent to ≤ 160W LED	$ 215.00	$ 185.00
250W HID to ≤ 140W LED Fixture or Lamp	$ 195.00	$ 235.00
400W HID to ≤ 175W LED Fixture or Lamp	$ 250.00	$ 285.00
1000W HID to ≤ 400W LED Fixture or Lamp	$ 565.00	$ 450.00
75-100W Incandescent Can to ≤ 20W LED Retrofit Fixture	$ 40.00	$ 50.00
Controls		
Occupancy Sensor Controls with Built-in Relays (no wall switch)	$ 40.00	$ 40.00
DLC Qualified LLLC Fixture	$ 150.00	$ 70.00

Marketing

Key to the success of the Prescriptive Lighting Program is clear communication to lighting supply houses, distributors, electricians, and customers regarding incentive requirements and forms. The Avista website communicates program requirements and highlights opportunities for customers. In addition, the company's regionally based account executives play an integral role in delivering the prescriptive lighting program to commercial/industrial customers. Any changes to the program typically include 120 days' advance notice to allow customers to submit applications for incentives under the old requirements and/or incentive levels if desired. This usually includes – at a minimum – direct email communication to trade allies as well as website updates.

Impact Evaluation

TABLE 19 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM IMPACT FINDINGS – ELECTRIC

Program Type	Reported Saving (kWh)	Evaluated Savings (kWh)	Realization Rate
Prescriptive Lighting	6,416,259	6,416,285	100%

Recommendations

Within the Prescriptive Lighting Program, evaluators recommend collecting space HVAC configuration information and using interactive HVAC effects factors when calculating prescriptive lighting savings for interior spaces.

Plans for 2023

With the more sophisticated measure-level detail in iEnergy, Avista has been able to update lighting measures annually to reflect market conditions, including adding new measures that were typically paid for through the Site-Specific Program. Some refinement to the program is anticipated in 2023 as the company plans to use increased incentive calculations ($0.26/kWh) for deemed amounts.

Avista will continue to be flexible in making midyear changes as needed to further encourage program participation and will review the impacts of the new Small Business Lighting Program (see program description on page 90). Additionally, Avista plans to increase customer self-service by launching a web interface that allows customers to submit their incentive applications. Finally, Avista will consider collecting space HVAC configuration information to inform HVAC interactive effects, while considering how to balance the accuracy of savings with the ease of customer and contractor participation in the program.

Commercial/Industrial Prescriptive Non-Lighting Programs

TABLE 20 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM METRICS

Prescriptive Non-Lighting Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		13
Overall kWh Savings		75,625
Incentive Spend	$	11,764
Non-Incentive Utility Costs	$	2,949
Idaho Energy Efficiency Rider Spend	$	14,713
Prescriptive Non-Lighting Program Summary – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		33
Overall Therm Savings		18,252
Incentive Spend	$	41,390
Non-Incentive Utility Costs	$	80,300
Idaho Energy Efficiency Rider Spend	$	121,690

Description

Commercial Food Service Equipment Program – The Commercial Food Service Equipment Program encourages customers to purchase energy-efficient equipment either as a replacement for existing equipment or as a new product to support food service activities. To meet eligibility requirements, customers must install equipment that meets efficiency requirements and utilizes an Avista-provided fuel. For equipment that requires hot water heat, Avista must provide that heat source for eligibility. This program offers a variety of electric and natural gas food service equipment. Customers who meet the requirements must submit rebate paperwork within 90 days of project completion. Incentives are disbursed after receipt of documentation and verification of equipment eligibility.

Compressed Air Line Isolation Program – The Compressed Air Line Isolation Program was developed to offer a prescriptive path for Avista electric customers with a 15 horsepower (HP) or greater rotary screw compressor. It offers direct installation of a compressed air leak reduction device. Energy savings are generated by reducing the impact of compressed air leaks during off-hour periods. Customers can work with compressed air contractors to do a two-week pre-logging of compressed air systems, install a line isolation device, and complete the project with a two-week post-logging. After logging is complete, a site report is presented that summarizes the kWh savings and includes photos of actual installation (including nameplate), invoices, and a completed rebate form. Incentives are paid to the contractor with no cost to the customer. In mid 2022, a measure was added to this program for compressed air leak detection. A preliminary acoustic imaging detector audit provides a report of leaks, leaks are repaired, and a second audit is done to verify that leaks have been repaired. The Leak Q report is submitted with the rebate form and an incentive is paid for kWh savings.

Commercial Natural Gas HVAC – The Commercial Natural Gas HVAC Program encourages Avista commercial natural gas customers to save energy by choosing to install energy-efficient natural gas furnaces and boilers. It offers seven different equipment types that customers may select from to best fit their business needs and save energy dollars. Incentives are paid by the input kBtu and the efficiency of the equipment selected. Customers must submit rebate forms with proof of purchase invoices and AHRI certificates within 90 days of project completion. Incentives are disbursed after receipt of documentation and verification of eligibility.

Green Motors Rewind – The Green Motors Rewind Program offers Avista commercial electric customers an instant rebate on their service center invoice for a green rewind of an existing motor. Qualifying motors must fall between 15 and 5,000 HP and be used in an industrial capacity. The program pays $1 per HP to the service center and another $1 per HP off the invoice for the customer. Green Motors Practices Group is the third party that manages this program for the region and is paid an administrative fee of $.05 per kWh savings per customer rewind. Program participation is presented monthly by Green Motors Practices Group in the form of an invoice accompanied by detailed service center information per project.

Fleet Heat – The Fleet Heat Program is provided to Avista commercial electric customers who use uncontrolled block heaters to keep fleet engines warm when their vehicles are not running during the colder climate months – typically from the end of October to the end of March. This program offers a product that provides an engine-mounted remote thermostat with an ambient temperature thermostat in a Twinstat cord to maximize energy efficiency. Upon receiving the rebate form, Avista will order cords from Hotstart based on the information provided on the form and deliver the cords to the customer. The customer is responsible for the installation of the cords and the initial payment to Hotstart. After installation verification, Avista refunds the customer's Twinstat cord costs.

Commercial Grocer – The Commercial Grocer Program is offered to Avista commercial electric customers with a range of retrofit energy savings measures associated with commercial refrigeration. The incentives within this program offer specific measures that can be installed and applied for after project completion. Customers may install any of the eligible measures – display case lighting, motors, controls, strip curtains, gaskets – and then apply for an incentive by submitting a rebate form with associated invoicing and providing proof of purchase and installation. Incentives are disbursed after receipt of documentation and verification of eligibility.

Commercial VFD Retrofit – The Commercial Variable Frequency Drive Retrofit Program offers incentives to customers to increase the energy efficiency of their HVAC fan or pump applications with a variable frequency drive. Installing a VFD on an existing unit of equipment enables that equipment to be more energy efficient. This program is available for Avista commercial electric customers. The incentive is calculated at $200 per HP of the motor the VFD is installed on. Post-installation verification is required before payment may be issued for all VFD projects. Customers may apply for this incentive after they install a VFD on an existing piece of eligible equipment and submit required documentation. Incentive disbursement will be processed after an installation inspection has occurred.

Commercial Pay for Performance – The Commercial Pay for Performance is an incentive program that pays customers for actual energy savings at the meter. Energy savings can come from building retrofits and equipment upgrades as well as from behavioral, operations and maintenance, and retro-commissioning activities. Pay for Performance pays annual incentives for all electricity/natural gas saved, rather than separate incentives for individual measures. Qualifying customers who implement whole-building energy retrofits will receive a set incentive rate for measurable savings that are achieved over the course of three years, with incentive payments made at the end of each year. Incentives are paid at .08 per kWh and 1.25 per therm. This program is available for any Avista commercial customers who own or operate buildings with at least 20,000 square feet of heated or cooled space and have consistent and measurable energy usage. Each building must have stable energy use over the past year and be metered separately, preferably with interval meters. To be eligible for this program, customers must identify planned improvements with savings of at least 10 percent of the building's baseline kWh or therm consumption. Manufacturing/Industrial processes are excluded from this program but may be eligible under the site-specific path. Customers submit a completed rebate form, and Avista establishes a usage baseline, approves the projects, and sends a contract for the project. After improvements are implemented, savings are measured against the baseline, and payments are made annually for three years if savings are met.

Program Activities

- ***Electric:*** Savings of 75,625 kWh, a decrease of 17 percent compared to 91,163 kWh in 2021.
- ***Natural Gas:*** Savings of 18,252 therms, a decrease of 12 percent compared to 20,725 therms in 2021.

FIGURE 16 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM INCENTIVE DOLLARS BY MEASURE – ELECTRIC

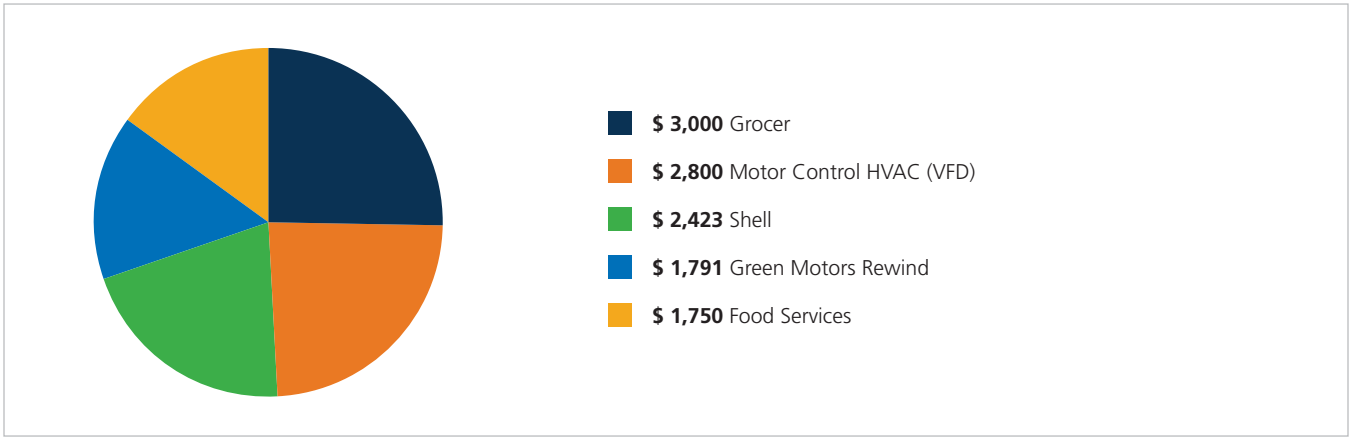
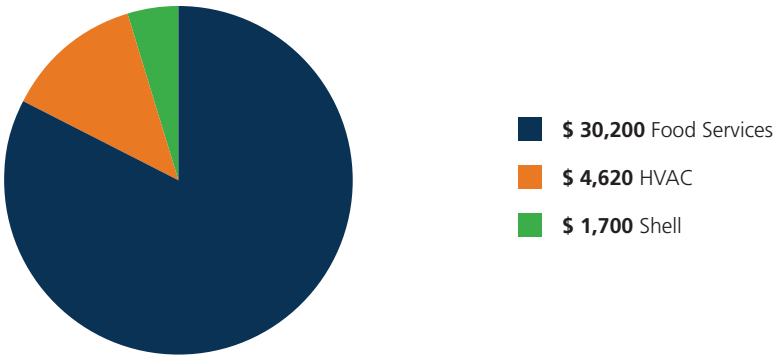


FIGURE 17 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM
INCENTIVE DOLLARS BY MEASURE – NATURAL GAS



Program Changes

In 2022, a few changes were made to the Commercial Food Service Equipment Program and several more were made to the Commercial Grocer Program. Please see Table 21 for changes that occurred as of January 2022. A leak detection measure was added to the Commercial Compressed Air Program midway through the year. An entirely new Pay for Performance Program was also added to Avista's prescriptive program offerings for commercial/residential customers. Launched in the fall, the program saw no completed projects in 2022, but multiple projects are expected to be completed in 2023.

TABLE 21 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM REBATE CHANGES

2022 Changes to Prescriptive Non-Lighting Rebates	2021	2022	Notes
Commercial Food Service Equipment Program			
4 Pan Electric and Natural Gas Steamer	$ 1,700	$ 1,300	Measure Decrease
6 Pan Electric and Natural Gas Steamer	$ 2,600	$ 2,200	Measure Decrease
7-12 Pan Electric and Natural Gas Steamer	$ 3,200	$ 2,488	Measure Decrease
Electric Convection Oven	$ 220	$ 200	Measure Decrease
Ice Machines 799 lbs/day and under	$ 160	0	Measures Removed
Ice Machines 800 lbs/day and over	New	$ 200	Measures Added
Commercial Grocer Program			
LT Case: T12 to LP LED Inside Lamp	$ 10	$ 15	Measure Increase
MT Case: T12 to LP LED Inside Lamp	$ 10	$ 15	Measure Increase
T12 to LP LED Outside Lamp	$ 7	$ 15	Measure Increase
T8 to LP LED Outside Lamp	$ 7	$ 15	Measure Increase
MT Case: 2 T8 to 1 High Power LED Inside Lamp	$ 18	$ 20	Measure Increase

2022 Changes to Prescriptive Non-Lighting Rebates	2021	2022	Notes
MT Case 2 T12 to 1 High Power LED Inside Lamp	$ 18	$ 20	Measure Increase
LT Case: 2 T8 to 1 High Power LED Inside Lamp	$ 18	$ 20	Measure Increase
LT Case: 2 T12 to 1 High Power LED Inside Lamp	$ 18	$ 20	Measure Increase
MT Case: 2 T8 to 1 High Power LED Outside Lamp	$ 10	$ 15	Measure Increase
MT Case: 2 T12 to 1 High Power LED Outside Lamp	$ 10	$ 15	Measure Increase
Strip Curtains	$ 5	$ 10	Measure Increase
20W ECM replacing 20W Shaded Pole	New	$ 100	Measure Added
20W ECM replacing 1/20HP Shaded Pole	New	$ 100	Measure Added
20W ECM replacing 1/15HP Shaded Pole	New	$ 100	Measure Added
20W ECM replacing 1/20HP Permanent Split Capacitor	New	$ 100	Measure Added
20W ECM replacing 1/15HP Permanent Split Capacitor	New	$ 100	Measure Added
1/20HP ECM replacing 1/20HP Shaded Pole	New	$ 100	Measure Added
1/20HP ECM replacing 1/15HP Shaded Pole	New	$ 100	Measure Added
1/20HP ECM replacing 1/15HP Permanent Split Capacitor	New	$ 100	Measure Added
1/15HP ECM replacing 1/20HP Shaded Pole	New	$ 100	Measure Added
Medium Temp ECM replacing Shaded Pole 9W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Shaded Pole 10-15W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Shaded Pole 16-20W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Shaded Pole 20+W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Permanent Split Capacitor 9W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Permanent Split Capacitor 10-15W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Permanent Split Capacitor 16-20W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Permanent Split Capacitor 20+W output power	New	$ 50	Measure Added
Medium Temp PMSM replacing Shaded Pole 9W output power	New	$ 50	Measure Added
Medium Temp PMSM replacing Shaded Pole 10-15W output power	New	$ 50	Measure Added
Medium Temp PMSM replacing Permanent Split Capacitor 9W output power	New	$ 50	Measure Added
Medium Temp PMSM replacing Permanent Split Capacitor 10-15W output power	New	$ 50	Measure Added
Low Temp ECM replacing Shaded Pole 9W output power	New	$ 50	Measure Added
Low Temp ECM replacing Shaded Pole 10-15W output power	New	$ 50	Measure Added
Low Temp ECM replacing Shaded Pole 16-20W output power	New	$ 50	Measure Added
Low Temp ECM replacing Shaded Pole 20+W output power	New	$ 50	Measure Added

2022 Changes to Prescriptive Non-Lighting Rebates	2021	2022	Notes
Low Temp ECM replacing Permanent Split Capacitor 9W output power	New	$ 50	Measure Added
Low Temp ECM replacing Permanent Split Capacitor 10-15W output power	New	$ 50	Measure Added
Low Temp ECM replacing Permanent Split Capacitor 16-20W output power	New	$ 50	Measure Added
Low Temp ECM replacing Permanent Split Capacitor 20+W output power	New	$ 50	Measure Added
Low Temp PMSM replacing Shaded Pole 9W output power	New	$ 50	Measure Added
Low Temp PMSM replacing Shaded Pole 10-15W output power	New	$ 50	Measure Added
Low Temp PMSM replacing Permanent Split Capacitor 9W output power	New	$ 50	Measure Added
Low Temp PMSM replacing Permanent Split Capacitor 10-15W output power	New	$ 50	Measure Added
Walk-In Cooler Evaporator Fan Motor 20W Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 20W Shaded Pole to 1/20HP ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/20HP Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/20HP Shaded Pole to 1/20HP ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/20HP Shaded Pole to 1/15HP ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/15HP Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/15HP Shaded Pole to 1/20HP ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/15HP Shaded Pole to 1/15HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 20W Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 20W Shaded Pole to 1/20HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/20HP Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/20HP Shaded Pole to 1/20HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/20HP Shaded Pole to 1/15HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/15HP Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/15HP Shaded Pole to 1/20HP ECM	New	$ 100	Measure Added

2022 Changes to Prescriptive Non-Lighting Rebates	2021	2022	Notes
Walk-In Freezer Evaporator Fan Motor 1/15HP Shaded Pole to 1/15HP ECM	New	$ 100	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Medium Temp >44W – 2 or more motors/controller	New	$ 50	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Medium Temp 24-43W – 2 or more motors/controller	New	$ 50	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Low Temp >44W – 3 or more motors/controller	New	$ 50	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Low Temp 24-43W – 3 or more motors/controller	New	$ 50	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Medium Temp ≤23W – 5 or more motors/controller	New	$ 50	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Low Temp ≤23W – 7 or more motors/controller	New	$ 50	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Medium Temp >44W – 1 or 2 motors/controller	New	$ 50	Measure Added
Evaporator Fan ECM Motor Controller Walk-In Low Temp >44W – 1 or 2 motors/controller	New	$ 50	Measure Added

Marketing

Avista account executives market these programs, as do external trade allies. All commercial programs are also featured on the Avista efficiency website.

Impact Evaluation

Electric: Table 22 shows the reported and evaluated electric energy savings for Avista's commercial/industrial Prescriptive Non-Lighting Program path, as well as the realization rates between the evaluated and reported savings for 2022. The overall program path achieved a 100 percent realization rate for electric programs.

TABLE 22 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM IMPACT FINDINGS – ELECTRIC

Program Type	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
HVAC	14,308	14,308	100%
Food Service Equipment	10,532	10,537	100%
Grocer	36,468	36,468	100%
Shell	4,490	4,490	100%
Green Motors	9,822	9,822	100%
Commercial/Industrial Total	**75,620**	**75,625**	**100%**

Natural Gas: Prescriptive programs also achieved a realization rate of 100 percent.

TABLE 23 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM IMPACT FINDINGS – NATURAL GAS

Program Type	Reported Savings (Therms)	Evaluated Savings (Therms)	Realization Rate
HVAC	5,082	5,082	100%
Food Service Equipment	12,910	12,910	100%
Shell	260	260	100%
Commercial/Industrial Total	**18,252**	**18,252**	**100%**

Recommendations

Evaluators offered the following recommendations to improve realization rates for prescriptive programs:

- Within the HVAC Program, when collecting measure information for boiler measures, evaluators recommend collecting information about the type of facility where the retrofit is occurring (grocery, restaurant, and lodging; medical – hospital and outpatient; or all other) to allow for measure savings assessment using RTF materials.
- Within the Grocer Program, when collecting measure information for energy conservation measures, evaluators recommend collecting information about the motor power of the baseline motor.

Plans for 2023

Avista will reassess all program measures and incentive levels in 2023 and will consider the above recommendations as HVAC and Grocer Program measures migrate to the new Midstream Program.

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Twin Lakes, Idaho

RESIDENTIAL SECTOR

Overview

Avista's residential sector portfolio is composed of several approaches that encourage customers to consider energy-efficiency improvements within their homes. Prescriptive rebate programs are the main component of the portfolio and are augmented by a variety of additional interventions, including select distribution of low-cost lighting and weatherization materials, direct-installation programs, and a multifaceted, multichannel outreach and customer engagement effort.

Nearly $2 million in rebates and direct customer benefits were provided to Idaho residential customers to offset the cost of implementing these energy-efficiency measures in 2022. All programs within the residential sector portfolio combined contributed 1,134 MWh and 266,415 therms to the annual energy savings.

TABLE 24 – RESIDENTIAL SAVINGS BY PROGRAM

Residential	Electric Savings (kWh)	Natural Gas Savings (Therms)
Water Heating	27,769	28,408
HVAC	517,702	216,236
Shell	137,338	20,360
Fuel-Efficiency	326,625	–
ENERGY STAR Homes	55,400	–
Multifamily/Small Home Weatherization	18,754	955
Appliances	32,467	457
Multifamily Direct Install	17,478	–
Residential Total	**1,133,532**	**266,415**

Marketing

Meeting customers where they are, with information that's valuable to them, drives Avista's marketing strategies to increase awareness of and engagement with its energy-efficiency programs and resources. In 2022, the company's energy-efficiency campaigns underwent a creative refresh. Existing channels – including bill inserts, print and electronic newsletters, email, and social media – continued to expand education and program awareness. Digital tactics were expanded to reach additional audiences.

Over the course of the year, 67 separate posts about energy-efficiency education and programs were shared on Avista's Facebook page, generating over 175,940 impressions and a reach of over 172,250. Content focused on energy-saving tips and tools to help customers manage their use. Energy-saving tips and information were also shared in the company's print and electronic newsletter nine out of 12 months.

Seasonal energy-saving material was shared throughout the year, with summer cooling tips promoted on social media, in Avista's newsletter, and via direct email outreach. Avista updated its winter heating campaign, providing cold weather energy-saving tips to customers via bill insert, newsletter, print advertising, social media, direct email, and digital advertising. Digital ads and website content were translated into Spanish. This campaign exceeded 8,745,000 total impressions.

FIGURE 18 – RESIDENTIAL REBATES SUMMER BILL INSERT

FIGURE 19 – RESIDENTIAL ENERGY-EFFICIENCY PRINT ADS

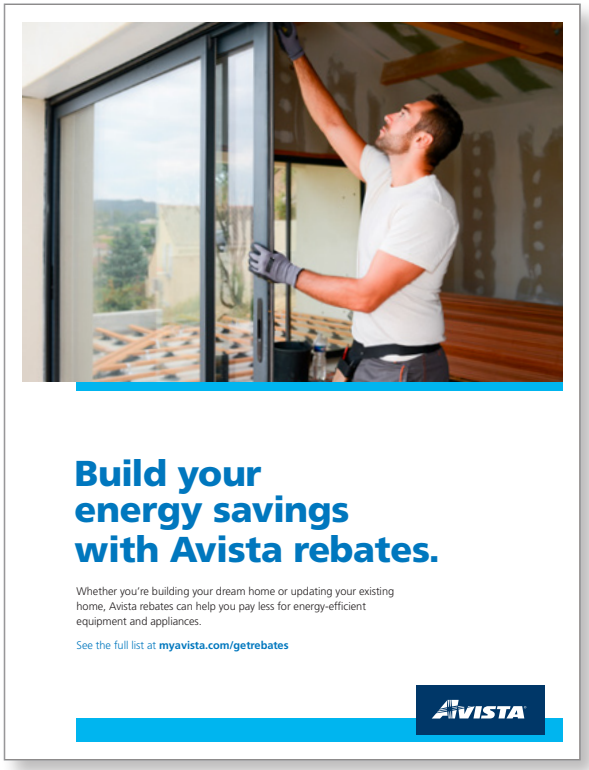

FIGURE 20 – RESIDENTIAL BEAT THE HEAT STAY COOL AND SAVE ENERGY THIS SUMMER EMAIL

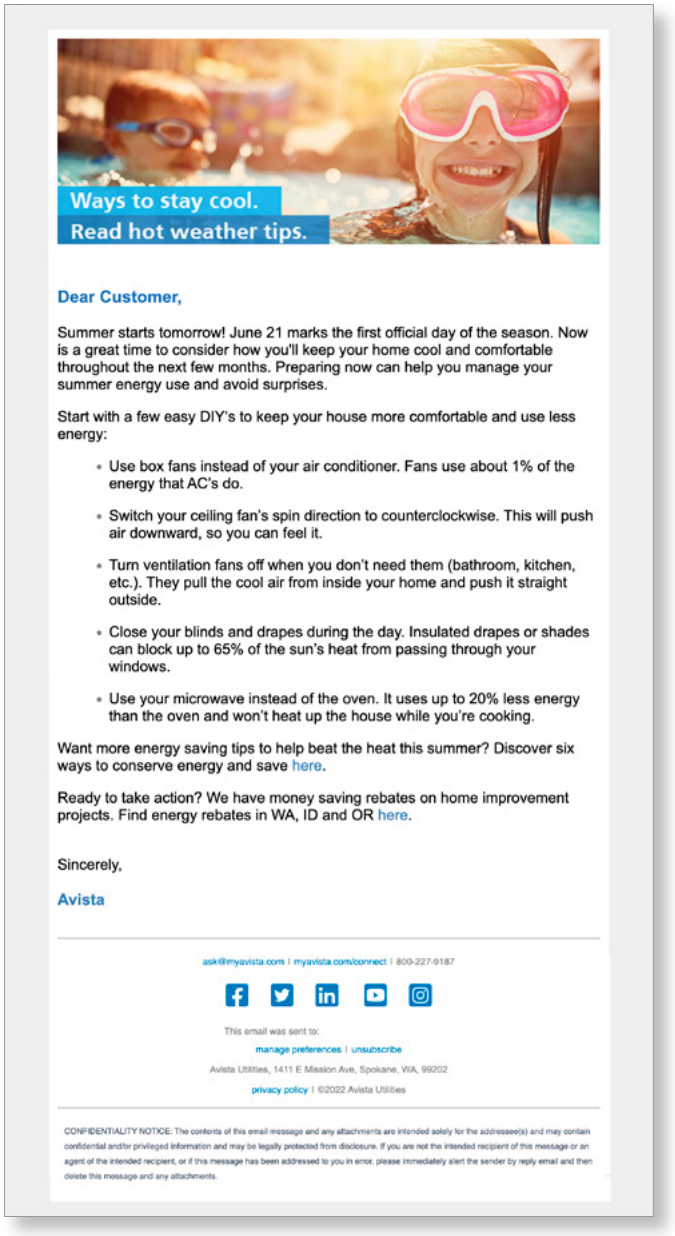

FIGURE 21 – RESIDENTIAL SUMMER BILL FACEBOOK POST

FIGURE 22 – RESIDENTIAL JULY 2022 CONNECTIONS NEWSLETTER

AVISTA

Connections

July 2022 | Washington | Idaho

Ways to save

It's home improvement season here in the northwest.

It's time for increasing not only your home's value, but also your family's comfort and enjoyment. But there's another reason to consider an upgrade or two. On average, nearly half of residential energy bills go into heating and cooling your home. Which means that every improvement you make now can have a long-term impact on your energy use.

And with our energy-efficiency rebates, you'll save even more. Like getting $4 per square foot back on new windows, $400 on a tankless natural gas water heater, or $1,000 when you switch your electric furnace to an air-source heat pump. You can even get $150 back when you install a smart thermostat—one of the easiest ways to get a handle on your energy use.

Whether you're remodeling or just looking to use less energy, check out our complete list of energy efficiency rebates and tips at myavista.com/waytosave.

Beat the heat

Summer is right around the corner and before you know it, the sun will be beating down on your house. Now is the perfect time to plan how you'll keep your home cool and comfortable over the next few months. Early preparation will help you manage your energy use and avoid surprises on your bill.

There are lots of ways to keep the sun's heat out of your house. Simple adjustments and low or no-cost do-it-yourself projects can make a noticeable difference. Getting started is easy. Here are some quick tips to save energy.

- Use box fans before turning on your air conditioner. Fans use about 1% of the energy that AC's do.
- Switch your ceiling fan's spin direction to counterclockwise. This will push air downward, so you can feel it.
- Turn ventilation fans off when you don't need them (bathroom, kitchen, etc.). They pull the cool air from inside your home and push it straight outside.
- Set your thermostat at 78°. Each degree above that can save 3% on your cooling bill.
- Close your blinds and drapes during the day. Insulated drapes or shades can block up to 65% of the sun's heat from passing through your windows.
- Use your microwave instead of the oven. It uses up to 20% less energy than the oven and won't heat up the house while you're cooking.
- Barbeque outside. Summer barbeques are fun and don't heat up the inside of your house.
- Hang laundry outside to dry. Avoiding the dryer will save energy and keep your house cooler.
- Landscape with shade trees or vines. Reduce the amount of heat entering your home on south-facing sides. Remember to call 811 before you dig.
- Check your insulation levels. Proper attic, wall and crawlspace insulation will keep

Continued on back»

Continued from front

Beat the heat

hot air out and cool air in.

Want more energy saving tips to help beat the heat this summer? We've got you covered with lots of DIY videos and ideas by visiting myavista.com/askanexpert.

Got a larger project in mind? Check out our energy efficiency rebate options to see how we may be able to save you some money. Learn more at myavista.com/getrebates.

Staying cool and comfortable this summer doesn't have to cost a lot or be difficult.

Know what's below

Before you break ground with a shovel, auger or other equipment, call 811 at least two business days before you dig—it's the law. A utility representative will come mark the approximate location of your buried utility lines. The service is free for Avista residential customers. Privately-owned lines can be located for a fee.

Call 811 before you dig checklist

Never disturb the ground until you complete these steps:

- Use white paint to mark the zone where you plan to dig.
- Call 811 and wait for the utility representative to mark the facilities owned by Avista.
- Maintain and respect these locate marks.
- If your located ticket expires, you must call in for a new locate.
- Hand dig within the 24-inch tolerance zone to expose the marked utility.

If you damage, hit or nick an electric or natural gas line, immediately notify Avista customer service at (800) 227-9187. If you damage a pipeline and natural gas is escaping, DO NOT FOLD OVER THE PIPE to seal the leak. Static charge can ignite the gas. Walk upwind a safe distance away, then call 911 and Avista.

Visit myavista.com/811 for additional information.

Ground mark identification

Ground markings are in different colors to indicate the locations and types of utility facilities buried below. Valid periods for locate marks are: WA – 45 days; ID – 21 days. If anyone digs after the listed times, they are digging with an invalid ticket.

Do you need help paying your bill?

We have options.

We understand that there may be instances when customers find themselves facing financial difficulties. Avista partners with community agencies to provide financial assistance, plus we offer other services to help you manage and pay your bill such as **Comfort Level Billing, Preferred Due Date,** and **Payment Arrangements**.

We're here to help. Please call us at (800) 227-9187 to discuss your options with a Customer Service Representative or for more information visit myavista.com/assistance.

Wildfire season is here

Learn how Avista is prepared for wildfire season and how you can be ready too at myavista.com/wildfire.

Get more information on keeping your property safe from wildfire at idahofirewise.org in Idaho and wildfireready.com in Washington.

Connect with us

Mailing Address: 1411 E. Mission, PO Box 3727, Spokane, WA 99220-3727

Toll-Free: (800) 227-9187 | Web Site: myavista.com | Email: ask@myavista.com

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AVISTA

FIGURE 23 – RESIDENTIAL WINTER BILL INSERT

FIGURE 24 – RESIDENTIAL NOVEMBER 2022 CONNECTIONS NEWSLETTER

AVISTA

Connections

November 2022 | Washington | Idaho

Save energy and money with rebates

Are you considering home improvements to help reduce your energy use? We can help offset the cost of energy-efficient equipment and upgrades that will help you stay comfortable and save energy. Thinking about new windows, a new furnace, or adding insulation? We've got a rebate for that. You can also save on water heaters, heat pumps, smart thermostats and more.

See all of our energy-efficiency rebates at myavista.com/getrebates.

How cold weather impacts home energy use

Have you felt the need to bundle up lately?

Winter is just around the corner and your house is feeling that chill, too. When it gets cold outside, your home has to use more energy to stay warm, even if you don't touch its thermostat. Homes use more energy this time of year because they cool down quicker—much like a cup of coffee.

In the summer, a warm cup of coffee will stay warm for quite some time, even if placed outside. If placed outside during the winter though, it will cool down rather quickly. So, as the temperature outside drops and your house struggles to retain heat, its heating system has to run more frequently and for longer periods of time. This causes its energy use to spike, which you likely notice between October and February or March.

The cost of heating your home can account for 40% to 60% of your monthly winter energy bill, but there are easy ways to help manage that energy use and maintain comfort.

Use this handy checklist to get started:

- **Check fireplace dampers** – When not in use, a chimney with an open damper can allow up to 25% of the heated air in your house to escape.

Continued on other side»

Continued from front

How cold weather impacts home energy use

- **Change furnace filter and remove buildup on baseboard heaters** – Dust and debris will block heat transfer, so even if your heater clicks on, your room will not warm up efficiently. Our Furnace Filter Replacement Program can help ensure you never forget to replace your filter again.
- **Adjust thermostat** – Set your thermostat in the winter to 68°. Reducing the temperature below that by just three degrees can result in a 10% reduction of energy used for heating.
- **Check water heater** – Water heating can account for nearly 14% of your monthly energy use and is often the second largest source of consumption in your home.
- **Seal drafts and leaks** – Use items like window plastic, caulk, and weather stripping to keep the warm air in and the cold air out. If upgrading your insulation, we may have a rebate available to help.

For more winter energy-saving tips, visit myavista.com/winterbill.

Do you need help paying your bill?

We understand that there may be instances when customers find themselves facing financial difficulties. Avista partners with community agencies to provide financial assistance, plus we offer other services to help you manage and pay your bill such as **Comfort Level Billing, Preferred Due Date,** and **Payment Arrangements**.

We're here to help. Please call us at (800) 227-9187 to discuss your options with a Customer Service Representative or for more information, visit myavista.com/assistance.

We have options.

Be alert to invisible carbon monoxide

Natural gas is the cleanest burning fossil fuel available. But if natural gas isn't burned properly, say, because of a faulty furnace, it can emit carbon monoxide (CO), a colorless, odorless gas that can cause flu-like symptoms and even death. Be alerted when CO is present. Install a UL-listed carbon monoxide detector.

We just want you to be safe. Visit us at myavista.com/safety for more information.

Connect with us

Mailing Address: 1411 E. Mission, PO Box 3727, Spokane, WA 99220-3727
Toll-Free: (800) 227-9187 | Web Site: myavista.com | Email: ask@myavista.com

AVISTA

FIGURE 25 – RESIDENTIAL WINTER BILL GOOGLE DISPLAY ADS

FIGURE 26 – RESIDENTIAL WINTER BILL VIDEO

FIGURE 27 – RESIDENTIAL WINTER BILL PRINT AD, SPANISH

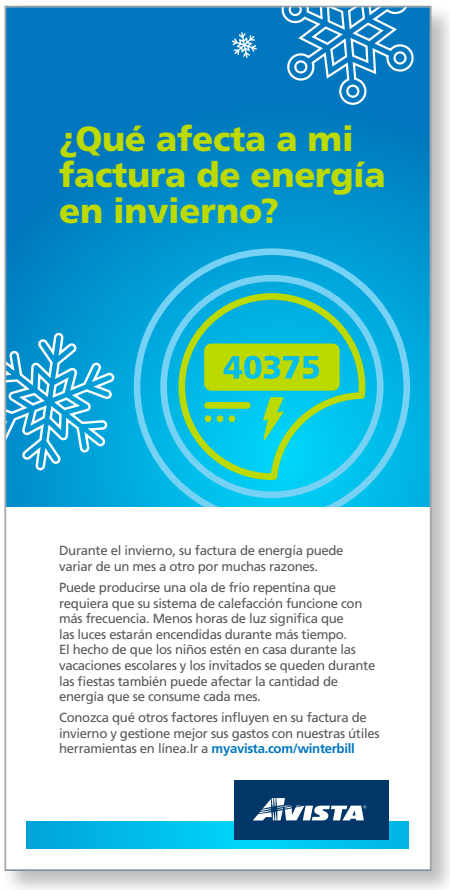


FIGURE 28 – RESIDENTIAL WINTER BILL GOOGLE DISPLAY ADS, SPANISH

FIGURE 29 – RESIDENTIAL WINTER BILL VIDEO, SPANISH

At Home with Lisa

Many Avista customers live in older homes with energy-efficiency challenges. In 2020, the company partnered with Lisa, an Avista customer who bought her 1910 house because she loved the old-world character – and then quickly discovered it wasn't very energy-friendly. She attended an Avista energy fair and discovered how easy implementing some efficiency measures can be. Lisa began writing weekly features sharing her experience with simple do-it-yourself projects around her house that help improve her energy use and comfort. Most of Lisa's articles focus on low- or no-cost energy-saving tips that customers can do on their own, regardless of their home's fuel type or heating system. Titled "At Home with Lisa," her articles are hosted on Avista's website at the Connections blog. They're also shared on Avista's social media pages.

In 2022, 43 separate "At Home with Lisa" weekly blogs were posted on myavista.com and were viewed 8,922 times. On social media, Lisa posts were shared during 38 separate weeks, generating over 105,530 impressions and a reach of over 103,630. After receiving positive reactions from customers about Lisa's content and storytelling, Avista looked to expand her reach, hoping to influence similar customers to act. Avista expanded the "At Home with Lisa" series to a digital campaign, utilizing static ads and short videos, as well as a bill insert, social media posts, and a newsletter article. In the videos, Lisa walks viewers through the simple DIY projects she is completing in her effort to reduce her home energy use and improve comfort. Projects include everything from thermostat control to mail slot fixes, hot water heater wrap to window plastic, door sweeps to insulated drapes, and kitchen appliance tips to lighting.

Prior to the digital campaign's launch in late November, Avista's residential energy saving tips webpage averaged 251 page views per month, with a page ranking of around 108 (out of over 600 pages of content on Avista's website). Post launch, with digital ads and videos directing viewers to this page for additional education and help, page view averages jumped to over 40,550 per month, with an average page ranking at eight. Page views peaked in December at 64,501, pushing the page ranking into the top five – an accomplishment, considering transactional (payment, outage reporting, etc.) pages typically dominate Avista's page rankings. Digital ads proved successful as well, topping 9,578,160 impressions.

The company is continuing to partner with Lisa and identify additional opportunities to leverage interest in receiving energy saving information through the voice and experience of a fellow customer.

FIGURE 30 – RESIDENTIAL AT HOME WITH LISA GOOGLE DISPLAY ADS

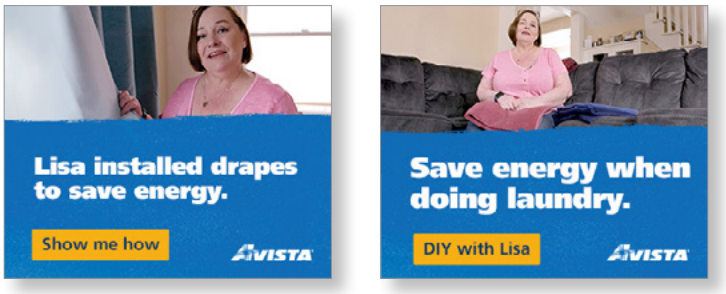
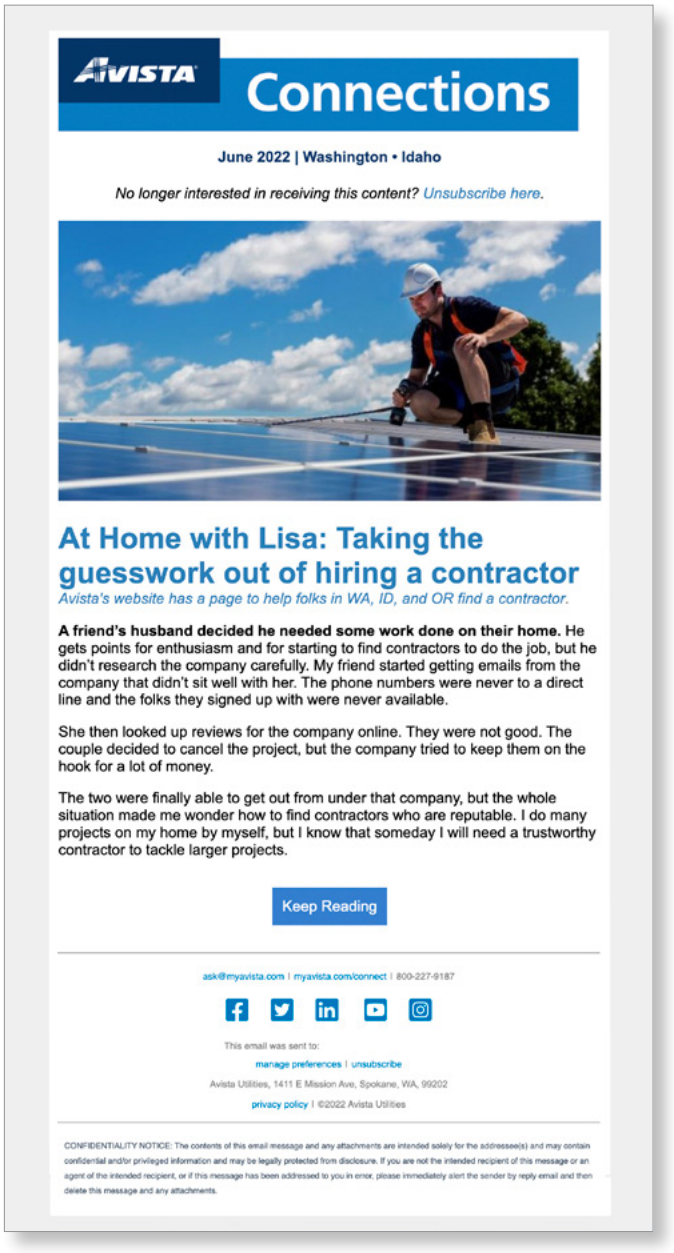


FIGURE 31 – RESIDENTIAL AT HOME WITH LISA MONTHLY AVISTA NEWSLETTER EMAIL



Avista Connections

June 2022 | Washington • Idaho

No longer interested in receiving this content? Unsubscribe here.

At Home with Lisa: Taking the guesswork out of hiring a contractor

Avista's website has a page to help folks in WA, ID, and OR find a contractor.

A friend's husband decided he needed some work done on their home. He gets points for enthusiasm and for starting to find contractors to do the job, but he didn't research the company carefully. My friend started getting emails from the company that didn't sit well with her. The phone numbers were never to a direct line and the folks they signed up with were never available.

She then looked up reviews for the company online. They were not good. The couple decided to cancel the project, but the company tried to keep them on the hook for a lot of money.

The two were finally able to get out from under that company, but the whole situation made me wonder how to find contractors who are reputable. I do many projects on my home by myself, but I know that someday I will need a trustworthy contractor to tackle larger projects.

Keep Reading

ask@myavista.com | myavista.com/connect | 800-227-9187

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FIGURE 32 – RESIDENTIAL AT HOME WITH LISA BILL INSERT

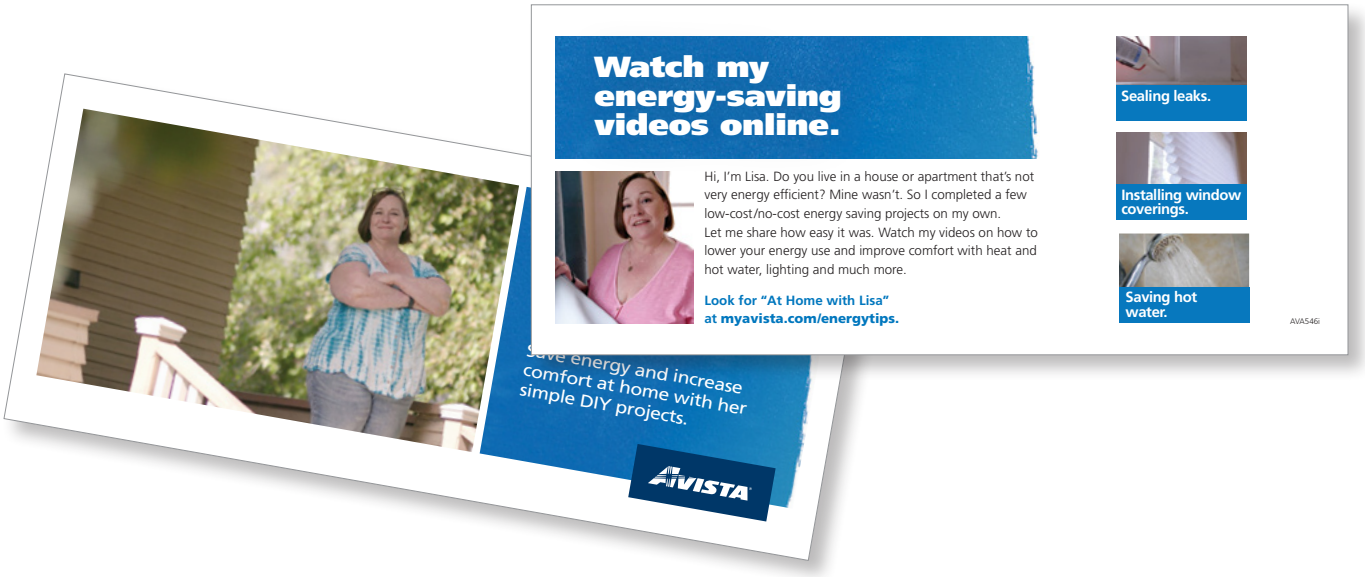
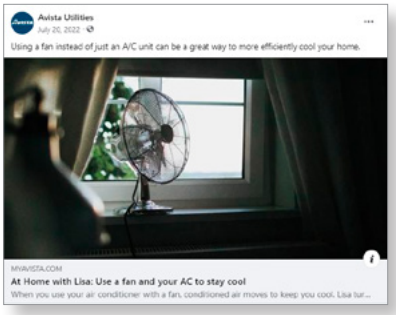
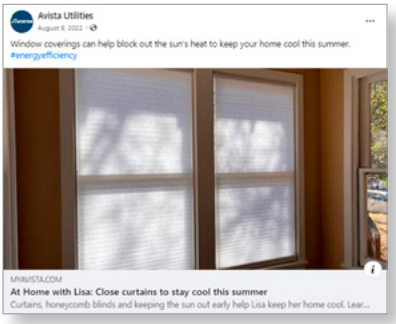


FIGURE 33 – RESIDENTIAL AT HOME WITH LISA FACEBOOK POSTS





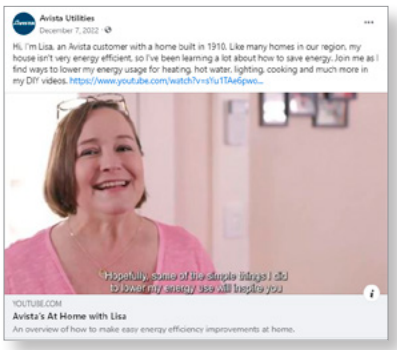


FIGURE 34 – RESIDENTIAL AT HOME WITH LISA VIDEO SERIES

The At Home with Lisa video series included 25 short videos that covered topics such as:

- window plastic and caulking
- insulated drapes and honeycomb shades
- outside window shades
- weather seals and door sweeps
- water heater insulation
- water temperature and use
- kitchen appliance use
- home heating and cooling

Impact Evaluation: Residential Sector

While some individual program results varied, the residential sector performed strongly overall in 2022. Savings realization rates were as follows:

- ***Electric:*** Total verified savings of 1,133,532 kWh with a realization rate of 89 percent.
- ***Natural Gas:*** Evaluated natural gas savings show a realization rate of 108 percent on savings of 266,485 therms.

Complete impact evaluations for electric and natural gas are included as Appendices A and B.

Performance and Savings Goals

The electric program portfolio achieved 39 percent of the 2022 savings goal. The Multifamily Direct Install Program continued to be impacted by COVID-19 restrictions, operating on a limited basis with 10 projects completed in 2022. The Multifamily/Small Home Weatherization and the Fuel-Efficiency Programs also had lower-than-expected savings, driven by lower-than-expected participation.

Although the Fuel-Efficiency Program did not meet its target, it still accounted for 29 percent of total residential sector savings. HVAC measures accounted for 46 percent of savings. The ENERGY STAR Homes Program far surpassed its kWh saving goal, contributing 5 percent of residential savings.

Table 25 shows savings goals assigned to Avista's residential sector programs for 2022, as well as reported savings and the goal portion achieved in 2022.

TABLE 25 – RESIDENTIAL PROGRAMS VERIFIED ELECTRIC SAVINGS

Program	Savings Goals (kWh)	Verified Savings (kWh)	Percentage of Goal
Water Heating	16,324	27,769	188%
HVAC	349,613	517,702	92%
Shell	252,351	137,338	87%
Fuel-Efficiency	2,391,800	326,625	48%
ENERGY STAR Homes	6,630	55,400	1087%
Multifamily/Small Home Weatherization	877,625	18,754	2%
Appliances	4,220	32,467	318%
Multifamily Direct Install	520,289	17,478	3%
Residential Total	**2,924,887**	**1,133,532**	**39%**

The natural gas segment of the portfolio achieved 60 percent of the goal for 2022.

The following shows the percentage of residential evaluated savings provided by each program:

- The HVAC Program accounted for 81 percent of residential natural gas savings.
- The Water Heating Program accounted for 11 percent of residential natural gas savings.
- The Shell Program accounted for 8 percent of residential natural gas savings.

Table 26 shows savings goals assigned to Avista's residential sector programs for 2022, as well as reported savings and percentage of goal achieved in 2022.

TABLE 26 – RESIDENTIAL PROGRAMS REPORTED NATURAL GAS SAVINGS

Program	Savings Goals (Therms)	Verified Savings (Therms)	Percentage of Goal
Water Heating	60,640	28,408	47%
HVAC	278,408	216,236	78%
Shell	44,596	20,360	46%
Multifamily/Small Home Weatherization	62,464	955	2%
Appliances	669	457	68%
Residential Total	**446,777**	**266,415**	**60%**

Cost-Effectiveness

Tables 27 and 28 show the residential sector cost-effectiveness results by fuel type. Note that these values are inclusive of both the prescriptive programs and the Multifamily Direct Install Program.

TABLE 27 – RESIDENTIAL ELECTRIC COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,801,050	$ 2,026,982	1.38
Utility Cost Test (UCT)	$ 1,130,938	$ 772,086	1.46
Participant Cost Test (PCT)	$ 2,745,017	$ 1,589,625	1.73
Ratepayer Impact (RIM)	$ 1,130,938	$ 3,182,374	0.36

TABLE 28 – RESIDENTIAL NATURAL GAS COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,223,790	$ 3,292,497	0.68
Utility Cost Test (UCT)	$ 2,223,789	$ 1,445,359	1.54
Participant Cost Test (PCT)	$ 5,491,488	$ 3,198,687	1.72
Ratepayer Impact (RIM)	$ 2,223,789	$ 5,585,299	0.40

Program-by-Program Summaries

Residential HVAC Program

TABLE 29 – RESIDENTIAL HVAC PROGRAM METRICS

HVAC Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		311
Overall kWh Savings		517,702
Incentive Spend	$	165,112
Non-Incentive Utility Costs	$	149,834
Idaho Energy Efficiency Rider Spend	$	314,946
HVAC Program Summary – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		3,040
Overall Therm Savings		216,236
Incentive Spend	$	985,291
Non-Incentive Utility Costs	$	47,082
Idaho Energy Efficiency Rider Spend	$	1,032,374

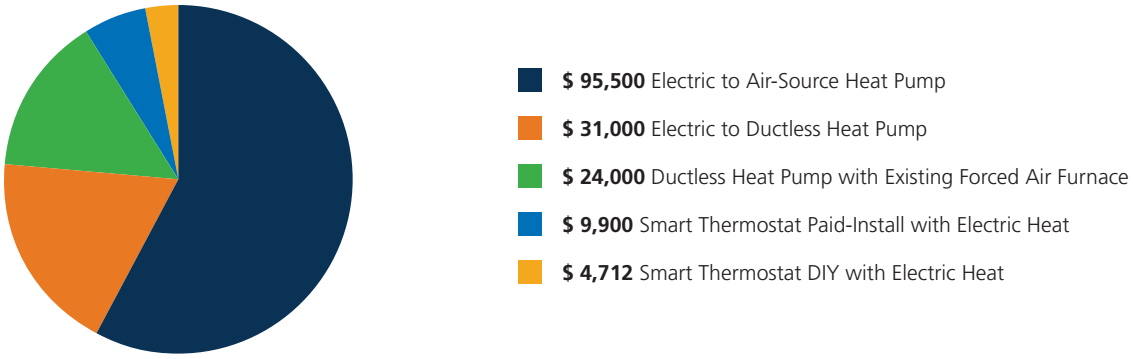
Description

Avista encourages customers to select a high-efficiency solution when making heating upgrades to their homes. Idaho electric customers who heat their homes with Avista electricity may be eligible for a rebate for converting their electric straight-resistance space heating to an air-source or ductless heat pump system. Annual energy use in the home pre-upgrade must show 8,000 kWh or more (and less than 340 therms if natural gas is also available) of heating use. Idaho residential natural gas customers who heat their homes with natural gas may be eligible for a rebate for installing a high-efficiency natural gas furnace or boiler. The supporting documentation required for participation includes, but may not be limited to, copies of project invoices and an Air Conditioning, Heating, and Refrigeration Institute (AHRI) certification. The rebate is paid to the customer after the measure has been installed and associated documentation has been received. Vendors generate participation using the Avista rebate as a sales tool for their services.

Program Activities

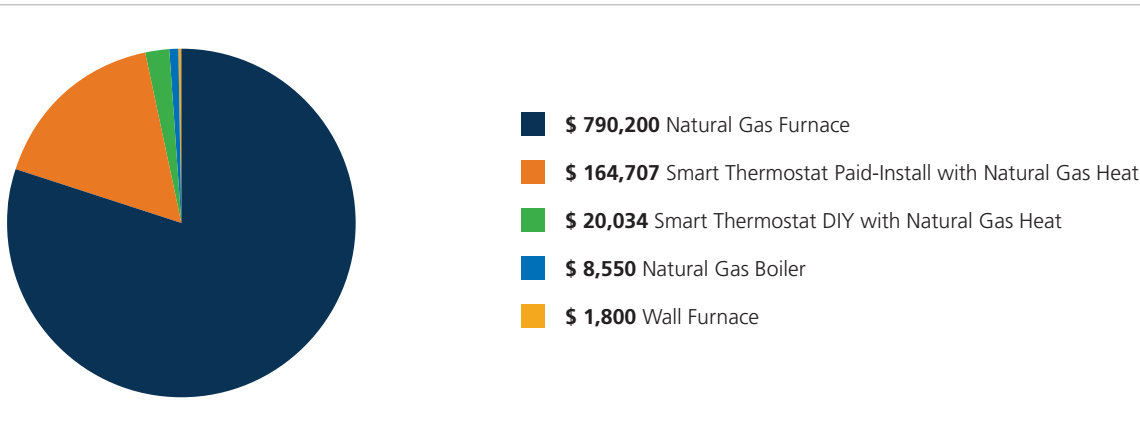
- ***Electric:*** Savings of 517,702 kWh in 2022, 45 percent of the overall savings achieved in Avista's residential portfolio. The program achieved 92 percent of its savings goal of 349,613 kWh.
- ***Natural Gas:*** Savings of 216,236 therms in 2022 – 81 percent of the overall residential savings. The program achieved less than its savings goal of 342,173 therms (62 percent of goal).

FIGURE 35 – RESIDENTIAL HVAC PROGRAM INCENTIVE DOLLARS BY MEASURE – ELECTRIC



For the electric HVAC program, electric furnace to air-source heat pump conversions comprised approximately 58 percent of residential HVAC electric incentives. Ductless heat pump incentives comprised approximately 34 percent of incentives in 2022.

FIGURE 36 – RESIDENTIAL HVAC PROGRAM INCENTIVE DOLLARS BY MEASURE – NATURAL GAS



High-efficiency natural gas furnaces continued to provide the largest portion of natural gas savings in the residential sector portfolio, comprising 80 percent of Avista's 2022 residential HVAC incentives. Smart thermostats continued to be popular, with 1,198 installed in the Idaho service territory (1,094 for natural gas HVAC systems and 104 for electric HVAC systems).

Program Marketing

The program was included in the winter heating campaign to increase awareness and drive program participation. See pages 43-54. In 2022, Avista program managers kept in contact with trade allies via topical, focused email messages to notify them of upcoming program changes and deadlines. Engagement with trade allies continues to be an important marketing strategy for this program.

Impact Evaluation

The ADM impact evaluation team found a 92 percent realization rate for the electric HVAC Program and a 97 percent realization rate for the natural gas HVAC Program in 2022.

The realization rate for the electric savings in the HVAC Program deviate from 100 percent due to the differences between the applied Avista TRM prescriptive savings value and the true Avista TRM or appropriate RTF UES value.

Evaluators reviewed the Avista TRM values and verified tracking data to estimate net program adjusted savings. In addition, they reviewed and applied the current RTF UES values for the electric measures, along with verified tracking data, to estimate net program verified savings for this measure. For HVAC measures such as ductless heat pumps and air source heat pumps, RTF savings are dependent on housing type (single family, multifamily, or manufactured housing). Evaluators verified the home type when applying RTF values to each sampled project, which led to higher or lower savings than expected, depending on housing type.

The smart thermostat measures realization rates are low because the Avista TRM uses an average of retail and direct install savings values as well as an average across heating types, while evaluators assigned the appropriate RTF UES value for each installation type and heating zone. Appropriate categories in the RTF led to a lower-than-expected savings for the direct install and retail rebates for this measure. In addition, four of the 23 total smart thermostat measures were verified to lack requirements in the RTF, and therefore savings for those four smart thermostats were removed. The measure-level ISRs were also applied to these savings values, which did not affect the realization rate, as the ISRs displayed were 100 percent for all measures in the HVAC Program.

The realization rate for the natural gas savings in the Water Heating Program was 97.40 percent with 28,407.84 therms saved. Evaluators found two instances where expected savings differed from verified savings: one project for the 50 gallon natural gas water heater and another for the natural gas tankless water heater. Since these projects did not meet minimum equipment efficiency requirements, their savings were verified to be zero therms. Evaluators recommend verifying equipment efficiency prior to fulfilling rebates for this program. These two adjustments are the only adjustments that led to the 97.40 percent realization rate.

Recommendations

ADM offered the following recommendations for Avista's residential HVAC Program:

- Evaluators note instances where the web-based rebate data indicates that the household has electric space heating, but all other sources (project data and document verification) indicate natural gas space heating, and vice versa. They recommend updating data collection standards so that all sources of information reflect the same values as the project documentation.

- A number of smart thermostat rebates included equipment that did not meet RTF measure specifications to receive verified savings through the RTF workbooks, which the Avista TRM values are drawn from. Evaluators recommend providing a qualified product list for customers to ensure that purchased smart thermostats meet program requirements. In addition, evaluators recommend that Avista verify each program rebate to confirm qualifications after the rebates are submitted.

Plans for 2023

Beginning in mid-2023, Avista will be shifting the rebate program for all HVAC measures except smart thermostats to a midstream incentive model. The existing downstream model and midstream models will overlap for a short time to allow customers and contractors to adjust to the new program.

For smart thermostats, new protocols associated with the iEnergy rebate verification process include verification of home type and space heating type during the incentive approval process. Avista will also consider incorporating a qualified product list into program requirements for future program years.

Residential Shell Program

TABLE 30 – RESIDENTIAL SHELL PROGRAM METRICS

Shell Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		119
Overall kWh Savings		137,338
Incentive Spend	$	74,032
Non-Incentive Utility Costs	$	67,181
Idaho Energy Efficiency Rider Spend	$	141,212
Shell Program Summary – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		354
Overall Therm Savings		20,360
Incentive Spend	$	198,834
Non-Incentive Utility Costs	$	9,501
Idaho Energy Efficiency Rider Spend	$	208,336

Description

Avista encourages residential customers to improve their home's building envelope by adding insulation or storm windows or upgrading existing windows or doors. Following the same annual energy usage requirements as the HVAC program, Idaho residential electric customers who heat their homes with Avista electric and use at least 8,000 kWh a year are eligible to apply, as are Idaho residential natural gas customers with an annual home heating usage of 340 therms. This rebate approach issues payment to the customer following installation. All measures except doors require installation by a qualified contractor.

Rebates are offered for insulation of attics, floors, and walls, with each type of insulation having specific pre- and post-installation R-value requirements. Required contractor documentation includes an invoice and contractor verification of the square footage of the space insulated and both pre- and post-installation R-values.

Replacement windows must have a U-factor rating of .29 or lower to qualify and supporting documentation must include the invoice, along with window dimensions and U-factor ratings.

Contractor-installed storm windows must have a glazing material emissivity less than 0.22 with a solar transmittance greater than 0.55. Required documentation includes the invoice and window dimensions.

Program Activities

- ***Electric:*** Savings of 137,338 kWh in 2022 (12 percent of the overall residential savings), a 37 percent decrease from the 219,690 kWh achieved in 2021.
- ***Natural Gas:*** Savings of 20,360 therms in 2022, or 8 percent of the overall residential savings. The program had an 12 percent increase in savings relative to the 18,214 therms achieved in 2021.

The savings derived from the residential Shell Program for both natural gas and electric homes are primarily attributed to single-pane window replacements.

Shell Program participants have generally been inclined to replace existing windows with regular windows rather than with storm windows.

Program Changes

ENERGY STAR-rated exterior doors were added to the program in 2022. Unlike other shell measures, rebates for exterior doors did not require contractor installation or minimum annual usage.

Marketing

The program was included in the winter heating campaign to increase awareness and drive participation. See pages 43-54. Marketing efforts build awareness of opportunities in the home and drive customers to the website for rebate information. Additional communication methods to encourage program participation include promotion on Avista's website and bill inserts.

Impact Evaluation

ADM arrived at a 67 percent realization rate of savings for prescriptive shell rebate measures in electric homes and an 84 percent realization rate for rebate measures in homes with natural gas. This includes all three insulation cavities (attic, floor, and wall), along with regular and storm window installation and ENERGY STAR-certified insulated doors.

The realization rate for electric savings in the Shell Program deviates from 100 percent, primarily due to differences between the categories applied in the Avista TRM prescriptive savings values and the more detailed categories with unique RTF UES values related to heating type and climate zone. For single- and double-pane window replacement, wall insulation, and attic insulation, the Avista TRM values are lower than the values for Idaho's climate zone in the RTF UES values. Evaluators recommend adjusting the Avista TRM values to align more closely with the RTF UES values, making particular adjustments based on the observed participation within each heating type category. In addition, small changes to verified quantity led to variation in the realization rate for each measure type.

The realization rate for natural gas savings in the Shell Program is lower than 100 percent, primarily due to differences in quantity in the tracking data and verified documentation.

Recommendations

ADM offered the following recommendation for the residential Shell Program:

- In the Shell Program, evaluators recommend that Avista update the attic insulation and single- and double-pane window TRM values to the appropriate RTF UES value. Avista's TRM uses 1.5 kWh per square foot, whereas the RTF displays 0, 1, or 2 kWh per square foot, depending on heating type and heating and cooling zone. Similarly, the difference between RTF savings and the Avista TRM value for window replacements is drastic, with the RTF indicating much lower savings for the window replacements, based on U-values and double- versus single-pane values. Evaluators recommend that Avista ensures the correct RTF UES values are used to calculate expected savings and incorporates more granularity by climate zone, heating type, U-value, and single- versus double-pane-specific savings into Avista's TRM.

Plans for 2023

In 2023, Avista will consider adding a do-it-yourself option for window rebates in response to customer requests. Some customers, especially those in rural or remote areas, undertake window replacement projects themselves and are dissatisfied by the lack of rebate options for this category.

Avista will also consider incorporating more granularity into the TRM in 2023 for window measures.

Residential Water Heating Program

TABLE 31 – RESIDENTIAL WATER HEATING PROGRAM METRICS

Water Heating Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		23
Overall kWh Savings		27,769
Incentive Spend	$	4,945
Non-Incentive Utility Costs	$	4,487
Idaho Energy Efficiency Rider Spend	$	9,432
Water Heating Program Summary – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		395
Overall Therm Savings		28,408
Incentive Spend	$	148,800
Non-Incentive Utility Costs	$	7,110
Idaho Energy Efficiency Rider Spend	$	155,910

Description

Avista customers who use either electricity or natural gas to heat their water are eligible for participation in the residential Water Heating Program. Three different types of water heaters are available: a high-efficiency electric heat pump water heater, a natural gas tankless water heater, or a natural gas high-efficiency storage tank water heater.

Efficiency ratings for all equipment are verified according to the contractor invoice or the AHRI certification and must be included with the customer's rebate application.

Program Activities

- ***Electric:*** Program savings were 27,769 kWh in 2022, a 10 percent decrease from the 30,726 kWh of savings achieved in 2021.
- ***Natural Gas:*** Overall therm savings were 28,408 therms, a 32 percent decrease from 41,972 therms achieved in 2021. Savings accounted for 11 percent of the residential portfolio, and the program achieved 96 percent of its savings goal of 39,436 therms.

The program saw a participation of 420 units, a decrease from the 591 units incentivized in 2021, but it was still a fairly high-volume year compared to recent program years.

Marketing

The creative refresh of residential efficiency campaigns in 2022 helped to build awareness of opportunities in the home and drive customers to the website for rebate information. See pages 43-54. Additional communication methods that encourage program participation include promotion on Avista's website and bill inserts. Finally, communication with trade allies continues to drive participation, as some trade allies utilize the rebates as a sales promotion tool.

Impact Evaluation

ADM arrived at a realization rate of 98 percent for the electric program and 97 percent for the natural gas program.

The realization rate for the electric savings in the Water Heating Program deviates from 100 percent due to the Avista TRM prescriptive savings value. The Avista TRM assigns a combination of the values the RTF assigns for Tier 2 and Tier 3 heat pump water heaters. However, among document verification, evaluators found that most water heaters are Tier 3 or higher, which the RTF UES assigns a higher savings value.

In addition, the Avista TRM assigns the savings values for water heaters of any size. During document review, evaluators found that most of the water heaters have a storage tank under 55 gallons, which has a higher savings value in the RTF than water heaters with unknown tank sizes. Some storage tanks, however, were verified to hold 80 gallons, which carries a larger savings value in the RTF than storage tanks with 50 or 55 gallons. Evaluators applied the RTF UES value for the associated tank size and tier for each model number in the sampled rebates. These changes led to the high realization rate for the electric heat pump water heater measure in the Water Heating Program. The ISRs for each measure in the Water Heating Program were 10 percent and therefore did not affect the verified savings realization rates.

The realization rate for the natural gas savings in the Water Heating Program deviated from 100 percent because one project for the 50 gallon natural gas water heater and another for the natural gas tankless water heater were verified to not meet minimum equipment efficiency requirements. Savings for these two projects, therefore, were verified to be zero therms.

Recommendations

- Evaluators offered no recommendations for electric water heating measures.
- For natural gas measures, evaluators recommend that equipment efficiency is verified prior to fulfilling rebates for this program. These two adjustments are the only adjustments that led to the 97.40 percent realization rate.

Plans for 2023

All three water heater products will be available in 2023, with an increase both to the incentives for and the efficiency ratings of the heat pump water heater (2.9) and the natural gas tankless water heater (.93).

Residential ENERGY STAR/NEEM Manufactured Homes Program

TABLE 32 – RESIDENTIAL ENERGY STAR/NEEM MANUFACTURED HOMES PROGRAM METRICS

ENERGY STAR/NEEM Manufactured Homes Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		19
Overall kWh Savings		55,400
Incentive Spend	$	19,000
Non-Incentive Utility Costs	$	17,242
Idaho Energy Efficiency Rider Spend	$	36,242

Description

Any Idaho residential electric customer who purchases a new ENERGY STAR manufactured home as certified by Northwest Energy-Efficient Manufactured (NEEM) with Avista electric and/or Avista natural gas for space and water heating is eligible for the rebate.

NEEM-certified homes provide energy savings beyond code requirements for space heating, water heating, shell measures, lighting, and appliances. Space-heating equipment may include electric forced air, an electric heat pump, or a natural gas furnace. This rebate encompasses the whole home and may not be combined with other Avista individual measure rebate offers (such as high-efficiency water heaters).

The ENERGY STAR Manufactured Homes Program promotes a sustainable, low-operating-cost, environmentally friendly structure as an alternative to traditional home construction to both builders and homeowners. In Idaho, Avista offers both electric and natural gas energy-efficiency programs; as a result, the company has structured the program to account for homes where either a single fuel or both fuels are used for space and water heating needs. Avista continues to support the regional program to encourage sustainable building practices.

Program Activities

- ***Electric:*** ENERGY STAR Homes electric savings were 55,400 kWh in 2022. The program accounted for 5 percent of the residential electric savings portfolio.
- ***Natural Gas:*** No ENERGY STAR natural gas homes participated in the program in 2022.

The 2022 incentive for ENERGY STAR Manufactured Homes was $1,000 for homes using either Avista electric service or homes with both electric and natural gas.

Impact Evaluation

Evaluators arrived at a realization rate of 88 percent for the electric ENERGY STAR Homes Program.

The realization rate for the electric savings in the ENERGY STAR Homes Program deviated from 100 percent due to the categorical differences between the applied Avista TRM prescriptive savings value and the more detailed RTF UES categories.

The Avista TRM applies RTF savings values from heating zone 2 to all rebates. In addition, the Avista TRM does not take into account cooling zone, which also affects savings assigned in the RTF. Evaluators applied the appropriate RTF savings values for the heating zone and cooling zone for each rebated household. This change led to low realization rates for some rebates and high realization rates for others within the same Avista ENERGY STAR home – manufactured furnace measure category. The overall effect of this change on the measure is an upward adjustment on the savings that a fully natural gas-heated home would realize. Evaluators verified that all dual fuel homes had natural gas as the primary heating type. Therefore, they assigned electric savings from the RTF associated with a fully natural gas-heated home at 43 kWh per year rather than the fully electric value that Avista applied.

Evaluators did not conduct a verification survey for the ENERGY STAR Homes Program and therefore did not adjust verified savings with an ISR.

Recommendations

- Evaluators recommend that Avista's TRM be updated to reflect the electric savings of 43 kWh for a fully natural gas-heated home.

Plans for 2023

There are no substantial measure changes planned for this program in 2022. However, Avista will include a TRM savings value of 43 kWh for natural gas-heated ENERGY STAR homes.

Residential Multifamily/Small Home Program

TABLE 33 – RESIDENTIAL MULTIFAMILY/SMALL HOME PROGRAM METRICS

Multifamily/Small Home Program Summary – Electric		2022
Participation, Savings and Costs		
Conservation Projects		22
Overall kWh Savings		18,754
Incentive Spend	$	8,618
Non-Incentive Utility Costs	$	7,821
Energy Efficiency Rider Spend	$	16,439
Multifamily/Small Home Program Summary – Natural Gas		**2022**
Participation, Savings and Costs		
Conservation Projects		20
Overall Therm Savings		955
Incentive Spend	$	6,980
Non-Incentive Utility Costs	$	334
Energy Efficiency Rider Spend	$	7,314

Description

Created in response to a gap in program availability, the Multifamily/Small Home Program addresses two unique barriers to Avista's residential rebate program. First, customers who did not meet minimum annual energy usage requirements of 8,000 kWh or 340 therms were not eligible for the program. The annual usage requirement is in place to ensure an Avista fuel is being used as a primary heat source instead of an alternative heat source (e.g., oil, wood, propane). Second, condominium owners have historically been excluded from program eligibility because condos are typically multifamily buildings.

The company has often been forced to turn away owners of condominiums or small houses for window or insulation rebates, as very little to no energy savings existed for these homes. Customers were left dissatisfied and confused as to why their condo or their 800-square-foot stick-built home would not qualify for a rebate. In 2022, Avista decided to test the interest and the energy savings that may be achieved in these types of housing structures by providing incentives for window replacement, storm windows, insulation, and line voltage thermostats.

Energy savings claimed are less than the traditional residential rebate program. Savings were determined by considering lower estimated energy use and home square footage.

Program Activities

The Residential Multifamily/Small Homes Program accounted for 2 percent of program savings for electric and less than 1 percent of savings for natural gas programs.

- ***Electric:*** Savings of 18,754 kWh in 2022, a decrease of 85 percent compared to 129,232 kWh achieved in 2021.
- ***Natural Gas:*** Savings of 955 therms in 2022, a decrease of 80 percent over the 4,756 therms achieved in 2021.

Program Changes

Due to increased interest in the program in 2022, the measure list for these homes was extended to offer all incentives currently obtainable through the residential rebate program.

Impact Evaluation

Evaluators arrived at a realization rate of 76 percent for the small home and multifamily electric program and 94 percent for the natural gas program.

Evaluators found that many projects exceed Avista's definition of a small home, which includes a single family home that is less than 1,000 square feet or a multifamily home with five units or more. They recommend claiming projects on single family homes that are larger than 1,000 square feet in the Multifamily/Small Home Weatherization Program.

In addition, evaluators note that the current program rebate applications do not provide an option to indicate "multifamily" home type. Rather, the current rebate application includes the following options: "single family," "manufactured," "new construction," and "other." Evaluators recommend adding a "multifamily" option to consistently apply RTF savings for each of the measures.

Most projects displayed realization rates that differ from 100 percent due to variations in home type for all measures and verified U-values for windows measures. In addition, the updated weatherization workbook for single family homes has significantly lower savings than the updated weatherization workbook for multifamily homes. Evaluators verified the home type via Zillow to apply the correct savings from the single family, multifamily, and manufactured home RTF workbooks. These adjustments led to high and low realization rates across each measure.

Recommendations

Evaluators recommend that Avista verify home type prior to applying Avista TRM values. They also recommend creating separate single family and multifamily windows measures and savings values to apply in the Avista database, mimicking the RTF values, to ensure proper categorization of measure savings.

Plans for 2023

Customers with small homes were confused by the inclusion of their homes within the multifamily segment.

Beginning in 2023, the "multifamily" option will include homes with shared interior walls. Small single-family homes without shared interior walls will be served through the single-family program. Usage requirements will also be adjusted to improve equitable access to rebates for the entire customer population.

Residential Appliances Program

TABLE 34 – RESIDENTIAL APPLIANCES PROGRAM METRICS

Appliances Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		326
Overall kWh Savings		32,467
Incentive Spend	$	23,850
Non-Incentive Utility Costs	$	21,643
Idaho Energy Efficiency Rider Spend	$	45,493
Appliances Program Summary – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		84
Overall Therm Savings		457
Incentive Spend	$	4,150
Non-Incentive Utility Costs	$	198
Idaho Energy Efficiency Rider Spend	$	4,348

Description

Avista has historically offered incentives for high-efficiency appliances such as residential washers, dryers, and refrigerators through various avenues such as point-of-sale programs and prescriptive paths. Beginning in 2021 and continuing in 2022, the company's prescriptive offerings include rebates for ENERGY STAR-certified appliances, including:

- front-load and top-load washers
- electric dryers
- refrigerators/freezers
- freezers

Program Activities

- ***Electric:*** Savings of 32,467 kWh in 2022, a 42 percent increase over the 13,420 kWh savings achieved in 2021.
- ***Natural Gas:*** Savings of 457 therms in 2022, an 81 percent increase over the 253 therms achieved in 2021.

Program Changes

In 2022, ENERGY STAR-certified top-load washers were added to the program although with notably less energy savings than front-load models.

Impact Evaluation

Evaluators arrived at a realization rate of 65 percent for electric appliances and 110 percent for natural gas appliances rebated through the program.

The program-verified savings for electric appliances resulted in a realization rate of less than 100 percent, largely due to low savings from ENERGY STAR-certified refrigerator and refrigerator-freezer and ENERGY STAR-certified upright freezer projects. All fridge-freezer projects were verified as ENERGY STAR-qualified but not ENERGY STAR Most Efficient (ESME). The low realization rate for the fridge-freezer measure is due to the difference in RTF savings value between ENERGY STAR fridge-freezers (about 45 kWh/year) and ESME fridge-freezers (about 126 kWh). Avista TRM references the standard size refrigerator and refrigerator-freezer (side-mounted freezer) ESME at 124 kWh/year savings. Evaluators found that no rebated fridges met this requirement, so lower RTF savings were applied. In addition, one fridge-freezer rebate was not ENERGY STAR-rated.

Similarly, for the upright freezer measure, all projects were verified as ENERGY STAR-qualified but not ESME-qualified. The low realization rate is due to the difference in Avista TRM and RTF savings values. The RTF assigns ENERGY STAR fridges 26 kWh per unit, while ESME freezers are assigned 67 kWh per unit. The Avista TRM references the standard size freezer (upright) ESME savings at 67 kWh per year savings. However, because evaluators found that no freezers met the ESME qualifications, the lower ENERGY STAR savings values were applied to each project.

Finally, evaluators attributed zero kWh per unit savings to the ENERGY STAR-rated top load washer because the referenced RTF clothes washer workbook estimates that savings for this measure is negative, and therefore there are no proven RTF savings for this measure.

For natural gas appliances, evaluators note that all natural gas clothes dryer rebates were assigned zero therms expected savings. However, they applied Avista TRM UES to these rebates, leading to a high realization rate for the measure.

In addition, the RTF assigns 120 kWh per unit savings value for the front load washer. The evaluator assigned equivalent therms savings by dividing by 29.3, which is the conversion factor to convert kWh to therms. Evaluators therefore estimate 4 therms per unit of savings for each clothes washer. However, the Avista TRM erroneously converted this value to 6 therms per unit, leading to a low verified realization rate.

Finally, evaluators removed savings that were applied to the top load washer. The RTF clothes washer workbook calculates negative savings for the top load washer, as the market practice baseline for this measure is already more efficient than the incentivized efficiency. Therefore, since the RTF does not assign electric savings to top load washers, evaluators deem zero therms of equivalent savings. This led to a downward adjustment on the program's realization rate.

Recommendations

Evaluators found that the RTF assigns much lower savings than the Avista TRM for the electric fridge-freezer and upright freezer measures. The Avista TRM seems to reference ESME-certified savings for each of these measures. However, all projects rebated were verified to meet ENERGY STAR certification rather than ESME certification. This led to a drastically low realization rate for these measures. The evaluators recommend updating the Avista TRM to reflect appropriate RTF values.

In the natural gas Appliances Program, the evaluators note that all natural gas clothes dryer rebates were assigned zero therms expected savings. However, they applied Avista TRM UES to these rebates, leading to a high realization rate for the measure. Evaluators recommend investigating causes for this database error.

Plans for 2023

The program will continue with no changes in 2023; however, Avista will update its TRM in accordance with the above recommendations.

Residential Fuel-Efficiency Program

TABLE 35 – RESIDENTIAL FUEL-EFFICIENCY PROGRAM METRICS

Fuel-Efficiency Program Summary		2022
Participation, Savings, and Costs		
Conservation Projects		40
Overall kWh Savings		326,625
Incentive Spend	$	93,200
Non-Incentive Utility Costs	$	21,643
Idaho Energy Efficiency Rider Spend	$	114,843

Description

The Fuel-Efficiency Program encourages customers to consider converting their resistive electric space and water heating to natural gas. The direct use of natural gas continues to be the most efficient fuel choice when available, and, over time, offers the most economic value in terms of the operating costs of the equipment. While natural gas prices have risen slowly in recent years, the cost of infrastructure continues to rise at a faster pace, both for the utility and for customers' installation costs for these conversions. Avista residential customers who use more than 8,000 kWh of Avista electricity for straight-resistance heat are eligible to participate. This program is also available to customers considering a switch to a natural gas forced-air furnace. The rebate is also available as a combination space/water heat incentive for customers who plan to switch to natural gas for both systems.

In 2022, the rebate to convert from electric heat to a forced-air natural gas furnace or boiler was $2,100. The rebate to convert from electric heat to natural gas forced-air space and water heat was $2,850.

Program Activities

The Fuel-Efficiency Program obtained 326,625 kWh of savings in 2022, which is a decrease of 44 percent from the 586,226 kWh achieved in 2021. Savings from this program accounted for 29 percent of the residential electric savings portfolio.

Program Changes

No changes to this program were implemented in 2022.

Marketing

Energy-efficiency marketing efforts build considerable awareness of opportunities in the home and drive customers to the website for rebate information. See pages 43-54. Vendors generate participation using the rebate as a sales tool for their services. Additional communication methods that encourage program participation and utility website promotion include vendor training, retail location visits, and presentations at various customer events throughout the year.

Impact Evaluation

ADM arrived at a realization rate of 100 percent for the residential Fuel-Efficiency Program in the Idaho service territory. Evaluators reviewed the Avista TRM values, along with verified tracking data, to estimate net program adjusted savings for measures not evaluated through billing analysis. In addition, they reviewed and applied the current Avista TRM values for the electric measures, along with verified tracking data, to estimate net program verified savings for this measure. The applied Avista TRM prescriptive savings value and the verified savings aligned in the tracking data.

Plans for 2023

There are no planned changes for the program in 2023.

Priest River, Idaho

LOW-INCOME SECTOR

Program Summary

Low-Income Program

TABLE 36 – LOW-INCOME PROGRAM METRICS

Low-Income Program Summary – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		79
Overall kWh Savings		85,639
Incentive Spend	$	300,953
Non-Incentive Utility Costs	$	132,026
Idaho Energy Efficiency Rider Spend	$	432,979
Low-Income Program Summary – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		75
Overall Therm Savings		1,954
Incentive Spend	$	165,970
Non-Incentive Utility Costs	$	40,444
Idaho Energy Efficiency Rider Spend	$	206,414

For 2022, the Low-Income Program served 103 electric and 142 natural gas customers. Program participation for low-income programs is quantified in the number of installed units or square feet of installed insulation or windows.

Description

Avista collaborates with a community action partnership (CAP) agency to deliver low-income energy-efficiency programs in nine Idaho counties within the company's service territory. The CAP has the infrastructure to income-qualify customers and provides access to a variety of funding sources to install energy-efficiency improvements to the homes. The agency serving Avista's Idaho territory receives an annual funding amount of $875,000.

The agency may spend the contract amount at its discretion on either electric or natural gas efficiency measures. Improvements to the residential shell (e.g., insulation, windows) require that the home demonstrates a minimum level of annual energy use of either Avista electricity or natural gas for space heating purposes. For conversions from electric resistive heat to a heat pump or to a natural gas furnace, an annual kilowatt hour use of 4,000 is required. Within the annual funding allocation is a 15 percent reimbursement for administrative costs. The agency may also choose to use up to 15 percent of its annual allocation for home repair, as well as other health and safety improvements.

To guide the agencies toward projects that are most beneficial to Avista's energy-efficiency efforts, the company provides an approved list of measures that are considered cost-effective and allow for full reimbursement of the installation.

A qualified list of measures allows for partial reimbursement of efficiency improvements that may not be cost-effective from a utility perspective but may be vital for the home's functionality. These measures are compensated with an amount that is equal to the utility's avoided cost of the energy savings associated with the energy-efficiency improvement.

Program Activities

For 2022, the program achieved 86,539 kWh of verified electric savings and 1,954 therms of verified natural gas savings in Idaho. Table 37 shows Avista savings goals for the low-income sector for 2022, as well as reported savings and goal portions achieved.

TABLE 37 – LOW-INCOME PROGRAM EVALUATED SAVINGS

Program	Savings Goals	Verified Savings	Percentage of Goal
Electric (kWh)	109,952	85,639	140%
Natural Gas (Therms)	16,078	1,954	20%

Avista continued to reimburse the agencies for 100 percent of the cost for installing most energy-efficiency measures defined on the approved measure list (see Table 38). Avista deemed these measures as cost-effective during the development of the 2022 *Annual Conservation Plan*, which took place in late 2021.

TABLE 38 – LOW-INCOME PROGRAM APPROVED MEASURE LIST

Electric Measures	Natural Gas Measures
Air Infiltration Air-Source Heat Pump Attic Insulation Doors – ENERGY STAR-Rated Duct Insulation Duct Sealing Floor Insulation LED Lamps Refrigerator – ENERGY STAR-Rated Wall Insulation Windows – ENERGY STAR-Rated Electric to Air-Source Heat Pump Electric to Ductless Heat Pump Heat Pump Water Heater (Tier 2-3)	Air Infiltration Air-Source Heat Pump Boiler (96% AFUE) Doors – ENERGY STAR-Rated Duct Insulation Duct Sealing Floor Insulation Furnace (95% AFUE) Wall Insulation Water Heater (storage) <55 gallon .65 EF Water Heater (tankless) .82 EF Windows – ENERGY STAR-Rated Fuel Conversion Measures Electric to Natural Gas Furnace Conversion Electric to Natural Gas Water Heater Electric to Air-Source Heat Pump (9 HSPF) Electric to Ductless Heat Pump (10 HSPF)

Measures that did not meet the utility cost-effectiveness test are found on the qualified rebate list. The agency is eligible to receive partial reimbursement for the installation. The reimbursement amount is equal to the avoided cost-energy value of the improvement. This approach focuses the agency toward installing measures that had the greatest cost-effectiveness from the utility's perspective. To allow for additional flexibility, the agency may use the health and safety dollars to fully fund the cost of the measures on the qualified rebate list.

TABLE 39 – LOW-INCOME PROGRAM QUALIFIED REBATE MEASURE LIST

Electric Measures	Natural Gas Measures
Air Source Heat Pump Replacement (9 HSPF) Electric to Natural Gas Water Heater Heat Pump Water Heater (Tier 2-3 any size)	Air Infiltration Attic Insulation Duct Insulation Duct Sealing Floor Insulation Wall Insulation

Customer Outreach

Customers who participate in the low-income weatherization program are often referred through the agency's energy-assistance program. Typically, Avista provides a handful of referrals from a variety of internal departments including energy efficiency, customer service, and its Customer Assistance Referral and Evaluation Services (CARES) Program. CARES representatives provide support for disabled, elderly, and low-income customers, or customers experiencing hardships related to employment, health, or finances.

Other referrals are the result of various outreach events that Avista hosts or is invited to attend. In partnership with the company's energy-efficiency efforts, its community and economic vitality department conducts conservation education and outreach for low-income customers, seniors, individuals living with disabilities, and veterans. The Avista outreach team reaches this target population through workshops, energy fairs, and mobile and general outreach. Each method includes demonstrations and distribution of low- and no-cost materials with a focus on energy efficiency, conservation tips and measures, and information regarding energy assistance that may be available through Community Action Agencies. One low-income and senior outreach goal is to increase awareness of energy assistance programs such as the Low-Income Home Energy Assistance Program (LIHEAP) and Project Share.

Avista recognizes several educational strategies as efficient and effective ways to deliver energy efficiency and conservation outreach:

- Energy conservation workshops for senior and low-income Avista customers.
- Energy fairs where attendees can receive information about low- and no-cost methods to weatherize their homes through demonstrations and limited samples – as well as learn about bill assistance and online account and energy management tools. Community partners that provide services to low-income populations and support to increase personal self-sufficiency are invited, at no cost, to host a booth and provide information about their services and accessibility. Multiple communication channels are used to promote Avista's energy fairs. Tactics include news releases, direct mail, email, flyers, community calendars, social media, signage, and print and radio advertising.

- Mobile outreach through the Avista energy resource vans, where visitors can learn about effective tips to manage their energy use, bill payment options, and community assistance resources.
- General outreach through energy management information and resources at events (such as resource fairs) and through partnerships that reach the target populations. General outreach also includes outlining bill payment options and assistance resources in senior and low-income publications.

Emerging from the pandemic in 2022, Avista cautiously revamped outreach activity to ensure public and staff safety and well-being. To serve customers in a safe manner, the outreach team dropped off energy-saving items and information at food banks, participated in mobile food bank drive-through events, and partnered with community-based organizations to provide home energy kits to their clients. Kits were delivered to multiple community partners, including senior centers and churches. In addition to receiving a free energy kit, they could also request a free energy use guide (pictured on page 80) as well as the "Avista Kids" children's energy savings activities book (pictured on page 82).

The team conducted and participated in 27 events that reached 2,092 Idaho residents, resulting in the distribution of 3,790 LED lamps for these customers. Table 40 shows an overview of outreach activities.

TABLE 40 – LOW-INCOME PROGRAM OUTREACH EVENT AND LED BULB DISTRIBUTION SUMMARY

Description	Number of Events/ Activities	Contacts	LEDs
Energy Fairs	0	0	0
General Outreach	25	1,979	3,514
Mobile Outreach	1	63	176
Workshops	1	50	100
Low-Income Total	**27**	**2,092**	**3,790**

Marketing

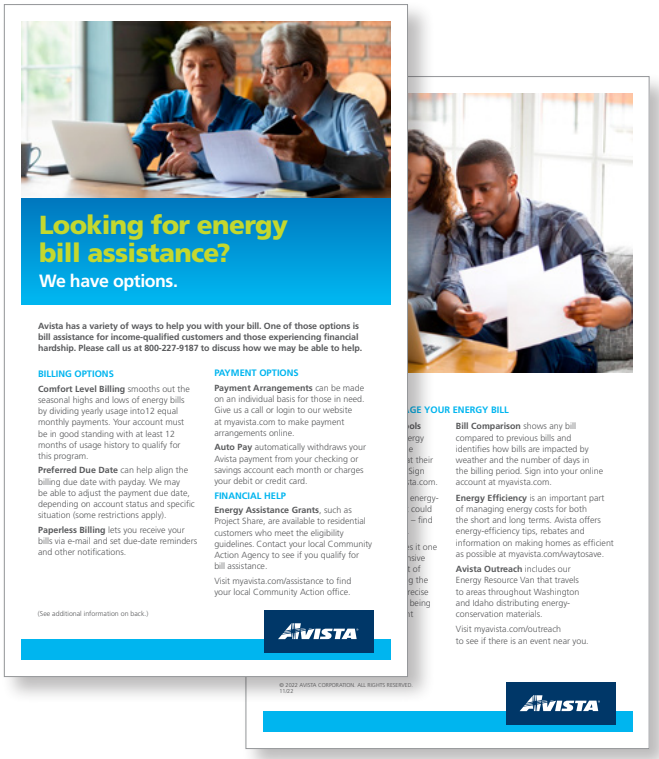
Avista provided support to agencies to increase awareness of its weatherization programs throughout the year. The primary goal of these marketing activities was to connect eligible households to their local agency for weatherization services. Marketing tactics included direct-mail postcards, email, flyers for agencies to circulate and print, and weatherization information on Avista's website for customers also seeking bill assistance. Marketing collateral was published in both English and Spanish. Avista's Energy Resource Van was also marketed as a resource for agencies to request at their events or sites. The van is staffed by Avista employees who share low- and no-cost energy saving tips as well as bill assistance options with attendees.

FIGURE 37 – LOW-INCOME PROGRAM HOME ENERGY SAVINGS KIT BROCHURE

FIGURE 38 – LOW-INCOME PROGRAM WEATHERIZATION FLYER

FIGURE 39 – LOW-INCOME ENERGY USE GUIDE

FIGURE 40 – LOW-INCOME BILL ASSISTANCE FLYERS



Looking for energy bill assistance?

We have options.

Avista has a variety of ways to help you with your bill. One of those options is bill assistance for income-qualified customers and those experiencing financial hardship. Please call us at 800-227-9187 to discuss how we may be able to help.

BILLING OPTIONS

Comfort Level Billing smooths out the seasonal highs and lows of energy bills by dividing yearly usage into12 equal monthly payments. Your account must be in good standing with at least 12 months of usage history to qualify for this program.

Preferred Due Date can help align the billing due date with payday. We may be able to adjust the payment due date, depending on account status and specific situation (some restrictions apply).

Paperless Billing lets you receive your bills via e-mail and set due-date reminders and other notifications.

PAYMENT OPTIONS

Payment Arrangements can be made on an individual basis for those in need. Give us a call or login to our website at myavista.com to make payment arrangements online.

Auto Pay automatically withdraws your Avista payment from your checking or savings account each month or charges your debit or credit card.

FINANCIAL HELP

Energy Assistance Grants, such as Project Share, are available to residential customers who meet the eligibility guidelines. Contact your local Community Action Agency to see if you qualify for bill assistance.

Visit myavista.com/assistance to find your local Community Action office.

(See additional information on back.)

AVISTA

GE YOUR ENERGY BILL

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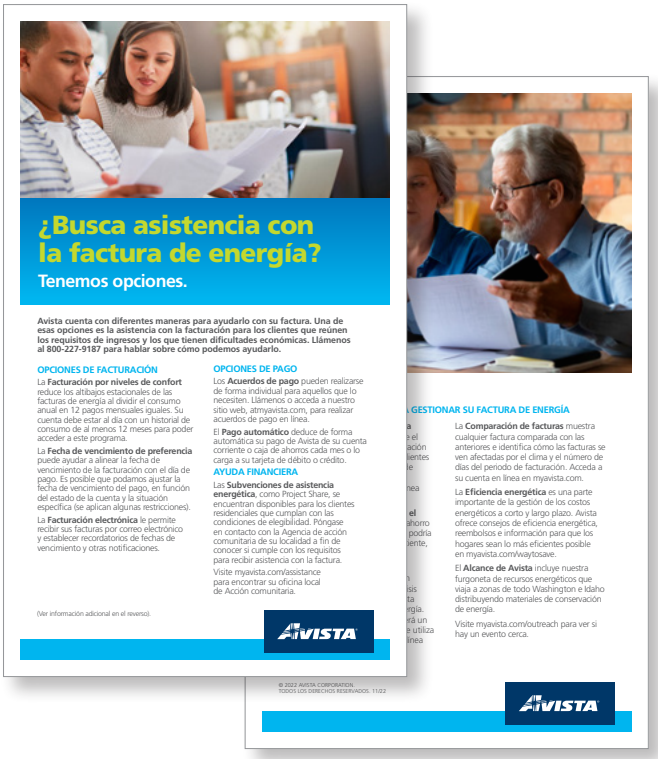
Bill Comparison shows any bill compared to previous bills and identifies how bills are impacted by weather and the number of days in the billing period. Sign into your online account at myavista.com.

Energy Efficiency is an important part of managing energy costs for both the short and long terms. Avista offers energy-efficiency tips, rebates and information on making homes as efficient as possible at myavista.com/waytosave.

Avista Outreach includes our Energy Resource Van that travels to areas throughout Washington and Idaho distributing energy-conservation materials.

Visit myavista.com/outreach to see if there is an event near you.

AVISTA



¿Busca asistencia con la factura de energía?

Tenemos opciones.

Avista cuenta con diferentes maneras para ayudarlo con su factura. Una de esas opciones es la asistencia con la facturación para los clientes que reúnen los requisitos de ingresos y los que tienen dificultades económicas. Llámenos al 800-227-9187 para hablar sobre cómo podemos ayudarlo.

OPCIONES DE FACTURACIÓN

La **Facturación por niveles de confort** reduce los altibajos estacionales de las facturas de energía al dividir el consumo anual en 12 pagos mensuales iguales. Su cuenta debe estar al día con un historial de consumo de al menos 12 meses para poder acceder a este programa.

La **Fecha de vencimiento de preferencia** puede ayudar a alinear la fecha de vencimiento de la facturación con el día de pago. Es posible que podamos ajustar la fecha de vencimiento del pago, en función del estado de la cuenta y la situación específica (se aplican algunas restricciones).

La **Facturación electrónica** le permite recibir sus facturas por correo electrónico y establecer recordatorios de fechas de vencimiento y otras notificaciones.

OPCIONES DE PAGO

Los **Acuerdos de pago** pueden realizarse de forma individual para aquellos que lo necesiten. Llámenos o acceda a nuestro sitio web, atmyavista.com, para realizar acuerdos de pago en línea.

El **Pago automático** deduce de forma automática su pago de Avista de su cuenta corriente o caja de ahorros cada mes o lo carga a su tarjeta de débito o crédito.

AYUDA FINANCIERA

Las **Subvenciones de asistencia energética**, como Project Share, se encuentran disponibles para los clientes residenciales que cumplan con las condiciones de elegibilidad. Póngase en contacto con la Agencia de acción comunitaria de su localidad a fin de conocer si cumple con los requisitos para recibir asistencia con la factura.

Visite myavista.com/assistance para encontrar su oficina local de Acción comunitaria.

(Ver información adicional en el reverso).

AVISTA

GESTIONAR SU FACTURA DE ENERGÍA

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La **Comparación de facturas** muestra cualquier factura comparada con las anteriores e identifica cómo las facturas se ven afectadas por el clima y el número de días del periodo de facturación. Acceda a su cuenta en línea en myavista.com.

La **Eficiencia energética** es una parte importante de la gestión de los costos energéticos a corto y largo plazo. Avista ofrece consejos de eficiencia energética, reembolsos e información para que los hogares sean lo más eficientes posible en myavista.com/waytosave.

El **Alcance de Avista** incluye nuestra furgoneta de recursos energéticos que viaja a zonas de todo Washington e Idaho distribuyendo materiales de conservación de energía.

Visite myavista.com/outreach para ver si hay un evento cerca.

AVISTA

FIGURE 41 – KIDS CAN SAVE ENERGY TOO COLORING AND ACTIVITY BOOK

Impact Evaluation

The Low-Income Program achieved a realization rate of 97 percent for electricity and 101 percent for natural gas savings in 2022.

Evaluators note that most deviations from a 100 percent realization rate at measure level – for electric measures – are due to the inaccurate reference in Avista's TRM to unit-level savings for LED bulbs. Some deviations also occurred because the 20 percent savings cap was not applied to all measures found to be installed in a household.

For natural gas measures, there were a few notable deviations between the expected and verified savings, leading to a realization rate close to 100 percent. Evaluators did identify one instance where verified savings from a duct insulation measure was two times the reported savings. The reason for this deviation is unclear, however, evaluators recommend that the company works to ensure that the Avista TRM rates are properly applied.

Recommendations

Evaluators offered the following recommendations for Avista's Idaho Low-Income Program:

- Evaluators found one project where the 20 percent annual usage savings cap was not applied to all measures in the household, leading to a lower realization rate for the measures in that household. Evaluators recommend ensuring that savings caps are applied to all measures within a household for expected savings calculations.
- Evaluators found unit-level savings for LED bulbs were inaccurately referenced for the Low-Income Program. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to a 11 percent realization rate for LED bulb projects under the program. Evaluators recommend updating database calculations to use Avista TRM values during expected savings calculations.
- Evaluators identified one instance where verified savings from a duct insulation measure was double the reported savings. They recommend that the company works to ensure that the Avista TRM rates are properly applied throughout its rebate database.

Cost-Effectiveness

Tables 41 and 42 show the low-income sector cost-effectiveness results by fuel type.

TABLE 41 – LOW-INCOME PROGRAM ELECTRIC COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 187,553	$ 418,870	0.45
Utility Cost Test (UCT)	$ 125,197	$ 512,126	0.24
Participant Cost Test (PCT)	$ 434,226	$ 166,027	2.62
Ratepayer Impact (RIM)	$ 83,527	$ 687,070	0.12

TABLE 42 – LOW-INCOME PROGRAM NATURAL GAS COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 61,168	$ 203,869	0.30
Utility Cost Test (UCT)	$ 61,168	$ 197,268	0.31
Participant Cost Test (PCT)	$ 172,725	$ 132,801	1.30
Ratepayer Impact (RIM)	$ 21,400	$ 243,792	0.09

Plans for 2023

The agency will continue to implement weatherization measures in the next two-year contracting cycle. As mentioned previously, the measures that appear on the approved and acceptable measure lists may fluctuate annually based on utility cost-effectiveness tests.

The flexibility given to how the dollars are used for the health, safety, and repair allocation does allow for non-cost-effective measures to be fully funded. Excluding pandemic years, the agencies have demonstrated the ability to spend most of their utility allocation. With the increase to the percentages in the administration/program support category, the company will work with its advisory group on a periodic review of this allocation.

Avista will continue to revisit unit energy savings (UES) assumptions for measures as part of its annual business planning process. The company also continues to re-evaluate the units used to set program participation goals for the year. Finally, Avista will ensure that the TRM is updated to reflect any UES adjustments. With low-income programs moving into the iEnergy system in 2023, Avista expects that TRM maintenance will become more automated, reducing or eliminating TRM-related errors in future impact evaluations. Application of the 20 percent savings cap is also expected to be more uniform after the iEnergy migration.

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Wallace, Idaho

PILOT PROGRAMS

Program-by-Program Summaries

Active Energy Management

Consistent with Avista's goals to be carbon-neutral by 2030 and carbon-free by 2045, the Active Energy Management (AEM) pilot focuses on innovative ways to achieve deep energy savings in commercial buildings. AEM can be defined in industry terms as a strategic energy management program that employs monitoring-based commissioning processes and the intelligent fault detection and diagnostic tools.

For this pilot, Avista has partnered with Edo, a joint investment between Avista Development and McKinstry. The AEM pilot uses the newly built eco-district's communication networks, cloud services, and data-mining algorithms to capture, process, and disseminate actionable information to participants in the program. The technology platform is expected to provide a framework to evaluate building performance.

The energy management pilot represents an enhanced approach to utility customer solutions. Specifically, the pilot provides high-touch energy management services and education to customers to complete the identified energy conservation measures.

Recruitment ended in 2022 with 12 customers and 19 buildings participating across two states in Avista's service territory (6 customers in Idaho and 6 in Washington). Over the next two years (2023-2024), the program's focus will be on meeting the following goals:

1. Achieve 4.8 million kWh of energy savings over the pilot term.
2. Acquire rich facility operating information that can inform future rate or program design, particularly focused on future load flexibility programs.
3. Increase customer satisfaction for participating building owners and operators.
4. Gain insight into customer willingness to participate in future demand flexibility programs.
5. Demonstrate non-energy benefits from program participation, including occupant comfort, reduced greenhouse gas emissions, and improved equipment life expectancy.

Residential Home Energy Audit Pilot Program

Description

Taking advantage of previous experience and aligning with industry best practices, Avista launched a pilot Home Energy Audit Program in 2019. Eligible participants included residential customers who use Avista energy as their primary heating source and reside in Kootenai County, Idaho or in Spokane County, Washington. The program was implemented by Avista using a contract auditor. In early 2020, Avista gained support from the Energy Efficiency Advisory Group and commission staff for both Idaho and Washington to move the program from pilot to full program status.

Program Activities

Modifications to program marketing materials and agreement forms were underway prior to the COVID-19 pandemic; restrictions effectively suspended the program. As a result, no audits were conducted in 2020, 2021, or the first half of 2022.

The program resumed in June 2022 and was offered across the utility's entire Idaho and Washington service territory. Avista estimated that 200 audits would be conducted between the two states per year. During the last half of the calendar year 2022 (June through December), 121 audits were completed, 23 of which were in Idaho. However, interest in the program proved to be greater than what Avista anticipated. Applications increased as outside temperatures decreased and exceeded staff's ability to process them.

Plans for 2023

Avista is working through the backlog in 2023 and has revised program participation estimates to 500 audits annually across both states.

Customer education about energy efficiency and cross-program awareness are the key focus areas of this program. Avista is working with its third-party evaluator to develop an analysis plan for participating homes. The purpose of this one-year post audit would be to determine if energy savings can be attributed to the program, either directly or indirectly, through increased participation in other Avista energy-efficiency programs.

AeroBarrier Pilot Program

Reducing air leaks in a new-construction home results in sustainable benefits with increased comfort, reduced energy usage, and lower energy bills. Many builders recognize and promote this, but there are several value-based builders who choose not to meet air-seal code requirements. Avista targeted all builders in Idaho for this pilot and will track demographics of each to determine the value of and future potential for this program.

The pilot program offered incentives exclusively for the air-sealing method using AeroBarrier. This product differs from traditional air sealing practices that use spray foam, caulk, gaskets, and tape because AeroBarrier manufacturers its product (acrylic sealant) from technology invented, and proven, by the U.S. Department of Energy more than 20 years ago. The sealant is applied using sprayers throughout the home while it's under pressure, which delivers consistent results.

The pilot was launched in April 2021 to provide home builders with an incentive to seal new homes with AeroBarrier's product. It concluded in June 2022. The program is currently being evaluated by Avista's third-party evaluator to establish cost-effectiveness and determine whether to offer a full program. Results are expected in the third quarter of 2023 and will be discussed with Avista's fall EEAG meeting to determine next steps.

Small Business Lighting Direct Install

Description

Resource Innovations, the third-party consultant hired to implement the Small Business Lighting Direct Install pilot, will establish a turnkey lighting program to recruit and train trade allies/installers to engage customers with energy-efficiency opportunities. The pilot is designed for hard-to-reach small business customers within Avista's service territory to supplement and enhance Avista's ongoing customer engagement and energy-efficiency efforts. It includes installation of low- and no-cost energy-savings lighting measures at each customer location (lamps, fixtures, and controls), a brief on-site audit to identify customer opportunities and interest in other Avista programs, and leave-behind materials and contact information for any customer follow-up questions or feedback.

Program Activities

Resource Innovations will use ZIP Code identifiers to "cluster" eligible customers and establish routes for door-to-door marketing. Additionally, myavista.com will host a web form for customers to sign up for the service. Trade allies/installers will have the opportunity to complete specialized training, wear/carry co-branded materials, and receive project leads in order to complete installations for this program. Resource Innovations will utilize the iEnergy software to conduct customer eligibility checks, facility walkthrough assessments, and project scope creation, as well as to generate customer facing reports and surveys. All applicable project data will be tracked in iEnergy.

Program Eligibility

Commercial customers who receive electric service in either Idaho or Washington under Schedule 11 or Schedule 12 will be eligible, and customers who have meters on multiple rate schedules in addition to Schedules 11 and 12 will be considered.

Plans for 2023

With the goal of completing 111 projects, the program will begin customer direct marketing and lighting installation early in the second quarter, after the following activities have been finalized: marketing plan, measure list, trade ally/installer recruitment and training, and software release of the iEnergy OnSite program tracking system.

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REGIONAL MARKET TRANSFORMATION

Silver Mt. Ski Resort, Kellogg, Idaho

REGIONAL MARKET TRANSFORMATION

Overview

Avista's local energy-efficiency portfolio consists of programs and supporting infrastructure designed to enhance and accelerate the saturation of energy-efficiency measures throughout its service territory through a combination of financial incentives, technical assistance, program outreach, and education. Utilities in the northwest, including Avista, work together through NEEA to realize broader regional efficiency opportunities. Avista has been participating in and funding NEEA since its inception in 1997.

Table 43 shows 2022 NEEA actual savings and associated costs for Idaho, which exclude internal administrative costs associated with the participation in the various NEEA activities and studies. These savings are above NEEA's established baseline and exclude utility-claimed savings from locally run programs.

A primary drive for the increase in electric savings is the adoption of a new building code in Idaho. According to a 2018 IECC driver by the Pacific Northwest National Laboratory, Idaho's new residential code is approximately 11.6 percent more efficient than the prior code, while the commercial code is roughly 3.9 percent more efficient. On the residential natural gas side, the new code is approximately 13 percent more efficient than the prior code[1].

TABLE 43 – ACTUAL SAVINGS AND ASSOCIATED COSTS FOR IDAHO

Fuel Type	2022 NEEA Final Reported Energy Savings	2022 Costs (Avista Financials)	Avista Idaho Current Funding Share (2021-2024)
Electric	5,694 MWh (0.65 aMW)	$ 1,507,782	1.69%
Natural Gas	282,088	$ 607,597	3.55%

In addition to code savings, NEEA continues to work on market development initiatives for a number of measures of interest to Avista's Idaho customers, including a highly efficient dedicated outside air systems (DOAS) approach; programs for commercial and industrial fans, more efficient variable speed heat pumps, and high-performance windows for residential applications.

NEEA also moved an efficient rooftop units program into market development in late 2022. The program's goal is to accelerate adoption of efficient natural gas rooftop units, while working to influence the adoption of improved testing procedures as well as more stringent federal standards. Savings data from this effort is expected to be available by the fourth quarter of 2023.

Avista's investment in NEEA programs is highly cost-effective. In a recent evaluation of NEEA's cost-effectiveness by ADM, NEEA programs were found to have an average UCT value of 8.55 over five program years (2017 to 2021)[2].

1) As reported in "Final 2022 Annual Savings Report" March 23, 2023 memo from NEEA to Avista. The memo included the following citations for code savings assumptions: a) https://www.pnnl.gov/main/publications/external/technical_reports/PNNL-28125.pdf; and b) neea.org, portal login, savings, codes.

2) As reported in "Evaluation of NEEA Impacts Allocated to Idaho Power Company and Avista Utilities within the State of Idaho, April 6, 2023, by ADM Associates, Inc."

Avista will continue to work closely with NEEA and other regional entities to identify overlapping priorities and objectives while simultaneously deploying a more thorough and customized market transformation strategy to its local market – including additional investment and direct coordination with the supply chain.

Electric Energy Savings Share

All the values provided in this report represent the amounts that are allocated to Avista's service territory, which is a combination of site-based energy savings data (where available) or an allocation of savings based on funding share. Using the funding share allocation approach, the funding share for Avista is split between 30 percent for Avista Idaho and 70 percent for Avista Washington. The funding share for Avista varies by funding cycle and within each cycle if the funding composition changes.

Natural Gas Energy Savings Share

NEEA's costs include all expenditures for operations and value delivery: energy savings initiatives; investments in market training and infrastructure; stock assessments, evaluations, data collection, and other regional and program research; emerging technology research and development; and all administrative costs.

Avista's criteria for funding NEEA's electric market transformation portfolio calls for the portfolio to deliver incrementally cost-effective resources beyond what could be acquired through Avista's local portfolio alone. Avista has historically communicated with NEEA the importance of that organization delivering cost-effective resources to the company's service territory. The company believes that NEEA will continue to offer cost-effective electric market transformation in the foreseeable future. Avista will continue to be active in the organizational oversight of NEEA, a critical step in ensuring that geographic equity, cost-effectiveness, and resource acquisition goals of market transformation are met.

Brio Eastside Collaborative Market Transformation

During 2022, Avista continued to investigate new market transformation efforts with a specific focus on energy-efficiency measures and solutions that work well in northern Idaho and eastern Washington. This engagement is complementary to NEEA's efforts for the broader region. The goal of this effort is aimed at assessing market transformation opportunities that drive greater local impact and create deeper customer engagement. To do this, Avista has partnered with Brio Energy and Idaho Power to pilot the application of a market transformation approach that focuses on mid- and upstream interventions to remove market barriers and create lasting change. The promotional period for Phase I of the Eastside Collaborative Pilot began in October 2021 in Idaho Power's service territory, and concluded with a four-month promotional period in Avista's service territory from May through September of 2022.

The following table summarizes the ductless heat pump unit sales from Phase I.

TABLE 44 – EASTSIDE COLLABORATIVE AND DUCTLESS HEAT PUMP PILOT PHASE I SUMMARY

Participating Distributor & Branch	Utility	Phase I Promo Period	Pilot Period Participating Distributor Branch Sales	Pilot Period Participating Dealer/ Contractor Installs	Participating Dealer/ Contractor Installs within Utility Service territories
Thermal Supply	Idaho Power	Oct 2021 – Apr 2022	1,395 (Oct – Jun)	48*	N/A
Sigler Idaho	Idaho Power	Apr – Aug 2022	364 (Apr – Aug)	169	167
Airefco Spokane	Avista	May – Sept 2022	865 (May – Sept)	329	212
Totals			**2,624**	**546**	**379****

* Assumed installs from two Thermal branches in Idaho (Meridian and Twin Falls), based on contractor self-reported sales, Daikin warranty data, and incentive data from Idaho Power.

** Included Thermal's sales in December's report, overlooking that they did not request incentives from Idaho Power in Phase I.

In Avista's service territory, 25 percent of units sold through the participating dealer were incentivized through this program. Of those 212 units, 57 were installed for Idaho customers, while 155 units were installed for Washington customers. In conversations with Brio, the participating distributor expressed enthusiasm about participating in the program, but did report some confusion about promotion requirements, which may have resulted in lower initial rebates than expected.

In early 2023, Brio will offer additional orientation webinars for dealers, to clarify promotion requirements. In Phase II of the pilot, which will extend into 2023, Airefco will be expanding participation to additional dealers. All distributors who participated in Phase I will continue into Phase II. To support Phase II activities, Brio has developed a toolkit for dealers to aid in recruitment. It includes draft emails for distributors to send to territory managers, an overview presentation of the pilot to circulate to interested parties, draft emails for territory managers to send to dealers, and templates to collect contact information for participating dealers.

Manufacturer and supply chain engagement is planned for early to mid-2023.

GLOSSARY OF TERMS

North Idaho

GLOSSARY OF TERMS

Advisory Group: Avista's group of external stakeholders who comment about the company's energy-efficiency activities.

AHRI (Air-Conditioning, Heating, and Refrigeration Institute) certificates: a certification widely recognized through the industry as a standard certification for HVAC/refrigeration efficiency.

advanced metering infrastructure (AMI): Systems that measure, collect, and analyze energy usage, from advanced devices such as electricity meters, natural gas meters, and/or water meters to various communication media on request or on a predetermined schedule.

Air-Conditioning, Heating, and Refrigeration Institute (AHRI): The trade association representing manufacturers of HVAC and water heating equipment.

aMW: The amount of energy that would be generated by one megawatt of capacity operating continuously for one full year. Equals 8,760 MWhs of energy.

American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE): Devoted to the advancement of indoor-environment-control technology in the heating, ventilation, and air conditioning (HVAC) industry, ASHRAE's mission is "to advance technology to serve humanity and promote a sustainable world."

Annual Conservation Plan (ACP): An Avista-prepared resource document that outlines the company's conservation offerings and its approach to energy efficiency, as well as details on verifying and reporting savings.

Annual Conservation Report (ACR): An Avista-prepared resource document that summarizes its annual energy efficiency achievements.

annual fuel utilization efficiency (AFUE): A measurement on how efficiently a furnace or boiler uses its fuel.

avoided cost: An investment guideline describing the value of conservation and generation resource investments in terms of the cost of more expensive resources that would otherwise have to be acquired.

baseline: Conditions, including energy consumption, which would have occurred without implementation of the subject's energy-efficiency activity. Baseline conditions are sometimes referred to as "business-as-usual" conditions.

baseline efficiency: The energy use of the baseline equipment, process, or practice that is being replaced by a more efficient approach to providing the same energy service. It is used to determine the energy savings obtained by the more efficient approach.

baseline period: The period of time selected as representative of facility operations before an energy-efficiency activity takes place.

Biennial Conservation Plan (BCP): An Avista-prepared resource document that outlines Avista's conservation offerings and its approach to energy efficiency, as well as details on verifying and reporting savings for a two-year period.

Building Owners & Managers Association (BOMA): An international federation of local associations and global affiliates that represents the owners, managers, service providers, and other property professionals of all commercial building types.

Business Partner Program (BPP): An outreach effort designed to raise awareness of utility programs and services that can assist rural small business customers in managing their energy bills.

British thermal unit (Btu): The amount of heat energy necessary to raise the temperature of one pound of water one degree Fahrenheit (3,413 Btus are equal to one kilowatt-hour).

busbar: The physical electrical connection between the generator and transmission system. Load on a system is typically measured at the busbar.

capacity: The maximum power that a machine or system can produce or carry under specified conditions. The capacity of generating equipment is generally expressed in kilowatts or megawatts. In terms of transmission lines, capacity refers to the maximum load a line is capable of carrying under specified conditions.

Clean Energy Implementation Plan (CEIP): Introduced within a subsection of the Clean Energy Transformation Act, a CEIP must describe the utility's plan for making progress toward meeting the clean energy transformation standards while it continues to pursue all cost-effective, reliable, and feasible conservation and efficiency resources.

Clean Energy Transformation Act (CETA): Signed into law in 2019, the Clean Energy Transformation Act requires electric utilities to supply their Washington customers with 100 percent renewable or non-emitting electricity with no provision for offsets.

coefficient of performance (COP): A ratio of useful heating or cooling provided to work (energy) required for heat pumps, refrigerators, or air conditioning systems. Higher COPs equate to more efficient systems and lower operating costs.

Community Action Partnership (CAP): General term for Community Action Programs, Community Action Agencies, and Community Action Centers that provide services such as low-income weatherization through federal and state and other funding sources (e.g., utility constitutions).

Community Energy Efficiency Program (CEEP): Created by the Washington State Legislature in 2009, CEEP encourages homeowners and small businesses across the state to make energy-efficiency retrofits and upgrades.

conservation: According to the Northwest Power Act, any reduction in electric power consumption as a result of increases in the efficiency of energy use, production, or distribution.

conservation potential assessment (CPA): An analysis of the amount of conservation available in a defined area. Provides savings amounts associated with energy-efficiency measures to input into the company's integrated resource planning process.

cooling degree days: A measure of how hot the temperature was on a given day or during a period of days. A day with a mean temperature of 80°F has 15 cooling degree days. If the next day has a mean temperature of 83°F, it has 18 cooling degree days. Historically, the fixed temperature has been set at 65 degrees Fahrenheit, the outdoor temperature above which cooling was typically needed.

cost-effective: According to the Northwest Power Act, a cost-effective measure or resource must be forecast to be reliable and available within the time it is needed, and to meet or reduce electrical power demand of consumers at an estimated incremental system cost no greater than that of the least-costly, similarly reliable and available alternative or combination of alternatives.

curtailment: An externally imposed reduction of energy consumption due to a shortage of resources.

customer/customer classes: Category(ies) of customer(s) defined by provisions found in tariff(s) published by the entity-providing service, approved by the PUC. Examples of customer classes are residential, commercial, industrial, agricultural, local distribution company, core, and non-core.

decoupling: In conventional utility regulation, utilities make money based on how much energy they sell. A utility's rates are based largely on an estimation of costs of providing service over a certain set time period, with an allowed profit margin, divided by a forecasted amount of unit sales over the same time period. If the actual sales turn out to be as forecasted, the utility will recover all of its fixed costs and its set profit margin. If the actual sales exceed the forecast, the utility will earn extra profit.

deemed savings: Primarily referred to as unit energy savings, an estimate of the energy savings for a single unit of an installed energy-efficiency measure that (a) has been developed from data sources and analytical methods that are widely considered acceptable for the measure and purpose, and (b) is applicable to the situation being evaluated.

demand: The load that is drawn from the source of supply over a specified interval of time (in kilowatts, kilovolt-amperes, or amperes). Also, the rate at which natural gas is delivered to or by a system, part of a system, or piece of equipment, expressed in cubic feet, therms, Btus or multiples thereof, for a designated period of time (such as during a 24-hour day).

demand response (DR): A voluntary and temporary change in consumers' use of electricity when the power system is stressed.

demand side management (DSM): The process of helping customers use energy more efficiently. Used interchangeably with energy efficiency and conservation, although conservation technically means using less while DSM and energy efficiency mean using less while still having the same useful output of function.

direct load control (DLC): The means by which a utility can signal a customer's appliance to stop operations to reduce the demand for electricity. Such rationing generally involves a financial incentive for the affected customer.

discount rate: The rate used in a formula to convert future costs or benefits to their present value.

distribution: The transfer of electricity from the transmission network to the consumer. Distribution systems generally include the equipment to transfer power from the substation to the customer's meter.

distributed generation (DG): An approach that employs a variety of small-scale technologies to both produce and store electricity close to the end users of power.

effective useful life (EUL): Sometimes referred to as measure life and often used to describe persistence. EUL is an estimate of the duration of savings from a measure.

emergency operating plan (EOP): A plan that assigns responsibility to organizations and individuals for carrying out specific actions to respond to an emergency. An EOP sets forth lines of authority, lays out organizational roles and responsibilities during an emergency, and illustrates how actions will be coordinated. An EOP also describes how people and property will be protected in emergencies and natural disasters, and identifies personnel, equipment, facilities, and supplies to use during recovery operations.

end-use: A term referring to the final use of energy; it often refers to the specific energy services (for example, space heating), or the type of energy-consuming equipment (for example, motors).

energy assistance advisory group: An ongoing energy assistance program advisory group to monitor and explore ways to improve Avista's Low-Income Rate Assistance Program (LIRAP).

Energy Efficiency Advisory Group (EEAG): A group which advises investor-owned utilities on the development of integrated resource plans and conservation programs.

energy-efficiency measure: Refers to either an individual project conducted, or technology implemented, to reduce the consumption of energy at the same or an improved level of service. Often referred to as simply a "measure."

Energy Independence Act (EIA): Requires electric utilities serving at least 25,000 retail customers to use renewable energy and energy conservation.

energy use intensity (EUI): A metric – energy per square foot per year – that expresses a building's energy use as a function of its size or other characteristics.

evaluation: The performance of a wide range of assessment studies and activities aimed at determining the effects of a program (and/or portfolio) and understanding or documenting program performance, program or program-related markets and market operations, program-induced changes in energy-efficiency markets, levels of demand or energy savings, or program cost-effectiveness. Market assessment, monitoring and evaluation, and verification are aspects of evaluation.

evaluation, measurement, and verification (EM&V): Catch-all term for evaluation activities at the measure, project, program, and/or portfolio level; can include impact, process, market, and/or planning activities. EM&V is distinguishable from measurement and verification (M&V) defined below.

ex-ante savings estimate: Forecasted savings value used for program planning or savings estimates for a measure; Latin for "beforehand."

ex-post evaluated estimated savings: Savings estimates reported by an independent, third-party evaluator after the energy impact evaluation has been completed. If only the term "ex-post savings" is used, it will be assumed that it is referring to the ex-post evaluation estimate, the most common usage; from Latin for "from something done afterward."

external evaluators (AKA third-party evaluators): Independent professional efficiency person or entity retained to conduct EM&V activities. Consideration will be made for those who are Certified Measurement and Verification Professionals (CMVPs) through the Association of Energy Engineers (AEE) and the Efficiency Evaluation Organization (EVO).

free rider: A common term in the energy efficiency industry meaning a program participant who would have installed the efficient product or changed a behavior regardless of any program incentive or education received. Free riders can be total, partial, or deferred.

generation: The act or process of producing electricity from other forms of energy.

Green Motors Practices Group (GMPG): A nonprofit corporation governed by electric motor service center executives and advisors whose goal is the continual improvement of the electric motor repair industry.

gross savings: The change in energy consumption and/or demand that results from energy-efficiency programs, codes and standards, and naturally-occurring adoption which have a long-lasting savings effect, regardless of why they were enacted.

heating degree days: A measure of the amount of heat needed in a building over a fixed period, usually a year. Heating degree days per day are calculated by subtracting from a fixed temperature the average temperature over the day. Historically, the fixed temperature has been set at 65 degrees Fahrenheit, the outdoor temperature below which heat was typically needed. As an example, a day with an average temperature of 45 degrees Fahrenheit would have 20 heating degree days, assuming a base of 65 degrees Fahrenheit.

heating seasonal performance factor (HSPF): Defined as the ratio of heat output over the heating season to the amount of electricity used in air-source or ductless heat pump equipment.

heating, ventilation, and air conditioning (HVAC): Sometimes referred to as climate control, HVAC is particularly important in the design of medium to large industrial and office buildings where humidity and temperature must all be closely regulated while maintaining safe and healthy conditions within.

high-intensity discharge (HID) fixture: A fixture that is bright and powerful enough to throw a high amount of lumens an extremely long distance; often used in very large spaces such as manufacturing facilities or sports stadiums.

HOU: Hours of use (an annual estimation of lighting or HVAC equipment operation hours).

Idaho Public Utilities Commission (IPUC): Regulators of investor-owned or privately owned utilities that provide natural gas, water, electricity, or some telephone services for profit.

impact evaluation: Determination of the program-specific, directly or indirectly induced changes (e.g., energy and/or demand usage) attributable to an energy-efficiency program.

implementer: Avista employee whose responsibilities are directly related to operations and administration of energy-efficiency programs and activities, and who may have energy savings targets as part of their employee goals or incentives, or in the case of a third-party implementer, may be contractually obligated to implement programs on behalf of Avista.

incremental cost: The difference between the cost of baseline equipment or services and the cost of alternative energy-efficient equipment or services.

installation verification (IV) report: A detailed report documenting installed conservation measures on a site-specific project.

in-service rate: The percentage of energy-efficiency measures in an impact evaluation sample that have been installed as expected, in accordance with incentive program parameters.

Integrated Resource Plan (IRP): A comprehensive evaluation of future electric or natural gas resource plans. The IRP must evaluate the full range of resource alternatives to provide adequate and reliable service to a customer's needs at the lowest possible risk-adjusted system cost. These plans are filed with the state public utility commissions on a periodic basis.

International Performance Measurement and Verification Protocol (IPMVP): A guidance document with a framework and definitions describing the four M&V approaches; a product of the Energy Valuation Organization (www.evo-world.org).

investor-owned utility (IOU): A utility that is organized under state law as a corporation to provide electric power service and earn a profit for its stockholders.

kilowatt (kW): The electrical unit of power that equals 1,000 watts.

kilowatt-hour (kWh): A basic unit of electrical energy that equals one kilowatt of power applied for one hour.

kilo British thermal unit (kBtu): Btu, which stands for British thermal units, measures heat energy. Each Btu equals the amount of heat needed to raise one pound of water one degree Fahrenheit; the prefix kilo means 1,000, which means that a kBtu equals 1,000 Btu.

levelized cost of energy (LCOE): The present value of a resource's cost (including capital, financing, and operating costs) converted into a stream of equal annual payments. This stream of payments can be converted to a unit cost of energy by dividing them by the number of kilowatt-hours produced or saved by the resource in associated years. By levelizing costs, resources with different lifetimes and generating capabilities can be compared.

line losses: The amount of electricity lost or assumed lost when transmitting over transmission or distribution lines. This is the difference between the quantity of electricity generated and the quantity delivered at some point in the electric system.

Low-Income Home Energy Assistance Program (LIHEAP): Federal energy assistance program, available to qualifying households based on income, usually distributed by community action agencies or partnerships.

market effect evaluation: An evaluation of the change in the structure or functioning of a market, or the behavior of participants in a market, that results from one or more program efforts. Typically, the resultant market or behavior change leads to an increase in the adoption of energy-efficient products, services, or practices.

measure (also energy-efficiency measure or "EEM"): Installation of a single piece of equipment, subsystem or system, or single modification of equipment, subsystem, system, or operation at an end-use energy consumer facility, for the purpose of reducing energy and/or demand (and, hence, energy and/or demand costs) at a comparable level of service.

measure life: See Effective Useful Life (EUL).

measurement and verification (M&V): A subset of program impact evaluation that is associated with the documentation of energy savings at individual sites or projects, using one or more methods that can involve measurements, engineering calculations, statistical analyses, and/or computer simulation modeling. M&V approaches are defined in the International Performance Measurement and Verification Protocol (IPMVP available at www.evo-world.org).

megawatt (MW): The electrical unit of power that equals one million watts or one thousand kilowatts.

megawatt-hour (MWh): A basic unit of electrical energy that equals one megawatt of power applied for one hour.

net savings: The change in energy consumption and/or demand that is attributable to an energy-efficiency program. This change in energy use and/or demand may include, implicitly or explicitly, consideration of factors such as free drivers, non-net participants (free riders), participant and non-participant spillover, and induced market effects. These factors may be considered in how a baseline is defined and/or in adjustments to gross savings values.

non-energy benefit/non-energy impact (NEB/NEI): The quantifiable non-energy impacts associated with program implementation or participation; also referred to as non-energy benefits (NEBs) or co-benefits. Examples of NEIs include water savings, non-energy consumables and other quantifiable effects. The value is most often positive, but may also be negative (e.g., the cost of additional maintenance associated with a sophisticated, energy-efficient control system).

Northwest Energy Efficiency Alliance (NEEA): A nonprofit organization that works to accelerate energy efficiency in the Pacific Northwest through the adoption of energy-efficient products, services, and practices.

Northwest Power and Conservation Council (NWPCC): An organization that develops and maintains both a regional power plan and a fish and wildlife program to balance the environmental and energy needs of the Pacific Northwest.

Outside Air Temperature (OAT): Refers to the temperature of the air around an object, but unaffected by the object.

Participant Cost Test (PCT): The PCT measures quantifiable costs and benefits to the customer participating in a program – including, for example, the incentive paid by the utility under the program, as well as non-energy impacts. Since many customers do not base their decision to participate in a program entirely on quantifiable variables, this test cannot be a complete measure of the benefits and costs of a program to a customer.

portfolio: Collection of all programs conducted by an organization. In the case of Avista, portfolio includes electric and natural gas programs in all customer segments. It can also be used to refer to a collection of similar programs addressing the market. In this sense of the definition, Avista has an electric portfolio and a natural gas portfolio with programs addressing the various customer segments.

prescriptive: A prescriptive program is a standard offer for incentives for the installation of an energy-efficiency measure. Prescriptive programs are generally applied when the measures are employed in relatively similar applications.

process evaluation: A systematic assessment of an energy-efficiency program or program component for the purposes of documenting operations at the time of the examination, and identifying and recommending improvements to increase the program's efficiency or effectiveness for acquiring energy resources while maintaining high levels of participant satisfaction.

program: An activity, strategy, or course of action undertaken by an implementer. Each program is defined by a unique combination of program strategy, market segment, marketing approach, and energy-efficiency measure(s) included. Examples are a program to install energy-efficient lighting in commercial buildings and residential weatherization programs.

project: An activity or course of action involving one or multiple energy-efficiency measures at a single facility or site.

ratepayer impact (RIM): A cost effectiveness test that measures changes in customer bills or rates due to changes in utility revenues and operating costs caused by an energy efficiency or demand response program.

Regional Technical Forum of the Northwest Power and Conservation Council (RTF): A technical advisory committee to the Northwest Power and Conservation Council established in 1999 to develop standards to verify and evaluate energy efficiency savings.

realization rate (RR): Ratio of ex-ante reported savings to ex-post evaluated estimated savings. When realization rates are reported, they are labeled to indicate whether they refer to comparisons of (1) ex-ante gross reported savings to ex-post gross evaluated savings, or (2) ex-ante net reported savings to ex-post net evaluated savings.

reliability: When used in energy-efficiency evaluation, the quality of a measurement process that would produce similar results on (a) repeated observations of the same condition or event, or (b) multiple observations of the same condition or event by different observers. Reliability refers to the likelihood that the observations can be replicated.

reported savings: Savings estimates reported by Avista for an annual (calendar) period. These savings will be based on best available information.

request for proposal (RFP): Business document that announces and provides details about a project, as well as solicits bids from potential contractors.

retrofit: To modify an existing generating plant, structure, or process. The modifications are done to improve energy efficiency, reduce environmental impacts, or to otherwise improve the facility.

rigor: The level of expected confidence and precision. The higher the level of rigor, the more confident one is that the results of the evaluation are both accurate and precise, i.e., reliable.

ratepayer impact (RIM): A cost-effectiveness test that measures how customer bills or rates are affected by the changes in utility revenues and operating costs caused by the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels. Lower values equate to less impact on customer bills.

R-value or R-factor (resistance transfer factor): Measures how well a barrier, such as insulation, resists the conductive flow of heat.

schedules 90 and 190: Rate schedules that show energy-efficiency programs.

schedules 91 and 191: Rate schedules that are used to fund energy-efficiency programs.

sector(s): The economy is divided into four sectors for energy planning. These are the residential, commercial (e.g., retail stores, office and institutional buildings), industrial, and agriculture (e.g. dairy farms, irrigation) sectors.

service territory: The areas in Idaho, Washington, and Oregon served by Avista to provide either natural gas or electric service (or both).

site-specific: A non-residential program offering individualized calculations for incentives upon any electric or natural gas efficiency measure not incorporated into a prescriptive program.

simple payback: The time required before savings from a particular investment offset costs, calculated by investment cost divided by value of savings (in dollars). For example, an investment costing $100 and resulting in a savings of $25 each year would be said to have a simple payback of four years. Simple paybacks do not account for future cost escalation or other investment opportunities.

spillover: Reductions in energy consumption and/or demand caused by the presence of an energy-efficiency program, beyond the program-related gross savings of the participants and without direct financial or technical assistance from the program. There can be participant and/or non-participant spillover (sometimes referred to as "free drivers"). Participant spillover is the additional energy savings that occur as a result of the program's influence when a program participant independently installs incremental energy-efficiency measures or applies energy-saving practices after having participated in the energy-efficiency program. Non-participant spillover refers to energy savings that occur when a program non-participant installs energy-efficiency measures or applies energy savings practices as a result of a program's influence.

technical reference manual (TRM): An Avista-prepared resource document that contains Avista's (ex-ante) savings estimates, assumptions, sources for those assumptions, guidelines, and relevant supporting documentation for its natural gas and electricity energy-efficiency prescriptive measures which is populated and vetted by the RTF and 3rd party evaluators.

total resource cost (TRC): A cost-effectiveness test that assesses the impacts of a portfolio of energy-efficiency initiatives regardless of who pays the costs or who receives the benefits. The test compares the present value of costs of efficiency for all members of society (including all costs to participants and program administrators) compared to the present value of all quantifiable benefits, including avoided energy supply and demand costs and non-energy impacts.

transmission: The act or process of long-distance transport of electric energy, generally accomplished by elevating the electric current to high voltages. In the Pacific Northwest, Bonneville operates a majority of the high-voltage, long-distance transmission lines.

uniform energy factor (UEF): A measurement on how efficiently a water heater uses its fuel.

unit estimated savings (UES): Defines the first-year kWh savings value for an energy-efficiency measure.

U-value or U-factor: The measure of a material's ability to conduct heat, numerically equal to 1 divided by the R-value of the material. Used to measure the rate of heat transfer in windows. The lower the U-factor, the better the window insulates.

uncertainty: The range or interval of doubt surrounding a measured or calculated value within which the true value is expected to fall within some degree of confidence.

utility cost test (UCT): One of the four standard practice tests commonly used to evaluate the cost-effectiveness of DSM programs. The UCT evaluates the cost-effectiveness based upon a program's ability to minimize overall utility costs. The primary benefits are the avoided cost of energy in comparison to the incentive and non-incentive utility costs.

variable frequency drive (VFD): A type of motor drive used in electro-mechanical drive systems to control AC motor speed and torque by varying motor input frequency and voltage.

verification: An assessment that the program or project has been implemented per the program design. For example, the objectives of measure installation verification are to confirm (a) the installation rate, (b) that the installation meets reasonable quality standards, and (c) that the measures are operating correctly and have the potential to generate the predicted savings. Verification activities are generally conducted during on-site surveys of a sample of projects. Project site inspections, participant phone and mail surveys, and/or implementer and consumer documentation review are typical activities association with verification. Verification may include one-time or multiple activities over the estimated life of the measures. It may include review of commissioning or retro-commissioning documentation. Verification can also include review and confirmation of evaluation methods used, samples drawn, and calculations used to estimate program savings. Project verification may be performed by the implementation team, but program verification is a function of the third-party evaluator.

weather normalized: This is an adjustment that is made to actual energy usage, stream-flows, etc., which would have happened if normal weather conditions would have taken place.

weighted average cost of capital (WACC): A calculation of a firm's cost of capital in which each category of capital is proportionately weighted. All sources of capital, including common stock, preferred stock, bonds, and any other long-term debt, are included in a WACC calculation.

8,760: Total number of hours in a year.

APPENDICES AND SUPPLEMENTS

McEuen Park, Coeur d'Alene, Idaho

APPENDIX A – 2022 IDAHO ELECTRIC IMPACT EVALUATION REPORT

Avista Idaho PY2022

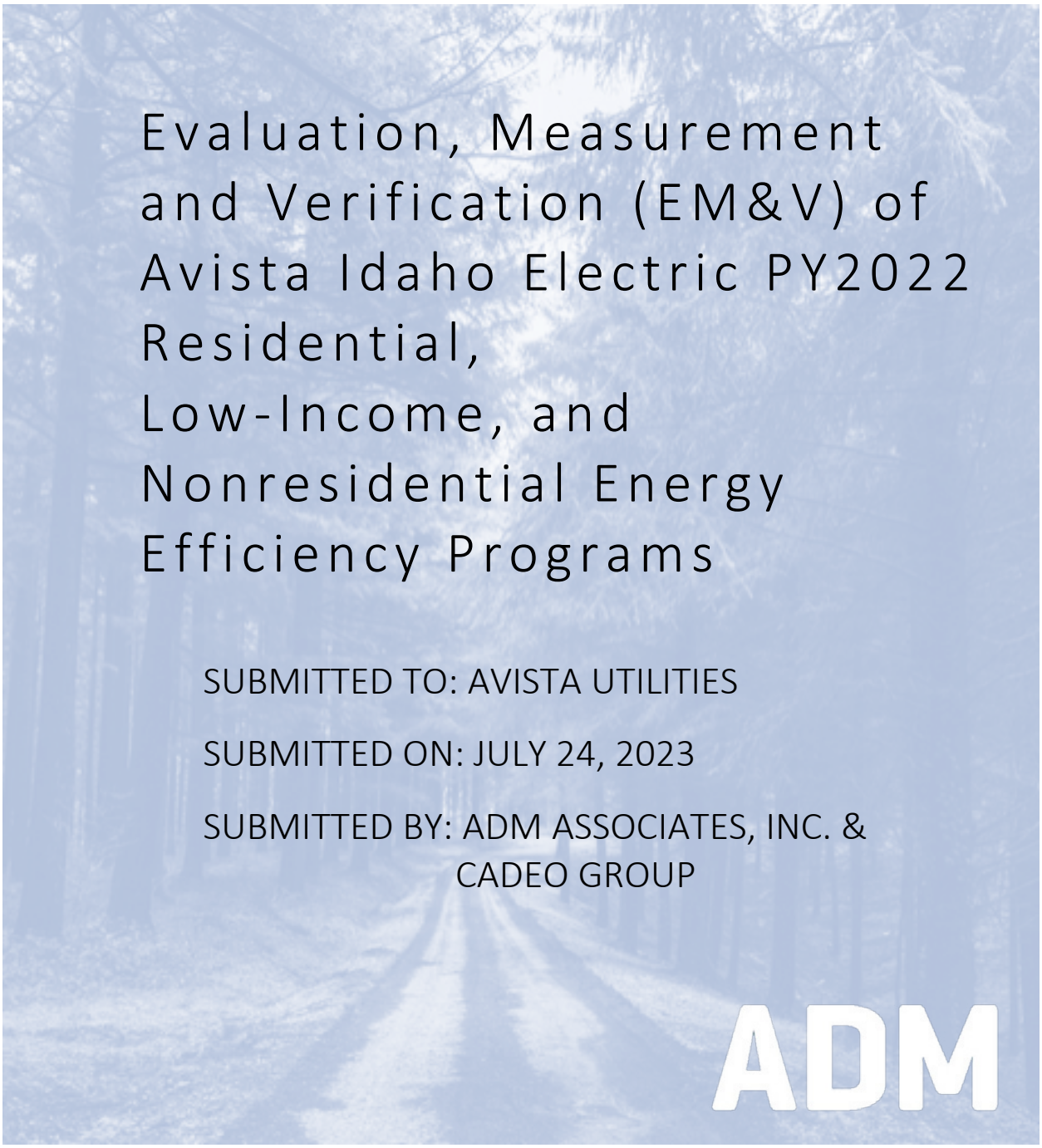

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Table of Contents

List of Tables

1. Executive Summary

This report is a summary of the Residential and Low-Income Electric Evaluation, Measurement, and Verification (EM&V) effort of the 2022 program year (PY2022) portfolio of programs for Avista Corporation (Avista) in the Idaho service territory. The evaluation was administered by ADM Associates, Inc. and Cadeo Group, LLC (herein referred to as the "Evaluators").

1.1 Savings Results

The Evaluators conducted an impact evaluation for Avista's Residential and Low-Income programs for PY2022. The Residential portfolio savings amounted to 1,133,532 kWh with a 88.82% realization rate. The Low-Income portfolio savings amounted to 85,639 kWh with a 97.33% realization rate. The Nonresidential savings amounted to 13,708,164 kWh with a 102.20% realization rate. The Evaluators summarize the Residential, Low-Income, and Nonresidential portfolio verified savings in Table 1-1 through Table 1-3, respectively.

Table 1-1: Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Water Heat	28,290	27,769	98.16%
HVAC	560,952	517,702	92.29%
Shell	205,907	137,338	66.70%
Fuel Efficiency	326,625	326,625	100.00%
ENERGY STAR Homes	62,909	55,400	88.06%
Small Home & MF Weatherization	24,785	18,754	75.66%
Appliances	50,079	32,467	64.83%
Multifamily Direct Install	16,701	17,478	104.65%
Total Res	**1,276,249**	**1,133,532**	**88.82%**

Table 1-2: Low-Income Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Low-Income	87,986	85,639	97.33%
Total Low-Income	**87,986**	**85,639**	**97.33%**

Table 1-3: Nonresidential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Lighting	6,416,259	6,416,285	100.00%
HVAC	14,308	14,308	100.00%
Food Service Equipment	10,532	10,537	100.05%
Grocer	36,468	36,468	100.00%
Shell	4,490	4,490	100.00%
Green Motors	9,822	9,822	100.00%
Site-Specific	6,920,802	7,216,254	104.27%

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Total Non-Residential	**13,412,681**	**13,708,164**	**102.20%**

Table 1-4 summarizes the electric programs offered to residential and low-income customers in the Idaho Avista service territory in PY2022 as well as the Evaluators' evaluation tasks and impact methodology for each program.

Table 1-4: Impact Evaluation Activities by Program and Sector

Sector	Program	Database Review	Survey Verification	Impact Methodology
Residential	Water Heat	✓	✓	RTF UES
Residential	HVAC	✓	✓	RTF UES
Residential	Shell	✓		RTF UES
Residential	Fuel Efficiency	✓	✓	RTF UES
Residential	ENERGY STAR® Homes	✓		RTF UES
Residential	Small Home & MF Weatherization	✓	✓	RTF UES
Residential	Appliances	✓	✓	RTF UES
Residential	Multifamily Direct Install	✓		SBW TRM
Low-Income	Low-Income	✓		Avista TRM
Nonresidential	Lighting	✓	✓	Avista TRM
Nonresidential	HVAC	✓		Avista TRM
Nonresidential	Food Service Equipment	✓		RTF UES, Avista TRM
Nonresidential	Grocer	✓		RTF UES
Nonresidential	Shell	✓		Avista TRM
Nonresidential	Green Motors	✓		RTF UES
Nonresidential	Site-Specific	✓		IPMVP

1.2 Conclusions and Recommendations

The following section details the Evaluators' conclusions and recommendations for each the Residential Portfolio, Low-Income Portfolio, and Nonresidential Portfolio program evaluations.

1.2.1 Conclusions

The following section details the Evaluator's findings resulting from the program evaluations for each the Residential Portfolio, Low-Income Portfolio, and Nonresidential Portfolio.

1.2.1.1 Residential Programs

The Evaluators provide the following conclusions regarding Avista's Residential electric programs:

- The Evaluators found the Residential portfolio to demonstrate a total of 1,133,532 kWh with a realization rate of 88.82%.

- The Shell Program, which contributes 12% of the expected savings, resulted in a realization rate of 67% whereas each of the other programs resulted in a combined 93% realization rate. The Fuel Efficiency Program contributed to a 5% decrease in the overall residential sector, which displayed a final realization rate of 89%.
- The Residential Portfolio impact evaluation resulted in a realization rate of 88.82% due to differences between the Avista TRM categories and the appropriately assigned RTF UES categories for each measure. The Evaluators note several instances in which the Avista TRM value reflects an average of a range of RTF UES values for the electric measures offered in the Idaho electric service territory. The values had been averaged across heating zones, water heater storage tank sizes, equipment efficiency values, housing types, and fuel types. The Evaluators, instead of applying these averages, verified the appropriate RTF UES values for each rebate for a sample of rebates in each program and applied the resulting realization rates to the population of rebates for each program. This led to a lower realization rate, as some rebates reflected RTF savings values higher than the average for that measure.
- The Evaluators conducted verification surveys for a random sample of customers who had participated in the residential prescriptive rebates programs. The Evaluators calculated in-service rates for measures in which in-service rates are not typically 100% (water heaters, furnaces, clothes washers and dryers, smart thermostats, etc). The Evaluators found that all surveyed measures responses indicated in-service rates of 100%. These values were applied to impact analysis results to estimate verified savings through the programs.
- The Evaluators found the CC&B tracking database consistently reflected values indicated on randomly sampled documents. However, some additional variables that are not currently collected remain critical to calculating verified savings, such as detailed home type (single family, multifamily, manufactured home), primary heating type (natural gas vs. electric), and water heater storage tank size.
- In the Water Heat Program, the Evaluators found that the Avista TRM assigns savings values for water heaters of “any size”. The Evaluators applied appropriate size-dependent RTF UES, leading to high realization rates for the measure, as some rebates were found to have 80-gallon tank sizes, which are allotted a larger kWh/unit savings value in the RTF than the <55 gallon tank size equipment.
- In the HVAC Program, the E Smart Thermostat DIY with Electric Heat and E Smart Thermostat Paid Install with Electric Heat realization rates are lower than 100% because the Avista TRM uses an average of heating type savings values, while the Evaluators assigned the appropriate RTF UES value for each heating zone. In addition, the E Electric To Air Source Heat Pump verified savings largely vary based on home type (single family vs. multifamily). The appropriate categories in the RTF led to lower-than-expected savings and higher than expected savings across individual projects within these measures, with an overall downward adjustment for these measures.

- In the Shell Program, the lack of granularity in the Avista TRM UES led to a low realization rate for attic insulation, wall insulation and window measures. The expected savings appeared to have use a value of 2 kwh per square foot for attic and wall savings calculations while Avista's TRM uses 1.5 kwh per square foot, and the RTF uses values from 0 to 2 kWh per square foot, depending on heating type and heating and cooling zones. Similarly, the difference between RTF savings and the Avista TRM value for window replacements is drastic, with the RTF indicating much lower savings for the window replacements, based on U-values and double vs. single pane values. The Evaluators recommend that Avista ensure that the correct RTF UES values are used to calculate expected savings and that Avista incorporate more granularity by climate zone, heating type, U-value, and single vs. double pane-specific savings into Avista's TRM. These differences in applied RTF savings values led to an overall realization rate of 67% for the Shell Program.
- The ENERGY STAR Homes Program displayed verified savings of 55,400 kWh and a realization rate of 88.06%. The Evaluators found that realization rates differed from 100% for this program due to application of heating zone and cooling zone via the RTF, which the Avista TRM lacks. In addition, the Evaluators found that realization rates differed from 100% due to savings value application. The realization for the E ENERGY STAR® Home – Manufactured, Gas & Electric measure is low because the expected savings employed an additive methodology between a gas-heated home and an electric-heated home for the electric savings. However, the Evaluators reviewed the RTF and determined that a manufactured with dual fuel and primary heating of natural gas would be closer to the savings an entirely gas heated home would save. Therefore, the Evaluators assigned electric savings from the RTF associated with a fully natural gas-heated home at 43 kWh saved per year. Additionally, the Evaluators found one heat pump ENERGY STAR home to be verified to have natural gas as the home's primary heating type. This led to significantly low realization for this project, which contributed to one third of the measure's overall participation. These two adjustments together led to an 88% realization rate for the program.
- In the Small Home & MF Weatherization Program, the Evaluators found that many projects exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). In addition, the Evaluators note that the current program rebate applications do not provide an option to indicate "Multifamily" home type. Rather, the current rebate application includes an option for "Single family", "Manufactured", "New construction", and "Other". Although quantity in the CC&B database were consistent, the Avista TRM savings values differed from verified RTF UES values for each of the projects. The majority of projects displayed realization rates that differ to 100% due to differences in savings between various home types. The Evaluators verified home type via Zillow to apply correct RTF workbook savings from the single family, multifamily, and manufactured home RTF workbooks. These adjustments led to high and low realization rates across each measure, as the RTF defines savings for each home type separately. The Evaluators recommend Avista verify home type and apply appropriate Avista TRM values based on home type in order to ensure proper estimation of measure savings.

- The Multifamily Direct Install Program displayed 64.83% realization with 32,467 kWh saved. The program verified savings resulted in a realization rate of above 100% largely due to low expected savings for the A-line 60W LEDs. The SBW document measure-level UES did not align with tracking data values. The Evaluators were unable to identify the cause of this discrepancy.
- The Appliance Program displayed a realization rate of 64.83% with 32,467 kWh savings. In this program, the Evaluators found that the Avista TRM currently assigns RTF savings defined for ENERGY STAR Most Efficient (ESME)-qualified fridges and freezers. However, the Evaluators found that all projects were verified to be ENERGY STAR-qualified, not ENERGY STAR Most Efficient (ESME)-qualified. The low realization rate is due to the difference in Avista TRM ESME-qualified and RTF ENERGY STAR-qualified savings values. Because the Evaluators found that no fridge-freezers or upright freezers to have met the ESME qualifications, the lower RTF ENERGY STAR savings values were applied to each project. In addition, the Evaluators attributed 0 kWh/unit savings to the E Energy Star Rated Top Load Washer because the referenced RTF clothes washer workbook estimates that savings for this measure is negative and therefore there is no proven RTF savings for this measure.

1.2.1.2 Low-Income Programs

The Evaluators provide the following conclusions regarding Avista's Low-Income electric programs:

- The Evaluators found the Low-Income portfolio to demonstrate a total of 85,639 kWh with a realization rate of 97.33%.
- The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolate each unique measure. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators conducted a whole-home billing analysis for all the electric measures combined in the Low-Income in order to estimate savings for the average household participating in the program, across all measures. Due to lack of statistical significance from the billing analysis results, The Evaluators did not apply these regression savings estimates to the program. Instead, the Evaluators designated the desk review savings as verified.
- In the Low-Income Program, the Evaluators found one project where the savings cap was not applied to all measures in the household, leading to a lower realization rate for the measures in that household.
- In the Low-Income Program, The Evaluators found the LED bulbs unit-level savings were inaccurately referenced. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11% realization for LED bulb projects under the program.

1.2.1.3 Nonresidential Programs

The Evaluators provide the following conclusions regarding Avista's Nonresidential electric programs:

- The Evaluators found the Non-Residential portfolio to demonstrate a total of 13,708,164 kWh with a realization rate of 102.20%.

- Verified savings for the Prescriptive Lighting Program are 6,416,285 kWh, 100.00% of claimed savings.
- Verified savings for the HVAC VFD Program is 14,308 kWh with a realization rate of 100.0%.
- Verified savings for the Food Service Equipment Program is 10,537 kWh with a realization rate of 100.05%. For one measure, Combination Ovens, the Evaluators found that claimed savings used an Avista TRM value of 6,422 kWh savings per measure. The RTF specifies 6,427 kWh for this measure, resulting in slightly higher verified savings. The Evaluators did not find any other deviations from TRM UES.
- The verified savings for the Grocer Program is 36,468 kWh with a realization rate of 100.0%.
- The verified savings for the Shell Program is 4,490 kWh with a realization rate of 100.0%.
- The verified savings for the Green Motor Rewind Program is 9,822 kWh with a realization rate of 100.0%.
- The Site-Specific program completed 31 projects in PY2022. Verified savings are 7,216,254 kWh, 104.27% of claimed savings.
- Five of the 12 sampled sites' realization varied from 100% due to the following reasons:
    - Discrepancies between listed and verified HVAC interactive factors
    - Discrepancies between listed and verified annual pump operating hours
    - Omitted equipment in claimed savings calculations, adjustments to power factors
    - Discrepancies between listed and verified VFD efficiency, and adjustments in VFD operating assumptions
    - Adjustments to annual production schedules

1.2.2 Recommendations

The following section details the Evaluator's recommendations resulting from the program evaluations for each the Residential Portfolio, Low-Income Portfolio, and Nonresidential Portfolio.

1.2.2.1 Residential Programs

The Evaluators offer the following recommendations regarding Avista's Residential electric programs:

- The Evaluators imputed home type and space heating type for a large number of sampled rebates, as the tracking database does not contain values for these characteristics or remain outdated. The mail-in rebates collect this information; however, it does not seem to be required to complete the rebate and therefore many rebates are missing this information. The Evaluators recommend verifying home type and space heating type during rebate application approval in order to apply correct savings values to each project.
- In addition, the Evaluators note that the current program rebate applications for the Small Home & MF Weatherization Program do not provide an option to indicate "Multifamily" home type. For the Small Home & MF Weatherization Program, project savings largely depends on the home type (single family vs. multifamily vs. manufactured). The current rebate application includes an option for "Single family", "Manufactured", "New construction", and "Other". The Evaluators recommend including an option for "Multifamily" in order to consistently apply RTF

savings for each of the measures. The Evaluators recommend Avista verify home type prior to applying Avista TRM values in order to ensure proper categorization of measure savings.

- The Evaluators found that many projects claimed under the Small Home & MF Weatherization Program exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). The Evaluators recommend claiming projects on single family homes that are larger than 1,000 SQFT into the Shell Program.
- In the Shell Program, the Evaluators recommend Avista update the attic insulation and single and double pane window Avista TRM values to the appropriate RTF UES value. Avista's TRM uses 1.5 kwh per square foot, whereas the RTF displays 0, 1, or 2 kWh per square foot, depending on heating type and heating and cooling zone. Similarly, the difference between RTF savings and the Avista TRM value for window replacements is drastic, with the RTF indicating much lower savings for the window replacements, based on U-values and double vs. single pane values. The Evaluators recommend that Avista ensure that the correct RTF UES values are used to calculate expected savings and that Avista incorporate more granularity by climate zone, heating type, U-value, and single vs. double pane-specific savings into Avista's TRM.
- In the Appliances Program, the Evaluators found that the RTF assigns much lower savings than the Avista TRM for the fridge-freezer and upright freezer measures. The Avista TRM seems to reference ESME-certified savings for each of these measures. However, all projects rebated were verified to meet ENERGY STAR certification rather than ESME certification. This led to a drastically low realization rate for these measures. The Evaluators recommend that Avista update the Avista TRM to reflect appropriate RTF values.
- Within the ENERGY STAR® Program, Evaluators note that the realization for the E ENERGY STAR® Home – Manufactured, Gas & Electric measure is low because the Avista TRM savings was employed using an additive methodology between a gas-heated home and an electric-heated home for the electric savings. However, the Evaluators reviewed the RTF and determined manufactured home electric savings for a fully natural gas heated home would be closer to the savings a gas heated home with electricity would save. The Evaluators recommend adjusting Avista TRM electric savings for duel fuel ENERGY STAR® homes to reflect the RTF values associated with a fully natural gas-heated home at 43 kWh saved per year.

1.2.2.2 Low-Income Programs

The Evaluators offer the following recommendations regarding Avista's Low-Income electric programs:

- The Evaluators found one project where the 20% annual usage savings cap was not applied to all measures in the household, leading to a lower realization rate for the measures in that household. The Evaluators recommend ensuring that savings caps are applied to all measures within a household for expected savings calculations.
- The Evaluators found the LED bulbs unit-level savings were inaccurately referenced for the Low-Income Program. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11% realization for LED bulb projects under the program. The

Evaluators recommend updating database calculations to use Avista TRM values during expected savings calculations.

1.2.2.3 Nonresidential Programs

The Evaluators offer the following recommendations regarding Avista's Nonresidential electric programs:

- Within the Grocer Program, when collecting measure information for ECM measures, the Evaluators recommend collecting information about the motor power of the baseline motor.
- Within the Prescriptive Lighting Program, the Evaluators recommend collecting space HVAC configuration information and use interactive HVAC effects factors when calculating prescriptive lighting savings for interior spaces.

2. General Methodology

The Evaluators performed an impact evaluation on each of the programs summarized in Table 1-4. The Evaluators used the following approaches to calculate energy impact defined by the International Performance Measurement and Verification Protocols (IPMVP)[1] and the Uniform Methods Project (UMP)[2]:

- Simple verification (web-based surveys supplemented with phone surveys)
- Document verification (review project documentation)
- Deemed savings (RTF UES and Avista TRM values)
- Whole facility billing analysis (IPMVP Option C)

The Evaluators completed the above impact tasks for each the electric impacts and the natural gas impacts for projects completed in the Idaho Avista service territory.

The M&V methodologies are program-specific and determined by previous Avista evaluation methodologies as well as the relative contribution of a given program to the overall energy efficiency impacts. Besides drawing on IPMVP, the Evaluators also reviewed relevant information on infrastructure, framework, and guidelines set out for EM&V work in several guidebook documents that have been published over the past several years. These include the following:

- Northwest Regional Technical Forum (RTF)[3]
- National Renewable Energy Laboratory (NREL), United States Department of Energy (DOE) The Uniform Methods Project (UMP): Methods for Determining Energy Efficiency Savings for Specific Measures, April 2013[4]
- International Performance Measurement and Verification Protocol (IPMVP) maintained by the Efficiency Valuation Organization (EVO) with sponsorship by the U.S. Department of Energy (DOE)[5]

The Evaluators kept data collection instruments, calculation spreadsheets, and monitored/survey data available for Avista records.

2.1 Glossary of Terminology

As a first step to detailing the evaluation methodologies, the Evaluators have provided a glossary of terms to follow:

- **Deemed Savings** – An estimate of an energy savings outcome (gross savings) for a single unit of an installed energy efficiency measure. This estimate (a) has been developed from data sources

[1] https://www.nrel.gov/docs/fy02osti/31505.pdf
[2] https://www.nrel.gov/docs/fy18osti/70472.pdf
[3] https://rtf.nwcouncil.org/measures
[4] Notably, The Uniform Methods Project (UMP) includes the following chapters authored by ADM. Chapter 9 (Metering Cross-Cutting Protocols) was authored by Dan Mort and Chapter 15 (Commercial New Construction Protocol) was Authored by Steven Keates.
[5] Core Concepts: International Measurement and Verification Protocol. EVO 100000 – 1:2016, October 2016.

and analytical methods that are widely accepted for the measure and purpose and (b) are applicable to the situation being evaluated.

- **Expected Savings** – Calculated savings used for program and portfolio planning purposes.
- **Adjusted Savings** – Savings estimates after database review and document verification has been completed using deemed unit-level savings provided in the Avista TRM. It adjusts for such factors as data errors and installation rates.
- **Verified Savings** – Savings estimates after the unit-level savings values have been updated and energy impact evaluation has been completed, integrating results from billing analyses and appropriate RTF UES and Avista TRM values.
- **Gross Savings** – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, regardless of why they participated.
- **Free Rider** – A program participant who would have implemented the program measure or practice in absence of the program.
- **Net-To-Gross** – A factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts.
- **Net Savings** – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, with adjustments to remove savings due to free ridership.
- **Non-Energy Benefits** – Quantifiable impacts produced by program measures outside of energy savings (comfort, health and safety, reduced alternative fuel, etc.).
- **Non-Energy Impacts** – Quantifiable impacts in energy efficiency beyond the energy savings gained from installing energy efficient measures (reduced cost for operation and maintenance of equipment, reduced environmental and safety costs, etc.).

2.2 Summary of Approach

This section presents our general cross-cutting approach to accomplishing the impact evaluation of Avista's Residential, Low-Income, and Nonresidential programs listed in Table 1-4. The Evaluators start by presenting our general evaluation approach. This chapter is organized by general task due to several overlap across programs.

The Evaluators outline the approach to verifying, measuring, and reporting the residential portfolio impacts as well as cost-effectiveness and summarizing potential program and portfolio improvements. The primary objective of the impact evaluation is to determine ex-post verified net energy savings. On-site verification and equipment monitoring was not conducted during this impact evaluation due to stay-at-home orders due to the COVID19 pandemic.

Our general approach for this evaluation considers the cyclical feedback loop among program design, implementation, and impact evaluation. Our activities during the evaluation estimate and verify annual energy savings and identify whether a program is meeting its goals. These activities are aimed to provide guidance for continuous program improvement and increased cost effectiveness for the 2022 and 2023 program years.

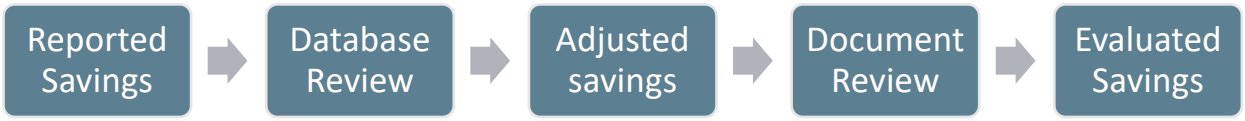
The Evaluators employed the following approach to complete impact evaluation activities for the programs. The Evaluators define three major approaches to determining net savings for Avista's programs:

- A *Deemed Savings* approach involves using stipulated savings for energy conservation measures for which savings values are well-known and documented. These prescriptive savings may also include an adjustment for certain measures, such as lighting measures in which site operating hours may differ from RTF values.
- A *Billing Analysis* approach involves estimating energy savings by applying a linear regression to measured participant energy consumption utility meter billing data. Billing analyses included billing data from nonparticipant customers. This approach does not require on-site data collection for model calibration. This approach aligns with the IPMVP Option C.
- A *Custom* approach, used for the Site-Specific program involves selecting the appropriate IPMVP option to apply to the specific measure or project. Typically, this is Option A, as most projects in the program are lighting retrofits, however Options B, C and D are also employed, depending upon the project. Specific methods are discussed in each site report.

The Evaluators accomplished the following quantitative goals as part of the impact evaluation:

- Verify savings with 10% precision at the 90% confidence level;
- Where appropriate, apply the RTF to verify measure impacts; and
- Where available data exists, conduct billing analysis with a suitable comparison group to estimate measure savings.
- Used IPMVP analysis methods for custom projects.

For each program, the Evaluators calculated adjusted savings for each measure based on the Avista TRM and results from the database review. The Evaluators calculated verified savings for each measure based on the RTF UES, Avista TRM, or billing analysis in combination with the results from document review. For the HVAC, Water Heat, Fuel Efficiency, Small Home & MF Weatherization, and Appliances programs, the Evaluators also applied in-service rates (ISRs) from verification surveys.



The Evaluators assigned methodological rigor level for each measure and program based on its contribution to the portfolio savings and availability of data.

The Evaluators analyzed billing data for all electric measure participants in the HVAC and Low-Income programs. The Evaluators applied billing analysis results to determine evaluated savings only for measures where savings could be isolated (that is, where a sufficient number of participants could be

identified who installed only that measure). Program-level realization rates for the HVAC, Water Heat, and Fuel Efficiency programs incorporate billing analysis results for some measures.

2.2.1 Database Review

At the outset of the evaluation, the Evaluators reviewed the databases to ensure that each program tracking database conforms to industry standards and adequately tracks key data required for evaluation.

Measure-level net savings were evaluated primarily by reviewing measure algorithms and values in the tracking system to assure that they are appropriately applied using the Avista TRM. The Evaluators then aggregated and cross-check program and measure totals.

The Evaluators reviewed program application documents for a sample of incented measures to verify the tracking data accurately represents the program documents. The Evaluators ensured the home installed measures that meet or exceed program efficiency standards.

2.2.2 Verification Methodology

This section summarizes the Evaluator's sampling methodologies for each prescriptive programs and site-specific programs.

2.2.2.1.1 Sampling Methodology for Prescriptive Programs

The Evaluators verified a sample of participating households for detailed review of the installed measure documentation and development of verified savings. The Evaluators verified tracking data by reviewing invoices and surveying a sample of participant customer households. The Evaluators also conducted a verification survey for program participants.

The Evaluators used the following equations to estimate sample size requirements for each program and fuel type. Required sample sizes were estimated as follows:

Equation 2-1: Sample Size for Infinite Sample Size

$$n = \left(\frac{Z \times CV}{d}\right)^2$$

Equation 2-2: Sample Size for Finite Population Size

$$n_0 = \frac{n}{1 + \left(\frac{n}{N}\right)}$$

Where,

- n = Sample size
- Z = Z-value for a two-tailed distribution at the assigned confidence level.
- CV = Coefficient of variation
- d = Precision level
- N = Population

For a sample that provides 90/10 precision, Z = 1.645 (the critical value for 90% confidence) and d = 0.10 (or 10% precision). The remaining parameter is *CV*, or the expected coefficient of variation of measures for which the claimed savings may be accepted. A *CV* of .5 was assumed for residential programs due to the homogeneity of participation[6], which yields a sample size of 68 for an infinite population. Sample sizes were adjusted for smaller populations via the method detailed in Equation 2-2.

The following sections describe the Evaluator's methodology for conducting document-based verification and survey-based verification.

2.2.2.1.2 Sampling Methodology for the Site-Specific Program

For the Site-Specific program, Simple Random Sampling is not an effective sampling methodology as the CV values observed in business programs are typically very high because the distributions of savings are generally positively skewed. Often, a relatively small number of projects account for a high percentage of the estimated savings for the program.

To address this situation, we use a sample design for selecting projects for the M&V sample that considers such skewness. With this approach, we select several sites with large savings for the sample with certainty and take a random sample of the remaining sites. To improve the precision, non-certainty sites are selected for the sample through systematic random sampling. That is, a random sample of sites remaining after the certainty sites have been selected is selected by ordering them according to the magnitude of their savings and using systematic random sampling. Sampling systematically from a list that is ordered according to the magnitude of savings ensures that any sample selected will have some units with high savings, some with moderate savings, and some with low savings. Samples cannot result that have concentrations of sites with atypically high savings or atypically low savings. Specific sampling characteristics are shown in the Site-Specific section of this report.

The following sections describe the Evaluator's methodology for conducting document-based verification and survey-based verification.

2.2.2.2 Document-Based Verification

The Evaluators requested rebate documentation for a subset of participating customers. These documents included invoices, rebate applications, pictures, and AHRI certifications for the following programs.

- Water Heat Program
- HVAC Program
- Shell Program
- Fuel Efficiency Program
- ENERGY STAR® Homes Program
- Small Home & MF Weatherization Program

[6] Assumption based off California Evaluation Framework: https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/EE_and_Energy_Savings_Assist/CAEvaluationFramework.pdf

- Appliances Program
- Low-Income Program
- Community Energy Efficiency Program
- Prescriptive Lighting Program
- HVAC Program (non-res)
- Food Service Equipment Program
- Grocer
- Shell Program (non-res)
- Green Motor Rewind

This sample of documents was used to cross-verify tracking data inputs. In the case the Evaluators found any deviations between the tracking data and application values, the Evaluators reported and summarized those differences in the Database Review sections presented for each program in Section 3.2 and Section 4.1.

The Evaluators developed a sampling plan that achieves a sampling precision of ±10% at 90% statistical confidence – or "90/10 precision" – to estimate the percentage of projects for which the claimed savings are verified or require some adjustment.

The Evaluators developed the following samples for each program's document review using Equation 2-1 and Equation 2-2. The Evaluators ensured representation in each state and fuel type for each measure.

Table 2-1: Document-based Verification Samples and Precision by Program

Sector	Program	Electric Population	Sample (With Finite Population Adjustment) *	Precision at 90% CI
Residential	Water Heat	23	18	90% ± 9.24%
Residential	HVAC	311	73	90% ± 8.43%
Residential	Shell	119	47	90% ± 9.37%
Residential	Fuel Efficiency	40	27	90% ± 9.14%
Residential	ENERGY STAR® Homes	19	16	90% ± 8.39%
Residential	Small Home & MF Weatherization	22	20	90% ± 5.68%
Residential	Appliances	326	66	90% ± 9.06%
Low-Income	Low-Income	408	87	90% ± 7.83%
Nonresidential	HVAC	473	70	±9.08%
Nonresidential	Food Service Equipment	4	4	±0%
Nonresidential	Grocer	2	2	±0%
Nonresidential	Shell	4	4	±0%
Nonresidential	Green Motors	1	1	±0%

*Assumes sample size of 68 for an infinite population, based on *CV* (coefficient of variation) = 0.5, *d* (precision) = 10%, *Z* (critical value for 90% confidence) = 1.645.

The table above represents the number of rebates in Idaho service territory only (does not include Idaho rebate samples). The Evaluators ensured representation of state and fuel type in the sampled rebates for document verification.

2.2.2.3 Survey-Based Verification

The Evaluators conducted survey-based verification for the Water Heat, HVAC, Fuel Efficiency, Small Home & MF Weatherization, and Appliances Programs. The primary purpose of conducting a verification survey is to confirm that the measure was installed and is still currently operational and whether the measure was early retirement or replace-on-burnout.

The Evaluators summarize the final sample sizes shown in Table 2-2 for the Idaho Electric Avista projects. The Evaluators developed a sampling plan that achieved a sampling precision of ±6.96% at 90% statistical confidence for ISRs estimates at the measure-level during web-based survey verification.

Table 2-2: Survey-Based Verification Sample and Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	23	0	N/A
Residential	HVAC	311	50	90% ± 10.67%
Residential	Fuel Efficiency	40	4	90% ± 39.51%
Residential	Small Home & MF Weatherization	22	3	90% ± 45.17%
Residential	Appliances	326	66	90% ± 9.06%
Non-Residential	Lighting*	472	2	90% ± 58.10%
Total		**1,194**	**125**	**90% ± 6.96%**

*These programs did not meet 90/10 precision for the survey-based verification.
For these programs, 100% in-service rates were assumed.

The Evaluators implemented a web-based survey to complete the verification surveys. The Evaluators contacted all customers in the programs listed in the table above with the goal of reaching 90/10 precision, however, all efforts were exhausted to reach these customers and therefore these programs do not display 90/10 precision at the program-level for in-service rate calculations. For programs in which this goal was not met, the Evaluators assumed in-service rates of 100%.

The findings from these activities served to estimate ISRs for each measure surveyed. These ISRs were applied to verification sample desk review rebates towards verified savings, which were then applied to the population of rebates. The measure-level ISRs resulting from the survey-based verification are summarized in Section 3.1.

2.2.3 Impact Evaluation Methodology

The Evaluators employed the following approach to complete impact evaluation activities for the programs. The Evaluators define two major approaches to determining net savings for Avista's programs:

- Deemed Savings
- Billing Analysis (IPMVP Option C)

The Site-Specific program also employed various IPMVP options, deepening upon the project and measure, and is discussed separately as it differs in approach from the approaches used in the remainder of the portfolio. In the following sections, the Evaluators summarize the general guidelines and activities followed to conduct each the deemed savings and billing analyses approaches above.

In the following sections, the Evaluators summarize the general guidelines and activities followed to conduct each of the above analyses.

2.2.3.1 Deemed Savings

This section summarizes the deemed savings analysis method the Evaluators employed for the evaluation of a subset of measures for each program. The Evaluators completed the validation for specific measures across each program using the RTF unit energy savings (UES) values, where available. The Evaluators ensured the proper measure unit savings were recorded and used in the calculation of Avista's ex-ante measure savings. The Evaluators requested and used the technical reference manual Avista employed during calculation of ex-ante measure savings (Avista TRM). The Evaluators documented any cases where recommend values differed from the specific unit energy savings workbooks used by Avista.

In cases where the RTF has existing unit energy savings (UES) applicable to Avista's measures, the Evaluators verified the quantity and quality of installations and apply the RTF's UES to determine verified savings.

2.2.3.2 Billing Analysis

This section describes the billing analysis methodology employed by the Evaluators as part of the impact evaluation and measurement of energy savings for measures with sufficient participation. The Evaluators performed billing analyses with a matched control group and utilized a quasi-experimental method of producing a post-hoc control group. In program designs where treatment and control customers are not randomly selected at the outset, such as for downstream rebate programs, quasi-experimental designs are required.

For the purposes of this analysis, a household is considered a treatment household if it has received a program incentive. Additionally, a household is considered a control household if the household has not received a program incentive. To isolate measure impacts, treatment households are eligible to be included in the billing analysis if they installed only one measure during the 2022 program year. Isolation of individual measures are necessary to provide valid measure-level savings. Households that installed more than one measure may display interactive energy savings effects across multiple measures that are not feasibly identifiable. Therefore, instances where households installed isolated measures are used in the billing analyses. In addition, the pre-period identifies the period prior to measure installation while the post-period refers to the period following measure installation.

The Evaluators utilized propensity score matching (PSM) to match nonparticipants to similar participants using pre-period billing data. PSM allows the evaluators to find the most similar household based on the customers' billed consumption trends in the pre-period and verified with statistical difference testing.

After matching based on these variables, the billing data for treatment and control groups are compared, as detailed in IPMVP Option C. The Evaluators fit regression models to estimate weather-dependent daily consumption differences between participating customer and nonparticipating customer households.

Cohort Creation

The PSM approach estimates a propensity score for treatment and control customers using a logistic regression model. A propensity score is a metric that summarizes several dimensions of household characteristics into a single metric that can be used to group similar households. The Evaluators created a post-hoc control group by compiling billing data from a subset of nonparticipants in the Avista territory to compare against treatment households using quasi-experimental methods. This allowed the Evaluators to select from a large group of similar households that have not installed an incented measure. With this information, the Evaluators created statistically valid matched control groups for each measure via seasonal pre-period usage. The Evaluators matched customers in the control group to customers in the treatment group based on nearest seasonal pre-period usage (e.g., summer, spring, fall, and winter) and exact 3-digit zip code matching (the first three digits of the five-digit zip code). After matching, the Evaluators conducted a *t*-test for each month in the pre-period to help determine the success of PSM.

While it is not possible to guarantee the creation of a sufficiently matched control group, this method is preferred because it is likely to have more meaningful results than a treatment-only analysis. Some examples of outside variables that a control group can sufficiently control for changes in economies and markets, large-scale social changes, or impacts from weather-related anomalies such as flooding or hurricanes.

After PSM, the Evaluators ran the following regression models for each measure:

- Fixed effect Difference-in-Difference (D-n-D) regression model (recommended in UMP protocols)[7]
- Random effects post-program regression model (PPR) (recommended in UMP protocols)
- Gross billing analysis (treatment only)

The second model listed above (PPR) was selected because it had the best fit for the data, identified using the adjusted R-squared. Further details on regression model specifications can be found below.

Data Collected

The following lists the data collected for the billing analysis:

1. Monthly billing data for program participants (treatment customers)
2. Monthly billing data for a group of non-program participants (control customers)
3. Program tracking data, including customer identifiers, address, and date of measure installation
4. National Oceanic and Atmospheric Administration (NOAA) weather data between January 1, 2021 and December 31, 2022)
5. Typical Meteorological Year (TMY3) data

Billing and weather data were obtained for program year 2022 and for one year prior to measure install dates (2021).

[7] National Renewable Energy Laboratory (NREL) Uniform Methods Project (UMP) Chapter 17 Section 4.4.7.

Weather data was obtained from the nearest weather station with complete data during the analysis years for each customer by mapping the weather station location with the customer zip code.

TMY weather stations were assigned to NOAA weather stations by geocoding the minimum distance between each set of latitude and longitude points. This data is used for extrapolating savings to long-run, 30-year average weather.

Data Preparation

The following steps were taken to prepare the billing data:

1. Gathered billing data for homes that participated in the program.
2. Excluded participant homes that also participated in the other programs, if either program disqualifies the combination of any other rebate or participation.
3. Gathered billing data for similar customers that did not participate in the program in evaluation.
4. Excluded bills missing address information.
5. Removed bills missing fuel type/Unit of Measure (UOM).
6. Removed bills missing usage, billing start date, or billing end date.
7. Remove bills with outlier durations (<9 days or >60 days).
8. Excluded bills with consumption indicated to be outliers.
9. Calendarized bills (recalculates bills, usage, and total billed such that bills begin and end at the start and end of each month).
10. Obtained weather data from nearest NOAA weather station using 5-digit zip code per household.
11. Computed Heating Degree Days (HDD) and Cooling Degree Days (CDD) for a range of setpoints. The Evaluators assigned a setpoint of 65°F for both HDD and CDD. The Evaluators tested and selected the optimal temperature base for HDDs and CDDs based on model *R*-squared values.
12. Selected treatment customers with only one type of measure installation during the analysis years and combined customer min/max install dates with billing data (to define pre- and post-periods).
13. Restricted to treatment customers with install dates in specified range (typically January 1, 2022 through June 30, 2022) to allow for sufficient post-period billing data.
14. Restricted to control customers with usage less than or equal to two times the maximum observed treatment group usage. This has the effect of removing control customers with incomparable usage relative to the treatment group.
15. Removed customers with incomplete post-period bills (<4 months).
16. Removed customers with incomplete pre-period bills.
17. Restricted control customers to those with usage that was comparable with the treatment group usage.
18. Created a matched control group using PSM and matching on pre-period seasonal usage and zip code.

Regression Models

The Evaluators ran the following models for matched treatment and control customers for each measure with sufficient participation. For net savings, the Evaluators selected either Model 1 or Model 2. The model with the best fit (highest adjusted R-squared) was selected. The Evaluators utilized Model 3 to estimate gross energy savings.

Model 1: Fixed Effects Difference-in-Difference Regression Model

The following equation displays the first model specification to estimate the average daily savings due to the measure.

Equation 2-3: Fixed Effects Difference-in-Difference (D-n-D) Model Specification

$$ADC_{it} = \alpha_0 + \beta_1(Post)_{it} + \beta_2(Post \times Treatment)_{it} + \beta_3(HDD)_{it} + \beta_4(CDD)_{it} + \beta_5(Post \times HDD)_{it} + \beta_6(Post \times CDD)_{it} + \beta_7(Post \times HDD \times Treatment)_{it} + \beta_8(Post \times CDD \times Treatment)_{it} + \beta_9(Month)_t + \beta_{10}(Customer\ Dummy)_i + \varepsilon_{it}$$

Where,

- *i* = the *i*th household
- *t* = the first, second, third, etc. month of the post-treatment period
- ADC_{it} = Average daily usage reading *t* for household *i* during the post-treatment period
- $Post_{it}$ = A dummy variable indicating pre- or post-period designation during period *t* at home *i*
- $Treatment_i$ = A dummy variable indicating treatment status of home *i*
- HDD_{it} = Average heating degree days (base with optimal Degrees Fahrenheit) during period *t* at home *i*
- CDD_{it} = Average cooling degree days (base with optimal Degrees Fahrenheit) during period *t* at home i *(if electric usage)*
- $Month_t$= A set of dummy variables indicating the month during period *t*
- $Customer\ Dummy_i$ = a customer-specific dummy variable isolating individual household effects
- ε_{it} = The error term
- α_0= The model intercept
- β_{1-10} = Coefficients determined via regression

The Average Daily Consumption (ADC) is calculated as the total monthly billed usage divided by the duration of the bill month. β_2 represents the average change in daily baseload in the post-period between the treatment and control group and β_7 and β_8 represent the change in weather-related daily consumption in the post-period between the groups. Typical monthly and annual savings were estimated by extrapolating the β_7 and β_8 coefficients with Typical Meteorological Year (TMY) HDD and CDD data. However, in the case of gas usage, only the coefficient for HDD is utilized because CDDs were not included in the regression model.

The equation below displays how savings were extrapolated for a full year utilizing the coefficients in the regression model and TMY data. TMY data is weighted by the number of households assigned to each weather station.

Equation 2-4: Savings Extrapolation

$$Annual\ Savings = \beta_2 * 365.25 + \beta_7 * TMY\ HDD + \beta_8 * TMY\ CDD$$

Model 2: Random Effects Post-Program Regression Model

The following equation displays the second model specification to estimate the average daily savings due to the measure. The post-program regression (PPR) model combines both cross-sectional and time series data in a panel dataset. This model uses only the post-program data, with lagged energy use for the same calendar month of the pre-program period acting as a control for any small systematic differences between the treatment and control customers; in particular, energy use in calendar month *t* of the post-program period is framed as a function of both the participant variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between treatment and control customers will be reflected in the differences in their past energy use, which is highly correlated with their current energy use. These interaction terms allow pre-program usage to have a different effect on post-program usage in each calendar month.

The model specification is as follows:

Equation 2-5: Post-Program Regression (PPR) Model Specification

$$\begin{aligned} ADC_{it} = \alpha_0 &+ \beta_1(Treatment)_i + \beta_2\ (PreUsage)_i + \beta_3\ (PreUsageSummer)_i \\ &+ \beta_4(PreUsageWinter)_i + \beta_5(Month)_t + \beta_6(Month \times PreUsage)_{it} \\ &+ \beta_7(Month \times PreUsageSummer)_{it} + \beta_8(Month \times PreUsageWinter)_{it} \\ &+ \beta_9(HDD)_{it} + \beta_{10}(CDD)_{it} + \beta_{11}(Treatment \times HDD)_{it} + \beta_{12}(Treatment \times CDD)_{it} \\ &+ \varepsilon_{it} \end{aligned}$$

Where,

- *i* = the *i*th household
- *t* = the first, second, third, etc. month of the post-treatment period
- ADC_{it} = Average daily usage for reading *t* for household *i* during the post-treatment period
- $Treatment_i$ = A dummy variable indicating treatment status of home *i*
- $Month_t$ = Dummy variable indicating month of month *t*
- $PreUsage_i$ = Average daily usage across household *i*'s available pre-treatment billing reads
- $PreUsageSummer_i$ = Average daily usage in the summer months across household *i*'s available pretreatment billing reads
- $PreUsageWinter_i$ = Average daily usage in the winter months across household *i*'s available pre-treatment billing reads
- HDD_{it} = Average heating degree days (base with optimal Degrees Fahrenheit) during period *t* at home *i*
- CDD_{it} = Average cooling degree days (base with optimal Degrees Fahrenheit) during period *t* at home i *(if electric usage)*

- ε_{it} = Customer-level random error
- α_0= The model intercept for home *i*
- β_{1-12} = Coefficients determined via regression

The coefficient β_1 represents the average change in consumption between the pre-period and post-period for the treatment group and β_{11} and β_{12} represent the change in weather-related daily consumption in the post-period between the groups. Typical monthly and annual savings were estimated by extrapolating the β_{11} and β_{12} coefficients with Typical Meteorological Year (TMY) HDD and CDD data.

The equation below displays how savings were extrapolated for a full year utilizing the coefficients in the regression model and TMY data.

Equation 2-6: Savings Extrapolation

$$Annual\ Savings = \beta_1 * 365.25 + \beta_{11} * TMY\ HDD + \beta_{12} * TMY\ CDD$$

Model 3: Gross Billing Analysis, Treatment-Only Regression Model

The sections above detail the Evaluator's methodology for estimating net energy savings for each measure. The results from the above methodology report net savings due to the inclusion of the counterfactual comparison group. However, for planning purposes, it is useful to estimate gross savings for each measure. To estimate gross savings, the Evaluators employed a similar regression model; however, only including participant customer billing data. This analysis does not include control group billing data and therefore models energy reductions between the pre-period and post-period for the measure participants (treatment customers).

To calculate the impacts of each measure, the Evaluators applied linear fixed effects regression using participant billing data with weather controls in the form of Heating Degree Days (HDD) and Cooling Degree Days (CDD). The following equation displays the model specification to estimate the average daily savings due to the measure.

Equation 2-7: Treatment-Only Fixed Effects Weather Model Specification

$$ADC_{it} = \alpha_0 + \beta_1(Post)_{it} + \beta_2(HDD)_{it} + \beta_3(CDD)_{it} + \beta_4(Post \times HDD)_{it} + \beta_5(Post \times CDD)_{it} + \beta_6(Customer\ Dummy)_i + \beta_7(Month)_t + \varepsilon_{it}$$

Where,

- *i* = the *i*th household
- *t* = the first, second, third, etc. month of the post-treatment period
- ADC_{it} = Average daily usage for reading *t* for household *i* during the post-treatment period
- HDD_{it} = Average heating degree days (base with optimal Degrees Fahrenheit) during period *t* at home *i*
- CDD_{it} = Average cooling degree days (base with optimal Degrees Fahrenheit) during period *t* at home i *(if electric usage)*
- $Post_{it}$ = A dummy variable indicating pre- or post-period designation during period *t* at home *i*

- $Customer\ Dummy_i$ = a customer-specific dummy variable isolating individual household effects
- ε_{it} = Customer-level random error
- α_0= The model intercept for home *i*
- β_{1-6} = Coefficients determined via regression

The results of the treatment-only regression models are gross savings estimates. The gross savings estimates are useful to compare against the net savings estimates. However, the treatment-only models are unable to separate the effects of the COVID19 pandemic. The post-period for PY2022 and perhaps also PY2022 are affected by the stay-at-home orders that had taken effect starting March 2021 in Idaho. The stay-at-home orders most likely affect the post-period household usage. Because there is insufficient post-period data before the shelter-in-place orders, the Evaluators were unable to separate the effects on consumption due to the orders and the effects on consumption due to the measure installation. Therefore, the results from this additional gross savings analysis are unable to reflect actual typical year savings. However, for planning purposes, these estimates may be useful.

2.2.4 Net-To-Gross

The Northwest RTF UES measures do not require NTG adjustments as they are built into the deemed savings estimates. In addition, billing analyses with counterfactual control groups, as proposed in our impact methodology, does not require a NTG adjustment, as the counterfactual represents the efficiency level at current market (i.e. the efficiency level the customer would have installed had they not participated in the program).

2.2.5 Non-Energy Benefits

The Evaluators used the Regional Technical Forum (RTF) to quantify non-energy benefits (NEBs) for residential measures with established RTF values where available. Measures with quantified NEBs include residential insulation, high efficiency windows, air source heat pumps, and ductless heat pumps.

In addition to the residential NEBs, the Evaluators applied the end-use non-energy benefit and health and human safety non-energy benefit to the Low-Income Program. The Evaluators understand that the two major non-energy benefits referenced above are uniquely applicable to the Low-Income Program. The Evaluators applied those benefits to the program impacts as well as additional non-energy benefits associated with individual measures included in the program. The Evaluators incorporated additional NEBs to the impact evaluation, as applicable. Additional details on the non-energy benefits applied can be found in Section 2.2.5.

3. Residential Impact Evaluation Results

The Evaluators completed an impact evaluation on Avista's Residential portfolio to verify program-level and measure-level energy savings for PY2022. The following sections summarize findings for each electric impact evaluation in the Residential Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, RTF, and billing analysis of participants and nonparticipants to evaluate savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data. Table 3-1 summarizes the Residential verified impact savings by program.

Table 3-1: Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Water Heat	28,290	27,769	98.16%
HVAC	560,952	517,702	92.29%
Shell	205,907	137,338	66.70%
Fuel Efficiency	326,625	326,625	100.00%
ENERGY STAR Homes	62,909	55,400	88.06%
Small Home & MF Weatherization	24,785	18,754	75.66%
Appliances	50,079	32,467	64.83%
Multifamily Direct Install	16,701	17,478	104.65%
Total Res	**1,276,249**	**1,133,532**	**88.82%**

In PY2022, Avista completed and provided incentives for residential electric measures in Idaho and reported total electric energy savings of 1,133,532 kWh. All programs except the Fuel Efficiency Program and Appliances Program met or exceeded savings goals based on reported savings, leading to an overall achievement of 88.82% of the expected savings for the residential programs. Further details of the impact evaluation results by program are provided in the sections following.

3.1 Simple Verification Results

The Evaluators surveyed 755 unique customers that participated in Avista's residential energy efficiency program in October 2022 and March 2023 using an email survey approach.

Customers with a valid email were sent the survey via an email invitation. The Evaluators surveyed customers that received rebates for the Water Heat, HVAC, Small Home & MF Weatherization, and Appliances Programs.

Table 3-2: Summary of Survey Response Rate

Population	Respondents
Initial email contact list	3,116
Invalid or bounced	134
Invalid or bounced email (%)	4.30%
Invitations sent (unique valid)	2,982
Completions	755
Response rate (%)	25.30%

3.1.1 In-Service Rates

The Evaluators calculated in-service rates of installed measures from simple verification surveys deployed to program participants for the Water Heat, HVAC, Fuel Efficiency, Small Home & MF Weatherization, and Appliances Programs. The Evaluators asked participants if the rebated equipment is currently installed and working, in addition to questions about the new equipment fuel type. The Evaluators achieved ±6.76% precision across the programs surveyed for the electric measures in Avista's service territory, summarized in Table 3-3.

Table 3-3: Simple Verification Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	23	0	N/A
Residential	HVAC	311	50	90% ± 10.67%
Residential	Fuel Efficiency	40	4	90% ± 39.51%
Residential	Small Home & MF Weatherization	22	3	90% ± 45.17%
Residential	Appliances	326	66	90% ± 9.06%
Total		**1,413**	**196**	**90% ±6.76%**

As previously stated, the Evaluators contacted all customers in the Water Heat Program, Fuel Efficiency Program, and Small Home & MF Weatherization Program with the goal of reaching 90/10 precision, however, all efforts were exhausted to reach these customers and therefore these programs do not display 90/10 precision at the program-level for in-service rate calculations. For programs in which this goal was not met, the Evaluators either assigned mixed-state (Idaho and Washington) in-service rates is precision meets the 90/10 goals, or assumed in-service rates of 100% if the mixed-state responses did not meet the 90/10 goals. The state-level (Idaho) and mixed state-level (Idaho and Washington) measure-level ISRs determined from the verification survey for each program in which simple verification was conducted is presented in Table 3-4, Table 3-5, and Table 3-6.

Table 3-4: Water Heat Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
E Heat Pump Water Heater*	0	100%	7	100%	Assume 100% ISR

*Due to lack of 90/10 precision, this ISR is instead assumed to be 100%

Table 3-5: HVAC Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
E Ductless Heat Pump with Existing Forced Air Furnace	11	100%	26	100%	State-specific ISR
E Electric To Air Source Heat Pump	20	100%	37	100%	State-specific ISR
E Electric to Ductless Heat Pump	3	100%	3	100%	State-specific ISR
E Smart Thermostat DIY with Electric Heat	5	100%	21	100%	State-specific ISR
E Smart Thermostat Paid Install with Electric Heat	11	100%	31	100%	State-specific ISR

Table 3-6: Fuel Efficiency Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
E Electric To Natural Gas Furnace*	3	100%	3	100%	Assume 100% ISR
E Electric To Natural Gas Furnace & Water Heat*	1	100%	1	100%	Assume 100% ISR

*Due to lack of 90/10 precision, this ISR is instead assumed to be 100%

Table 3-7: Small Home & MF Weatherization Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
E Multifamily Smart Thermostat DIY*	1	100%	1	100%	Assume 100% ISR
E Multifamily Wall Insulation With Electric Heat*	0	N/A	0	N/A	Assume 100% ISR
E Multifamily Window Replc With Electric Heat*	0	N/A	6	N/A	Assume 100% ISR
E Multifamily Ductless Heat Pump Replac Existing Baseboard*	0	N/A	0	100%	Assume 100% ISR
E Multifamily Attic Insulation With Electric Heat*	1	N/A	1	N/A	Assume 100% ISR
E Multifamily Energy Star Rated Insulated Door With El Heat*	1	100%	2	100%	Assume 100% ISR
E Multifamily Smart Thermostat Paid install*	0	N/A	0	100%	Assume 100% ISR
E Multifamily Air Source Heat Pump replac existing baseboard*	0	100%	0	100%	Assume 100% ISR
E Multifamily Heat Pump Water Heater*	0	N/A	0	100%	Assume 100% ISR
E Multifamily WIFI Thermostat with Baseboard Electric Heat*	0	N/A	0	100%	Assume 100% ISR

*Due to lack of 90/10 precision, this ISR is instead assumed to be 100%

Table 3-8: Appliance Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
E Energy Star Certified Refrigerator and Refrigerator-Freeze	28	100%	74	100%	State-specific ISR
E Energy Star Certified Upright Freezer	5	100%	13	100%	State-specific ISR
E Energy Star Rated Clothes Dryer	18	100%	59	100%	State-specific ISR
E Energy Star Rated Front Load Washer	14	100%	45	100%	State-specific ISR
E Energy Star Rated Top Load Washer*	0	N/A	0	N/A	Assume 100% ISR

*Due to lack of 90/10 precision, this ISR is instead assumed to be 100%

These ISR values were utilized in the desk reviews for each of the measures listed above in order to calculate verified savings. Additional insights from the survey responses are summarized in Appendix B.

3.2 Program-Level Impact Evaluation Results

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Residential sector in the section below.

3.2.1 Water Heat Program

The Water Heat Program encourages customers to replace their existing electric or natural gas water heater with high efficiency equipment. Customers receive incentives after installation and after submitting a completed rebate form. Table 3-9 summarizes the measures offered under this program.

Table 3-9: Water Heat Program Measures

Measure	Description	Impact Analysis Methodology
E Heat Pump Water Heater	Electric water heater (0.94 EF or higher)	RTF UES

The following table summarizes the verified electric energy savings for the Water Heat Program impact evaluation.

Table 3-10 Water Heat Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings	Adjusted Savings	Verified Savings	Realization Rate
E Heat Pump Water Heater	23	28,290	28,279	27,769	98.16%
Total	**23**	**28,290**	**28,279**	**27,769**	**98.16%**

The Water Heat Program displayed verified savings of 27,769 kWh with a realization rate of 98.16% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-11 Water Heat Program Incentive Costs by Measure

Measure	Incentive Costs
E Heat Pump Water Heater	$4,945.00
Total	**$4,945.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Water Heat Program in the section below.

3.2.1.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Water Heat Program.

3.2.1.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Water Heat Program. The Evaluators selected a subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.2.

The Evaluators found all Water Heat Program rebates to have completed rebate applications with the associated water heater model number and efficiency values filled in either the Customer Care & Billing (CC&B) web rebate data or mail-in rebate applications.

The Evaluators note that the CC&B web rebate data consistently reflected the same values found in the mail-in rebate applications, invoices, and AHRI certification documents submitted with the rebate application. However, the Evaluators found some water heaters to have storage tanks larger than 50 gallons. This information is crucial to assigning correct savings values for the rebate. The Evaluators recommend that Avista incorporate the storage tank size into rebate application forms.

In addition, the majority of rebates were accompanied with AHRI certification. In order to acquire accurate equipment efficiencies and tank sizes, AHRI certifications are required to be submitted with the rebate application, with an invoice that matches the model number found in the AHRI certification. The Evaluators were able to easily verify each sampled rebate's equipment due to inclusion of these documents.

The Evaluators found all sampled rebate equipment met or exceeded the measure efficiency requirements for the Water Heat Program.

3.2.1.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure. The Evaluators included questions such as:

- Was this water heater a new construction, or did it replace another water heater?
- Was the previous water heater functional?
- Is the newly installed water heater still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the Water Heat Program.

Table 3-12 displays the ISRs for each of the Water Heat measures for Idaho and Washington territory combined.

Table 3-12: Water Heat Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Program-Level Precision at 90% Confidence	In-Service Rate
E Heat Pump Water Heater	128	7	90% ± 26.54%%	100%

Although the Evaluators contacted all participants for this program, response rates did not meet the 90/10 precision goal for the program when considering participant responses in both Idaho and Washington combined. Therefore, the Evaluators assumed 100% in-service rate for this measure. However, of the participants who did respond, all survey respondents for each water heater measure described equipment to be currently functioning, supporting the 100% in-service rate assumption for this measure. The Evaluators applied these ISRs to each rebate to quantify verified savings for each measure.

3.2.1.4 Impact Analysis

This section summarizes the verified savings results for the Water Heat Program. The Evaluators calculated verified savings for the E Heat Pump Water Heater measure using the RTF workbook in place at the time the savings goal for the program was finalized The UES value associated with this measure was applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.1.5 Billing Analysis

The Evaluators did not conduct a billing analysis for the electric measures in the Water Heat Program.

3.2.1.6 Verified Savings

The Evaluators reviewed and applied the current RTF UES values for the E Heat Pump Water Heater measure along with verified tracking data to estimate net program savings for this measure. The verified savings for the program is 27,769 kWh with a realization rate of 98.16%, as displayed in Table 3-10.

The realization rate for the electric savings in the Water Heat Program deviate from 100% due to the Avista TRM prescriptive savings value. The Avista TRM assigns a combination of the values the RTF assigns for Tier 2 and Tier 3 heat pump water heaters. However, among document verification, the Evaluators found a majority of water heaters to be Tier 3 or higher, which the RTF UES assigns a higher savings value.

In addition, the Avista TRM assigns the savings values for water heaters of any size. During document review, the Evaluators found most of the water heaters to have a storage tank under 55 gallons, which has a higher savings value in the RTF than water heaters with unknown tank sizes. However, some storage tanks were verified to be 80 gallons, which carry a larger savings value in the RTF than storage tanks with 50 or 55 gallons. The Evaluators applied the RTF UES value for the associated tank size and tier found for each model number in the sampled rebates. These changes led to the high realization rate for the E Heat Pump Water Heater measure in the Water Heat Program. The ISRs for each of the measures in the Water Heat Program was 100% and therefore did not affect the verified savings realization rates.

3.2.2 HVAC Program

The HVAC program encourages installation of high efficiency HVAC equipment and smart thermostats through customer incentives. The program is available to residential electric or natural gas customers with a winter heating season usage of 4,000 or more kWh, or at least 160 Therms of space heating in the prior year. Existing or new construction homes are eligible to participate in the program. Table 3-9 summarizes the measures offered under this program.

Table 3-13: HVAC Program Measures

Measure	Description	Impact Analysis Methodology
E Ductless Heat Pump with Existing Forced Air Furnace	Electric forced air furnace replacement with ductless heat pump	RTF UES
E Electric To Air Source Heat Pump	Electric forced air furnace replacement with air source heat pump	RTF UES
E Electric to Ductless Heat Pump	Electric forced air furnace replacement with ductless heat pump	RTF UES
E Smart Thermostat DIY with Electric Heat	Self-installed connected thermostats in electrically heated home	RTF UES
E Smart Thermostat Paid Install with Electric Heat	Professionally installed connected thermostats in electrically heated home	RTF UES
E Variable Speed Motor	Variable speed motor in electrically heated home	N/A*

*No E Variable Speed Motor projects were completed in PY2022

The following table summarizes the verified electric energy savings for the HVAC Program impact evaluation.

Table 3-14: HVAC Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
E Ductless Heat Pump with Existing Forced Air Furnace	48	127,714	129,480	121,655	95.26%
E Electric To Air Source Heat Pump	96	296,640	296,664	277,211	93.45%
E Electric to Ductless Heat Pump	63	57,204	57,204	56,663	99.05%
E Smart Thermostat DIY with Electric Heat	38	29,960	28,443	21,904	73.11%
E Smart Thermostat Paid Install with Electric Heat	66	49,434	49,401	40,269	81.46%
Total	**311**	**560,952**	**561,192**	**517,702**	**92.29%**

The HVAC Program displayed verified savings of 517,702 kWh with a realization rate of 92.29% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-15: HVAC Program Incentive Costs by Measure

Measure	Incentive Costs
E Ductless Heat Pump with Existing Forced Air Furnace	$24,000.00
E Electric To Air Source Heat Pump	$95,500.00
E Electric to Ductless Heat Pump	$31,000.00
E Smart Thermostat DIY with Electric Heat	$4,712.40
E Smart Thermostat Paid Install with Electric Heat	$9,900.00
Total	**$165,112.40**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the HVAC Program in the section below.

3.2.2.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the HVAC Program.

3.2.2.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the HVAC Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.2.

The Evaluators found all HVAC Program rebates to have project documentation with the associated HVAC model number and efficiency values in either the CC&B web rebate data or mail-in rebate applications. The majority of project files contained associated AHRI certifications for the installed equipment. This allowed the Evaluators to easily verify equipment specifications to assign savings values to each sampled project.

The Evaluators note that not all rebate applications contained existing/new construction field and single family home/manufactured home fields. This field is an input to apply correct RTF UES values. The Evaluators recommend requiring this field be completed in rebate applications, both mail-in and web-based.

The Evaluators verified smart thermostat model specifications through the ENERGY STAR database and to verify if thermostat met all conditions required from the RTF measure specifications. The Evaluators verified that 4 of the 24 sampled thermostats did not meet RTF measure specifications due to lack of occupancy detection and/or geofencing capabilities, a specification required by the RTF. The remaining smart thermostats were verified to qualify for RTF measure savings.

The Evaluators found all other sampled rebate equipment met or exceeded the measure efficiency requirements for the HVAC Program.

3.2.2.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 2.2.2.3. The Evaluators included questions such as:

- What type of thermostat did this thermostat replace?

- Is your home heating with electricity, natural gas, or another fuel?
- Was the previous equipment functional?
  Is the newly installed equipment still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the HVAC Program. The responses to these additional questions can be found in Appendix B.

Table 3-16 displays the ISRs for each of the HVAC measures for Idaho electric territory only. The ISRs resulted in 6.93% precision at the 90% confidence interval for the program.

Table 3-16: HVAC Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Ductless Heat Pump with Existing Forced Air Furnace	112	26	90% ±6.93%	100%
E Electric To Air Source Heat Pump	173	37		100%
E Electric to Ductless Heat Pump	113	3		100%
E Smart Thermostat DIY with Electric Heat	144	21		100%
E Smart Thermostat Paid Install with Electric Heat	178	31		100%

The majority of survey respondents described equipment to be currently functioning, leading to a 100% ISR for the ductless heat pump and above 90% ISR for all remaining measures. The Evaluators applied the ISRs listed in Table 3-16 to each rebate to quantify verified savings for each measure.

3.2.2.4 Impact Analysis

This section summarizes the verified savings results for the HVAC Program. The Evaluators attempted to conduct a billing analysis for the HVAC measures, but participation was insufficient to complete verified savings using this methodology. Therefore, the Evaluators calculated verified savings for the HVAC measures using the RTF workbook in place at the time the savings goal for the program was finalized. These UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.2.5 Billing Analysis

The Evaluators did not conduct a billing analysis for the electric measures in the HVAC Program.

3.2.2.6 Verified Savings

The HVAC Program in total displays a realization rate of 92.29% with 517,702 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-14. The realization rate for the electric savings in the HVAC Program deviate from 100% due to the differences between the applied Avista TRM prescriptive savings value and the true Avista TRM or appropriate RTF UES value.

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program adjusted savings. In addition, the Evaluators reviewed and applied the current RTF UES values for the electric measures along with verified tracking data to estimate net program verified savings for this measure. For the HVAC measures such as ductless heat pumps and air source heat pumps, RTF

savings are dependent on housing type (single family/multifamily/manufactured housing). The Evaluators verified home type when applying RTF values to each sampled project, which led to higher or lower savings than expected, depending on housing type.

The smart thermostat measures realization rates are low because the Avista TRM uses an average of retail and direct install savings values as well as an average across heating types, while the Evaluators assigned the appropriate RTF UES value for each installation type and heating zone. appropriate categories in the RTF led to a lower-than-expected savings for the direct install and retail rebates for this measure. In addition, 4 of the 23 total smart thermostat measures were verified to lack requirements in the RTF, and therefore savings for those 4 smart thermostats were removed. The Measure-level ISRs were also applied to these savings values, which did not affect the realization rate, as ISRs displayed were 100% for all measures in the HVAC program.

3.2.3 Shell Program

The Shell Program provides incentives to customers for improving the integrity of the home's envelope with upgrades to windows and storm windows. Rebates are issued after the measure has been installed for insulation and window measures. Participating homes must have electric or natural gas heating and itemized invoices including measure details such as insulation levels, window values, and square footage. In order to be eligible for incentive, the single-family households, including fourplex or less, must demonstrate an annual electricity usage of at least 8,000 kWh or an annual gas usage of at least 340 Therms. Multifamily homes have no usage requirement. This program includes free manufactured home duct sealing implemented by UCONS. Table 3-9 summarizes the measures offered under this program.

Table 3-17: Shell Program Measures

Measure	Description	Impact Analysis Methodology
E Attic Insulation with Electric Heat	Attic insulation for homes heated with electricity	RTF UES
E Floor Insulation with Electric Heat	Floor insulation for homes heated with electricity	RTF UES
E Energy Star Certified Insulated Door	ENERGY STAR-certified door replacement in homes heated with electricity	RTF UES
E Storm Window with Electric Heat	High-efficiency storm window replacement for homes heated with electricity	RTF UES
E Wall Insulation with Electric Heat	Wall insulation for homes heated with electricity	RTF UES
E Window Replc from Double Pane W Electric Heat	High-efficiency double pane window replacement for homes heated with electricity	RTF UES
E Window Replc from Single Pane W Electric Heat	High-efficiency single pane window replacement for homes heated with electricity	RTF UES

The following table summarizes the adjusted and verified electric energy savings for the Shell Program impact evaluation.

Table 3-18: Shell Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
E Attic Insulation with Electric Heat	22	50,840	38,760	28,489	56%
E Energy Star Certified Insulated Door	8	7,272	9,090	12,119	167%
E Floor Insulation with Electric Heat	1	500	500	455	91%
E Wall Insulation with Electric Heat	4	9,964	7,473	7,387	74%
E Window Replc from Double Pane W Electric Heat	2	1,925	1,903	1,541	80%
E Window Replc from Single Pane W Electric Heat	82	135,406	133,824	87,346	65%
Total	**119**	**205,907**	**191,550**	**137,338**	**66.70%**

The Shell Program displayed verified savings of 137,338 kWh with a realization rate of 66.70% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-19: Shell Program Incentive Costs by Measure

Measure	Incentive Costs
E Attic Insulation with Electric Heat	$19,065.00
E Energy Star Certified Insulated Door	$1,500.00
E Floor Insulation with Electric Heat	$375.00
E Wall Insulation with Electric Heat	$3,736.50
E Window Replc from Double Pane W Electric Heat	$692.00
E Window Replc from Single Pane W Electric Heat	$48,663.40
Total	**$74,031.90**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Shell Program in the section below.

3.2.3.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Shell Program.

3.2.3.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Shell Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.2.

The Evaluators reviewed each measure number of units, square footage, and insulation where available. The Evaluators found three instances of the 31 single pane window replacement measures in which square footage quantity in the rebate application did not match the values presented in the project data. The Evaluators also found some cases where the quantity in the tracking data differed slightly from the documentation reviewed, leading to additional deviations from a 100% realization rate.

The Evaluators found that for one sampled measure, the quantity of the Energy Star insulated door measures in the project tracking data did not match the rebate data. The Evaluators also found one case in which the tracking data and rebate documentation showed that a sample customer had two Energy Star doors installed but the savings value only accounted for one customer. These factors lead to a realization rate above 100% for the Energy Star doors measures as highlighted in Table 3-18.

The Evaluators used the Avista TRM to determine adjusted savings and RTF UES values for verified savings. The Evaluators found that verified attic and wall insulation savings were less than expected savings primarily due to the differences between the categories applied in the Avista TRM prescriptive savings values and the more detailed categories present with unique RTF UES values associated with heating type, R-values and climate zone. The expected savings also appeared to use a value of 2 kwh per square foot while Avista's TRM uses 1.5 kwh per square foot. Both of these factors lead to a low realization rate for attic and wall insulation measures. The Evaluators also found that the granularity in RTF UES values by households characteristics also lead to a lower realization rate for double and single pane window replacement. The Evaluators recommend that Avista ensure that the latest RTF UES values are used to calculate expected savings and that Avista incorporate more granularity from the RTF into Avista's TRM.

The Evaluators imputed home type (single family home vs. manufactured home) and space heating type for several sampled rebates, as the tracking database did not contain values for these accounts, and rebate applications were not available to draw values from. This allows the Evaluators to accurately assign RTF values. The mail-in rebates collect this information; however, it does not seem to be required to complete the rebate and therefore many rebates are missing this information. The Evaluators recommend verifying home type and space heating type during rebate application approval in order to apply correct savings values to each project.

The Evaluators found no duplicate rebates in the project data and therefore did not remove any rebates from verified savings.

3.2.3.3 Verification Surveys

The Evaluators conducted verification surveys for Energy Star doors in Shell Program and found an in-service rate of 100%. The Evaluators did not conduct verification surveys for other measures in shell since weatherization measures historically have high verification rates.

3.2.3.4 Impact Analysis

This section summarizes the verified savings results for the Shell Program. The Evaluators calculated verified savings for the electric measures using the RTF workbook in place at the time the savings goals for the program was finalized. The Evaluators calculated adjusted savings for each measure using the active Avista TRM values and verified tracking data. These UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.3.5 Billing Analysis

The Evaluators did not conduct a billing analysis for the electric Shell measures, as the RTF provides valid UES savings for all measures incented through the program.

3.2.3.6 Verified Savings

The Shell Program in total displays a realization rate of 66.70% with 137,338 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-18. The realization rate for the electric savings in the Shell Program deviate from 100% primarily due to the differences between the categories applied in the Avista TRM prescriptive savings values and the more detailed categories present with unique RTF UES values associated with heating type and climate zone. For Single and Double Pane Window Replacement, wall insulation, and attic insulation, the Avista TRM values are lower than the values observed for Idaho's climate zone in the RTF UES values. The Evaluators recommend adjusting the Avista TRM values to more closely align with the RTF UES values making particular adjustments based on the observed participation within each heating type category. In addition, small changes to verified quantity led to variation in realization rate for each measure type.

3.2.4 Fuel Efficiency Program

The Residential Fuel Efficiency Program encourages customers to consider converting their resistive electric space and water heating equipment to natural gas. This program is offered to residential customers in the Idaho service territory. Customers must use Avista electricity for electric straight-resistance heating or water heating in order to qualify for the rebate, which is verified by evaluating their energy use. The home's electric baseboard or furnace heat consumption must indicate at least 8,000 kWh during the previous heating season. Customers receive incentives after installation and after submitting a completed rebate form. Table 3-9 summarizes the measures offered under this program.

Table 3-20: Fuel Efficiency Program Measures

Measure	Description	Impact Analysis Methodology
E Electric to Air Source Heat Pump	Electric central ducted forced air furnace to air source heat pump (9.0 HFSP or greater)	RTF UES
E Electric To Natural Gas Furnace	Electric baseboard or forced air furnace heat to natural gas forced air furnace	RTF UES
E Electric To Natural Gas Furnace & Water Heat	Electric to natural gas furnace and water heat combo	RTF UES

The following table summarizes the verified electric energy savings for the Fuel Efficiency Program impact evaluation.

Table 3-21: Fuel Efficiency Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings	Adjusted Savings	Verified Savings	Verified Realization Rate
E Electric to Air Source Heat Pump*	0	N/A	N/A	N/A	N/A
E Electric To Natural Gas Furnace	27	199,368	199,368	199,368	100.00%
E Electric To Natural Gas Furnace & Water Heat	13	127,257	127,257	127,257	100.00%
Total	**40**	**326,625**	**326,625**	**326,625**	**100.00%**

*The E Electric to Air Source Heat Pump measure had 0 rebates completed in PY2022

The Fuel Efficiency Program displayed verified savings of 326,625 kWh with a realization rate of 100.00% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-22: Fuel Efficiency Program Incentive Costs by Measure

Measure	Incentive Costs
E Electric to Air Source Heat Pump*	N/A
E Electric To Natural Gas Furnace	$56,150.00
E Electric To Natural Gas Furnace & Water Heat	$37,050.00
Total	**$93,200.00**

*The E Electric to Air Source Heat Pump measure had 0 rebates completed in PY2022

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Fuel Efficiency Program in the section below.

3.2.4.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Fuel Efficiency Program.

3.2.4.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Fuel Efficiency Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.2.

The Evaluators found all Fuel Efficiency Program rebates to have project documentation with the associated HVAC model number and efficiency values in either the CC&B web rebate data or mail-in rebate applications. The majority of project files contained associated AHRI certifications for the installed equipment. This allowed the Evaluators to easily verify equipment specifications to assign savings values to each sampled project.

The Evaluators found the CC&B data does not contain manufacturer information. The Evaluators recommend this as an input in the CC&B data. The E Electric to Natural Gas Furnace & Water Heat measure CC&B data does not detail both the furnace and the water heater model number and manufacturer details. Instead, it contains only the furnace or only the water heater equipment, but not both. The Evaluators recommend collecting both equipment manufacturer, model number, and efficiency for the combination measures.

The Evaluators found all sampled rebate equipment met or exceeded the measure efficiency requirements for the Fuel Efficiency Program.

3.2.4.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure, as described in Section 2.2.2.3. The Evaluators included questions such as:

- Is your home heating with electricity, natural gas, or another fuel?
- Was the previous equipment functional?

- Is the newly installed equipment still properly functioning?

The responses to this verification survey were used to calculate in-service rates (ISRs) for the measures offered in the Fuel Efficiency Program. The responses to these additional questions can be found in Appendix B.

Table 3-12 displays the ISRs for each of the Fuel Efficiency measures for Idaho territory. The ISRs did not meet 10% precision at the 90% confidence interval for the program.

Table 3-23: Fuel Efficiency Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Electric To Natural Gas Furnace	27	3	±16.7%	100%
E Electric To Natural Gas Furnace & Water Heat	13	1		100%

Although the Evaluators contacted all participants for this program, response rates did not meet the 90/10 precision goal for the program. Therefore, the Evaluators assumed 100% in-service rate for this measure. However, of the participants who did respond, all survey respondents for each furnace water heater combination measure described equipment to be currently functioning, supporting the 100% in-service rate assumption for this measure.

3.2.4.4 Impact Analysis

This section summarizes the verified savings results for the Fuel Efficiency Program. The Evaluators attempted to conduct a billing analysis for the Fuel Efficiency Program measures, but participation was insufficient to complete verified savings using this methodology. The Evaluators calculated verified savings for the gas measures using the active Avista TRM values. These UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

The following sections summarize the results of the billing analysis and the desk review, with a summary of the verified savings for the Fuel Efficiency Program.

3.2.4.5 Billing Analysis

The Evaluators did not conduct a billing analysis for the measures in the Fuel Efficiency Program, as there were insufficient participants. Table 3-24 displays customer counts for customers considered for billing analysis (i.e. customer with single-measure installations) and identifies measures that met the requirements for a billing analysis.

Table 3-24: Measures Considered for Billing Analysis, Fuel Efficiency Program

Measure	Measure Considered for Billing Analysis	Number of Customers w/ Isolated-Measure Installations	Sufficient Participation for Billing Analysis
E Electric To Natural Gas Furnace	✓	50	
E Electric To Natural Gas Furnace & Water Heat	✓	34	

3.2.4.6 Verified Savings

The Fuel Efficiency Program in total displays a realization rate of 100.00% with 326,625 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-14. The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program adjusted savings for measures not evaluated through billing analysis. In addition, the Evaluators reviewed and applied the current Avista TRM values for the electric measures along with verified tracking data to estimate net program verified savings for this measure.

The realization rate for the electric savings in the Fuel Efficiency Program does not deviate from 100%. The applied Avista TRM prescriptive savings value and the verified savings aligned in the tracking data.

3.2.5 ENERGY STAR® Homes Program

The ENERGY STAR® Homes Program provides rebates for homes within Avista's service territory that attain an ENERGY STAR® certification. This program incentivizes ENERGY STAR® Eco-rated homes. Table 3-25 summarizes the measures offered under this program.

Table 3-25: ENERGY STAR® Homes Program Measures

Measure	Description	Impact Analysis Methodology
E ENERGY STAR Home - Manufactured, Furnace	ENERGY STAR-rated manufactured home with electric furnace	RTF UES
G ENERGY STAR Home - Manufactured, Natural Gas	ENERGY STAR-rated manufactured home with natural gas heating	RTF UES
G ENERGY STAR Home - Manufactured, Gas & Electric	ENERGY STAR-rated manufactured home with gas and electric	RTF UES

The following table summarizes the verified electric energy savings for the ENERGY STAR® Homes Program impact evaluation.

Table 3-26: ENERGY STAR® Homes Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
E Energy Star Home - Manufactured, Furnace	15	49,725	49,725	55,303	111.22%
E Energy Star Home - Manufactured, Gas & Electric	4	13,184	13,260	97	0.74%
Total	**19**	**62,909**	**62,985**	**55,400**	**88.06%**

The ENERGY STAR® Homes Program displayed verified savings of 55,400 kWh with a realization rate of 88.06% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-27: ENERGY STAR® Homes Program Incentive Costs by Measure

Measure	Incentive Costs
E Energy Star Home - Manufactured, Furnace	$15,000.00
E Energy Star Home - Manufactured, Gas & Electric	$4,000.00
Total	**$19,000.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the ENERGY STAR® Homes Program in the section below.

3.2.5.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the ENERGY STAR® Homes Program.

3.2.5.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the ENERGY STAR® Homes Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.2.

The Evaluators found no significant or notable discrepancies in the project data and rebate documentation for the rebates in the Idaho electric service territory.

3.2.5.3 Verification Surveys

The Evaluators did not conduct verification surveys for the ENERGY STAR® Homes Program.

3.2.5.4 Impact Analysis

This section summarizes the verified savings results for the ENERGY STAR® Homes Program. The Evaluators calculated verified savings for the electric measures using the RTF workbook in place at the time the savings goal for the program was finalized. These RTF UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.5.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate adjusted program savings for each of the ENERGY STAR® Homes measures. In addition, the Evaluators reviewed and applied the current RTF UES values for each measure along with verified tracking data to estimate net program savings.

The ENERGY STAR® Homes Program in total displays a realization rate of 88.06% with 55,400 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-26. The realization rate for the electric savings in the ENERGY STAR® Homes Program deviate from 100% due to the categorical differences between the applied Avista TRM prescriptive savings value and the more detailed RTF UES categories.

The Avista TRM applies RTF savings values from heating zone 2 to all rebates. In addition, the Avista TRM does not take into account cooling zone, which also affects savings assigned in the RTF. The Evaluators

applied the appropriate RTF savings values for the heating zone and cooling zone for each rebated household. This change led to low realization rates for some rebates and high realization rates for others within the same Avista E ENERGY STAR® Home – Manufactured Furnace measure category. The overall effect this change had on the measure is an upward adjustment on savings.

The realization for the E ENERGY STAR® Home – Manufactured, Gas & Electric measure is low because the expected savings employed an additive methodology between a gas-heated home and an electric-heated home for the electric savings. However, the Evaluators reviewed the RTF and determined manufactured home with dual fuel and primary natural gas heating would be closer to the savings a fully gas heated home would save. The Evaluators verified that all dual fuel homes had natural gas as the primary heating type. Therefore, the Evaluators assigned electric savings from the RTF associated with a fully natural gas-heated home at 43 kWh saved per year rather than the fully electric value that Avista applied.

The Evaluators did not conduct a verification survey for the ENERGY STAR® Homes Program and therefore did not adjust verified savings with an ISR.

3.2.6 Small Home & MF Weatherization Program

The Small Home & MF Weatherization Program is a residential prescriptive program that waives the energy usage requirement that is typically employed for residential prescriptive programs. This benefits small homes (less than 1,000 square feet in size) and multifamily dwellings (specifically customers in condominiums larger than five units in size). While this program is designed for all customers, it could also benefit members of Named Communities who reside in smaller homes.

This section summarizes the impact results of the evaluation results for the Small Home & MF Weatherization Program. Table 3-28 summarizes the measures offered under this program.

Table 3-28: Small Home & MF Weatherization Program Measures

Measure	Description	Impact Analysis Methodology
E Multifamily Ductless Heat Pump Replac Existing Baseboard	Conversion from electric baseboard with high efficiency ductless heat pump in multifamily home	RTF UES
E Multifamily Heat Pump Water Heater	Install high efficiency heat pump water heater in multifamily home	RTF UES
E Multifamily Smart Thermostat DIY	Connected thermostat for multifamily homes with electric heat, self-installed	RTF UES
E Multifamily WIFI Thermostat with Baseboard Electric Heat	Connected thermostat for multifamily homes with electric heat	RTF UES
E Multifamily Energy Star Rated Insulated Door With El Heat	Install ENERGY STAR-certified door in multifamily home	RTF UES
E Multifamily Wall Insulation With Electric Heat	Wall insulation for multifamily homes with electric heat	RTF UES
E Multifamily Attic Insulation With Electric Heat	Attic insulation for multifamily homes with electric heat	RTF UES
E Multifamily Smart Thermostat Paid install	Connected thermostat for multifamily homes with electric heat, contractor-installed	RTF UES
E Multifamily Air Source Heat Pump replac existing baseboard	Conversion to air source heat pump from electric baseboard for multifamily home	RTF UES
E Multifamily Floor Insulation With Electric Heat	Floor insulation for multifamily homes with electric heat	RTF UES
E Multifamily Window Replc With Electric Heat	Window replacement for multifamily homes with electric heat	RTF UES

The following table summarizes the verified electric energy savings for the Small Home & MF Weatherization impact evaluation.

Table 3-29: Small Home & MF Weatherization Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Multifamily Smart Thermostat DIY	2	1,399	1,300	939	67.12%
E Multifamily Wall Insulation With Electric Heat	1	870	871	1,037	119.12%
E Multifamily Window Replc With Electric Heat	10	12,634	5,621	8,913	70.55%
E Multifamily Ductless Heat Pump Replac Existing Baseboard	1	908	1,300	856	94.27%
E Multifamily Attic Insulation With Electric Heat	4	3,978	581	2,494	62.71%
E Multifamily Energy Star Rated Insulated Door With El Heat	1	606	4	529	87.35%
E Multifamily Smart Thermostat Paid install	2	1,300	1,300	1,143	87.92%
E Multifamily Air Source Heat Pump replac existing baseboard	1	3,090	3,090	2,842	91.97%
Total	**22**	**24,785**	**14,067**	**18,754**	**75.66%**

The Small Home & MF Weatherization Program displayed verified savings of 18,754 kWh with a realization rate of 75.66% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-30: Small Home & MF Weatherization Incentive Costs by Measure

Measure	Incentive Costs
E Multifamily Smart Thermostat DIY	$250.00
E Multifamily Wall Insulation With Electric Heat	$240.00
E Multifamily Window Replc With Electric Heat	$4,540.56
E Multifamily Ductless Heat Pump Replac Existing Baseboard	$500.00
E Multifamily Attic Insulation With Electric Heat	$1,687.50
E Multifamily Energy Star Rated Insulated Door With El Heat	$100.00
E Multifamily Smart Thermostat Paid install	$300.00
E Multifamily Air Source Heat Pump replac existing baseboard	$1,000.00
Total	**$8,618.06**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for Small Home & MF Weatherization Program in the section below.

3.2.6.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Small Home & MF Weatherization Program.

3.2.6.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Small Home & MF Weatherization Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.2.

The rebate application form sufficiently collects all required RTF measure specification details. All rebate applications and tracking data contain smart thermostat manufacturer and model number. The Evaluators were able to verify the models for RTF specifications for connected thermostats.

The Evaluators found that many projects exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). The Evaluators recommend claiming projects on single family homes that are larger than 1,000 SQFT into the Shell Program.

In addition, the Evaluators note that the current program rebate applications do not provide an option to indicate “Multifamily” home type. Rather, the current rebate application includes an option for “Single family”, “Manufactured”, “New construction”, and “Other”. The Evaluators recommend including an option for “Multifamily” in order to consistently apply RTF savings for each of the measures.

The Evaluators reviewed each measure number of units, square footage, and insulation where available. The Evaluators found no instances in which square footage quantity in the rebate application does not match the values presented in the project data attic insulation. The Evaluators also note that Avista consistently verified square footage and R-values with customers when information was unclear. The tracked quantity and U-values were then documented in the tracking database consistently.

Although quantity in the CC&B database were consistent, the Avista TRM savings values differed from verified RTF UES values for each of the projects. The majority of projects displayed realization rates larger than 100% due to differences in home type. The Evaluators verified home type via Zillow to apply correct RTF workbook savings from the single family, multifamily, and manufactured home RTF workbooks. These adjustments led to high realization rates for the overall program.

The Evaluators imputed home type (single family home vs. manufactured home vs. multifamily home) and space heating type for a number of sampled rebates, as the tracking database did not contain values for these accounts, and rebate applications were not available to draw values from. This allows the Evaluators to accurately assign RTF values. The mail-in rebates collect this information; however, it does not seem to be required to complete the rebate and therefore many rebates are missing this information. The Evaluators recommend verifying home type and space heating type during rebate application approval in order to apply correct savings values to each project.

The realization rate for the E Multifamily Smart Thermostat DIY is low because one of the two thermostats were verified to lack RTF qualification due to lack of occupancy sensor or geolocation capabilities. The realization rate for the E Multifamily Energy Star Rated Insulated Door With El Heat is low because the RTF UES is 75% the magnitude of the Avista TRM value.

The Evaluators found no duplicate rebates in the project data and therefore did not remove any rebates from verified savings.

3.2.6.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 2.2.2.3. The Evaluators included questions such as:

- What type of thermostat did this thermostat replace?
- Is your home heating with electricity, natural gas, or another fuel?
- Was the previous equipment functional?
  Is the newly installed equipment still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the Small Home & MF Weatherization Program. The responses to these additional questions can be found in Appendix B.

Table 3-16 displays the ISRs for each of the Small Home & MF Weatherization measures for Idaho and Washington electric territory combined. The ISRs resulted in 45.17% precision at the 90% confidence interval for the program.

Table 3-31: Small Home & MF Weatherization Program Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Multifamily Smart Thermostat DIY	2	1	90% ±45.17%	Assume 100% ISR
E Multifamily Wall Insulation With Electric Heat	1	0		Assume 100% ISR
E Multifamily Window Replc With Electric Heat	10	0		Assume 100% ISR
E Multifamily Ductless Heat Pump Replac Existing Baseboard	1	0		Assume 100% ISR
E Multifamily Attic Insulation With Electric Heat	4	1		Assume 100% ISR
E Multifamily Energy Star Rated Insulated Door With El Heat	1	1		Assume 100% ISR
E Multifamily Smart Thermostat Paid install	2	0		Assume 100% ISR
E Multifamily Air Source Heat Pump replac existing baseboard	1	0		Assume 100% ISR
E Multifamily Heat Pump Water Heater	N/A	N/A		Assume 100% ISR
E Multifamily WIFI Thermostat with Baseboard Electric Heat	N/A	N/A		Assume 100% ISR

Although the Evaluators contacted all participants for this program, response rates did not meet the 90/10 precision goal for the program. Therefore, the Evaluators assumed 100% in-service rate for this measure. However, of the participants who did respond, all survey respondents for each smart thermostat measure described equipment to be currently functioning, supporting the 100% in-service rate assumption for this measure. The Evaluators applied these ISRs to each rebate to quantify verified savings for each measure.

3.2.6.4 Impact Analysis

This section summarizes the verified savings results for the Small Home & MF Weatherization Program. The Evaluators calculated verified savings for the electric measures using the RTF workbook in place at the time the savings goal for the program was finalized.

3.2.6.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. Final verified savings were estimated using the RTF UES values associated with each measure. The Small Home & MF Weatherization Program displayed 75.66% realization with 18,754 kWh saved, as displayed in Table 3-29.

Although quantity in the CC&B database were consistent, the Avista TRM savings values differed from verified RTF UES values for each of the projects. The majority of projects displayed realization rates that differ from 100% due to differences in home type for all measures and verified U-values for windows measures. In addition, the updated weatherization workbook for single family homes has significantly lower savings than the updated weatherization workbook for multifamily homes. The Evaluators verified home type via Zillow to apply correct RTF workbook savings from the single family, multifamily, and manufactured home RTF workbooks. These adjustments led to high and low realization rates across each measure. The Evaluators recommend Avista verify home type prior to applying Avista TRM values, and to create a separate single family and a separate multifamily windows measure and savings value to apply in the Avista database, mimicking the RTF values, in order to ensure proper categorization of measure savings.

3.2.7 Multifamily Direct Install Program

The Multifamily Direct Install Program (MFDI) Program is administered by SBW Consulting, Inc (SBW). This program provides direct installation and audits for customers to install direct install measures and identify additional energy efficiency opportunities. This program is available to customers who receive electric service from Avista and have a five-unit or more multifamily property. The program also serves hard-to-reach customer segment as well as Avista's low- and limited-income population. Table 3-28 summarizes the measures offered under this program.

Table 3-32: Multifamily Direct Install Program Measures

Measure	Description	Impact Analysis Methodology
Screw-in LED lamps	Efficient LED lighting of various types	SBW TRM
Kitchen/bathroom faucet aerators	1 gallon per minute faucet aerator	SBW TRM
Vending miser	Controls for vending machines	SBW TRM

The following table summarizes the verified electric energy savings for the Multifamily Direct Install Program impact evaluation.

Table 3-33: Multifamily Direct Install Verified Electric Savings

Measure	Participation	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Screw-in LED lamp (A-line 60W)	748	3,988	4,834	121.23%
Screw-in LED lamp (3.8)	127	3,305	3,266	98.82%
Screw-in LED lamp (G25)	25	628	597	95.06%
Faucet aerator (1 GPM)	132	5,544	5,544	100.00%
Kitchen Aerator	83	3,237	3,237	100.00%
Total	**1,115**	**16,701**	**17,478**	**104.65%**

The Multifamily Direct Install Program displayed verified savings of 17,478 kWh with a realization rate of 104.65% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-34: Multifamily Direct Install Program Incentive Costs by Measure

Measure	Incentive Costs
Screw-in LED lamp (A-line 60W)	$12,716.00
Screw-in LED lamp (3.8)	$2,667.00
Screw-in LED lamp (G25)	$425.00
Faucet aerator (1 GPM)	$1,056.00
Kitchen Aerator	$664.00
Total	**$17,528.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for Multifamily Direct Install Program in the section below.

3.2.7.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Multifamily Direct Install Program.

3.2.7.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Multifamily Direct Install Program. This involved verifying direct install models, wattages, and measure specifications. There were no further project-level documents to verify other than tracking data provided.

The Evaluators found no duplicate rebates in the project data and therefore did not remove any rebates from verified savings.

3.2.7.3 Verification Surveys

The Evaluators did not select a subset of participant customers to survey for simple verification of installed measure. Instead, the Evaluators interviewed a subset of multifamily property managers. The Evaluators included questions such as:

- What type of equipment did the measure replace?
- Is your facility's space heated with electricity or natural gas?
- Was the previous equipment functional?
- Is the newly installed equipment still installed and properly functioning?

The responses to this interviews were used to assess in-service rates offered in the Multifamily Direct Install Program. However, the Evaluators note that the SBW measure-level savings technical reference manual included assumed in-service rates within the savings calculations.

3.2.7.4 Impact Analysis

This section summarizes the verified savings results for the Multifamily Direct Install Program. The Evaluators calculated verified savings for the electric measures using the SBW savings document.

3.2.7.5 Verified Savings

The Evaluators reviewed the SBW savings values along with verified tracking data to estimate net adjusted program savings for those measures. Final verified savings were estimated using the SBW UES values associated with each measure. The Multifamily Direct Install Program displayed 104.65% realization with 17,478 kWh saved, as displayed in Table 3-29.

The program verified savings resulted in a realization rate of above 100% largely due to low expected savings for the A-line 60W LEDs. The SBW document measure-level UES did not align with tracking data values. The Evaluators were unable to identify the cause of this discrepancy.

3.2.8 Appliances Program

The Appliances Program is residential prescriptive program that offers incentives for customers to upgrade their existing clothes washers and dryers to ENERGY STAR-rated clothes dryers and washers.

This section summarizes the impact results of the evaluation results for the Appliances Program. Table 3-28 summarizes the measures offered under this program.

Table 3-35: Appliances Program Measures

Measure	Description	Impact Analysis Methodology
E Energy Star Certified Refrigerator and Refrigerator-Freeze	ENERGY STAR-certified refrigerator or refrigerator-freezer for residential homes	RTF UES
E Energy Star Certified Upright Freezer	ENERGY STAR-certified standard or compact freezer for residential homes	RTF UES
E Energy Star Rated Clothes Dryer	ENERGY STAR-certified clothes dryer for residential homes	RTF UES
E Energy Star Rated Front Load Washer	ENERGY STAR-certified clothes washer for residential homes	RTF UES
E Energy Star Rated Top Load Washer	ENERGY STAR-certified clothes washer for residential homes	RTF UES

The following table summarizes the verified electric energy savings for the Appliances Program impact evaluation.

Table 3-36: Appliances Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Energy Star Certified Refrigerator and Refrigerator-Freeze	151	18,724	18,724	1,572	8.39%
E Energy Star Certified Upright Freezer	31	2,077	2,077	549	26.44%
E Energy Star Rated Clothes Dryer	75	21,750	21,728	22,002	101.16%
E Energy Star Rated Front Load Washer	62	7,346	7,440	8,345	113.59%
E Energy Star Rated Top Load Washer	7	182	182	0	0.00%
Total	**326**	**50,079**	**50,151**	**32,467**	**64.83%**

The Appliances Program displayed verified savings of 32,467 kWh with a realization rate of 64.83% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-37: Appliances Program Incentive Costs by Measure

Measure	Incentive Costs
E Energy Star Certified Refrigerator and Refrigerator-Freeze	$15,100.00
E Energy Star Certified Upright Freezer	$1,550.00
E Energy Star Rated Clothes Dryer	$3,750.00
E Energy Star Rated Front Load Washer	$3,100.00
E Energy Star Rated Top Load Washer	$350.00
Total	**$23,850.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for Appliances Program in the section below.

3.2.8.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Appliances Program.

3.2.8.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Appliances Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.2.

The rebate application form sufficiently collects all required RTF measure specification details. All rebate applications and tracking data contain AHRI documentation or model numbers to verify model specifications. The Evaluators were able to verify the models for RTF specifications for the majority of projects.

The Evaluators verified each model specification with values provided by ENERGY STAR qualified product lists. The Evaluators found that 1 of the 30 sampled clothes washer projects did not qualify due to minimum volume requirements specified by the RTF. All other sampled projects qualified for RTF savings.

The Evaluators found no duplicate rebates in the project data and therefore did not remove any rebates from verified savings.

3.2.8.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 2.2.2.3. The Evaluators included questions such as:

- What type of clothes washer/dryer did this equipment replace?
- Is your home heating's water heated with electricity or natural gas?
- Was the previous equipment functional?
  Is the newly installed equipment still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the Appliances Program. The responses to these additional questions can be found in Appendix B.

Table 3-16 displays the ISRs for each of the Appliances measures for Idaho electric territory only. The ISRs resulted in ±9.06% precision at the 90% confidence interval for the program.

Table 3-38: Appliances Program Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Energy Star Certified Refrigerator and Refrigerator-Freeze	151	28	90% ±9.06%	100%
E Energy Star Certified Upright Freezer	31	5		100%
E Energy Star Rated Clothes Dryer	75	18		100%
E Energy Star Rated Front Load Washer	62	14		100%
E Energy Star Rated Top Load Washer	7	0		Assume 100% ISR

All survey respondents described equipment to be currently functioning, leading to a 100% ISR for each measure. For the E Energy Star Rate Top Load Washer, since there were no respondents, the Evaluators assumed a 100% in-service rate for this measure. The Evaluators applied the ISRs listed in Table 3-16 to each rebate to quantify verified savings for each measure.

3.2.8.4 Impact Analysis

This section summarizes the verified savings results for the Appliances Program. The Evaluators calculated verified savings for the electric measures using the RTF workbook in place at the time the savings goal for the program was finalized.

3.2.8.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. Final verified savings were estimated using the RTF UES values associated with each measure. The Appliances Program displayed 64.83% realization with 32,467 kWh saved, as displayed in Table 3-29.

The program verified savings resulted in a realization rate of less than 100% largely due to low savings attributed to E Energy Star Certified Refrigerator and Refrigerator-Freezer and E Energy Star Certified Upright Freezer projects. All fridge-freezer projects were verified to be ENERGY STAR-qualified, but not ENERGY STAR Most Efficient (ESME). The low realization rate for the fridge-freezer measure is due to the difference in RTF savings value between ENERGY STAR fridge-freezers (about 45kWh/year) and ESME fridge-freezers (about 126 kWh). Avista TRM references the Standard Size Refrigerator and Refrigerator-Freezer - Side-mounted Freezer - ESME at 124 kWh/year savings, but the Evaluators found that no rebated fridges met this requirement, and therefore lower RTF savings were applied. In addition, one fridge-freezer rebate was not ENERGY STAR rated.

Similarly, for the upright freezer measure, all projects were verified to be ENERGY STAR-qualified, but not ESME-qualified. The low realization rate is due to the difference in Avista TRM and RTF savings values. The RTF assigns ENERGY STAR fridges 26kWh/unit, while ESME freezers are assigned 67 kWh/unit. The Avista TRM references the Standard Size Freezer - Upright – ESME savings at 67 kWh/year savings. However, because the Evaluators found that no freezers met the ESME qualifications, the lower ENERGY STAR savings values were applied to each project.

Finally, the Evaluators attributed 0 kWh/unit savings to the E Energy Star Rated Top Load Washer because the referenced RTF clothes washer workbook estimates that savings for this measure is negative and therefore there is no proven RTF savings for this measure.

4. Low-Income Impact Evaluation Results

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies ("Agencies") and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

The Evaluators completed an impact evaluation on Avista's Low-Income portfolio to verify program-level and measure-level energy savings for PY2022. The following sections summarize findings for each electric impact evaluation in the Low-Income Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, and RTF values to evaluate verified savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data.

Table 4-1: Low-Income Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Low-Income	87,986	85,639	97.33%
Total Low-Income	**87,986**	**85,639**	**97.33%**

In PY2022, Avista completed and provided incentives for low-income electric measures in Idaho and achieved total electric energy savings of 85,639 kWh. The Low-Income sector had achieved 97.33% of the savings expectations. Further details of the impact evaluation results by program are provided in the sections following.

4.1 Program-Level Impact Evaluation Results

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Low-Income sector in the section below.

4.1.1 Low-Income Program

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies ("Agencies") and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

Avista provides CAP agencies with the following approved measure list, which are reimbursed in full by Avista. Avista also provides a rebate list of additional energy saving measures the CAP agencies are able to utilize which are partially reimbursed. The following table summarizes the measures offered under this program.

Table 4-2 summarizes the measures offered under this program.

Table 4-2: Low-Income Program Measures

Measure	Impact Analysis Methodology
Air Infiltration	Avista TRM
Air source heat pump	
Attic insulation	
Duct insulation	
Duct sealing	
Electric to air source heat pump	
Electric to ductless heat pump	
ENERGY STAR® door	
ENERGY STAR® refrigerator	
ENERGY STAR® window	
Floor insulation	
Heat pump water heater	
LED lighting	
Wall insulation	
High efficiency furnace	
High efficiency tankless natural gas water heater	
Natural gas boiler	

Table 4-3 summarizes the verified electric energy savings for the Low-Income Program impact evaluation.

Table 4-3: Low-Income Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Air Infiltration	12	6,935	6,706	6,706	96.69%

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Duct Sealing	2	963	707	707	73.45%
E Ductless Heat Pump	1	3,016	3,016	3,016	100.01%
E Energy Star Doors	3	516	519	519	100.69%
E Energy Star Windows	9	4,953	4,560	4,560	92.07%
E INS - Attic	2	1,097	823	823	75.02%
E INS - Duct	3	632	535	535	84.66%
E INS - Floor	4	3,964	3,595	3,595	90.70%
E To G Furnace Conversion	4	13,092	13,092	13,092	100.00%
E To Heat Pump Conversion	13	51,990	51,989	51,989	100.00%
Health And Safety	10	-	-	-	N/A
LED Bulbs	16	829	96	96	11.58%
Total	**79**	**87,986**	**85,639**	**85,639**	**97.33%**

The Low-Income Program displayed verified savings of 85,639 kWh with a realization rate of 97.33% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 4-4: Low-Income Program Incentive Costs by Measure

Measure	Incentive Costs
E Air Infiltration	$14,894.30
E Duct Sealing	$339.58
E Ductless Heat Pump	$10,140.00
E Energy Star Doors	$2,540.98
E Energy Star Windows	$23,793.21
E INS - Attic	$3,287.00
E INS - Duct	$898.99
E INS - Floor	$9,569.63
E To G Furnace Conversion	$50,959.20
E To Heat Pump Conversion	$142,535.41
Health And Safety	$41,670.36
LED Bulbs	$324.16
Total	**$300,952.82**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for Low-Income Program in the section below.

4.1.1.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Low-Income Program.

4.1.1.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Low-Income Program. The Evaluators selected a subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.2.

During review, the Evaluators found that all the requested project information clearly outlined measure details and calculations. In addition, the Evaluators found database quantity information to be consistent with documents verified.

However, the Evaluators found some instances in which 20% savings cap was not applied to all measures found to be installed in a household, leading to low realization rates for one of the projects in the program.

The Evaluators found the LED bulbs unit-level savings were inaccurately referenced. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11% realization for LED bulb projects under the program. The Evaluators recommend updating database calculations to use Avista TRM values during expected savings calculations.

These few instances of downward adjustment led to a realization rate of 97% for the Low-Income Program.

4.1.1.3 Verification Surveys

The Evaluators did not conduct verification surveys for the Low-Income Program.

4.1.1.4 Impact Analysis

This section summarizes the verified savings results for the Low-Income Program. The Evaluators calculated verified savings for Low-Income Program measures using the Avista TRM. However, a whole building billing analysis was completed to supplement the findings from the desk review.

4.1.1.5 Billing Analysis

The results of the billing analysis for the Low-Income Program are provided below.

The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolate each unique measure. In doing so, the Evaluators also isolate the measure effects using the customer's consumption billing data. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators were unable to estimate measure-level savings through billing analysis.

The Evaluators instead conducted a whole-home billing analysis for all the electric measures combined in order to estimate savings for the average household participating in the program, across all measures. The Evaluators successfully created a matched cohort for the electric measure households. Customers were matched based on average pre-period seasonal usage, including summer, fall, winter, and spring for each control and treatment household. The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used propensity score matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers.

Table 4-5 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Low-Income Program as it provided the highest adjusted R-squared among the regression models. However, savings for this model are not statistically significant at the 90% level, indicated by the lower 90% confidence bound at 0 Therms saved per year. The customers considered for

billing analysis include customers in both Washington and Idaho service territories to gather the maximum number of customers possible for precise savings estimates.

Table 4-5: Measure Savings, Low-Income Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (kWh)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
All Electric Measures	36	466	363.26*	0.00	1235.33	0.74	Model 2: PPR

*Not statistically significant

Due to lack of statistical significance from the billing analysis results, The Evaluators did not apply these regression savings estimates to the program. Instead, the Evaluators estimated savings through the program by applying Avista TRM values to verified quantities. Further details of the billing analysis can be found in Appendix A.

4.1.1.6 Verified Savings

Due to insufficient participation to conduct measure-level billing analyses, the Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program savings for those measures. Adjusted savings were estimated using the Avista TRM. The Low-Income Program in total displays a realization rate of 97.33% with 85,639 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 4-3. Due to requirements for measure-level verified savings for cost-effectiveness testing, the Evaluators designated the adjusted savings as final.

The Evaluators note that most deviations from 100% realization rate at measure level are due to the inaccurate reference to LED bulbs unit-level savings in Avista's TRM and some were also due to the fact that the 20% savings cap was not applied to all measures found to be installed in a household.

5. Non-Residential Impact Evaluation Results

The Evaluators completed an impact evaluation on Avista's Non-Residential portfolio to verify program-level and measure-level energy savings for PY2022. The following sections summarize findings for each electric impact evaluation in the Non-Residential Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, RTF, IPMVP, supplemental sources and billing analysis of participants to evaluate savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data. Table 5-1 summarizes the Non-Residential verified impact savings by program.

Table 5-1: Non-Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Lighting	6,416,259	6,416,206	6,416,285	100.00%
HVAC	14,308	14,308	14,308	100.00%
Food Service Equipment	10,532	10,532	10,537	100.05%
Grocer	36,468	36,468	36,468	100.00%
Shell	4,490	4,490	4,490	100.00%
Green Motors	9,822	9,822	9,822	100.00%
Site-Specific	6,920,802	7,176,491	7,216,254	104.27%
Total Non-Residential:	**13,412,681**	**13,668,317**	**13,708,164**	**102.20%**

In PY2022, Avista completed and provided incentives for non-residential electric measures in Idaho and achieved a total electric energy savings of 13,708,164 kWh. All programs exceeded savings claims based on reported savings, leading to an overall achievement of 102.20% of the expected savings for the non-residential programs.

5.1 Verification Results

5.1.1 Database & Document Verification

Before conducting the impact analyses, the Evaluators conducted a database review for all prescriptive programs. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Document-Based Verification in Section 2.2.2.2.

The Evaluators requested rebate documentation for a subset of participating customers. These documents included invoices, rebate applications, pictures, AHRI certificates and DLC screenshots and similar types of documents for the following programs:

- Lighting
- HVAC (VFD) Program
- Food Service Equipment Program
- Grocer Program

- Shell Program
- Green Motors Program

This sample of documents was used to cross-verify tracking data inputs. In the case the Evaluators found any deviations between the tracking data and application values, the Evaluators reported and summarized those differences in the appropriate report chapters.

The Evaluators developed a sampling plan that achieves a sampling precision of ±10% at 90% statistical confidence – or "90/10 precision" – for document verification.

Table 5-2 displays program populations, sample sizes for document verification and resulting precision.

Table 5-2: Prescriptive Program Verification Precision

Program	Population (Projects)	Sampled (Projects)	Precision
Lighting	473	70	±9.08%
HVAC	4	4	±0%
Food Service Equipment	2	2	±0%
Grocer	4	4	±0%
Shell	1	1	±0%
Green Motors	2	2	±0%

5.1.2 Survey and On-Site Verification

Unlike Residential measures, non-residential measures typically have a 100% installation rate or a deemed in-service rate (ISR) included in RTF and Avista TRM UES. The two exceptions to this are Prescriptive Lighting measures and customs projects, such as those in the Site-Specific programs. Verification for these programs was addressed in two ways:

5.1.2.1 Prescriptive Lighting Verification

To access Prescriptive Lighting ISRs the Evaluators conducted a survey of program participants. A total of 472 projects included a contact email, of which 74 were unique. Customers with a valid email were sent the survey via an email invitation, followed a week later by a follow-up reminder to those who had not responded.

The Evaluators asked participants if the rebated equipment is currently installed and working, in addition to questions about HVAC configurations. The Evaluators achieved ±58.10% precision across the Prescriptive Lighting Program in Avista's WA service territory, summarized in Table 5-3.

Table 5-3: Survey Verification

Population	Respondents	ISR	Precision at 90% CI
472	2	100%	±58.10%

All respondents reported that their rebated equipment was currently installed and operating.

5.1.2.2 Site-Specific Verification

For the Site-Specific program, the Evaluators conducted 9 on-site visits to verify full installation and equipment operation as described in the project scope. This is discussed further in the Site-Specific chapter.

Table 5-4: On-Site Verification

Program	Population	On-Site Visits	Precision at 90% CI (by claimed savings)
Site-Specific	31	9	±9.35%[8]

5.2 Program-Level Impact Evaluation Results

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Non-Residential sector in the section below.

[8] Sampling precision based on sample stratified by kWh. Multiple projects occurred at several sites, necessitating only a single visit for multiple sampled projects.

5.1.3 Prescriptive Lighting Program

This program is intended to prompt commercial electric customers to increase the energy efficiency of their lighting equipment through direct financial incentives. It indirectly supports the infrastructure and inventory necessary to ensure that the installation of high-efficiency equipment is a viable option for customers.

In an effort to streamline the process and make it easier for customers and vendors to participate in the program, Avista developed a prescriptive approach for commercial/industrial customers in 2004. This program provides for many common retrofits to receive a pre-determined incentive amount. The Prescriptive Lighting program makes it easier for customers – especially smaller customers and vendors – to participate in the program.

The measures included in the Prescriptive Lighting program include retrofits from fluorescent lamps and fixtures, HID, directional, and incandescent can fixtures to more energy-efficient LED light sources and controls.

The Prescriptive Lighting Program accounts for the largest share of non-residential expected savings, or roughly 50.5% of the expected non-residential portfolio.

Table 5-5 summarizes the measures offered under this program.

Table 5-5: Prescriptive Lighting Program Measures

Location	Measure	Savings Source
Interior	LED tubes	Prescriptive Calculations
	LED U-Bend	
	LED W reduction	
	LED Downlamps/Directional	
	Linear LED Fixtures	
	HID LED fixtures/lamps	
	Occupancy Sensors	
	LLLC Fixtures	
Exterior	HID LED fixtures/lamps	
	Sign Lighting	
New Construction	HID LED fixtures	

Prescriptive Lighting Program impact evaluation by measure, and then are summarized in Table 5-6.

Table 5-6: Interior Prescriptive Lighting Program Verified Electric Savings

Measure	Number of Projects	claimed kWh	adjusted kWh	verified kWh	kWh RR
1000 watt HID Fixture to 400 watt or less LED Fixture	5	195,128	195,128	195,128	100.00%
1000 watt HID Fixture to 400 watt or less LED Fixture or Retrofit (Ext)	11	333,235	333,235	333,235	100.00%
150 watt HID Fixture to 50 watt or less LED Fixture or Retrofit (Ext)	16	77,272	77,272	77,272	100.00%

175 watt HID Fixture to 100 watt or less LED Fixture (Ext, NC)	2	1,987	1,987	1,987	100.00%
175 watt HID Fixture to 100 watt or less LED Fixture or Retrofit (Ext)	32	81,986	81,986	81,986	100.00%
2, 3, 4-Lamp T12/T8 Fixture to LED Qualified 2x4 Fixture	44	241,199	241,199	241,199	100.00%
20-50 watt MR16 to MR16 LED 2-9 watt	1	4,586	4,586	4,586	100.00%
250 watt HID Fixture to 140 watt or less LED Fixture (Ext, NC)	2	3,072	3,072	3,072	100.00%
250 watt HID Fixture to 140 watt or less LED Fixture or Retrofit (Ext)	39	280,494	280,494	280,494	100.00%
250-watt HID Fixture to 140-watt or less LED Fixture	15	94,638	94,638	94,638	100.00%
2-Lamp T12/T8 Fixture to LED Qualified 1x4 Fixture	9	5,762	5,762	5,762	100.00%
2-Lamp T12/T8 Fixture to LED Qualified 2x2 Fixture	14	21,552	21,552	21,552	100.00%
320 and 400 watt HID Fixture to 160 or less watt LED Fixture (Ext, NC)	4	12,273	12,273	12,273	100.00%
320 watt HID Fixture to 160 watt or less LED Fixture or Retrofit (Ext)	9	191,532	191,532	191,532	100.00%
400 watt HID Fixture to 175 watt or less LED Fixture	33	642,007	642,007	642,007	100.00%
400 watt HID Fixture to 175 watt or less LED Fixture or Retrofit (Ext)	73	683,718	683,718	683,718	100.00%
70-89 watt HID Fixture to 25 watt or less LED Fixture or Retrofit (Ext)	14	48,531	48,531	48,531	100.00%
750 watt HID Fixture to 300 watt or less LED Fixture or Retrofit (Ext)	1	9,370	9,370	9,370	100.00%
75-100 watt Incandescent Can to less than 20 watt LED Fixture Retrofit	15	71,946	71,946	71,946	100.00%
90-100 watt HID Fixture to 30 watt or less LED Fixture or Retrofit (Ext)	18	71,034	71,034	71,034	100.00%
DLC Qualified LLLC Fixture	9	91,033	91,033	91,033	100.00%
Four Pin Base CFL to 17 watt or less Plug in LED	38	151,790	151,790	151,790	100.00%
Occupancy sensors built-in relays	5	5,429	5,350	5,429	100.00%
Sign Lighting	53	130,510	130,539	130,539	100.02%
T12/T8 (2') Lamp to 1-Lamp less than 13 watt T8 TLED	16	11,127	11,127	11,127	100.00%
T12/T8 (3') Lamp to 1-Lamp less than 17 watt T8 TLED	8	3,582	3,582	3,582	100.00%
T12/T8 (4') Lamp to 1-Lamp less than 23 watt T8 TLED	275	2,174,671	2,174,671	2,174,671	100.00%
T12/T8 8' Fixture to 90 watt or less 8' LED fixture	14	113,461	113,460	113,460	100.00%
T12/T8 Eight-Foot to LED	20	49,071	49,071	49,071	100.00%
T12/T8 U-Bend to less than 23 watt T8 LED	10	5,023	5,023	5,023	100.00%
T5 Lamp to 1-Lamp less than 18 watt T5 TLED	4	48,409	48,409	48,409	100.00%
T5HO (4') 4-Lamp to 135 watt of less LED Fixture	7	41,570	41,570	41,570	100.00%
T5HO (4') 6-Lamp to 160 watt of less LED Fixture	14	175,778	175,777	175,777	100.00%
T5HO Lamp to 1-Lamp less than 29 watt T5HO TLED	35	343,484	343,484	343,484	100.00%
Total	**865**	**6,416,259**	**6,416,206**	**6,416,285**	**100.00%**

The following table summarizes the incentive costs associated with the program.

Table 5-7: Prescriptive Lighting Program Incentives

Measure	Measure Count	Total Electric Incentives
Lighting	54,527	$1,422,500.93

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Prescriptive Lighting Program in the section below.

5.1.3.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Prescriptive Lighting Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 5.1.1. Data points checked between project applications and program tacking counts, wattages/DLCs sheets, hours of operation and measure cost values. Below, Table 5-8 shows the project population, the number of projects checked and the overall precision.

Table 5-8: Prescriptive Lighting Program Verification Precision

Population	Sampled	Precision
473	70	±9.08%

Below, Table 5-9 shows the count of discrepancies found between program tracking and project-level data.

Table 5-9: Prescriptive Lighting Program Verification Findings

Count Correction	Location Correction	Hours Correction	Wattage Correction
0	5	10	5

No corrections to discrepancies resulted in appreciable changes to verified savings.

5.1.3.2 Impact Analysis

The Evaluators calculated verified savings by using a standard engineering algorithm:

$$kWh_{savings} = \sum \left(\left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{pre} - \left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{post} \right) \times AOH \times ISR$$

Where:

Nfixt(i), pre = Pre-retrofit number of fixtures of type i
Nfixt(i), post = Post-retrofit number of fixtures of type i
Wfixt(i), pre = Rated wattage of pre-retrofit fixtures of type i (Standard Wattage Table developed from RTF materials)
Wfixt(i), post = Rated wattage of post-retrofit fixtures of type i (Varies). Self-reported.
AOH = Annual operating hours for specified space type (Varies). Self-reported.
ISR = The In-Service Rate, or storage rate (94.8%, weighted average based on type) Obtained from RTF Midstream Lighting v4.1

5.1.3.3 Verified Savings

The verified savings for the program is 6,416,285 kWh with a realization rate of 100.00%, as displayed in Table 5-6. Expected savings calculations did not incorporate in-service rates into calculations. These were included in verified savings calculations, resulting in lower verified savings.

5.1.4 Prescriptive HVAC VFD Program

The Prescriptive HVAC Variable Frequency Drive Program is intended to prompt customers to increase the energy efficiency of their HVAC fan or pump applications with a Variable Frequency Drive (VFD) retrofit. Adding a VFD to HVAC systems is an effective tool for cutting operating costs, improving overall system performance, and reducing wear and tear on motors. The prescriptive rebate approach issues payment to the customer after the measure has been installed. Commercial customers who use Avista electricity and apply the VFD to the eligible fan or pump measures are eligible for this program.

The Prescriptive HVAC Variable Frequency Drive Retrofit Program is offered for retrofitting VFDs on existing HVAC equipment. Customers must submit a completed rebate form, invoices, and documentation to verify the horsepower of the motor on which the VFD was installed within 90 days of installation. This program is promoted by trade allies, Avista account executives, the Avista website, and Avista marketing efforts. The website is also used to communicate program requirements, incentives, and forms.

Table 3-9 summarizes the measures offered under this program.

Table 5-10: Prescriptive HVAC VFD Program Measures

Measure	Impact Analysis Methodology
HVAC Cooling Pump	Avista TRM UES
HVAC Fan	Avista TRM UES
HVAC Heating Pump or Combo	Avista TRM UES

The following table summarizes the verified electric energy savings for the Prescriptive HVAC VFD Program impact evaluation.

Table 5-11: Prescriptive HVAC VFD Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings	Adjusted Savings	Verified Savings	Realization Rate
VFD on Supply Fan or Supply Air Handler	4	14,308	14,308	14,308	100.0%
Total	**4**	**14,308**	**14,308**	**14,308**	**100.0%**

The following table summarizes the incentive costs associated with the program.

Table 5-12: Prescriptive HVAC VFD Program Incentives

Measure	Measure Count	Total Electric Incentives
VFDs on HVAC Systems	14	$2,800.00

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Prescriptive HVAC VFD Program in the section below.

5.1.4.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Prescriptive HVAC VFD Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 5.1.1. Verification of project documents included data points such as quantity,

motor horsepower, installation location and costs of the equipment. Table 5-13 shows the project population, the number of projects checked and the overall precision.

Table 5-13: Prescriptive HVAC VFD Program Verification Precision

Population	Sampled	Precision
2	2	±0%

The Evaluators did not find any deviations between project applications and program tracking data.

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive HVAC VFD Program.

5.1.4.2 Impact Analysis

This section summarizes the verified savings results for the Prescriptive HVAC VFD Program. The Evaluators calculated verified savings for VFD measures using the Avista TRM. The Evaluators attempted to use the RTF to calculate verified savings, however found project documentation to be insufficient to determine key characteristics necessary to assign RTF UES. A recommendation is made below to address this. Final verified savings were calculated by applying the appropriate TRM UES to a census of measures.

5.1.4.3 Verified Savings

The Evaluators reviewed and applied the current TRM UES values to verified tracking data to estimate net program savings for this measure. The verified savings for the program is 14,308 kWh with a realization rate of 100.00%, as displayed in

5.1.5 Food Service Equipment Program

The Food Service Equipment Program offers incentives for commercial customers who purchase or replace food service equipment with ENERGY STAR-qualified equipment. This prescriptive rebate approach issues payment to the customer after the measure has been installed. Commercial customers who use Avista electricity to operate the equipment submitted for a rebate are eligible for this program. Customers must submit a completed rebate form and invoices within 90 days after the installation has been completed. Avista will send incentive checks to the customers or their designees after each project is approved. The website is also used to communicate program requirements, incentives, and forms.

Table 3-9 summarizes the measures offered under this program.

Table 5-14: Prescriptive Food Service Equipment Program Measures

Measure	Impact Analysis Methodology
Convection oven	RTF, Convection Oven v4.2
Combination oven	RTF, Commercial Cooking RTF Combination Ovens v4.2
Griddle	RTF, Griddles v1.2
Rack oven	RTF, Rack Ovens v1.2
Dishwasher	Avista TRM, Non-Res Dishwashers (multiple)
Energy Star ice machine	RTF, Commercial ENERGY STAR™ Ice Makers v1.3
Fryer	RTF, Commercial Cooking Fryer v4.2
Hot food holding cart	RTF, Commercial Cooking Hot Food Cabinet v4.2
Steam cookers	RTF, Commercial Cooking Steamer v4.2
Pre-rinse sprayer	Avista TRM, Non-Res Pre-Rinse Sprayer (multiple)
Overwrapper	RTF, On-Demand Overwrappers v1.1

The following table summarizes the verified electric energy savings for the Prescriptive Food Service Equipment Program impact evaluation.

Table 5-15: Prescriptive Food Service Equipment Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings	Adjusted Savings	Verified Savings	Realization Rate
Commercial Combination Oven Electric (5-14 pans)	1	6,422	6,422	6,427	100.08%
Commercial Dishwasher High Temp Electric Hot Water	1	4,110	4,110	4,110	100.00%
Total	**2**	**10,532**	**10,532**	**10,537**	**100.05%**

The following table summarizes the incentive costs associated with the program.

Table 5-16: Food Service Equipment Program Incentives

Measure	Measure Count	Total Electric Incentives
Commercial Combination Oven Electric (5-14 pans)	1	$1,000.00
Commercial Dishwasher High Temp Electric Hot Water	1	$750.00
Total	**2**	**$1,750.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities and results for the Prescriptive Food Service Equipment Program in the section below.

5.1.5.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Prescriptive Food Service Equipment Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 5.1.1. Data points checked between project applications and program tacking include fuel type, capacity, ENERGYSTAR® status, quantity and measure cost values.

Table 5-18 shows the project population, the number of projects checked and the overall precision.

Table 5-17: Prescriptive Food Service Equipment Program Verification Precision

Population	Sampled	Precision
2	2	±0%

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive Food Service Equipment Program.

5.1.5.2 Impact Analysis

This section summarizes the verified savings results for the Prescriptive Food Service Equipment Program. The Evaluators calculated verified savings for the food service measures using RTF UES in place at the time the savings goals for the program was finalized. For measures where RTF UES were not available or unsuitable, the 2022 Avista TRM was used to verify savings. Final verified savings were calculated by applying the appropriate UES to a census of measures.

5.1.5.3 Verified Savings

The Evaluators reviewed and applied the appropriate UES values to verified tracking data to estimate program savings for these measures. Verified savings for the program is 10,537 kWh with a realization rate of 100.0%, as displayed in Table 5-15. For one measure, Combination Ovens, the Evaluators found that claimed savings used an Avista TRM value of 6,422 kWh savings per measure. The RTF specifies 6,427 kWh for this measure, resulting in slightly higher verified savings. The Evaluators did not find any other deviations from TRM UES.

5.1.6 Grocer Program

This program offers incentives to customers who increase the energy efficiency of their refrigerated cases and related grocery equipment. Refrigeration often represents the primary electricity expense in a grocery store or supermarket. The prescriptive rebate approach issues payment to the customer after the measure has been installed. Commercial customers who use Avista fuel for the measure applied for are eligible.

Customers must submit a completed rebate form and invoice within 90 days after the installation has been completed. This program is promoted by trade allies, Avista account executives, the Avista website, and Avista marketing efforts. The website is also used to communicate program requirements, incentives, and forms.

Table 5-18 summarizes the measures offered under this program.

Table 5-18: Grocer Program Measures

Measure	Impact Analysis Methodology
Refrigerator Case Lighting	RTF EUS
ASH Controls	RTF EUS
Door Gaskets	Avista TRM UES
Floating Head Pressure Controls	RTF EUS
Strip Curtains	RTF EUS
Walk-In ECM Controllers	RTF EUS
ECMs on Evaporator Fans	Avista TRM UES
ECM Replacing Evaporator PS and PSC	RTF EUS
Refrigerator Case Lighting	RTF Commercial Grocery Display Case Lighting v1.2
ASH Controls	RTF EUS
Door Gaskets	RTF EUS
Floating Head Pressure Controls	RTF EUS
Strip Curtains	RTF EUS

The following table summarizes the verified electric energy savings for the Grocer Program impact evaluation.

Table 5-19: Grocer Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings	Adjusted Savings	Verified Savings	Realization Rate
Low Temp ECM	2	12,224	12,224	12,224	100.00%
Med Temp ECM	2	24,244	24,244	24,244	100.00%
Total	**4**	**36,468**	**36,468**	**36,468**	**100.00%**

The following table summarizes the incentive costs associated with the program.

Table 5-20: Grocer Program Incentives

Measure	Measure Count	Total Electric Incentives
Low Temp ECM	16	$800.00

Med Temp ECM	44	$2,200.00
Total	**60**	**$3,000.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities and results for the Grocer Program in the section below.

5.1.6.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Grocer Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 5.1.1. Data points checked between project applications and program tacking including measure specification, quantity and measure cost values.

Table 5-21 shows the project population, the number of projects checked and the overall precision.

Table 5-21: Verification Precision

Population	Sampled	Precision
4	4	±0%

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Grocer Program.

5.1.6.2 Impact Analysis

This section summarizes the verified savings results for the Prescriptive Food Service Equipment Program. The Evaluators calculated verified savings for the food service measures using RTF UES in place at the time the savings goals for the program was finalized. Final verified savings were calculated by applying the appropriate UES to a census of measures.

5.1.6.3 Verified Savings

The Evaluators reviewed and applied the appropriate UES values to verified tracking data to estimate program savings for these measures. The verified savings for the program is 36,438 kWh with a realization rate of 100.00%, as displayed in Table 5-19.

5.1.7 Prescriptive Shell Program

The Commercial Prescriptive Shell Program offers incentives to commercial customers who improve the envelopes of their existing buildings by adding insulation, which may make a business more energy-efficient and comfortable. This prescriptive rebate approach issues payment to the customer after the measure has been installed by a licensed contractor. Commercial customers must have an annual heating footprint for a fuel provided by Avista.

Customers must submit a completed rebate form, invoices, and an insulation certificate within 90 days after the installation has been completed. Avista will send incentive checks to customers or their designees after each project is approved. This program is promoted by trade allies, Avista account executives, the Avista website, and Avista marketing efforts. The website is also used to communicate program requirements, incentives, and forms.

Table 5-22Table 3-9 summarizes the measures offered under this program.

Table 5-22: Prescriptive Shell Program Measures

Measure	Impact Analysis Methodology
Attic Insulation	Avista TRM UES
Roof Insulation	Avista TRM UES
Wall Insulation	Avista TRM UES

The following table summarizes the verified electric energy savings for the Prescriptive Shell Program impact evaluation.

Table 5-23: Prescriptive Shell Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings	Adjusted Savings	Verified Savings	Realization Rate
Attic =< R11 to R45+	1	4,490	4,490	4,490	100.00%
Total	**1**	**4,490**	**4,490**	**4,490**	**100.00%**

The following table summarizes the incentive costs associated with the program.

Table 5-24: Shell Program Incentives

Measure	Measure Count	Total Electric Incentives
Attic =< R11 to R45+	3,230	$2,422.50
Total	**3,230**	**$2,422.50**

The Evaluators summarize the program-specific and measure-specific impact analysis activities and results for the Prescriptive Shell Program in the section below.

5.1.7.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Prescriptive Shell Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 5.1.1. Data points checked between project applications and program tacking

include R-levels, square footage of installation, HVAC configuration and measure cost values. Below, Table 5-25 shows the project population, the number of projects checked and the overall precision.

Table 5-25: Prescriptive Shell Program Verification Precision

Population	Sampled	Precision
1	1	±0%

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive Shell Program.

5.1.7.2 Impact Analysis

This section summarizes the verified savings results for the Prescriptive Shell Program. The Evaluators calculated verified savings for the insulation measures using the Avista TRM, in place at the time the savings goals for the program was finalized. Final verified savings were calculated by applying the appropriate UES to a census of measures.

5.1.7.3 Verified Savings

The Evaluators reviewed and applied the current TRM UES values for the Attic and Wall Insulation measures along with verified tracking data to estimate net program savings for this measure. The verified savings for the program is 4,490 kWh with a realization rate of 100.0%, as displayed Table 5-23.

5.1.8 Green Motors Program

The Green Motors Program ensures quality rewinding that results in the motor maintaining its original efficiency, which is commonly called a "green rewind." The Green Motors Practices Group (GMPG) is a non-profit organization that identifies, promotes, and verifies only excellent member motor service centers. These companies are committed to consistently producing repair/rewinds that retain or improve reliability and efficiency and provide on-site motor driven systems assistance.

The incentive for this program is $1 per HP of the motor being rewound, up to $10,000 for 5,000 HP, and is taken directly off the customer bill at the service center. There is also a $1 per HP fee paid to the service center for participating.

Table 5-26 summarizes the measures offered under this program.

Table 5-26: Green Motors Program Measures

Measure	Impact Analysis Methodology
Motor Rewind (Industrial)	Avista TRM 2022 UES

The following table summarizes the verified electric energy savings for the Green Motors Program impact evaluation.

Table 5-27: Green Motors Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings	Adjusted Savings	Verified Savings	Realization Rate
300 HP Ind	1	4,535	4,535	4,535	100.00%
350 HP Ind	1	5,287	5,287	5,287	100.00%
Total	**2**	**9,822**	**9,822**	**9,822**	**100.00%**

The following table summarizes the incentive costs associated with the program.

Table 5-28: Green Motors Program Incentives

Measure	Measure Count	Total Electric Incentives
300 HP Ind	300	$826.75
350 HP Ind	350	$964.35
Total	**650**	**$1,791.10**

The Evaluators summarize the program-specific and measure-specific impact analysis activities and results for the Green Motors Program in the section below.

5.1.8.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Green Motors Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 5.1.1. Data points checked between project applications and program tacking including operating hours, RPM, motor horsepower and measure cost values.

Table 5-29 shows the project population, the number of projects checked and the overall precision.

Table 5-29: Green Motors Program Verification Precision

Population	Sampled	Precision
2	2	±0%

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Green Motors Program.

5.1.8.2 Impact Analysis

This section summarizes the verified savings results for the Green Motors Program. The Evaluators calculated verified savings for motor rewinding using the Avista TRM, in place at the time the savings goals for the program was finalized. Final verified savings were calculated by applying the appropriate UES to a census of measures.

5.1.8.3 Verified Savings

The Evaluators reviewed and applied the current TRM UES values for all measures along with verified tracking data to estimate net program savings for this measure. The verified savings for the program is 9,822 kWh with a realization rate of 100.0%, as displayed in Table 5-27.

5.1.9 Site-Specific Program

The Site-Specific Program provides calculated incentives to support the installation of qualifying energy efficiency equipment at commercial/industrial sites. These projects typically have a higher degree of complexity than the traditional prescriptive offerings and rely on custom calculations of savings and incentive levels. Examples of these projects include process improvements, upgrades to specialized equipment used in manufacturing, lighting installations that rely on specialized controls, and other measures designed around the customer's specific needs.

Avista's Site-Specific Program is a major component in its non-residential electric offerings. The program approach strives for a flexible response to energy efficiency projects that have demonstrable kWh savings within program criteria. The majority of site-specific kWh savings are composed of custom lighting projects and custom HVAC, envelope, and industrial process load projects that do not fit the prescriptive path. The Site-Specific Program is available to all commercial/industrial retail electric customers, and typically brings in the largest portion of savings to the overall energy efficiency portfolio.

The following table summarizes the verified electric energy savings for the Site-Specific Program impact evaluation.

Table 5-30: Site-Specific Program Verified Electric Savings

PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
31	6,920,802	7,176,491	7,216,254	104.27%

The Site-Specific Program displayed verified savings of 7,216,254 kWh with a realization rate of 104.27% against the expected savings for the program.

Table 5-31: Site-Specific Program Costs

Incentive Costs
$1,561,656.73

The Evaluators summarize the program-specific and measure-specific impact analysis activities and results for the Site-Specific Program in the section below.

5.1.9.1 Sample Design

Unlike other non-residential programs, completing a census review of all Site-Specific projects is not feasible. To ensure accurate verified savings estimates, the Evaluators developed a sample of representative sites to inspect using the Stratified Random Sampling procedure detailed in 2.2.2.1.2. This procedure provides 90% confidence and +/- 10% precision with a significantly reduced sample than random sampling would require, by selecting the highest saving facilities with certainty, thereby minimizing the variance that non-sampled sites can contribute to the overall results.

The participant population for the Site-Specific Program was divided into five strata. Table 5-32 summarizes the strata boundaries and sample frames for the Site-Specific Program.

Table 5-32: Site-Specific Program Sample Design

Descriptor	Stratum 1	Stratum 2	Stratum3	Stratum 4	Stratum 5	Totals
Strata boundaries (kWh)	< 5,000	5,001 - 50,000	50,001 - 400,000	400,001 - 2,000,000	> 2,000,001	
Number of projects	5	16	6	3	1	**31**
Total kWh savings	10,299	260,037	949,565	2,624,292	3,076,609	**6,920,802**
Average kWh Savings	2,060	16,252	158,261	874,764	3,076,609	**223,252**
Standard deviation of kWh	1,392	8,258	112,300	28,512	N/A	**601,361**
Coefficient of variation	0.676	0.508	0.710	0.520	0.000	**0.000**
Final design sample	**2**	**4**	**2**	**3**	**1**	**12**

Two of the highest-savings sites (both in the 5th stratum) were also specifically selected for verification and analysis. Verified sampling precision is ±9.35% at 90%.

Table 5-33: Site-Specific Program Sample Summary

# Sites in Population	Review Sample Size	Precision
31	12	9.35% at 90%

5.1.9.2 Project Document Review and On-Site Visits

Once representative projects were selected, the Evaluators obtained all project-related documentation for review. These documents typically included spec sheets, building characteristics, calculators, invoices, project photos and trending data. This information allowed the Evaluators to replicate claimed savings estimates and develop M&V plans to be used in assessing verified savings and collecting on-site data.

Using project-specific M&V plans, the Evaluators visited sampled to verify measure installation and operating parameters, as well as building parameters such as square footage and HVAC configurations. The Evaluators were able to conduct visits at 10 of the 12 sampled sites.

5.1.9.3 Impact Approaches

The majority (8/14) projects were lighting projects and could be analyze using standard savings algorithms. Below, the two equations show the algorithms used in calculating savings from lighting projects.

$$kWh_{savings} = \sum \left(\left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{pre} - \left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{post} \right) \times AOH \times IEF$$

$$kW_{savings} = \sum \left(\left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{pre} - \left[N_{fixt(i)} \times \frac{W_{fixt(i)}}{1000} \right]_{post} \right) \times CF \times IEF$$

Where:

Nfixt(i), pre = Pre-retrofit number of fixtures of type i
Nfixt(i), post = Post-retrofit number of fixtures of type i
Wfixt(i), pre = Rated wattage of pre-retrofit fixtures of type i (Standard Wattage Table developed from RTF materials)

Wfixt(i), post = Rated wattage of post-retrofit fixtures of type i (Taken from project spec sheets)
CF = Peak demand coincidence factor (80%, for most measures)
AOH = Annual operating hours for specified space type (Varies. Collected during M&V site visits)
IEF = Site-Specific Interactive effects factor specific to building and Site-Specific configuration (developed from RTF materials)

For non-lighting projects, specific methodology varies between IPMVP Options A-C, and is described as needed in individual site reports, located in Appendix C: Site-Specific Program Project Reports.

5.1.9.4 Site-Level Realization

Adjusted and verified savings were developed for each sampled site. The realization rates for sites within each stratum were then applied to the non-sampled sites within their respective stratum. Table 5-34 presents realization at the site level, with Table 5-35 presenting results at the stratum level.

Table 5-34: Site-Specific Expected, Adjusted and Verified kWh Savings by Project

Project ID	Expected kWh Savings	Adjusted kWh Savings	Verified kWh Savings	Realization Rate
SSLP_81717	1,663	1,663	1,663	100.0%
SSLP_80105	4,475	4,475	4,475	100.0%
SSLP_81224	7,802	7,802	7,802	100.0%
SSLP_80312	11,925	11,925	11,925	100.0%
SSLP_80512	25,507	25,507	25,507	100.0%
SSLP_80599	29,742	29,675	29,675	99.8%
SSOP_81531	93,301	80,796	99,147	106.3%
SSLP_78714	344,924	344,924	344,924	100.0%
SSLP_79005	476,885	476,885	476,885	100.0%
SSOP_74531	776,307	793,437	793,437	102.2%
SSOP_74548	1,371,100	1,386,589	1,386,589	101.1%
SSOP_80742	3,076,609	3,327,005	3,327,005	108.1%
Total	**6,220,239**	**6,490,683**	**6,509,034**	**104.6%**

Table 5-35: Site-Specific Summary of kWh Savings by Sample Stratum

Stratum	Expected kWh Savings	Adjusted kWh Savings	Verified kWh Savings	Realization Rate
1	10,299	10,298	10,298	99.99%
2	260,037	259,808	259,808	99.91%
3	949,565	922,469	962,232	101.33%
4	2,624,292	2,656,911	2,656,911	101.24%
5	3,076,609	3,327,005	3,327,005	108.14%
Total	**6,920,802**	**7,176,491**	**7,216,254**	**104.27%**

5.1.9.5 Discussion of Non-100% Realization

Below are brief explanations of differences between claimed and verified savings for projects with realization rates that are not 100%.

- **SSLP_80599 -** The Evaluators were unable to recreate expected savings for (14) 2L F96T12HO-E to (21) 76W LED strips. Verified savings was calculated using actual fixture wattages, verified lighting hours of operation and deemed HVAC interactive factors specific to the building type and HVAC configuration (Medium Office, ID, >2006 vintage). This resulted in slightly reduced kWh savings.
- **SSOP_81831 -** The Evaluators were unable to fully reconstruct all claimed savings calculations, but it appears that HVAC interactive effects were omitted. These effects were included in verified savings calculations, leading to a slightly high realization rate.
- **SSOP_74531 -** The ex-ante assumed only 1 pump was running and just used north pump data as it was the primary pump during the monitoring period. This makes sense based on the customer saying only one runs at a time, however, there were a few instances when the north pump stopped, and the south pump took over and their operation overlapped briefly (which is expected to occasionally happen). The Evaluators used the summed % amps instead of the north pump % amps which reduced savings slightly (1%). The ex-ante also subtracted the standard deviation of the post average power from their overall kW demand reduction which lowered the realization rate. The Evaluators used the average kW values when calculating the kW demand reduction.

  The kWh RR was also impacted by the annual operation hours. The ex-ante assumed annual hours of 8,500 but according to the customer on a site visit, the facility has at least one pump running 24/7 365. The Evaluators used 8760 annual hours which increased the realization rate by 3%.
- **SSOP_74548 -** The ex-ante calculations treated the new agitator as part of the project. The evaluator didn't include the new agitator in the savings calcs since it isn't really part of a VFD system upgrade. These changes reduced the overall savings and realization rate.

  The power factors for the baseline and as-built systems were different in the ex-ante and ex post analyses. The ex-ante used 0.772 baseline power factor based on the assumption that the baseline motor is a DC motor controlled by a DC VFD (Ex ante source: AC vs DC Drives Advantages of Power Factor Comparison - Mechanical Electrical Systems Inc. (variablefrequencydrive.com)). The evaluator assumed a constant speed motor baseline with a power factor of 0.85. The ex-ante assumed a 0.98 power factor for the post-install motors while the evaluator used the motor nameplate power factor. These changes reduced the overall savings and realization rate.

  The final difference in calculation parameters was the annual hours of operation. The ex-ante assumed 8,500 hours while the evaluator used 8,652 hours based on the customers' testimony during an on-site visit. This change increased the overall savings and realization rate. The net effect of these discrepancies was somewhat balanced, only raising the realization rate by 1%.

SSOP_80742 - The ex ante analysis assumed 2021 levels of production while the Evaluators used an average of the 2018 and 2021 production. Since the 2021 production was higher than 2018 production, the realization rate was high.

Additionally, ex ante calculations for all lighting projects assumed an 80% chance that lighting would operate during times of peak demand. The Evaluators found that for multiple projects the lighting fixtures runs continuously, so there is a 100% chance of them operating during the peak period. The coincidence factor was adjusted from 80% to 100% for these measures.

Individual reports for each sampled site are included in Appendix C: Site-Specific Program Project Reports.

5.1.9.6 Verified Savings

The Site-Specific Program in total displays a realization rate of 104.27% with 7,216,254 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 5-30.

6. Appendix A: Billing Analysis Results

This appendix provides additional details on the billing analyses conducted for each program.

6.1 Low-Income Program

The Evaluators conducted a whole-home billing analysis for all the electric measures combined in order to estimate savings for the average household participating in the program, across all measures. The Evaluators successfully created a matched cohort for the electric measure households. Customers were matched on their average pre-period seasonal usage, including summer, fall, winter, and spring for each control and treatment household.

The Evaluators were provided a considerable pool of control customers to draw upon, as shown in Table 6-1. The Evaluators used propensity score matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 6-1, are the impact of various restrictions on the number of treatment and control customers that were included in the final regression model. The "Starting Count" displays the beginning number of customers available prior to applying the data restrictions, while the "Ending Count" displays the number of customers after applying data restrictions and final matching.

Table 6-1: Cohort Restrictions, Low-Income Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
Whole home electric	Starting Count	126	4717
	Install Date Range: January 1, 2022 to June 30, 2022	37	4717
	Control Group Usage Outlier (>2X max treatment usage)	37	4665
	Incomplete Post-Period Bills (<6 months)	36	4400
	Incomplete Pre-Period Bills (<10 months)	36	4399
	Ending Count (Matched by PSM)	36	466

Figure 6-1 and Figure 6-2 display the density of each variable employed in propensity score matching for the combined electric measures before and after conducting matching.

The distributions prior to matching appear to be less similar in summer, with control customers averaging higher usage. However, after matching, the pre-period usage distribution in summer is more similar between the groups. The remaining pre-period seasons (winter, summer, fall), closely overlap before and after matching, indicating little differences exist on average between the groups prior to matching and validating the initial selection of control customers.

Figure 6-1: Covariate Balance Before Matching, Low-Income Electric Measures

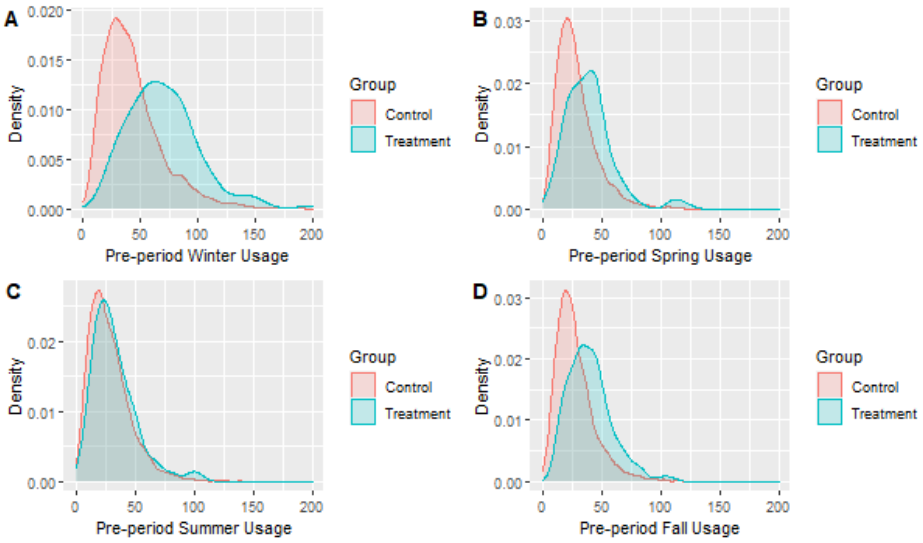
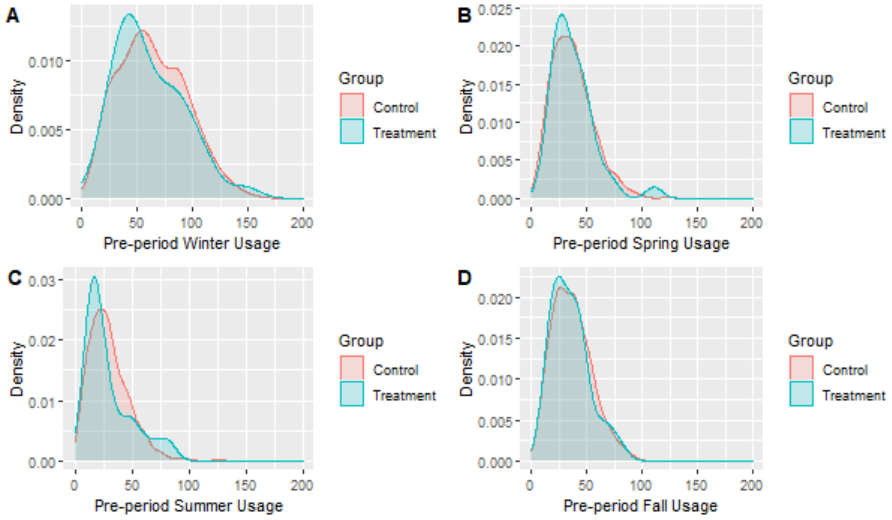


Figure 6-2: Covariate Balance After Matching, Low-Income Electric Measures



The Evaluators performed three tests to determine the success of PSM:

1. *t*-test on pre-period usage by month
2. Joint chi-square test to determine if any covariates are imbalanced
3. Standardized difference test for each covariate employed in matching

All tests confirmed that PSM performed well for each measure. The t-test displayed no statistically significant differences at the 95% level in average daily consumption between the treatment and control groups for any month in the pre-period. In addition, the chi-squared test returned a p-value well over 0.05 for all measures, indicating that pre-period usage was balanced between the groups. Lastly, the standardized difference test returned values were under 10 (well under the recommended cutoff of 25), further indicating the groups were well matched on all included covariates.

Table 6-2 provides results for the *t*-test on pre-period usage between the treatment and control groups after matching for the Low-Income program. The P-Value is over 0.05 for each month, meaning pre-period usage between treatment and control groups is similar at the 95% confidence level.

Table 6-2: Pre-period Usage T-test for Electric Measures, Low-Income Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	65.47	61.29	1.06	3.95	0.29	No
Feb	62.41	57.47	1.34	3.69	0.18	No
Mar	48.80	45.07	1.30	2.88	0.20	No
Apr	37.87	35.37	1.11	2.27	0.27	No
May	28.33	27.42	0.53	1.73	0.60	No
Jun	26.88	26.89	0.00	2.06	1.00	No
Jul	30.49	29.64	0.33	2.58	0.74	No
Aug	29.40	27.55	0.80	2.32	0.43	No
Sep	25.38	24.96	0.23	1.81	0.82	No
Oct	33.45	31.78	0.86	1.94	0.39	No
Nov	53.21	48.69	1.41	3.22	0.16	No
Dec	64.47	60.42	1.25	3.25	0.21	No

Table 6-3 provides customer counts for customers in the final regression model by assigned weather station ID for each measure. In addition, TMY HDD and CDD from the nearest available TMY weather station is provided as well as the weighted HDD/CDD for each measure. The HDD and CDD was weighted by the number of treatment customers assigned to a weather station.

Table 6-3: TMY Weather, Low-Income Program

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
All Electric Measures	726817	3	726985	4207	245	5829	376
	727830	3	727830	5347	861	5829	376
	727834	3	727834	6773	343	5829	376
	727850	1	727850	6436	224	5829	376
	727856	17	727856	6052	437	5829	376
	727857	7	727857	6322	265	5829	376
	727870	2	727857	6322	265	5829	376

In addition to the net savings value represented above, the Evaluators also conducted a treatment-only regression model for each of the measures described above. Table 6-4 provides annual savings/customer for the Low-Income program for all electric measures and regression model. The PPR model was selected for ex-post net savings because it provided the best fit for the data (highest

adjusted R-squared). The treatment-only model represents estimated gross savings for this measure. The Evaluators estimate gross savings for each Low-Income participant is 1,005 kWh per year.

Table 6-4: Household Savings for All Regression Models, Low-Income Program

Measure	Model	# of Treatment Customers	# of Control Customers	Annual Savings/Customer	90% Lower CI	90% Upper CI	Adjusted R-Squared
All Electric Measures	Diff-in-diff	36	466	1005.41*	0.00	4340.16	0.29
	PPR	36	466	363.26*	0.00	1235.33	0.74
	Treatment Only (Gross)	36	466	5082.85	3186.76	6978.93	0.27

*Not statistically significant

The results of the billing analysis indicate no statistically significant savings were found for the electric measures.

7. Appendix B: Summary of Survey Respondents

This section summarizes additional insights gathered from the simple verification surveys deployed by the Evaluators for the impact evaluation of Avista's Residential and Low-Income Programs.

Survey respondents confirmed installing between one and three measures that were rebated by Avista, displayed in Table 7-1.

Table 7-1: Type and Number of Measures Received by Respondents

Measure Category	Total	Percent
No Measures	36	4.80%
One Measure	84	11.10%
Two Measures	390	51.70%
Three Measures	168	22.20%
Four Measures	56	7.40%
Five or more measures	119	*15.80%*
HVAC	171	22.60%
Water Heater	99	13.10%
Smart Thermostat	201	26.60%
Clothes Washer	84	11.10%
Clothes Dryer	73	9.70%

The Evaluators asked respondents to provide information regarding their home, as displayed in Table 7-2. Similar to the previous impact evaluation findings, the majority of respondents noted owning a single-family home between 1,000 and 3,000 square feet with central air conditioning.

Table 7-2: Survey Respondent Home Characteristics[9]

Question	Response	Percent
Do you rent your home? (n=755)	Own	94.30%
	Rent	1.30%
	Own and rent to someone else	0.90%
	I don't know	0%
	Prefer not to answer	3.40%
Which of the following best describes your home? (n=755)	Single-family house detached	87.20%
	Single-family house attached to one or more other houses	3.30%

[9] Four contractors or construction companies were not asked these questions.

	Mobile or manufactured home	6.20%
	Apartment	*0.60%*
	Other	1.90%
	I don't know	0.30%
	Prefer not to say	0.50%
Does your home have central air conditioning? (n=755)	Yes	74.40%
About how many square feet is your home? (n=629)	Less than 1,000ft^2	4.10%
	1,000-1,999ft^2	14.90%
	2,000-2,999ft^2	6.80%
	3,000-3,999ft^2	3.30%
	4,000ft^2 or more	2.50%
When was your home built? (n=719)	Before 1950	19.90%
	1950 to 1959	11.00%
	1960 to 1969	6.80%
	1970 to 1979	16.30%
	1980 to 1989	6.80%
	1990 to 1999	15.30%
	2000 to 2009	12.80%
	2010 to 2019	5.00%
	2020 to Present	5.70%
	I don't know	0.40%

8. Appendix C: Site-Specific Program Project Reports

This section displays site reports for each sampled project in the Site-Specific Program.

Project Number SSLP_81717

Project Background

The participant is a light manufacturing facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (9) 3L F28T8 HBs were replaced by (9) 2x2 LED panels

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are based upon verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-1: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Other	Gas Heat, Air Conditioned	3,120

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-2: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
3L F28T8 HB to 2x2 LED panels	9	9	97	43	3,120	1,663	1,663	1,663	100.0%
Total						**1,663**	**1,663**	**1,663**	**100.0%**

Table 8-3: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
3L F28T8 HB to 2x2 LED panels	9	9	97	43	0.42	0.42	0.42	100.0%
Total					**0.42**	**0.42**	**0.42**	**100.0%**

Results

For project #81717 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-4: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
3L F28T8 HB to 2x2 LED panels	1,663	0.42	100.0%	100.0%	0	0.00	-23
Total	**1,663**	**0.42**	**100.0%**	**100.0%**	**0**	**0.00**	**-23**

Project Number SSLP_80105

Project Background

The participant is a retail store that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (8) 4L F32T8s were replaced by (8) 47.2W LED tube fixtures
- (40) 1L 15W CFs were replaced by (25) 14W LED tubes
- (4) 4L F32T8s were replaced by (16) 17W TLED tubes

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-5: Savings Inputs

Facility or Space Type	HVAC Configuration	Pre Annual Hours	Post Annual Hours
Retail Strip Mall	Gas Heat/Air Conditioned	3,640	3,640

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-6: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
4L F32T8 to 2x4 LED tubes	8	8	112	47	3,640	2,089	2,089	2,089	100.0%
1L 15W CF to 14W accent LEDs	40	25	18	14	3,640	1,472	1,472	1,472	100.0%
4L F32T8 to 17W LED tubes	4	16	112	17	3,640	914	914	914	100.0%
Total						**4,475**	**4,475**	**4,475**	**100.0%**

Table 8-7: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
4L F32T8 to 2x4 LED tubes	8	8	112	47	0.46	0.46	0.46	100.0%
1L 15W CF to 14W accent LEDs	40	25	18	14	0.32	0.32	0.32	100.0%
4L F32T8 to 17W LED tubes	4	16	112	17	0.20	0.20	0.20	100.0%
Total					**0.98**	**0.98**	**0.98**	**100.0%**

Results

For project #SSLP_80105 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-8: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
4L F32T8 to 2x4 LED tubes	2,089	0.46	100.0%	100.0%	0	0.00	-34
1L 15W CF to 14W accent LEDs	1,472	0.32	100.0%	100.0%	0	0.00	-24
4L F32T8 to 17W LED tubes	914	0.20	100.0%	100.0%	0	0.00	-15
Total	**4,475**	**0.98**	**100.0%**	**100.0%**	0	**0.00**	**-72**

Project Number SSLP_81224

Project Background

The participant is a mall that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (39) 3L F17T8s were replaced by (31) 2x2 LED panels

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are based on verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-9: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Retail Strip Mall	Gas Heat, Air Conditioned	5,200

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-10: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
3L F17T8 to 2x2 LED panels	39	31	67	41	5,200	7,802	7,802	7,802	100.0%
Total						**7,802**	**7,802**	**7,802**	**100.0%**

Table 8-11: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
3L F17T8 to 2x2 LED panels	39	31	67	41	1.20	1.20	1.20	100.0%
Total					**1.20**	**1.20**	**1.20**	**100.0%**

Results

For project # SSLP_81224 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-12: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
3L F17T8 to 2x2 LED panels	7,802	1.20	100.0%	100.0%	0	0.00	-126
Total	**7,802**	**1.20**	**100.0%**	**100.0%**	**0**	**0.00**	**-126**

Project Number SSLP_80312

Project Background

The participant is a manufacturing facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (63) 2L F96T12HO-Es were replaced by (42) high bay LED fixtures

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-13: Savings Inputs

Facility or Space Type	HVAC Configuration	Pre Annual Hours	Post Annual Hours
Large Office	Gas Heat, no AC	3,120	3,120

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-14: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
2L F96T12HO-E to high bay LED fixture	63	42	155	149	3,120	11,925	11,925	11,925	100.0%
Total						**11,925**	**11,925**	**11,925**	**100.0%**

Table 8-15: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
2L F96T12HO-E to high bay LED fixture	63	42	155	149	3.06	3.06	3.06	100.0%
Total					**3.06**	**3.06**	**3.06**	**100.0%**

Results

For project #SSLP_80312 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-16: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
2L F96T12HO-E to high bay LED fixture	11,925	3.06	100.0%	100.0%	0	0.00	-149
Total	**11,925**	**3.06**	**100.0%**	**100.0%**	0	**0.00**	**-149**

Project Number SSLP_80512

Project Background

The participant is a middle school that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (25) 350W pulse start MHs were replaced by (25) 190W High Bay LEDs

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-17: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Primary School	Gas Heat, Air Conditioned	4,432

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-18: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
1L MH 350 PS to 190W LED	25	25	380	191	4,432	25,507	25,507	25,507	100.0%
Total						**25,507**	**25,507**	**25,507**	**100.0%**

Table 8-19: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
1L MH 350 PS to 190W LED	25	25	380	191	4.00	4.00	4.00	100.0%
Total					**4.00**	**4.00**	**4.00**	**100.0%**

Results

For project #SSLP_80512 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-20: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
1L MH 350 PS to 190W High Bay LED	25,507	4.00	100.0%	100.0%	0	0.00	-457
Total	**25,507**	**4.00**	**100.0%**	**100.0%**	**0**	**0.00**	**-457**

Project Number SSLP_80599

Project Background

The participant is a manufacturing facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (52) 2L F96T12HO-Es were replaced by (38) 149W LED high bay fixtures
- (94) 2L F32T8s were replaced by (26) 149W LED high bay fixtures
- (21) 2L F96T12HO-Es were replaced by (20) 75W LED low bay fixtures
- (14) 2L F96T12HO-Es were replaced by (21) 76W LED strips
- (40) 3L F28T8 HBs were replaced by (40) 43.2W LED 2x2 panels
- (6) 2L F96T12HO-Es were replaced by (6) 76W LED strips

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-21: Savings Inputs

Facility or Space Type	HVAC Configuration	Pre Annual Hours	Post Annual Hours
Medium Office	Gas Heat	3,120	3,120
Medium Office	Gas Heat, Air Conditioned	3,120	3,120

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-22: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
2L F96T12HO-E to 149W LED high bay fixtures	52	38	160	149	3,120	8,293	8,293	8,293	100.0%
2L F32T8 to 149W LED high bay fixtures	94	26	58	149	3,120	4,923	4,923	4,923	100.0%
2L F96T12HO-E to 75W LED low bay fixtures	21	20	160	75	3,120	5,803	5,803	5,803	100.0%
2L F96T12HO-E to 76W LED strips	14	21	160	76	3,120	2,154	2,088	2,088	96.9%
3L F28T8 HB to 43.2W LED 2x2 panels	40	40	97	43	3,120	6,997	6,997	6,997	100.0%

2L F96T12HO-E to 76W LED strips	6	6	160	76	3,120	1,571	1,571	1,571	100.0%
Total						**29,742**	**29,675**	**29,675**	**99.8%**

Table 8-23: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
2L F96T12HO-E to 149W LED high bay fixtures	52	38	160	149	2.13	2.13	2.13	100.0%
2L F32T8 to 149W LED high bay fixtures	94	26	58	149	1.26	1.26	1.26	100.0%
2L F96T12HO-E to 75W LED low bay fixtures	21	20	160	75	1.49	1.49	1.49	100.0%
2L F96T12HO-E to 76W LED strips	14	21	160	76	0.55	0.57	0.57	103.6%
3L F28T8 HB to 43.2W LED 2x2 panels	40	40	97	43	1.79	1.77	1.77	98.9%
2L F96T12HO-E to 76W LED strips	6	6	160	76	0.40	0.40	0.40	100.0%
Total					**7.62**	**7.62**	**7.62**	**100.0%**

Results

For project # SSLP_80599 the kWh realization rate is 99.8% and the kW realization rate is 100.0%.

Table 8-24: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
2L F96T12HO-E to 149W LED high bay fixtures	8,293	2.13	100.0%	100.0%	0	0.00	-166
2L F32T8 to 149W LED high bay fixtures	4,923	1.26	100.0%	100.0%	0	0.00	-98
2L F96T12HO-E to 75W LED low bay fixtures	5,803	1.49	100.0%	100.0%	0	0.00	-116
2L F96T12HO-E to 76W LED strips	2,088	0.57	96.9%	103.6%	-66	0.02	-40
3L F28T8 HB to 43.2W LED 2x2 panels	6,997	1.77	100.0%	98.9%	0	-0.02	-134
2L F96T12HO-E to 76W LED strips	1,571	0.40	100.0%	100.0%	0	0.00	0
Total	**29,675**	**7.62**	**99.8%**	**100.0%**	**-67**	**0.04**	**-554**

The Evaluators were unable to recreate expected savings for (14) 2L F96T12HO-E to (21) 76W LED strips. Verified savings was calculated using actual fixture wattages, verified lighting hours of operation and deemed HVAC interactive factors specific to the building type and HVAC configuration (Medium Office, ID, >2006 vintage). This resulted in slightly reduced kWh savings.

Project Number SSOP_81831

Project Background

The participant is a new primary school that received incentives from Avista for installing reduced power density lighting and above code insulation. The Evaluators verified the participant had installed:

- (639) LED fixtures (30.5 average watts) in a 49,793 square foot space

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for new constructions lighting, or lighting power density, was evaluated using a standard algorithm, shown below, and ASHRAE 90.1 LPD ratios:

$$kWhsavings = \sum[(Nfixt(i) \times Wfixt(i)\ 1000\ )\ pre - (Nfixt(i) \times Wfixt(i)\ 1000\ )\ post] \times AOH \times IEF$$

$$kWsavings = \sum[(Nfixt(i) \times Wfixt(i)\ 1000\ )\ pre - (Nfixt(i) \times Wfixt(i)\ 1000\ )\ post] \times CF \times IEFD$$

Nfixt(i),pre = Pre-retrofit number of fixtures of type i Nfixt(i)

post = Post-retrofit number of fixtures of type i

Wfixt(i),pre = Rated wattage of pre-retrofit fixtures of type i

Wfixt(i),post = Rated wattage of post-retrofit fixtures of type

1,000 = Conversion constant from watts to kilowatts

CF = Peak demand coincidence factor (80%)

AOH = Annual operating hours for specified building type

IEFD = Interactive effects factor for demand savings, kW

IEFE = Interactive effects factor for energy savings, kWh

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-25: kWh Savings Calculations

Measure	Location	Allowable LPD	Verified LPD	AOH	Expected kWh Savings	Verified kWh Savings	kWh Realization Rate
NC Lighting	Strip Mall	0.82	0.51	5,824	93,301	99,147	106.27%

Results

For project #SSOP_81531 the kWh realization rate is 106.27%.

Table 8-26: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
NC Lighting	99,147	13.62	101.0%	N/A	5,846	0.00	-1,602
Total	**99,147**	**13.62**	**101.0%**	**N/A**	**5,846**	**0.00**	**-1,602**

The Evaluators were unable to fully reconstruct all claimed savings calculations, but it appears that HVAC interactive effects were omitted. These effects were included in verified savings calculations, leading to a slightly high realization rate.

Project Number SSLP_78714

Project Background

The participant is a big box retail store that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (515) 200W LEDs were replaced by (494) 163W high bay LED fixtures, controlled by day sensors

The lighting is controlled so that while the business is open the lights function at 100% illumination, then are dimmed to 50% illumination overnight.

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-27: Savings Inputs

Facility or Space Type	HVAC Configuration	Pre Annual Hours	Post Annual Hours
Retail Stand Alone	Gas Heat/Air Conditioned	5,110	3,322
Retail Stand Alone	Gas Heat/Air Conditioned	3,650	3,650

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-28: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Pre AOH	Post AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post						
200W LED to 163W LED highbay (daytime)	515	494	200	163	5,110	3,322	297,128	297,128	297,128	100.0%
200W LED to 163W LED highbay (nighttime)	258	247	200	163	3,650	3,650	47,796	47,796	47,796	100.0%
Total							**344,924**	**344,924**	**344,924**	**100.0%**

Table 8-29: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
200W LED to 163W LED highbay	515	494	200	163	20.77	20.77	20.77	100.0%
200W LED to 163W LED highbay	258	247	200	163	10.48	10.48	10.48	100.0%
Total					**31.25**	**31.25**	**31.25**	**100.0%**

The lighting is controlled so that while the business is open the lights function at 100% illumination, then are dimmed to 50% illumination overnight.

Results

For project # SSLP_78714, the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-30: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
200W LED to 163W LED highbay	297,128	20.77	100.0%	100.0%	0	0.00	-1,715
200W LED to 163W LED highbay	47,796	10.48	100.0%	N/A	0	0.00	-276
Total	**344,924**	**31.25**	**100.0%**	**100.0%**	**0**	**0.00**	**-1,991**

Project Number SSLP_79005

Project Background

The participant is a manufacturing facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (80) 150W HPS fixtures were replaced by (80) 50W LED fixtures
- (87) 250W HPS fixtures were replaced by (87) 80W LED fixtures
- (4) 400W HPS fixtures were replaced by (4) 130W LED fixtures
- (2) 70W HPS fixtures were replaced by (2) 30W LED fixtures
- (18) 175W MH fixtures were replaced by (18) 50W LED fixtures
- (20) 250W MH fixtures were replaced by (20) 80W LED fixtures
- (19) 400W MH fixtures were replaced by (19) 130W LED fixtures
- (26) 400W MH fixtures were replaced by (26) 80W LED fixtures

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-31: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Warehouse	None	8,760

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-32: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
150W HPS fixtures to 50W LED fixtures	80	80	190	51	8,760	97,271	97,271	97,271	100.0%
250W HPS fixtures to 80W LED fixtures	87	87	295	78	8,760	165,151	165,151	165,151	100.0%
400W HPS fixtures to 130W LED fixtures	4	4	450	130	8,760	11,220	11,220	11,220	100.0%
70W HPS fixtures to 30W LED fixtures	2	2	92	29	8,760	1,102	1,102	1,102	100.0%
175W MH fixtures to 50W LED fixtures	18	18	215	51	8,760	25,828	25,828	25,828	100.0%

250W MH fixtures to 80W LED fixtures	20	20	286	78	8,760	36,389	36,389	36,389	100.0%
400W MH fixtures to 130W LED fixtures	19	19	455	130	8,760	54,126	54,126	54,126	100.0%
400W MH fixtures to 80W LED fixtures	26	26	455	78	8,760	85,797	85,797	85,797	100.0%
Total						**476,885**	**476,885**	**476,885**	**100.0%**

Table 8-33: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
150W HPS fixtures to 50W LED fixtures	80	80	190	51	8.88	11.10	11.10	125.0%
250W HPS fixtures to 80W LED fixtures	87	87	295	78	15.09	18.85	18.85	124.9%
400W HPS fixtures to 130W LED fixtures	4	4	450	130	1.02	1.28	1.28	125.0%
70W HPS fixtures to 30W LED fixtures	2	2	92	29	0.10	0.13	0.13	135.4%
175W MH fixtures to 50W LED fixtures	18	18	215	51	2.36	2.95	2.95	125.0%
250W MH fixtures to 80W LED fixtures	20	20	286	78	3.32	4.15	4.15	125.0%
400W MH fixtures to 130W LED fixtures	19	19	455	130	4.94	6.18	6.18	125.0%
400W MH fixtures to 80W LED fixtures	26	26	455	78	7.83	9.79	9.79	125.0%
Total					**43.54**	**54.43**	**54.43**	**125.0%**

Results

For project #SSLP_79005 the kWh realization rate is 100.0% and the kW realization rate is 125.0%.

Table 8-34: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
150W HPS fixtures to 50W LED fixtures	97,271	11.10	100.0%	125.0%	0	2.22	0
250W HPS fixtures to 80W LED fixtures	165,151	18.85	100.0%	124.9%	0	3.77	0
400W HPS fixtures to 130W LED fixtures	11,220	1.28	100.0%	125.0%	0	0.26	0
70W HPS fixtures to 30W LED fixtures	1,102	0.13	100.0%	135.4%	0	0.03	0
175W MH fixtures to 50W LED fixtures	25,828	2.95	100.0%	125.0%	0	0.59	0
250W MH fixtures to 80W LED fixtures	36,389	4.15	100.0%	125.0%	0	0.83	0
400W MH fixtures to 130W LED fixtures	54,126	6.18	100.0%	125.0%	0	1.24	0
400W MH fixtures to 80W LED fixtures	85,797	9.79	100.0%	125.0%	0	1.95	0
Total	**476,885**	**54.43**	**100.0%**	**125.0%**	0	**10.89**	**0**

Ex ante calculations assumed an 80% peak coincidence factor, but the lights operate continuously, so the factor was adjusted to 100%, resulting in an additional 10.89 kW reduction.

Project Number SSOP_79005

Project Background

The participant is a manufacturing facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (80) 150W HPS fixtures were replaced by (80) 50W LED fixtures
- (87) 250W HPS fixtures were replaced by (87) 80W LED fixtures
- (4) 400W HPS fixtures were replaced by (4) 130W LED fixtures
- (2) 70W HPS fixtures were replaced by (2) 30W LED fixtures
- (18) 175W MH fixtures were replaced by (18) 50W LED fixtures
- (20) 250W MH fixtures were replaced by (20) 80W LED fixtures
- (19) 400W MH fixtures were replaced by (19) 130W LED fixtures
- (26) 400W MH fixtures were replaced by (26) 80W LED fixtures

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s). Savings for the lighting measures were calculated using industry standard lighting retrofit algorithms. Annual lighting hours of operation are verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-35: Savings Inputs

Space Type	HVAC Configuration	Pre Annual Hours	Post Annual Hours
Interior/Area Lighting	None	8,760	8,760

Savings Calculations

Using deemed values from the table above, the evaluators calculated lighting savings as follows:

Table 8-36: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Pre AOH	Post AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post						
150W HPS fixtures to 50W LED fixtures	80	80	190	51	8,760	8,760	97,271	97,271	97,271	100.0%
250W HPS fixtures to 80W LED fixtures	87	87	295	78	8,760	8,760	165,151	165,151	165,151	100.0%
400W HPS fixtures to 130W LED fixtures	4	4	450	130	8,760	8,760	11,220	11,220	11,220	100.0%
70W HPS fixtures to 30W LED fixtures	2	2	92	29	8,760	8,760	1,102	1,102	1,102	100.0%

175W MH fixtures to 50W LED fixtures	18	18	215	51	8,760	8,760	25,828	25,828	25,828	100.0%
250W MH fixtures to 80W LED fixtures	20	20	286	78	8,760	8,760	36,389	36,389	36,389	100.0%
400W MH fixtures to 130W LED fixtures	19	19	455	130	8,760	8,760	54,126	54,126	54,126	100.0%
400W MH fixtures to 80W LED fixtures	26	26	455	78	8,760	8,760	85,797	85,797	85,797	100.0%
Total							**476,885**	**476,885**	**476,885**	**100.0%**

Table 8-37: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
150W HPS fixtures to 50W LED fixtures	80	80	190	51	8.88	11.10	11.10	125.0%
250W HPS fixtures to 80W LED fixtures	87	87	295	78	15.09	18.85	18.85	124.9%
400W HPS fixtures to 130W LED fixtures	4	4	450	130	1.02	1.28	1.28	125.0%
70W HPS fixtures to 30W LED fixtures	2	2	92	29	0.10	0.13	0.13	135.4%
175W MH fixtures to 50W LED fixtures	18	18	215	51	2.36	2.95	2.95	125.0%
250W MH fixtures to 80W LED fixtures	20	20	286	78	3.32	4.15	4.15	125.0%
400W MH fixtures to 130W LED fixtures	19	19	455	130	4.94	6.18	6.18	125.0%
400W MH fixtures to 80W LED fixtures	26	26	455	78	7.83	9.79	9.79	125.0%
Total					**43.54**	**54.43**	**54.43**	**125.0%**

Results

For project #SSLP_79005 the kWh realization rate is 100.0% and the kW realization rate is 125.0%.

Table 8-38: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
150W HPS fixtures to 50W LED fixtures	97,271	11.10	100.0%	125.0%	0	2.22	0
250W HPS fixtures to 80W LED fixtures	165,151	18.85	100.0%	124.9%	0	3.77	0
400W HPS fixtures to 130W LED fixtures	11,220	1.28	100.0%	125.0%	0	0.26	0
70W HPS fixtures to 30W LED fixtures	1,102	0.13	100.0%	135.4%	0	0.03	0
175W MH fixtures to 50W LED fixtures	25,828	2.95	100.0%	125.0%	0	0.59	0
250W MH fixtures to 80W LED fixtures	36,389	4.15	100.0%	125.0%	0	0.83	0
400W MH fixtures to 130W LED fixtures	54,126	6.18	100.0%	125.0%	0	1.24	0

400W MH fixtures to 80W LED fixtures	85,797	9.79	100.0%	125.0%	0	1.95	0
Total	**476,885**	**54.43**	**100.0%**	**125.0%**	0	**10.89**	**0**

Ex ante calculations assumed an 80% peak coincidence factor, but the lights operate continuously, so the factor was adjusted to 100%, resulting in an additional 10.89 kW reduction.

Project Number SSOP_74531

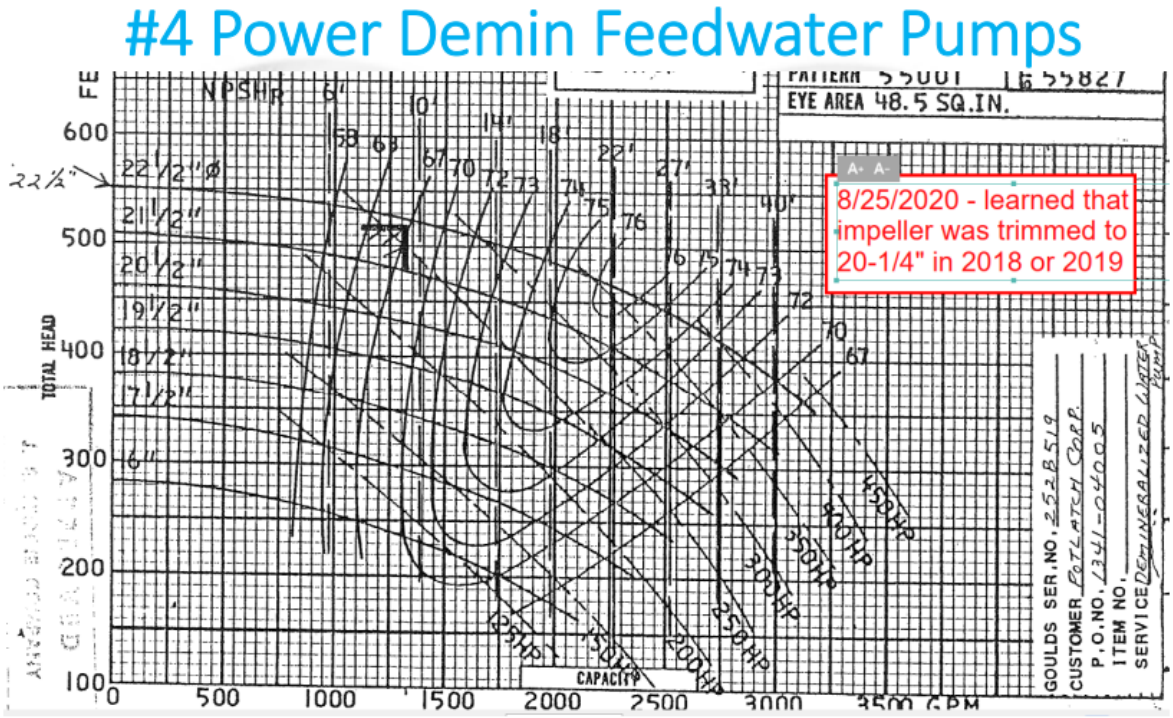
Project Background

The participant is a paper manufacturer that received incentives from Avista for replacing two fixed speed pumps with two VFD controlled pumps for the demineralized boiler feedwater. The Evaluators verified the participant had installed:

- (2) 450HP pump motors with VFD controls.

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and equipment configuration. Savings for the VFD measure were calculated using custom methods. The baseline system power was calculated using trended PSI, pump curves, and assumed motor efficiency. See below for the pump curve:



The baseline average power was calculated using the following equations:

$$Pump\ Power\ (HP) = Flow\ (GPM) \times System\ Head\ (ft)/(3{,}960 \times Motor\ Eff \times Pump\ Eff)$$

$$Pump\ Power\ (HP) = 800\ GPM \times 464\ ft/(3{,}960 \times 95\% \times 58\%) = 170.24\ HP$$

$$Pump\ Power\ (kW) = Pump\ Power\ (HP) \times 0.746\ kW/HP = 127\ kW$$

Motor % amperage and % load data was gathered on the post installation system and used with the full load amperage to calculate the average current. The post average power was calculated using the three-phase power equation shown below:

$$Pump\ Power\ (kW) = Current\ (amps) \times Voltage\ (VAC) \times PF \times \sqrt{3}/(VFD\ efficiency \times 1000\ {}^{W}/_{kW})$$

$$Pump\ Power\ (kW) = 43.81A \times 480V \times 0.98 \times \sqrt{3}/(98\% \times 1000) = 36.42\ kW$$

During a site visit, the Evaluators confirmed that only one pump runs at a time and that at least one pump runs 24/7, 365. The pump motors are theoretically identical and only one is scheduled to run at a time, however, the logged data showed occasional overlap when the load is switched from one pump to another. In light of this, the average power was calculated as the sum of the North and South pump average power. The annual energy use in the baseline and post cases were calculated by multiplying the respective average power by the annual use time, 8760 hours.

Since the production is consistent throughout the day as well as throughout the year, the kW demand reduction is the difference in average kW between the baseline and post periods.

The values used in calculating energy and demand savings are presented in the table below.

Table 8-39: Savings Inputs

Measure	Baseline Avg kW	Post Avg kW	Annual Hours	Baseline kWh	Post kWh	kW Reduction	kWh Savings
Boiler Feedwater Pump VFDs	127	36.42	8760	1,112,485	319,048	90.58	793,437

Savings Calculations

Using values from the table above, the Evaluators calculated VFD savings as follows:

Table 8-40: VFD kWh Savings Calculations

Measure	Baseline kW	Post kW	AOH	Baseline kWh	Post kWh	Expected kWh Savings	Verified kWh Savings	kWh Realization Rate
Boiler Feedwater VFDs	127	36.42	8,760	1,112,458	319,048	776,307	793,437	102%

Table 8-41: VFD kW Savings Calculations

Measure	Baseline kW	Post kW	Expected kW Reduction	Verified kW Reduction	kW Realization Rate
Boiler Feedwater VFDs	127	36.42	87	90.58	104%

Results

For project SSOP_74531 the kWh realization rate is 102% and the kW realization rate is 104%.

Table 8-42: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
Boiler Feedwater VFDs	793,437	90.58	102.2%	104%	n/a	n/a	n/a

The ex-ante assumed only 1 pump was running and just used north pump data as it was the primary pump during the monitoring period. This makes sense based on the customer saying only one runs at a time, however, there were a few instances when the north pump stopped, and the south pump took over and their operation overlapped briefly (which is expected to occasionally happen). The Evaluators used the summed % amps instead of the north pump % amps which reduced savings slightly (1%). The ex-ante also subtracted the standard deviation of the post average power from their overall kW demand reduction which lowered the realization rate. The Evaluators used the average kW values when calculating the kW demand reduction.

The kWh RR was also impacted by the annual operation hours. The ex-ante assumed annual hours of 8,500 but according to the customer on a site visit, the facility has at least one pump running 24/7 365. The Evaluators used 8760 annual hours which increased the realization rate by 3%.

Project Number SSOP_74548

Project Background

The participant is a paper manufacturer that received incentives from Avista for replacing two pulp agitator motors with new VFD controlled motors. The Evaluators verified the participant had installed:

- (2) 400HP motors with VFD controls.

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and equipment configuration. Savings for the VFD measure were calculated using custom methods. Motor amperage and load data was gathered on the baseline and post installation systems. The north agitator was down for repairs during the baseline monitoring period so its energy use was modeled using trended % load data and south agitator logged amps. The average amperage and % load were calculated from the baseline data and used to estimate the max amperage into the VFD. This max amperage was applied to the baseline north agitator average % load to calculate the baseline amperage. The amperage, input voltage, and an assumed power factor were used in 3-phase power equations to estimate the baseline power and extrapolate energy use over a 1 year period.

The post-install average VFD amperage was calculated for the north and south agitator motors. The amperage, input voltage, and motor nameplate power factor were used in 3-phase power equations to estimate the as-built power and extrapolate energy use over a 1 year period.

The energy savings are the difference between the 1-year baseline energy and 1-year as-built energy.

The annual hours used to calculate annual energy use were calculated based on the customer's testimony. The customer claimed the motors run 24/7, 365 with the exception of six 18-hour maintenance periods annually. The annual hours were calculated as 8,652 hours.

Since the production is assumed consistent throughout the day as well as throughout the year, the kW demand reduction is the difference in average kW between the baseline and post periods.

The values used in calculating energy and demand savings are presented in the table below.

Table 8-43: Savings Inputs

VFD Equipment	Baseline Avg Amps	Baseline Voltage	Baseline Motor PF	Post Avg Amps	Post Voltage	Post Motor PF	AOH
N. Agitator	87.6	2,300	0.85	52	2300	0.78	8,652
S. Agitator	71.0	2,300	0.85	62	2300	0.84	8,652

Savings Calculations

Using values from the table above, the evaluators calculated VFD savings as follows:

Table 8-44: VFD kWh Savings Calculations

Measure	Baseline kW	Post kW	AOH	Baseline kWh	Post kWh	Expected kWh Savings	Verified kWh Savings	kWh Realization Rate
Pulp Agitator VFDs	537.05	376.79	8,652	4,646,585	3,259,996	1,371,100	1,386,589	101.1%

Table 8-45: VFD kW Savings Calculations

Measure	Baseline kW	Post kW	Expected kW Reduction	Verified kW Reduction	kW Realization Rate
Pulp Agitator VFDs	537.05	376.79	0	160.26	n/a

Results

For project SSOP_74548 the kWh realization rate is 101% and the kW realization rate is n/a.

Table 8-46: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate	kW Realization Rate	kWh Adjustments	kW Adjustments	Therm Penalty
Pulp AgitatorVFDs	1,386,589	160.26	101.1%	n/a	n/a	n/a	n/a

The ex-ante calculations treated the new agitator as part of the project. The evaluator didn't include the new agitator in the savings calcs since it isn't really part of a VFD system upgrade. These changes reduced the overall savings and realization rate.

The power factors for the baseline and as-built systems were different in the ex-ante and ex post analyses. The ex-ante used 0.772 baseline power factor based on the assumption that the baseline motor is a DC motor controlled by a DC VFD (Ex ante source: AC vs DC Drives Advantages of Power Factor Comparison - Mechanical Electrical Systems Inc. (variablefrequencydrive.com)). The evaluator assumed a constant speed motor baseline with a power factor of 0.85. The ex-ante assumed a 0.98 power factor for the post-install motors while the evaluator used the motor nameplate power factor. These changes reduced the overall savings and realization rate.

The final difference in calculation parameters was the annual hours of operation. The ex-ante assumed 8,500 hours while the evaluator used 8,652 hours based on the customers' testimony during an on-site visit. This change increased the overall savings and realization rate.

The net effect of these discrepancies was somewhat balanced, only raising the realization rate by 1%.

Project Number SSOP_80742

Project Background

The participant is a lumber mill that received incentives from Avista for replacing an older style of log mill line with a new highly efficient log line. The Evaluators verified the participant had installed the log line and VFDs associated with the new motors.

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos, and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation, assumed operating parameters and HVAC configuration(s).

Savings for the new log mill line measure was calculated using an energy intensity (kWh/board foot) billing analysis. The ex ante analysis monitored kWh billing data for the baseline and post-installation periods (2018 and 2021) and also provided total production in board feet over the monitoring periods. ADM attempted to use a billing regression analysis, however, no significant correlation between electricity use and outside air temperature was found. Annual peak demand savings were based on hourly metered data during summer peak demand periods (5pm-7pm). The average peak demand for the post-installation period was subtracted from the average peak demand during the baseline period to determine the average peak demand savings.

The monitored data provided was meter level electrical usage from (4) meters. (2) of the meters were for equipment that was outside the scope of this project. The Large Log Line (LLL, was replaced) was reconfigured to share the same meter as the Small Log Line (SLL, not replaced) as part of the project. This means that the kWh from both the log lines were summed in the model and the calculations were performed on the combined log line energy use.

The total energy (kWh) and production (board feet) were summed for the baseline and post-install periods. The energy intensity was calculated by dividing energy by production to determine the kWh per board foot for both periods. The annual production was determined by averaging the 2018 and 2021 production. The evaluators on-site visit confirmed that the production should not change significantly over the monitoring period (2018 and 2021) and should be considered typical. The difference in energy intensities was multiplied by the annual production to determine the kWh savings.

The values used in calculating savings are presented in the table below.

Table 8-47: Savings Inputs

Space Type	Energy use for Large and Small Log Lines (kWh)	Mill Production (BF)	Energy Intensity (kWh/BF)
Baseline (2018)	23,077,003	273,535,430	0.08437
Post (2021)	19,332,109	267,747,706	0.07220

Savings Calculations

Using energy intensity and mill production values from the table above, the evaluators calculated savings as follows:

Table 8-48: Lumber Mill Retrofit kWh Savings Calculations

Measure	2018 Pre Production	2021 Post Production	Average Production	Pre Energy Intensity	Post Energy Intensity	Energy Intensity Savings	kWh Savings
Upgrade Large Log Line	273,535,430	267,747,706	270,641,568	0.08437	0.07220	0.01216	3,291,807

Table 8-49: Lumber Mill Retrofit kW Savings Calculations

Measure	Baseline Average Peak kW	Post Average Peak kW	kW Savings
Upgrade Large Log Line	2,842	2,261	581.00

Results

For project SSOP_80742 the kWh realization rate is 107% and the kW realization rate is 104%.

Table 8-50: Verified Gross Savings, Realization Rates & Adjustments

Measure	Verified kWh Savings	Verified kW Reduction	kWh Realization Rate
Upgrade Large Log Line	3,291,807	581.00	108.1%

The difference in expected and realized savings can be attributed to assumptions used in the savings analysis. The ex ante analysis assumed 2021 levels of production while the Evaluators used an average of the 2018 and 2021 production. Since the 2021 production was higher than 2018 production, the realization rate was high.

Avista Idaho PY2022

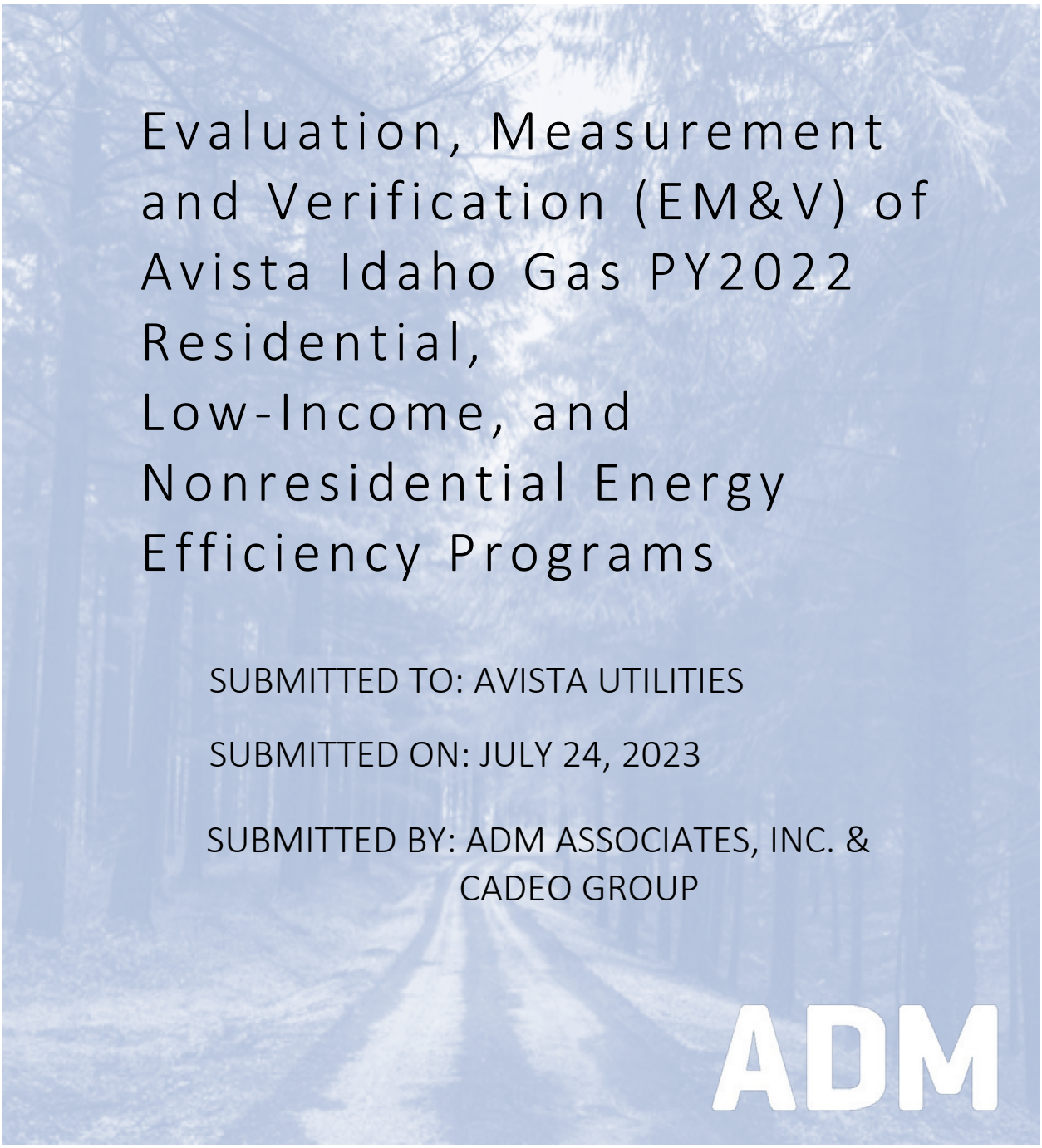


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Table of Contents

List of Tables

1. Executive Summary

This report is a summary of the Residential, Low-Income, and Nonresidential Gas Evaluation, Measurement, and Verification (EM&V) effort of the 2022 program year (PY2022) portfolio of programs for Avista Corporation (Avista) in the Idaho service territory. The evaluation was administered by ADM Associates, Inc. and Cadeo Group, LLC (herein referred to as the "Evaluators").

1.1 Savings Results

The Evaluators conducted an impact evaluation for Avista's Residential, Low-Income, and Nonresidential programs for PY2022. The Residential portfolio savings amounted to 266,415.08 Therms with a 109.30% realization rate. The Low-Income portfolio savings amounted to 1,954.31 Therms with a 100.64% realization rate. The Nonresidential portfolio savings amounted to 37,960.68 Therms with a 138.00% realization rate. The Evaluators summarize the Residential, Low-Income, and Nonresidential portfolio verified savings in Table 1-1 through Table 1-3, respectively.

Table 1-1: Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Water Heat	29,167.60	28,407.84	97.40%
HVAC	188,961.00	216,235.62	114.43%
Shell	24,195.05	20,360.10	84.15%
Fuel Efficiency[1]	0.00	0.00	-
ENERGY STAR Homes[2]	0.00	0.00	-
Small Home & MF Weatherization	1,011.78	954.61	94.35%
Appliances	417.15	456.91	109.53%
Multifamily Direct Install	0.00	0.00	-
Total Res	**243,752.58**	**266,415.08**	**109.30%**

Table 1-2: Low-Income Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Low-Income[3]	1,941.89	1,954.31	100.64%
Total Low-Income	**1,941.89**	**1,954.31**	**100.64%**

[1] The Fuel Efficiency Program displayed a verified Therms penalty of 19,468.00 Therms due to fuel conversion measures. For the purposes of this report, this penalty is not included in the overall metrics of natural gas-saving energy efficiency measures.
[2] The ENERGY STAR Homes Program displayed a verified Therms savings of 1,206.00 Therms for the electric measures.
[3] The Low-Income Program displayed a verified Therms penalty of 960.00 Therms due to fuel conversion measures.

Table 1-3: Nonresidential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
HVAC	5,081.68	5,081.68	100.00%
Food Service Equipment	12,910.00	12,910.00	100.00%
Shell	260	260	100.00%
Site-Specific	9,255.77	19,709.00	212.94%
Total	**27,507.45**	**37,960.68**	**138.00%**

Table 1-4 summarizes the gas programs offered to residential, low-income, and nonresidential customers in the Idaho Avista service territory in PY2022 as well as the Evaluators' evaluation tasks and impact methodology for each program.

Table 1-4: Impact Evaluation Activities by Program and Sector

Sector	Program	Database Review	Survey Verification	Impact Methodology
Residential	Water Heat	✓	✓	Avista TRM
Residential	HVAC	✓	✓	Avista TRM/IPMVP Option A
Residential	Shell	✓		Avista TRM
Residential	ENERGY STAR® Homes	✓		Avista TRM
Residential	Small Home & MF Weatherization	✓	✓	Avista TRM
Residential	Appliances	✓	✓	Avista TRM
Residential	Multifamily Direct Install	✓	✓	SBW TRM
Low-Income	Low-Income	✓		Avista TRM
Nonresidential	HVAC	✓		RTF, Avista TRM
Nonresidential	Food Service Equipment	✓		RTF, Avista TRM
Nonresidential	Shell	✓		Avista TRM
Nonresidential	Site-Specific	✓		IPMVP Options

1.2 Conclusions and Recommendations

The following section details the Evaluators' conclusions and recommendations for each the Residential Portfolio, Low-Income Portfolio, and Nonresidential Portfolio program evaluations.

1.2.1 Conclusions

The following section details the Evaluator's findings resulting from the program evaluations for each the Residential Portfolio, Low-Income Portfolio, and Nonresidential Portfolio.

1.2.1.1 Residential Programs

The Evaluators provide the following conclusions regarding Avista's Residential gas programs:

- The Evaluators found the Residential portfolio to demonstrate a total of 266,415.08 Therms with a realization rate of 109.30%.

- The Residential Portfolio impact evaluation resulted in a realization rate of 109.30% due to differences between the applied Avista TRM values and the active RTF UES or applied measure-level quantities for each measure in addition to the difference in savings values between the results from billing analyses and the Avista TRM.
- The Evaluators conducted verification surveys via web survey to collect information from customers who participated in the Water Heat, HVAC, Small Home & MF Weatherization, and Appliance programs. A total of 755 unique customers were surveyed between October 2022 and February 2023. The Evaluators collected information including the functionality of the efficient equipment, and the functionality of the replaced equipment. The Evaluators calculated in-service rates for the measures within these two programs in order to apply findings to the verified savings results for each program.
- The realization rate for the natural gas savings in the Water Heat Program was 97.40% with 28,407.84 Therms saved. The Evaluators found two instances in which expected savings differed from verified savings. One project for each the G 50 Gallon Natural Gas Water Heater and the G Tankless Water Heater were verified to not meet minimum equipment efficiency requirements, and therefore savings for these two projects were verified to be 0 Therms. The Evaluators recommend that equipment efficiency is verified prior to fulfilling rebates for this program. These two adjustments are the only adjustments that led to the 97.40% realization rate.
- The Evaluators explored a billing analysis for the natural gas water heater measures within the Water Heat Program. However, the G 50 Gallon Natural gas Water Heater and the G Tankless Gas Water Heater measures resulted in savings that were not statistically significant. Therefore, the Evaluators elected to use Avista TRM values to estimate verified savings. The Evaluators will explore further billing analyses for these measures during the next program year if participation permits.
- The HVAC Program in total displays a realization rate of 114.43% with 216,236 Therms verified natural gas savings in the Idaho service territory. The realization rate for the natural gas savings in the HVAC Program deviate from 100% due to differences between the billing analysis results and the RTF UES. The furnace measure has larger billing analysis results to the Avista TRM value (billing analysis indicated 103.16 Therms saved for G Natural Gas Furnace, while Avista TRM indicated 81.66 Therms). In addition, one smart thermostat project was verified to not qualify based device capabilities and therefore the Evaluators removed savings for this project. All other rebates were assigned savings equivalent to the expected savings through Avista TRM values.
- The Evaluators attempted to estimate smart thermostat measure savings values for the HVAC Program. However, because the results from the billing analyses for smart thermostats were contradicting and/or inconclusive, the Evaluators elected to utilize Avista TRM values to estimate verified savings for these measures.

- The Shell Program displayed verified savings of 20,360 Therms with a realization rate of 84.15% against the expected savings for the program. The realization rate for the natural gas savings in the Shell Program deviate from 100% due to the differences between the differences in the quantity between the Avista tracking database and the verified documents. The Evaluators conducted a billing analysis for the attic insulation and window replacement measures, however, due to unexpectedly low savings estimates, the Evaluators chose to verify savings through the Avista TRM.
- There were no gas ENERGY STAR Homes rebates claimed for Idaho Gas in PY2022.
- In the Small Home & MF Weatherization Program, the Evaluators found that many projects exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). In addition, the Evaluators note that the current program rebate applications do not provide an option to indicate “Multifamily” home type. Rather, the current rebate application includes an option for “Single family”, “Manufactured”, “New construction”, and “Other”.
- The realization rate for the natural gas savings in the Small Home & MF Weatherization Program are unexpectedly high at 94.35% due to differences between the attic insulation savings values assigned to the project quantities and the verified Avista TRM prescriptive savings value. Avista used a value of 0.30 Therms/SQFT instead of multifamily attic Avista TRM value listed at 0.036 Therms/SQFT for the one sampled attic insulation measure. This led to a 120% realization rate for this measure. In addition, the Evaluators verified one window rebate to have almost half the square footage that the Avista database captured. This led to an 80% realization rate for the window replacement measure overall.
- The Appliances Program displayed verified savings of 457 Therms with a realization rate of 109.53%. The Evaluators note that all gas clothes dryer rebates were assigned 0 Therms expected savings. However, the Evaluators applied Avista TRM UES to these rebates, therefore leading to a high realization rate for the measure. In addition, the Avista TRM erroneously converted the RTF electric washer savings value to 6 Therms/unit instead of 4 Therms/unit, therefore leading to a low verified realization rate for this measure. Finally, the Evaluators removed savings applied to the top load washer because the RTF clothes washer workbook calculates negative savings for the top load washer, as the market practice baseline for this measure is already more efficient than the incentivized efficiency. Therefore, , the Evaluators deemed 0 equivalent savings in Therms for this measure. However, The upward adjustment for the clothes dryers outweighed the downward adjustments made for the clothes washers, and therefore the program displays a high realization rate.

1.2.1.2 Low-Income Programs

The Evaluators provide the following conclusions regarding Avista’s Low-Income natural gas programs:

- The Evaluators found the Low-Income portfolio to demonstrate a total of 1,954.31 Therms with a realization rate of 100.64%. The Low-Income Portfolio impact evaluation resulted verified savings that exceeded expected savings.
- The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolate each unique measure. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators conducted a whole-home billing analysis for all the natural gas measures combined in the Low-Income to estimate savings for the average household participating in the program, across all measures. However, the billing analysis results were not statistically significant. Therefore, the Evaluators found a realization rate of 100.64% from the desk review with Avista TRM values.
- The Evaluators note that the deviations from 100% realization rate is due verifying 20% annual household energy caps were properly applied. The Evaluators allowed full savings when the 20% annual cap was not reached by the sum of all project savings for the service address. For instances in which the 20% cap was met or exceeded, the Evaluators applied the appropriate cap to those projects, weighted by measure.

1.2.1.3 Nonresidential Programs

The Evaluators provide the following conclusions regarding Avista's Nonresidential gas programs:

- The Evaluators found the Non-Residential portfolio to demonstrate a total of 37,960.68 Therms with a realization rate of 138.00%. The difference can be attributed to the Site-Specific Program: In one project a correction was made to an calculation, and in the second measured savings, using a metered billing analysis, was higher than what had been calculated as expected savings.
- Verified savings for the HVAC Program are 5,081.68 Therms, 100.0% of claimed savings. The RTF does not currently offer a section for non-residential furnaces, however does for non-residential boilers. The Evaluators attempted to use the RTF to calculate verified savings for boilers, however found project documentation to be insufficient to determine key characteristics, necessary to assign RTF UES. Specific characteristics required are building type: 'Grocery, Restaurant, and Lodging,' 'Medical – Hospital and Outpatient' or 'All Other.' The Evaluators attempted to ascertain this information from detailed project-level documents but were unable to make determinations.
- Verified savings for the Food Service Equipment Program are 12,910.00 Therms, 100.0% of claimed savings. Both measures that appear in the PY2022 program there is no current RTF measure offering to supply UES, or the RTF measure does not include calculations for Therm savings. In these instances, the Evaluators used Avista TRM values. Evaluators did not find any deviations between claimed and verified TRM UES.

- Verified savings for the Shell Program are 260.00 Therms, 100.0% of claimed savings. The RTF does not provide a current measure listing for the measures in this program. The Evaluators calculated verified savings for the insulation measure using the 2022 Avista TRM.
- The Site-Specific program completed two projects in PY2022. Verified savings are 19,709.00 Therms, 212.94% of claimed savings. Savings for one site displayed 283.3% of expected savings when a metered billing analysis was performed.

1.2.2 Recommendations

The following section details the Evaluator's recommendations resulting from the program evaluations for each the Residential Portfolio, Low-Income Portfolio, and Nonresidential Portfolio.

1.2.2.1 Residential Programs

The Evaluators offer the following recommendations regarding Avista's Residential natural gas programs:

- The Evaluators note instances found in which the web-based rebate data indicates the household has electric space heating, but all other sources (project data and document verification) indicate natural gas space heating, and vice versa. The Evaluators recommend updating data collection standards in order for all sources of information to reflect the same values as the project documentation.
- The Evaluators found that many projects claimed under the Small Home & MF Weatherization Program exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). The Evaluators recommend claiming projects on single family homes that are larger than 1,000 SQFT into the Shell Program.
- A number of smart thermostat rebates included equipment that did not meet RTF measure specifications to receive verified savings through the RTF workbooks, which the Avista TRM values are drawn from. The Evaluators recommend providing a qualified product list for customers to ensure purchased smart Thermostat meets program requirements. In addition, the Evaluators recommend Avista verify each program rebate to verify qualifications after rebates are submitted.
- In the Appliances Program, The Evaluators note that all gas clothes dryer rebates were assigned 0 Therms expected savings. However, the Evaluators applied Avista TRM UES to these rebates, therefore leading to a high realization rate for the measure. The Evaluators recommend investigating causes for this database error.
- The Evaluators recommend removing the top load washer from Appliance Program offerings, as the RTF clothes washer workbook calculates negative savings for the top load washer. This indicates that the market practice baseline for this measure is already more efficient than the incentivized to load washer efficiency.

- The Evaluators recommend Avista update the front load clothes washer Avista TRM value to correctly convert 120 kWh/unit to 4 Therms/unit. Currently, the Avista TRM reflects 6 Therms/unit.

1.2.2.2 Low-Income Programs

The Evaluators offer the following recommendations regarding Avista's Low-Income natural gas programs:

- The Evaluators note that the majority of deviations from 100% realization rate in the Low-Income Program is due verifying 20% annual household energy caps were properly applied. The Evaluators recommend verifying each of these values are documented and applied.
- The Evaluators identified one instance in which verified savings from a duct insulation measure was double the reported savings. The reason for this deviation is unclear, however, the Evaluators recommend that Avista work to ensure Avista TRM rates are properly applied throughout the Avista rebate database.

1.2.2.3 Nonresidential Programs

The Evaluators offer the following recommendations regarding Avista's Nonresidential natural gas programs:

- Within the HVAC Program, when collecting measure information for boiler measures, the Evaluators recommend collecting information about the type of facility the retrofit is occurring in, 'Grocery, Restaurant, and Lodging,' 'Medical – Hospital and Outpatient' or 'All Other' to allow for measure savings assessment using RTF materials.

2. General Methodology

The Evaluators performed an impact evaluation on each of the programs summarized in Table 1-4. The Evaluators used the following approaches to calculate energy impact defined by the International Performance Measurement and Verification Protocols (IPMVP)[4] and the Uniform Methods Project (UMP)[5]:

- Simple verification (web-based surveys supplemented with phone surveys)
- Document verification (review project documentation)
- Deemed savings (RTF UES and Avista TRM values)
- Whole facility billing analysis (IPMVP Option C)

The Evaluators completed the above impact tasks for each the electric impacts and the natural gas impacts for projects completed in the Idaho Avista service territory.

The M&V methodologies are program-specific and determined by previous Avista evaluation methodologies as well as the relative contribution of a given program to the overall energy efficiency impacts. Besides drawing on IPMVP, the Evaluators also reviewed relevant information on infrastructure, framework, and guidelines set out for EM&V work in several guidebook documents that have been published over the past several years. These include the following:

- Northwest Regional Technical Forum (RTF)[6]
- National Renewable Energy Laboratory (NREL), United States Department of Energy (DOE) The Uniform Methods Project (UMP): Methods for Determining Energy Efficiency Savings for Specific Measures, April 2013[7]
- International Performance Measurement and Verification Protocol (IPMVP) maintained by the Efficiency Valuation Organization (EVO) with sponsorship by the U.S. Department of Energy (DOE)[8]

The Evaluators kept data collection instruments, calculation spreadsheets, and monitored/survey data available for Avista records.

2.1 Glossary of Terminology

As a first step to detailing the evaluation methodologies, the Evaluators have provided a glossary of terms to follow:

- **Deemed Savings** – An estimate of an energy savings outcome (gross savings) for a single unit of an installed energy efficiency measure. This estimate (a) has been developed from data sources

[4] https://www.nrel.gov/docs/fy02osti/31505.pdf
[5] https://www.nrel.gov/docs/fy18osti/70472.pdf
[6] https://rtf.nwcouncil.org/measures
[7] Notably, The Uniform Methods Project (UMP) includes the following chapters authored by ADM. Chapter 9 (Metering Cross-Cutting Protocols) was authored by Dan Mort and Chapter 15 (Commercial New Construction Protocol) was Authored by Steven Keates.
[8] Core Concepts: International Measurement and Verification Protocol. EVO 100000 – 1:2016, October 2016.

and analytical methods that are widely accepted for the measure and purpose and (b) are applicable to the situation being evaluated.

- **Expected Savings** – Calculated savings used for program and portfolio planning purposes.
- **Adjusted Savings** – Savings estimates after database review and document verification has been completed using deemed unit-level savings provided in the Avista TRM. It adjusts for such factors as data errors and installation rates.
- **Verified Savings** – Savings estimates after the updated unit-level savings values have been updated and energy impact evaluation has been completed, integrating results from billing analyses and appropriate RTF UES and Avista TRM values.
- **Gross Savings** – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, regardless of why they participated.
- **Free Rider** – A program participant who would have implemented the program measure or practice in absence of the program.
- **Net-To-Gross** – A factor representing net program savings divided by gross program savings that is applied to gross program impacts to convert them into net program load impacts.
- **Net Savings** – The change in energy consumption directly resulting from program-related actions taken by participants in an efficiency program, with adjustments to remove savings due to free ridership.
- **Non-Energy Benefits** – Quantifiable impacts produced by program measures outside of energy savings (comfort, health and safety, reduced alternative fuel, etc.).
- **Non-Energy Impacts** – Quantifiable impacts in energy efficiency beyond the energy savings gained from installing energy efficient measures (reduced cost for operation and maintenance of equipment, reduced environmental and safety costs, etc.).

2.2 Summary of Approach

This section presents our general cross-cutting approach to accomplishing the impact evaluation of Avista's Residential, Low-Income, and Nonresidential programs listed in Table 1-4. The Evaluators start by presenting our general evaluation approach. This chapter is organized by general task due to several overlap across programs.

The Evaluators outline the approach to verifying, measuring, and reporting the residential portfolio impacts as well as cost-effectiveness and summarizing potential program and portfolio improvements. The primary objective of the impact evaluation is to determine ex-post verified net energy savings. On-site verification and equipment monitoring was not conducted during this impact evaluation due to stay-at-home orders due to the COVID19 pandemic.

Our general approach for this evaluation considers the cyclical feedback loop among program design, implementation, and impact evaluation. Our activities during the evaluation estimate and verify annual energy savings and identify whether a program is meeting its goals. These activities are aimed to provide guidance for continuous program improvement and increased cost effectiveness for the 2022 and 2023 program years.

The Evaluators employed the following approach to complete impact evaluation activities for the programs. The Evaluators define two major approaches to determining net savings for Avista's programs:

- A *Deemed Savings* approach involves using stipulated savings for energy conservation measures for which savings values are well-known and documented. These prescriptive savings may also include an adjustment for certain measures, such as lighting measures in which site operating hours may differ from RTF values.
- A *Billing Analysis* approach involves estimating energy savings by applying a linear regression to measured participant energy consumption utility meter billing data. Billing analyses included billing data from nonparticipant customers. This approach does not require on-site data collection for model calibration. This approach aligns with the IPMVP Option C.
- A *Custom* approach, used for the Site-Specific program involves selecting the appropriate IPMVP option to apply to the specific measure or project. Typically this is Option A as most projects in the program are lighting retrofits, however Options B, C and D are also employed, depending upon the project. Specific methods are discussed in each site report.

The Evaluators accomplished the following quantitative goals as part of the impact evaluation:

- Verify savings with 10% precision at the 90% confidence level;
- Where appropriate, apply the RTF to verify measure impacts; and
- Where available data exists, conduct billing analysis with a suitable comparison group to estimate measure savings.

For each program, the Evaluators calculated adjusted savings for each measure based on the Avista TRM and results from the database review. The Evaluators calculated verified savings for each measure based on the RTF UES, Avista TRM, or billing analysis in combination with the results from document review. For the HVAC, Water Heat, and Fuel Efficiency programs, the Evaluators also applied in-service rates (ISRs) from verification surveys.

The Evaluators assigned methodological rigor level for each measure and program based on its contribution to the portfolio savings and availability of data.

The Evaluators analyzed billing data for all natural gas measure participants in the HVAC and Low-Income programs. The Evaluators applied billing analysis results to determine evaluated savings only for measures where savings could be isolated (that is, where a sufficient number of participants could be identified who installed only that measure). Program-level realization rates for the HVAC, Water Heat, and Fuel Efficiency programs incorporate billing analysis results for some measures.

2.2.1 Database Review

At the outset of the evaluation, the Evaluators reviewed the databases to ensure that each program tracking database conforms to industry standards and adequately tracks key data required for evaluation.

Measure-level net savings were evaluated primarily by reviewing measure algorithms and values in the tracking system to assure that they are appropriately applied using the Avista TRM. The Evaluators then aggregated and cross-check program and measure totals.

The Evaluators reviewed program application documents for a sample of incented measures to verify the tracking data accurately represents the program documents. The Evaluators ensured the home installed measures that meet or exceed program efficiency standards.

2.2.2 Verification Methodology

The Evaluators verified a sample of participating households for detailed review of the installed measure documentation and development of verified savings. The Evaluators verified tracking data by reviewing invoices and surveying a sample of participant customer households. The Evaluators also conducted a verification survey for program participants.

The Evaluators used the following equations to estimate sample size requirements for each program and fuel type. Required sample sizes were estimated as follows:

Equation 2-1 Sample Size for Infinite Sample Size

$$n = \left(\frac{Z \times CV}{d}\right)^2$$

Equation 2-2 Sample Size for Finite Population Size

$$n_0 = \frac{n}{1 + \left(\frac{n}{N}\right)}$$

Where,

- n = Sample size
- Z = Z-value for a two-tailed distribution at the assigned confidence level.
- CV = Coefficient of variation
- d = Precision level
- N = Population

For a sample that provides 90/10 precision, *Z* = 1.645 (the critical value for 90% confidence) and *d* = 0.10 (or 10% precision). The remaining parameter is *CV*, or the expected coefficient of variation of measures for which the claimed savings may be accepted. A *CV* of .5 was assumed for residential programs due to

the homogeneity of participation[9], which yields a sample size of 68 for an infinite population. Sample sizes were adjusted for smaller populations via the method detailed in Equation 2-2.

The following sections describe the Evaluator's methodology for conducting document-based verification and survey-based verification.

2.2.2.1 Document-Based Verification

The Evaluators requested rebate documentation for a subset of participating customers. These documents included invoices, rebate applications, pictures, and AHRI certifications for the following programs:

- Water Heat Program
- HVAC Program
- Shell Program
- Fuel Efficiency Program
- ENERGY STAR® Homes Program
- Small Home & MF Weatherization Program
- Multifamily Direct Install Program
- Appliances Program
- Low-Income Program

This sample of documents was used to cross-verify tracking data inputs. In the case the Evaluators found any deviations between the tracking data and application values, the Evaluators reported and summarized those differences in the Database Review sections presented for each program in Section 3.2 and Section 4.1.

The Evaluators developed a sampling plan that achieves a sampling precision of ±10% at 90% statistical confidence – or "90/10 precision" – to estimate the percentage of projects for which the claimed savings are verified or require some adjustment.

The Evaluators developed the following samples for each program's document review using Equation 2-1 and Equation 2-2. The Evaluators ensured representation in each state and fuel type for each measure.

[9] Assumption based off California Evaluation Framework:

https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/EE_and_Energy_Savings_Assist/CAEvaluationFramework.pdf

Table 2-1: Document-based Verification Samples and Precision by Program

Sector	Program	Gas Population	Sample (With Finite Population Adjustment)*	Precision at 90% CI
Residential	Water Heat	395	60	90% ± 9.79%
Residential	HVAC	3,040	73	90% ± 9.51%
Residential	Shell	354	66	90% ± 9.14%
Residential	ENERGY STAR® Homes	0	0	N/A
Residential	Small Home & MF Weatherization	20	18	90% ± 6.29%
Residential	Appliances	84	46	90% ± 8.21%
Residential	Multifamily Direct Install	0	0	N/A
Low-Income	Low-Income	75	21	90% ± 15.33%
Total		**3,975**	**291**	**90% ± 4.64%**

*Assumes sample size of 68 for an infinite population, based on *CV* (coefficient of variation) = 0.5, *d* (precision) = 10%, *Z* (critical value for 90% confidence) = 1.645.

The table above represents the number of rebates in Idaho service territory only. The Evaluators ensured representation of state and fuel type in the sampled rebates for document verification.

2.2.2.2 Survey-Based Verification

The Evaluators conducted survey-based verification for the Water Heat Program, HVAC Program, and Appliances Program. The primary purpose of conducting a verification survey is to confirm that the measure was installed and is still currently operational and whether the measure was early retirement or replace-on-burnout.

The Evaluators summarize the final sample sizes of sampled Idaho Gas Avista projects shown in Table 2-2 for the programs listed. The Evaluators developed a sampling plan that achieved a sampling precision of ±6.48% at 90% statistical confidence for ISRs estimates at the measure-level during web-based survey verification.

Table 2-2: Survey-Based Verification Sample and Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	395	31	90% ± 14.2%
Residential	HVAC	3,040	100	90% ± 8.09%
Residential	Small Home & MF Weatherization	20	4	90% ± 37.74%
Residential	Appliances	84	19	90% ± 16.7%
Total		**3,539**	**154**	**90% ± 6.48%**

The Evaluators implemented a web-based survey to complete the verification surveys. The findings from these activities served to estimate ISRs for each measure surveyed. These ISRs were applied to verification sample desk review rebates towards verified savings, which were then applied to the population of rebates. The measure-level ISRs resulting from the survey-based verification are summarized in Section 3.1.

2.2.2.3 Survey-Based Verification

For sampled projects in the Site-Specific program, the Evaluators conducted onsite visits to the facilities to verify installation, collected facility characteristic and collected any data needed to conducted savings calculations. In ID, one of two sites was visited to verify natural gas measures. Further details are available in the Site-Specific chapter.

2.2.3 Impact Evaluation Methodology

The Evaluators employed the following approach to complete impact evaluation activities for the programs. The Evaluators define two major approaches to determining net savings for Avista's programs:

- Deemed Savings
- Billing Analysis (IPMVP Option C)

The Site-Specific program also employed various IPMVP options, deepening upon the project and measure, and is discussed separately as it differs in approach from the approaches used in the remainder of the portfolio. In the following sections, the Evaluators summarize the general guidelines and activities followed to conduct each the deemed savings and billing analyses approaches above.

2.2.3.1 Deemed Savings

This section summarizes the deemed savings analysis method the Evaluators employed for the evaluation of a subset of measures for each program. The Evaluators completed the validation for specific measures across each program using the RTF unit energy savings (UES) values, where available. The Evaluators ensured the proper measure unit savings were recorded and used in the calculation of Avista's ex-ante measure savings. The Evaluators requested and used the technical reference manual Avista employed during calculation of ex-ante measure savings (Avista TRM). The Evaluators documented any cases where recommend values differed from the specific unit energy savings workbooks used by Avista.

In cases where the RTF has existing unit energy savings (UES) applicable to Avista's measures, the Evaluators verified the quantity and quality of installations and apply the RTF's UES to determine verified savings.

2.2.3.2 Billing Analysis

This section describes the billing analysis methodology employed by the Evaluators as part of the impact evaluation and measurement of energy savings for measures with sufficient participation. The Evaluators performed billing analyses with a matched control group and utilized a quasi-experimental method of producing a post-hoc control group. In program designs where treatment and control customers are not randomly selected at the outset, such as for downstream rebate programs, quasi-experimental designs are required.

For the purposes of this analysis, a household is considered a treatment household if it has received a program incentive. Additionally, a household is considered a control household if the household has not

received a program incentive. To isolate measure impacts, treatment households are eligible to be included in the billing analysis if they installed only one measure during the 2020 and 2021 program years. Isolation of individual measures are necessary to provide valid measure-level savings. Households that installed more than one measure may display interactive energy savings effects across multiple measures that are not feasibly identifiable. Therefore, instances where households installed isolated measures are used in the billing analyses. In addition, the pre-period identifies the period prior to measure installation while the post-period refers to the period following measure installation.

The Evaluators utilized propensity score matching (PSM) to match nonparticipants to similar participants using pre-period billing data. PSM allows the evaluators to find the most similar household based on the customers' billed consumption trends in the pre-period and verified with statistical difference testing.

After matching based on these variables, the billing data for treatment and control groups are compared, as detailed in IPMVP Option C. The Evaluators fit regression models to estimate weather-dependent daily consumption differences between participating customer and nonparticipating customer households.

Cohort Creation

The PSM approach estimates a propensity score for treatment and control customers using a logistic regression model. A propensity score is a metric that summarizes several dimensions of household characteristics into a single metric that can be used to group similar households. The Evaluators created a post-hoc control group by compiling billing data from a subset of nonparticipants in the Avista territory to compare against treatment households using quasi-experimental methods. This allowed the Evaluators to select from a large group of similar households that have not installed an incented measure. With this information, the Evaluators created statistically valid matched control groups for each measure via seasonal pre-period usage. The Evaluators matched customers in the control group to customers in the treatment group based on nearest seasonal pre-period usage (e.g., summer, spring, fall, and winter) and exact 3-digit zip code matching (the first three digits of the five-digit zip code). After matching, the Evaluators conducted a *t*-test for each month in the pre-period to help determine the success of PSM.

While it is not possible to guarantee the creation of a sufficiently matched control group, this method is preferred because it is likely to have more meaningful results than a treatment-only analysis. Some examples of outside variables that a control group can sufficiently control for are changes in economies and markets, large-scale social changes, or impacts from weather-related anomalies such as flooding or hurricanes.

After PSM, the Evaluators ran the following regression models for each measure:

- Fixed effect Difference-in-Difference (D-n-D) regression model (recommended in UMP protocols)[10]
- Random effects post-program regression model (PPR) (recommended in UMP protocols)

[10] National Renewable Energy Laboratory (NREL) Uniform Methods Project (UMP) Chapter 17 Section 4.4.7.

- Gross billing analysis (treatment only)

The second model listed above (PPR) was selected because it had the best fit for the data, identified using the adjusted R-squared. Further details on regression model specifications can be found below.

Data Collected

The following lists the data collected for the billing analysis:

1. Monthly billing data for program participants (treatment customers)
2. Monthly billing data for a group of non-program participants (control customers)
3. Program tracking data, including customer identifiers, address, and date of measure installation
4. National Oceanic and Atmospheric Administration (NOAA) weather data between January 1, 2020 and December 31, 2022)
5. Typical Meteorological Year (TMY3) data

Billing and weather data were obtained for program year 2022 and for one year prior to measure install dates (2021).

Weather data was obtained from the nearest weather station with complete data during the analysis years for each customer by mapping the weather station location with the customer zip code.

TMY weather stations were assigned to NOAA weather stations by geocoding the minimum distance between each set of latitude and longitude points. This data is used for extrapolating savings to long-run, 30-year average weather.

Data Preparation

The following steps were taken to prepare the billing data:

1. Gathered billing data for homes that participated in the program.
2. Excluded participant homes that also participated in the other programs, if either program disqualifies the combination of any other rebate or participation.
3. Gathered billing data for similar customers that did not participate in the program in evaluation.
4. Excluded bills missing address information.
5. Removed bills missing fuel type/Unit of Measure (UOM).
6. Removed bills missing usage, billing start date, or billing end date.
7. Remove bills with outlier durations (<9 days or >60 days).
8. Excluded bills with consumption indicated to be outliers.
9. Calendarized bills (recalculates bills, usage, and total billed such that bills begin and end at the start and end of each month).
10. Obtained weather data from nearest NOAA weather station using 5-digit zip code per household.

11. Computed Heating Degree Days (HDD) and Cooling Degree Days (CDD) for a range of setpoints. The Evaluators assigned a setpoint of 65°F for both HDD and CDD. The Evaluators tested and selected the optimal temperature base for HDDs and CDDs based on model *R*-squared values.
12. Selected treatment customers with only one type of measure installation during the analysis years and combined customer min/max install dates with billing data (to define pre- and post-periods).
13. Restricted to treatment customers with install dates in specified range (typically January 1, 2022 through June 30, 2022) to allow for sufficient post-period billing data.
14. Restricted to control customers with usage less than or equal to two times the maximum observed treatment group usage. This has the effect of removing control customers with incomparable usage relative to the treatment group.
15. Removed customers with incomplete post-period bills (<4 months).
16. Removed customers with incomplete pre-period bills.
17. Restricted control customers to those with usage that was comparable with the treatment group usage.
18. Created a matched control group using PSM and matching on pre-period seasonal usage and zip code.

Regression Models

The Evaluators ran the following models for matched treatment and control customers for each measure with sufficient participation. For net savings, the Evaluators selected either Model 1 or Model 2. The model with the best fit (highest adjusted R-squared) was selected. The Evaluators utilized Model 3 to estimate gross energy savings.

Model 1: Fixed Effects Difference-in-Difference Regression Model

The following equation displays the first model specification to estimate the average daily savings due to the measure.

Equation 2-3: Fixed Effects Difference-in-Difference (D-n-D) Model Specification

$$\begin{aligned} ADC_{it} = \alpha_0 &+ \beta_1(Post)_{it} + \beta_2(Post \times Treatment)_{it} + \beta_3(HDD)_{it} + \beta_4(CDD)_{it} \\ &+ \beta_5(Post \times HDD)_{it} + \beta_6(Post \times CDD)_{it} + \beta_7(Post \times HDD \times Treatment)_{it} \\ &+ \beta_8(Post \times CDD \times Treatment)_{it} + \beta_9(Month)_t + \beta_{10}(Customer\ Dummy)_i + \varepsilon_{it} \end{aligned}$$

Where,

- *i* = the *i*th household
- *t* = the first, second, third, etc. month of the post-treatment period
- ADC_{it} = Average daily usage reading *t* for household *i* during the post-treatment period
- $Post_{it}$ = A dummy variable indicating pre- or post-period designation during period *t* at home *i*
- $Treatment_i$ = A dummy variable indicating treatment status of home *i*
- HDD_{it} = Average heating degree days (base with optimal Degrees Fahrenheit) during period *t* at home *i*

- CDD_{it} = Average cooling degree days (base with optimal Degrees Fahrenheit) during period *t* at home i *(if electric usage)*
- $Month_t$= A set of dummy variables indicating the month during period *t*
- $Customer\ Dummy_i$ = a customer-specific dummy variable isolating individual household effects
- ε_{it} = The error term
- α_0= The model intercept
- β_{1-10} = Coefficients determined via regression

The Average Daily Consumption (ADC) is calculated as the total monthly billed usage divided by the duration of the bill month. β_2 represents the average change in daily baseload in the post-period between the treatment and control group and β_7 and β_8 represent the change in weather-related daily consumption in the post-period between the groups. Typical monthly and annual savings were estimated by extrapolating the β_7 and β_8 coefficients with Typical Meteorological Year (TMY) HDD and CDD data. However, in the case of gas usage, only the coefficient for HDD is utilized because CDDs were not included in the regression model.

The equation below displays how savings were extrapolated for a full year utilizing the coefficients in the regression model and TMY data. TMY data is weighted by the number of households assigned to each weather station.

Equation 2-4: Savings Extrapolation

$$Annual\ Savings = \beta_2 * 365.25 + \beta_7 * TMY\ HDD + \beta_8 * TMY\ CDD$$

Model 2: Random Effects Post-Program Regression Model

The following equation displays the second model specification to estimate the average daily savings due to the measure. The post-program regression (PPR) model combines both cross-sectional and time series data in a panel dataset. This model uses only the post-program data, with lagged energy use for the same calendar month of the pre-program period acting as a control for any small systematic differences between the treatment and control customers; in particular, energy use in calendar month *t* of the post-program period is framed as a function of both the participant variable and energy use in the same calendar month of the pre-program period. The underlying logic is that systematic differences between treatment and control customers will be reflected in the differences in their past energy use, which is highly correlated with their current energy use. These interaction terms allow pre-program usage to have a different effect on post-program usage in each calendar month.

The model specification is as follows:

Equation 2-5: Post-Program Regression (PPR) Model Specification

$$\begin{aligned} ADC_{it} = {} & \alpha_0 + \beta_1(Treatment)_i + \beta_2\ (PreUsage)_i + \beta_3\ (PreUsageSummer)_i \\ & + \beta_4(PreUsageWinter)_i + \beta_5(Month)_t + \beta_6(Month \times PreUsage)_{it} \\ & + \beta_7(Month \times PreUsageSummer)_{it} + \beta_8(Month \times PreUsageWinter)_{it} \\ & + \beta_9(HDD)_{it} + \beta_{10}(CDD)_{it} + \beta_{11}(Treatment \times HDD)_{it} + \beta_{12}(Treatment \times CDD)_{it} \\ & + \varepsilon_{it} \end{aligned}$$

Where,

- *i* = the *i*th household
- *t* = the first, second, third, etc. month of the post-treatment period
- ADC_{it} = Average daily usage for reading *t* for household *i* during the post-treatment period
- $Treatment_i$ = A dummy variable indicating treatment status of home *i*
- $Month_t$ = Dummy variable indicating month of month *t*
- $PreUsage_i$ = Average daily usage across household *i*'s available pre-treatment billing reads
- $PreUsageSummer_i$ = Average daily usage in the summer months across household *i*'s available pretreatment billing reads
- $PreUsageWinter_i$ = Average daily usage in the winter months across household *i*'s available pre-treatment billing reads
- HDD_{it} = Average heating degree days (base with optimal Degrees Fahrenheit) during period *t* at home *i*
- CDD_{it} = Average cooling degree days (base with optimal Degrees Fahrenheit) during period *t* at home i *(if electric usage)*
- ε_{it} = Customer-level random error
- α_0= The model intercept for home *i*
- β_{1-12} = Coefficients determined via regression

The coefficient β_1 represents the average change in consumption between the pre-period and post-period for the treatment group and β_{11} and β_{12} represent the change in weather-related daily consumption in the post-period between the groups. Typical monthly and annual savings were estimated by extrapolating the β_{11} and β_{12} coefficients with Typical Meteorological Year (TMY) HDD and CDD data.

The equation below displays how savings were extrapolated for a full year utilizing the coefficients in the regression model and TMY data.

Equation 2-6: Savings Extrapolation

$$Annual\ Savings = \beta_1 * 365.25 + \beta_{11} * TMY\ HDD + \beta_{12} * TMY\ CDD$$

Model 3: Gross Billing Analysis, Treatment-Only Regression Model

The sections above detail the Evaluator's methodology for estimating net energy savings for each measure. The results from the above methodology report net savings due to the inclusion of the counterfactual comparison group. However, for planning purposes, it is useful to estimate gross savings for each measure. To estimate gross savings, the Evaluators employed a similar regression model; however, only including participant customer billing data. This analysis does not include control group billing data and therefore models energy reductions between the pre-period and post-period for the measure participants (treatment customers).

To calculate the impacts of each measure, the Evaluators applied linear fixed effects regression using participant billing data with weather controls in the form of Heating Degree Days (HDD) and Cooling Degree Days (CDD). The following equation displays the model specification to estimate the average daily savings due to the measure.

Equation 2-7: Treatment-Only Fixed Effects Weather Model Specification

$$ADC_{it} = \alpha_0 + \beta_1(Post)_{it} + \beta_2(HDD)_{it} + \beta_3(CDD)_{it} + \beta_4(Post \times HDD)_{it} + \beta_5(Post \times CDD)_{it} + \beta_6(Customer\ Dummy)_i + \beta_7(Month)_t + \varepsilon_{it}$$

Where,

- *i* = the *i*th household
- *t* = the first, second, third, etc. month of the post-treatment period
- ADC_{it} = Average daily usage for reading *t* for household *i* during the post-treatment period
- HDD_{it} = Average heating degree days (base with optimal Degrees Fahrenheit) during period *t* at home *i*
- CDD_{it} = Average cooling degree days (base with optimal Degrees Fahrenheit) during period *t* at home i *(if electric usage)*
- $Post_{it}$ = A dummy variable indicating pre- or post-period designation during period *t* at home *i*
- $Customer\ Dummy_i$ = a customer-specific dummy variable isolating individual household effects
- ε_{it} = Customer-level random error
- α_0= The model intercept for home *i*
- β_{1-6} = Coefficients determined via regression

The results of the treatment-only regression models are gross savings estimates. The gross savings estimates are useful to compare against the net savings estimates. However, the treatment-only models are unable to separate the effects of the COVID19 pandemic. The post-period for PY2022 and perhaps also PY2022 are affected by the stay-at-home orders that had taken effect starting March 2021 in Idaho. The stay-at-home orders most likely affect the post-period household usage. Because there is insufficient post-period data before the shelter-in-place orders, the Evaluators were unable to separate the effects on consumption due to the orders and the effects on consumption due to the measure installation. Therefore, the results from this additional gross savings analysis are unable to reflect actual typical year savings. However, for planning purposes, these estimates may be useful.

2.2.4 Net-To-Gross

The Northwest RTF UES measures do not require NTG adjustments as they are built into the deemed savings estimates. In addition, billing analyses with counterfactual control groups, as proposed in our impact methodology, does not require a NTG adjustment, as the counterfactual represents the efficiency level at current market (i.e. the efficiency level the customer would have installed had they not participated in the program).

2.2.5 Non-Energy Benefits

The Evaluators used the Regional Technical Forum (RTF) to quantify non-energy benefits (NEBs) for residential measures with established RTF values where available. Measures with quantified NEBs include residential insulation, high efficiency windows, air source heat pumps, and ductless heat pumps.

In addition to the residential NEBs, the Evaluators applied the end-use non-energy benefit and health and human safety non-energy benefit to the Low-Income Program. The Evaluators understand that the two major non-energy benefits referenced above are uniquely applicable to the Low-Income Program. The Evaluators applied those benefits to the program impacts as well as additional non-energy benefits associated with individual measures included in the program. The Evaluators incorporated additional NEBs to the impact evaluation, as applicable. Additional details on the non-energy benefits applied can be found in Section 2.2.5.

3. Residential Impact Evaluation Results

The Evaluators completed an impact evaluation on Avista's Residential portfolio to verify program-level and measure-level energy savings for PY2022. The following sections summarize findings for each natural gas impact evaluation in the Residential Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, RTF, and billing analysis of participants and nonparticipants to evaluate savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data. Table 3-1 summarizes the Residential verified impact savings by program.

Table 3-1: Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Water Heat	29,167.60	28,407.84	97.40%
HVAC	188,961.00	216,235.62	114.43%
Shell	24,195.05	20,360.10	84.15%
ENERGY STAR Homes	0.00	0.00	-
Small Home & MF Weatherization	1,011.78	954.61	94.35%
Appliances	417.15	456.91	109.53%
Multifamily Direct Install	0.00	0.00	-
Total Res	**243,752.58**	**266,415.08**	**109.30%**

In PY2022, Avista completed and provided incentives for residential natural gas measures in Idaho and reported total natural gas savings of 266,415.08 Therms. All programs except the Appliances Program met savings goals based on reported savings, leading to an overall achievement of 109.30% of the expected savings for the residential programs. Further details of the impact evaluation results by program are provided in the sections following.

3.1 Simple Verification Results

The Evaluators surveyed 755 unique customers that participated in Avista's residential energy efficiency program from October 2022 to March 2023 using an email survey approach. The Evaluators also conducted targeted follow-up outreach to customers for certain measures.

The Evaluators surveyed customers that received rebates for Water Heat, HVAC, Small Home & MF Weatherization, and Appliance programs.

Table 3-2: Summary of Survey Response Rate

Population	Respondents
Initial email contact list	1,376
Invalid or bounced	53
Invalid or bounced email (%)	*4%*
Invitations sent (unique valid)	1,323
Completions	302
Response rate (%)	23%

3.1.1 In-Service Rates

The Evaluators calculated in-service rates of installed measures from simple verification surveys deployed to program participants for the Water Heat and HVAC Programs. The Fuel Efficiency program was surveyed for the electric measures; the sample is provided in the Idaho Electric Impact Evaluation report and does not contribute to the precision for the Idaho Gas impacts. The Evaluators asked participants if the rebated equipment is currently installed and working, in addition to questions about the new equipment fuel type. The Evaluators achieved ±6.48% precision across the programs surveyed for the natural gas measures in Avista's service territory, summarized in Table 3-3.

Table 3-3: Simple Verification Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	395	31	90% ± 14.2%
Residential	HVAC	3,040	100	90% ± 8.09%
Residential	Small Home & MF Weatherization	20	4	90% ± 37.74%
Residential	Appliances	84	19	90% ± 16.7%
Total		**3,539**	**154**	**90% ± 6.48%**

The measure-level ISRs determined from the verification survey for each program in which simple verification was conducted is presented in the tables below. The tables below summarize Idaho-level (state-level) respondents and ISR as well as Idaho and Washington-level (mixed state-level) respondents and ISR.

Table 3-4: Water Heat Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
G 50 Gallon Natural Gas Water Heater*	6	100%	23	100%	Mixed state ISR
G Tankless Water Heater*	25	100%	71	100%	Mixed state ISR

*These measures did not receive enough responses to meet 90/10 precision and therefore 100% in-service rate is assumed

Table 3-5: HVAC Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
G FURNACE 95% (Multi-Stage)	N/A	N/A	24	100%	Mixed state ISR
G Natural Gas Boiler	1	100%	3	100%	State-specific ISR
G Natural Gas Furnace	59	100%	128	100%	State-specific ISR
G Smart Thermostat DIY with Natural Gas Heat	8	100%	47	96%	State-specific ISR
G Smart Thermostat Paid Install with Natural Gas Heat	32	100%	89	100%	State-specific ISR

Table 3-6: Small Home & MF Weatherization Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
G Multifamily 50 Gallon Natural Gas Water Heater*	N/A	N/A	1	100%	Assume 100% ISR
G Multifamily Attic Insulation With Natural Gas Heat*	1	100%	1	N/A	Assume 100% ISR
G Multifamily Furnace 95%*	N/A	N/A	0	100%	Assume 100% ISR
G Multifamily Smart Thermostat DIY*	1	100%	2	100%	Assume 100% ISR
G Multifamily Smart Thermostat Paid*	1	100%	1	100%	Assume 100% ISR
G Multifamily Tankless Water Heater*	N/A	N/A	0	100%	Assume 100% ISR
G Multifamily Window Replc With Natural Gas Heat*	1	100%	2	N/A	Assume 100% ISR
G Multifamily Wall Insulation With Natural Gas Heat*	N/A	N/A	0	100%	Assume 100% ISR

*These measures did not receive enough responses to meet 90/10 precision and therefore 100% in-service rate is assumed

Table 3-7: Appliances Program ISRs by Measure

Measure	State-level Respondents	State-level ISR	Mixed State-level Respondents	Mixed State-level ISR	ISR Methodology
G Energy Star Rated Clothes Dryer	6	100%	17	100%	Mixed state ISR
G Energy Star Rated Front Load Washer	12	100%	40	100%	Mixed state ISR

These ISR values were utilized in the desk reviews for the Water Heat, HVAC, Small Home & MF Weatherization, and Appliance Programs in order to calculate verified savings. Additional insights from the survey responses are summarized in Appendix B: Summary of Survey Respondents.

3.2 Program-Level Impact Evaluation Results

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Residential sector in the section below.

3.2.1 Water Heat Program

The Water Heat Program encourages customers to replace their existing electric or natural gas water heater with high efficiency equipment. Customers receive incentives after installation and after submitting a completed rebate form. Table 3-8 summarizes the gas measures offered under this program.

Table 3-8: Water Heat Program Measures

Measure	Description	Impact Analysis Methodology
G 50 Gallon Natural Gas Water Heater	Storage tank natural gas water heater, 50 gallons or less	Avista TRM
G Tankless Water Heater	Tankless natural gas water heater	Avista TRM

The following table summarizes the verified natural gas savings for the Water Heat Program impact evaluation.

Table 3-9: Water Heat Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G 50 Gallon Natural Gas Water Heater	31	698	676	465	66.67%
G Tankless Water Heater	364	28,470	28,392	27,943	98.15%
Total	**395**	**29,167.60**	**29,067.80**	**28,407.84**	**97.40%**

The Water Heat Program displayed verified savings of 28,407.84 Therms with a realization rate of 97.40% against the expected savings for the program. The following table summarizes the incentive costs from the program.

Table 3-10: Water Heat Program Costs

Measure	Incentive Costs
G 50 Gallon Natural Gas Water Heater	$3,200.00
G Tankless Water Heater	$145,600.00
Total	**$148,800.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Water Heat Program in the section below.

3.2.1.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Water Heat Program.

3.2.1.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Water Heat Program. The Evaluators selected a subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

The Evaluators found all Water Heat Program rebates to have completed rebate applications with the associated water heater model number and efficiency values filled in either the Customer Care & Billing (CC&B) web rebate data or mail-in rebate applications.

In addition, the Evaluators note that the CC&B web rebate data reflected consistent values between the mail-in rebate applications, invoices, and AHRI certification documents submitted with the rebate application. The Evaluators found two deviations, however. The Evaluators found that for one G 50 Gallon Natural Gas Water Heater and one G Tankless Water Heater, the minimum equipment efficiency was not met when the Evaluators verified appropriate AHRI documents.

3.2.1.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure. The Evaluators included questions such as:

- Was this water heater a new construction, or did it replace another water heater?
- Was the previous water heater functional?
- Is the newly installed water heater still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the Water Heat Program.

Table 3-11 displays the ISRs for each of the Water Heat measures for Idaho and Washington territory combined.

Table 3-11: Water Heat Verification Survey ISR Results

Measure	Number of Rebates*	Number of Survey Completes	Program-Level Precision at 90% Confidence	In-Service Rate
G 50 Gallon Natural Gas Water Heater	138	23	90% ±8.21%*	100%
G Tankless Water Heater	743	71		100%

*This count includes rebates from Washington and Idaho

All survey respondents for each water heater measure described equipment to be currently functioning, leading to a 100% ISR. The Evaluators applied these ISRs to each rebate to quantify verified savings for each measure.

3.2.1.4 Impact Analysis

This section summarizes the verified savings results for the Water Heat Program. The Evaluators conducted a billing analysis for measures where participation allowed. The Evaluators calculated verified savings for the remaining measures using active values from the Avista TRM workbook. These values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.1.5 Billing Analysis

The results of the billing analysis for the Water Heat Program are provided in this section. The methodology for the billing analysis is provided in Section 2.2.3.2.

Table 3-12 displays customer counts for customers considered for billing analysis (i.e. customer with single-measure installations) and identifies measures that met the requirements for a billing analysis.

Table 3-12: Measures Considered for Billing Analysis, Water Heat Program

Measure	Measure Considered for Billing Analysis	Number of Customers w/ Isolated-Measure Installations	Sufficient Participation for Billing Analysis
G 50 Gallon Natural Gas Water Heater	✓	51	
G Tankless Gas Water Heater	✓	225	✓

*This count includes rebates from Washington and Idaho

The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. The final number of customers in each the treatment and control group are listed in Table 3-13.

The Evaluators performed three tests to determine the success of PSM:

1. *t*-test on pre-period usage by month
2. Joint chi-square test to determine if any covariates are imbalanced
3. Standardized difference test for each covariate employed in matching

All tests confirmed that PSM performed well for each measure and the Evaluators conducted a linear regression using the matched participant and nonparticipant monthly billing data.

Table 3-13 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Water Heat Program as it provided the highest adjusted R-squared among the regression model for the tankless water heat measure. Although savings for the G Tankless Water Heater were statistically significant, the estimate is lower than what we would expect to see for this measure.

Table 3-13: Measure Savings, Water Heat Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
G Tankless Water Heater	225	224	13.78*	23.69	3.87	0.92	Model 2: PPR

*Not statistically significant

Because the results from this billing analyses are inconclusive, the Evaluators elected to utilize Avista TRM values to estimate verified savings for these measures. The findings from the PY2022 billing analyses for these measures may have been impacted by the COVID19 pandemic. Further details of the billing analysis for the variable speed motor measure can be found Appendix A.

3.2.1.6 Verified Savings

The Evaluators reviewed and applied the current Avista TRM values along with verified tracking data to estimate net program savings for this measure. The verified savings for the program is 28,407.84 Therms with a realization rate of 97.40%, as displayed in Table 3-9.

The realization rate for the natural gas savings in the Water Heat Program deviated from 100% because one project for each the G 50 Gallon Natural Gas Water Heater and the G Tankless Water Heater were verified to not meet minimum equipment efficiency requirements, and therefore savings for these two projects were verified to be 0 Therms. The Evaluators recommend that equipment efficiency is verified prior to fulfilling rebates for this program. These two adjustments are the only adjustments that led to the 97.40% realization rate.

3.2.2 HVAC Program

The HVAC program encourages installation of high efficiency HVAC equipment and smart Thermostats through customer incentives. The program is available to residential electric or natural gas customers with a winter heating season usage of 4,000 or more kWh, or at least 160 Therms of space heating in the prior year. Existing or new construction homes are eligible to participate in the program. Table 3-14 summarizes the measures offered under this program.

Table 3-14: HVAC Program Measures

Measure	Description	Impact Analysis Methodology
G Natural Gas Boiler	Natural gas boiler	Avista TRM
G Natural Gas Furnace	Natural gas forced air furnace	IPMVP Option A with billing data
G Natural Gas Wall Heater	Natural gas wall heater	Avista TRM
G Smart Thermostat DIY with Natural Gas Heat	Professionally installed connected Thermostats in natural gas-heated home	Avista TRM
G Smart Thermostat Paid Install with Natural Gas Heat	Variable speed motor in natural gas-heated home	Avista TRM

The following table summarizes the verified natural gas savings for the HVAC Program impact evaluation.

Table 3-15: HVAC Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Natural Gas Boiler	19	2,010	2,136	2,010	100.00%
G Natural Gas Furnace	1,751	152,685	123,519	181,116	118.62%
G Smart Thermostat DIY with Natural Gas Heat	173	4,635	4,609	3,477	75.01%
G Smart Thermostat Paid Install with Natural Gas Heat	1,094	29,304	29,146	29,306	100.01%
G Wall Furnace	3	327	245	327	100.00%
Total	**3,040**	**188,961.00**	**159,655.04**	**216,235.62**	**114.43%**

The HVAC Program displayed verified savings of 216,235.62 Therms with a realization rate of 114.43% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-16: HVAC Program Costs

Measure	Incentive Costs
G Natural Gas Boiler	$8,550.00
G Natural Gas Furnace	$790,200.00
G Smart Thermostat DIY with Natural Gas Heat	$20,034.42
G Smart Thermostat Paid Install with Natural Gas Heat	$164,706.88
G Wall Furnace	$1,800.00
Total	**$985,291.30**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the HVAC Program in the section below.

3.2.2.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the HVAC Program.

3.2.2.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the HVAC Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.1.

The Evaluators found all HVAC Program rebates to have project documentation with the associated HVAC model number and efficiency values in either the CC&B web rebate data or mail-in rebate applications. In addition, all projects contained associated AHRI certifications, allowing the Evaluators to easily verify model specifications.

3.2.2.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 2.2.2.2. The Evaluators included questions such as:

- What type of Thermostat did this Thermostat replace?
- Is your home heating with electricity, natural gas, or another fuel?
- Was the previous equipment functional?
- Is the newly installed equipment still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the HVAC Program. The responses to these additional questions can be found in Appendix A.

Table 3-17 displays the ISRs for each of the HVAC measures for Idaho and Washington natural gas territory combined. The ISRs resulted in ±8.09% precision at the 90% confidence interval for the program.

Table 3-17: HVAC Verification Survey ISR Results

Measure	Number of Rebates*	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
G Natural Gas Boiler	19	1	90% ±8.09%*	100%
G Natural Gas Furnace	1,751	59		100%
G Smart Thermostat DIY with Natural Gas Heat	173	8		100%
G Smart Thermostat Paid Install with Natural Gas Heat	1,094	32		100%
G Wall Furnace	3	0		Assume 100% ISR

*This count includes rebates from Washington and Idaho

Survey respondents described equipment to be currently functioning, leading to a 100% ISR for all measures except the G Natural Gas Furnace measure. The Evaluators applied the ISRs listed in Table 3-17 to each rebate to quantify verified savings for each measure.

3.2.2.4 Impact Analysis

This section summarizes the verified savings results for the HVAC Program. The Evaluators conducted a billing analysis for measures where participation allowed, however, the results were inconclusive. The Evaluators calculated verified savings for the remaining measures using active values from the Avista TRM workbook. These values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.2.5 Billing Analysis

The results of the billing analysis for the HVAC program are provided in this section. The methodology for the billing analysis is provided in Section 2.2.3.2.

Table 3-18 displays customer counts for customers considered for billing analysis (i.e. customer with single-measure installations) and identifies measures that met the requirements for a billing analysis. The customers considered for billing analysis include customers in both Washington and Idaho service territories in order to gather the maximum number of customers possible for precise savings estimates.

Table 3-18: Measures Considered for Billing Analysis, HVAC Program

Measure	Measure Considered for Billing Analysis	Number of Customers w/ Isolated-Measure Installations*	Sufficient Participation for Billing Analysis
G FURNACE 95% (Multi-Stage)	✓	187	✓
G Natural Gas Boiler	✓	2	
G Natural Gas Furnace	✓	1053	✓
G Smart Thermostat DIY with Natural Gas Heat	✓	427	✓
G Smart Thermostat Paid Install with Natural Gas Heat	✓	608	✓

*This count includes rebates from Washington and Idaho

The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. The final number of customers in each the treatment and control group are listed in provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the HVAC Program as it provided the highest adjusted R-squared among the regression models. Savings are not statistically significant at the 90% level for the DIY smart Thermostat measure.

Table 3-19.

The Evaluators performed three tests to determine the success of PSM:

4. *t*-test on pre-period usage by month
5. Joint chi-square test to determine if any covariates are imbalanced
6. Standardized difference test for each covariate employed in matching

All tests confirmed that PSM performed well for each measure and the Evaluators conducted a linear regression using the matched participant and nonparticipant monthly billing data.

provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the HVAC Program as it provided the highest adjusted R-squared among the regression models. Savings are not statistically significant at the 90% level for the DIY smart Thermostat measure.

Table 3-19 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the HVAC Program as it provided the highest adjusted R-squared among the regression models. Savings are not statistically significant at the 90% level for the DIY smart Thermostat measure.

Table 3-19: Measure Savings, HVAC Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
G FURNACE 95% (Multi-Stage)	187	183	20.28	37.19	3.36	0.91	Model 2: PPR
G Natural Gas Furnace	1,053	1,019	13.82	20.23	7.41	0.92	Model 2: PPR
G Smart Thermostat Paid Install with Natural Gas Heat	427	422	13.78	23.69	3.87	0.92	Model 2: PPR
G Smart Thermostat DIY with Natural Gas Heat*	608	594	-1.5	5.64	-8.64	0.94	Model 2: PPR

*Not statistically significant

Because the results from these three billing analyses are lower than we would expect for these measures, the Evaluators elected to utilize a retrofit isolation methodology for the furnaces, further described in the next section. For the smart thermostats, the Evaluators elected to use Avista TRM values to estimate verified savings.

Retrofit Isolation Results

A retrofit isolation approach was used to estimate savings for Natural Gas Furnaces in addition to the billing analysis. Because the retrofit isolation approach relies on extracting baseload usage estimate from summer (June – August) billing data, the sample was restricted to customers with installations in January, 2022 and 11 months of post installation data. Table 3-20 provides annual gas savings for Natural Gas Furnaces. The Evaluators estimate the G FURNACE 95% (Multi-Stage) at 103.16 Therms and the G Natural Gas Furnace measure to display an annual savings of 123.36 Therms. These verified valued were applied to all associated rebates in the Idaho gas service territory.

Table 3-20: Measure Savings for Natural Gas Furnaces, HVAC Program

Measure	# of Treatment Customers	Annual Savings/Customer (Therms)	90% Lower CI	90% Upper CI
G FURNACE 95% (Multi-Stage)	183	103.16	2.02	0.02
G Natural Gas Furnace	1,019	123.36	7.92	0.06

3.2.2.6 Verified Savings

The HVAC Program in total displays a realization rate of 114.43% with 216,235.04 Therms verified natural gas savings in the Idaho service territory, as displayed in Table 3-15.

The realization rate for the natural gas savings in the HVAC Program deviate from 100% due to differences between the billing analysis results and the RTF UES. In addition, one smart thermostat project was verified to not qualify based device capabilities and therefore the Evaluators removed savings for this project. All other rebates were assigned savings equivalent to the expected savings through Avista TRM values. The furnace measure has larger billing analysis results to the Avista TRM value (billing analysis indicated 103.16 Therms saved for G Natural Gas Furnace, while Avista TRM indicated 81.66 Therms).

The Evaluators attempted to estimate smart thermostat measure savings values for the HVAC Program. However, because the results from the billing analyses for smart thermostats were contradicting and/or inconclusive, the Evaluators elected to utilize Avista TRM values to estimate verified savings for these measures.

3.2.3 Shell Program

The Shell Program provides incentives to customers for improving the integrity of the home's envelope with upgrades to windows and storm windows. Rebates are issued after the measure has been installed for insulation and window measures. Participating homes must have natural gas or natural gas heating and itemized invoices including measure details such as insulation levels, window values, and square footage. In order to be eligible for incentive, the single-family households, including fourplex or less, must demonstrate an annual electricity usage of at least 8,000 kWh or an annual gas usage of at least 340 Therms. Multifamily homes have no usage requirement. This program includes free manufactured home duct sealing implemented by UCONS. Table 3-21 summarizes the measures offered under this program.

Table 3-21: Shell Program Measures

Measure	Description	Impact Analysis Methodology
G Attic Insulation With Natural Gas Heat	Attic insulation for homes heated with natural gas	Avista TRM
G Energy Star Certified Insulated Door	ENERGY STAR-certified door for homes heated with natural gas	Avista TRM
G Floor Insulation With Natural Gas Heat	Floor insulation for homes heated with natural gas	Avista TRM
G IGU Window Replc With Natural Gas Heat	IGU window replacement for homes heated with natural gas	Avista TRM
G Storm Windows with Natural Gas Heat	High-efficiency storm window replacement for homes heated with natural gas	Avista TRM
G Wall Insulation With Natural Gas Heat	Wall insulation for homes heated with natural gas	Avista TRM
G Window Replc With Natural Gas Heat	High-efficiency window replacement for homes heated with natural gas	Avista TRM

The following table summarizes the adjusted and verified natural gas savings for the Shell Program impact evaluation.

Table 3-22: Shell Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Attic Insulation With Natural Gas Heat	56	10,136	10,221	10,136	100.00%
G Energy Star Insulated Door	24	807	869	1,075	133.35%
G Floor Insulation With Natural Gas Heat	5	442	442	442	100.00%
G Storm Windows with Natural Gas Heat	1	34	33	33	97.37%
G Wall Insulation With Natural Gas Heat	13	899	899	1,299	144.61%
G Window Replc With Natural Gas Heat	255	11,878	11,476	7,374	62.08%
Total	**354**	**24,195.05**	**23,939.08**	**20,360.10**	**84.15%**

The Shell Program displayed verified savings of 20,360 Therms with a realization rate of 84.15% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-23: Shell Program Costs

Measure	Incentive Costs
G Attic Insulation With Natural Gas Heat	$50,678.25
G Energy Star Insulated Door	$4,100.00
G Floor Insulation With Natural Gas Heat	$5,530.50
G Storm Windows with Natural Gas Heat	$270.00
G Wall Insulation With Natural Gas Heat	$9,627.75
G Window Replc With Natural Gas Heat	$128,627.92
Total	**$198,834.42**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Shell Program in the section below.

3.2.3.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Shell Program.

3.2.3.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Shell Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

The Evaluators reviewed each measure number of units, square footage, and insulation where available. The Evaluators found six window replacement measures in which square footage quantity in the rebate application did not match the values presented in the project data. These instances are the primary reason for the lower than 100% realization rate.

The Evaluators also identified one wall insulation project where the square footage quantity in the rebate application was four times larger than the square footage in the tracking data, leading to a 145% realization rate for the wall measure as shown in Table 3-22.

The Evaluators identified one Energy Star Door measure in which three doors were installed but the expected savings only accounted for one door, leading to a verified savings that was three times the expected amount. This occurrence increased the realization rate to 133% for Energy Star certified insulated door measures as shown in Table 3-22

The Evaluators recommend collecting information on single-family/multi-family/manufactured in the web rebate form. This allows the Evaluators to categorize home type during the impact evaluation methodologies. The mail-in rebates collect this information; however, it does not seem to be required to complete the rebate and therefore many rebates are missing this information.

3.2.3.3 Verification Surveys

The Evaluators conducted verification surveys for Energy Star doors in Shell Program and found an in-service rate of 100%. The Evaluators did not conduct verification surveys for other measures in shell since weatherization measures historically have high verification rates.

3.2.3.4 Impact Analysis

This section summarizes the verified savings results for the Shell Program. The Evaluators calculated verified savings for the natural gas measures using the active Avista TRM values. The Evaluators calculated adjusted savings for each measure using the active Avista TRM values and verified tracking data. The Evaluators conducted a billing analysis for measures where participation allowed. However, the billing analysis results were not used due to unexpectedly low savings values. Therefore, the Avista TRM values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.3.5 Billing Analysis

The results of the billing analysis for the Shell program are provided in this section. The methodology for the billing analysis is provided in Section 2.2.3.2.

Table 3-24 displays customer counts for customers considered for billing analysis (i.e. customer with single-measure installations) and identifies measures that met the requirements for a billing analysis. The customers considered for attic insulation billing analysis include customers in both Washington and Idaho service territories to gather the maximum number of customers possible for precise savings estimates. Window was evaluated for ID alone.

Table 3-24: Measures Considered for Billing Analysis, Shell Program

Measure	Measure Considered for Billing Analysis	Number of Customers w/ Isolated-Measure Installations	Sufficient Participation for Billing Analysis
G Attic Insulation With Natural Gas Heat	✓	104	✓
G Energy Star Certified Insulated Door	✓	2	
G Floor Insulation With Natural Gas Heat	✓	1	
G Storm Windows with Natural Gas Heat	✓	1	
G Wall Insulation With Natural Gas Heat	✓	5	
G Window Replc With Natural Gas Heat	✓	136	✓

The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. The final number of customers in each the treatment and control group are listed in Table 3-25.

The Evaluators performed three tests to determine the success of PSM:

1. *t*-test on pre-period usage by month
2. Joint chi-square test to determine if any covariates are imbalanced
3. Standardized difference test for each covariate employed in matching

All tests confirmed that PSM performed well for each measure and the Evaluators conducted a linear regression using the matched participant and nonparticipant monthly billing data.

Table 3-25 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Shell Program as it provided the highest adjusted R-squared among the regression

models. Savings are statistically significant at the 90% level for all measures and the adjusted R-squared shows the model provided an excellent fit for the data (adjusted R-squared > 0.90).

Table 3-25: Measure Savings, Shell Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
G Attic Insulation With Natural Gas Heat	74	486	63.75	22.59	104.91	0.92	Model 2: PPR
G Window Replc With Natural Gas Heat	98	597	32.87	8.39	57.36	0.91	Model 2: PPR

The Evaluators found the G Attic Insulation With Natural Gas Heat measure to display a statistically significant verified savings value of 63.75 Therms per year. In addition, the Evaluators found statistically significant savings of 32.87 Therms per year for the G Window Replacement with Natural Gas Heat measure. Although the Evaluators estimated savings for these measures through billing analysis, the verified savings for the measures were calculated via Avista TRM due to unexpectedly low savings estimates when applying the modeled savings. Further details of the billing analysis for the Shell measures can be found in Appendix A: Billing Analysis Results.

3.2.3.6 Verified Savings

The Shell Program in total displays a realization rate of 84.15% with 20,360 Therms verified natural gas savings in the Idaho service territory, as displayed in Table 3-22. The realization rate for the natural gas savings in the Shell Program is lower than 100% due primarily to differences in quantity in the tracking data and the verified documentation.

3.2.4 Fuel Efficiency Program

The Residential Fuel Efficiency Program encourages customers to consider converting their resistive electric space and water heating equipment to natural gas. This program is offered to residential customers in the Idaho service territory. Customers must use Avista electricity for electric straight-resistance heating or water heating in order to qualify for the rebate, which is verified by evaluating their energy use. The home's electric baseboard or furnace heat consumption must indicate at least 8,000 kWh during the previous heating season. Customers receive incentives after installation and after submitting a completed rebate form. Table 3-26 summarizes the measures offered under this program.

Table 3-26: Fuel Efficiency Program Measures

Measure	Description	Impact Analysis Methodology
E Electric to Air Source Heat Pump	Electric central ducted forced air furnace to air source heat pump (9.0 HFSP or greater)	RTF UES
E Electric To Natural Gas Furnace	Electric baseboard or forced air furnace heat to natural gas forced air furnace	Billing Analysis
E Electric To Natural Gas Furnace & Water Heat	Electric to natural gas furnace and water heat combo	Avista TRM

The program does not contain any natural gas saving measures; however, the program includes a Therms penalty due to converting electric equipment to natural gas equipment. The verified Therms penalty is 19,468.00 Therms and represents a 100.00% realization rate against the expected Therms penalty amount of 19,468.00 Therms. The following table displays the Therms penalty by measure.

Table 3-27: Fuel Efficiency Program Verified Natural Gas Penalty

Measure	PY2022 Participation	Expected Penalty (Therms)	Adjusted Penalty (Therms)	Verified Penalty (Therms)	Verified Realization Rate
E Electric To Natural Gas Furnace	27	12,123	12,123	12,123	100.00%
E Electric To Natural Gas Furnace & Water Heat	13	7,345	7,345	7,345	100.00%
Total	**40**	**19,468.00**	**19,468.00**	**19,468.00**	**100.00%**

The Therms penalties represented in the table above are not aggregated in the Residential portfolio impact evaluation and are summarized here for planning purposes. The costs associated with this program are claimed in the Idaho Electric Impact Evaluation Report. The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Fuel Efficiency Program in Idaho Electric Impact Evaluation Report for PY2022.

3.2.5 ENERGY STAR® Homes Program

The ENERGY STAR® Homes Program provides rebates for homes within Avista's service territory that attain an ENERGY STAR® certification. This program incentivizes ENERGY STAR® Eco-rated homes. Table 3-28 summarizes the measures offered under this program.

Table 3-28: ENERGY STAR® Homes Program Measures

Measure	Description	Impact Analysis Methodology
G Energy Star Home - Manufactured, Natural Gas	ENERGY STAR-rated manufactured home with natural gas furnace	RTF UES
G Energy Star Home - Manufactured, Gas & Electric	ENERGY STAR-rated manufactured home with natural gas and electric	RTF UES

In PY2022, no gas ENERGY STAR Homes rebates were claimed.

3.2.6 Small Home & MF Weatherization Program

The Small Home & MF Weatherization Program is a residential prescriptive program that waives the energy usage requirement that is typically employed for residential prescriptive programs. This benefits small homes (less than 1,000 square feet in size) and multifamily dwellings (specifically customers in condominiums larger than five units in size). While this program is designed for all customers, it could also benefit members of Named Communities who reside in smaller homes.

This section summarizes the impact results of the evaluation results for the Small Home & MF Weatherization Program. Table 3-29 summarizes the measures offered under this program.

Table 3-29: Small Home & MF Weatherization Program Measures

Measure	Description	Impact Analysis Methodology
G Multifamily Attic Insulation With Natural Gas Heat	Attic insulation for multifamily homes with natural gas heat	Avista TRM
G Multifamily Smart Thermostat Paid	Connected thermostat for multifamily homes with electric heat, contractor-installed	Avista TRM
G Multifamily Furnace 95%	Install high efficiency furnace water heater in multifamily home	Avista TRM
G Multifamily Smart Thermostat DIY	Connected thermostat for multifamily homes with electric heat, self-installed	Avista TRM
G Multifamily Tankless Water Heater	Install high efficiency tankless water heater in multifamily home	Avista TRM
G Multifamily 50 Gallon Natural Gas Water Heater	Install high efficiency 50 gallon tank water heater in multifamily home	Avista TRM
G Multifamily Wall Insulation With Natural Gas Heat	Wall insulation for multifamily homes with electric heat	Avista TRM
G Multifamily Window Replc With Natural Gas Heat	Window replacement for multifamily homes with natural gas heat	Avista TRM

The following table summarizes the verified natural gas savings for the Small Home & MF Weatherization Program impact evaluation.

Table 3-30: Small Home & MF Weatherization Program Verified Natural Gas Savings

Measure	PY2022 Units	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Multifamily Attic Insulation With Natural Gas Heat	1	13	16	16	120.00%
G Multifamily Smart Thermostat DIY	4	107	107	107	100.01%
G Multifamily Smart Thermostat Paid	3	80	80	80	100.01%
G Multifamily Window Replc With Natural Gas Heat	6	299	147	240	80.03%
G Multifamily Furnace 95%	5	435	437	437	100.34%
G Multifamily Tankless Water Heater	1	78	77	77	98.08%

Measure	PY2022 Units	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Total	**20**	**1,011.78**	**862.11**	**954.61**	**94.35%**

The Small Home & MF Weatherization Program displayed verified savings of 954.61 Therms with a realization rate of 94.35% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-31: Small Home & MF Weatherization Program Costs

Measure	Incentive Costs
G Multifamily Attic Insulation With Natural Gas Heat	$324.00
G Multifamily Smart Thermostat DIY	$405.51
G Multifamily Smart Thermostat Paid	$450.00
G Multifamily Window Replc With Natural Gas Heat	$3,150.96
G Multifamily Furnace 95%	$2,250.00
G Multifamily Tankless Water Heater	$400.00
Total	**$6,980.47**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Small Home & MF Weatherization Program in the section below.

3.2.6.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Small Home & MF Weatherization Program.

3.2.6.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Small Home & MF Weatherization Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

The rebate application form sufficiently collects all required RTF measure specification details. All rebate applications and tracking data contain smart Thermostat manufacturer and model number. The Evaluators were able to verify the models for RTF specifications for connected Thermostats.

The Evaluators found that many projects exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). The Evaluators recommend claiming projects on single family homes that are larger than 1,000 SQFT into the Small Home & MF Weatherization Program.

In addition, the Evaluators note that the current program rebate applications do not provide an option to indicate "Multifamily" home type. Rather, the current rebate application includes an option for "Single family", "Manufactured", "New construction", and "Other". The Evaluators recommend including an option for "Multifamily" to consistently apply RTF savings for each of the measures.

The Evaluators reviewed each measure number of units, square footage, and insulation where available. The Evaluators found no instances in which square footage quantity in the rebate application does not

match the values presented in the project data attic insulation. The Evaluators also note that Avista consistently verified square footage and R-values with customers when information was unclear. The tracked quantity and U-values were then documented in the tracking database consistently.

The Evaluators found no duplicate rebates in the project data and therefore did not remove any rebates from verified savings.

3.2.6.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed non-weatherization measure. The Evaluators included questions such as:

- Was the previous equipment functional?
- Is the newly installed equipment still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the Small Home & MF Weatherization Program. Table 3-32 displays the ISRs for each of the measures for the Idaho territory alone.

Table 3-32: Small Home & MF Weatherization Verification Survey ISR Results

Measure	Number of Rebates*	Number of Survey Completes*	Program-Level Precision at 90% Confidence	In-Service Rate
G Multifamily 50 Gallon Natural Gas Water Heater	1	1	90% ±46.78%	Assume 100% ISR
G Multifamily Attic Insulation With Natural Gas Heat	5	0		Assume 100% ISR
G Multifamily Furnace 95%	4	1		100%
G Multifamily Smart Thermostat DIY	3	1		100%
G Multifamily Smart Thermostat Paid	1	0		Assume 100% ISR
G Multifamily Tankless Water Heater	6	1		Assume 100% ISR
G Multifamily Window Replc With Natural Gas Heat	1	1		Assume 100% ISR
G Multifamily Wall Insulation With Natural Gas Heat	5	0		Assume 100% ISR

*This count includes rebates from Idaho only

The response rate for this verification survey did not meet 90/10 precision goals for either single state or mixed state. Therefore, the Evaluators assumed 100% in-service rate for these measures. However, survey respondents for each smart thermostat, water heater, and furnace measure described equipment to be currently functioning, further supporting the 100% ISR assumption. The Evaluators applied these ISRs to each rebate to quantify verified savings for each measure.

3.2.6.4 Impact Analysis

This section summarizes the verified savings results for the Small Home & MF Weatherization Program. The Evaluators calculated verified savings for the natural gas measures using the most recent RTF workbook for the Small Home & MF Weatherization measures. These RTF UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.6.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. Final verified savings were estimated using the RTF UES values associated with each measure. The Small Home & MF Weatherization Program displayed 94.35% realization with 955 Therms saved, as displayed in Table 3-30.

The realization rate for the natural gas savings in the Small Home & MF Weatherization Program deviate from 100% due to differences between the attic insulation savings values assigned to the project quantities and the verified Avista TRM prescriptive savings value. Avista used a value of 0.30 Therms/SQFT instead of multifamily attic Avista TRM value listed at 0.036 Therms/SQFT for the one sampled attic insulation measure. This led to a 120% realization rate for this measure. In addition, the Evaluators verified one window rebate to have almost half the square footage that the Avista database captured. This led to an 80% realization rate for the window replacement measure overall. In-service rates did not affect the realization rates for this program, as the assumed ISR for this program is 100%, as described in the sections above.

3.2.7 Appliance Program

The Appliances Program is residential prescriptive program that offers incentives for customers to upgrade their existing clothes washers and dryers to ENERGY STAR-rated clothes dryers and washers.

This section summarizes the impact results of the evaluation results for the Appliances Program. Table 3-33 summarizes the measures offered under this program.

Table 3-33: Appliance Program Measures

Measure	Description	Impact Analysis Methodology
G Energy Star Rated Clothes Dryer	ENERGY STAR-certified clothes dryer for residential homes	RTF UES
G Energy Star Rated Front Load Washer	ENERGY STAR-certified front loading clothes washer for residential homes	RTF UES
G Energy Star Rated Top Load Washer	ENERGY STAR-certified top loading clothes washer for residential homes	RTF UES

The following table summarizes the verified natural gas savings for the Appliance Program impact evaluation.

Table 3-34: Appliance Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Energy Star Rated Clothes Dryer	27	73.44	266.96	252.13	343.31%
G Energy Star Rated Front Load Washer	50	301.50	204.78	204.78	67.92%
G Energy Star Rated Top Load Washer	7	42.21	28.67	0.00	0.00%
Total	**84**	**417.15**	**500.41**	**456.91**	**109.53%**

The Appliance Program displayed verified savings of 456.91 Therms with a realization rate of 109.53% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-35: Appliance Program Costs

Measure	Incentive Costs
G Energy Star Rated Clothes Dryer	$1,350.00
G Energy Star Rated Front Load Washer	$2,450.00
G Energy Star Rated Top Load Washer	$350.00
Total	**$4,150.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Appliance Program in the section below.

3.2.7.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Appliance Program.

3.2.7.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Appliance Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.1.

The Evaluators found all Appliance Program rebates to have project documentation with the associated model number and efficiency values in either the CC&B web rebate data or mail-in rebate applications. In addition, documents included AHRI certifications or model numbers necessary to verify AHRI certifications. This allowed Evaluators to easily verify model specifications and apply savings.

3.2.7.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 2.2.2.2. The Evaluators included questions such as:

- What type of clothes washer/dryer did this clothes washer/dryer replace?
- Is your home's water heated with electricity, natural gas, or another fuel?
- Was the previous equipment functional?
- Is the newly installed equipment still properly functioning?

The responses to this verification survey were used to calculate ISRs for the measures offered in the Appliance Program. The responses to these additional questions can be found in Appendix A.

Table 3-36 displays the ISRs for each of the Appliance measures for Idaho and Washington natural gas territory combined. The ISRs resulted in ±16.7% precision at the 90% confidence interval for the program.

Table 3-36: Appliance Verification Survey ISR Results

Measure	Number of Rebates*	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
G Energy Star Rated Clothes Dryer	27	6	90% ±16.7%	100%
G Energy Star Rated Front Load Washer	50	12		100%
G Energy Star Rated Top Load Washer	7	0		Assume 100% ISR

*This count includes rebates from Washington and Idaho

Although the survey responses did not meet the 90/10 precision goals, all survey respondents described equipment to be currently functioning, leading to a 100% ISR for all measures. The Evaluators applied the ISRs listed in Table 3-36 to each rebate to quantify verified savings for each measure.

3.2.7.4 Impact Analysis

This section summarizes the verified savings results for the Appliance Program. The Evaluators calculated verified savings for the remaining measures using active values from the Avista TRM workbook. These values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.2.7.5 Billing Analysis

The Evaluators did not complete a billing analysis for the measures in the Appliance Program.

3.2.7.6 Verified Savings

The Appliance Program in total displays a realization rate of 109.53% with 457 Therms verified natural gas savings in the Idaho service territory, as displayed in Table 3-34.

The Evaluators note that all gas clothes dryer rebates were assigned 0 Therms expected savings. However, the Evaluators applied Avista TRM UES to these rebates, therefore leading to a high realization rate for the measure.

In addition, the RTF assigns 120 kWh/unit savings value for the front load washer. The Evaluator assigned equivalent Therms savings by dividing by 29.3. The Evaluators therefore estimate 4 Therms/unit of savings for each clothes washer. However, the Avista TRM erroneously converted this value to 6 Therms/unit, therefore leading to a low verified realization rate.

Finally, the Evaluators removed savings applied to the top load washer. The RTF clothes washer workbook calculates negative savings for the top load washer, as the market practice baseline for this measure is already more efficient than the incentivized efficiency. Therefore, since the RTF does not assign electric savings to top load washers, the Evaluators deem 0 equivalent savings in Therms. This led to a downward adjustment on the program's realization rate.

Overall, the program displays a realization rate of 109.53% due to the unexpected savings accrued from the clothes dryers. The Evaluators recommend Avista correct savings estimates for the front load washer measure, remove the top load washer measure from program offerings, and perform additional quality assurance to ensure rebates are properly attributed savings throughout the database.

4. Low-Income Impact Evaluation Results

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies ("Agencies") and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

The Evaluators completed an impact evaluation on Avista's Low-Income portfolio to verify program-level and measure-level energy savings for PY2022. The following sections summarize findings for each natural gas impact evaluation in the Low-Income Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, and RTF values to evaluate verified savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data. Table 4-1 summarizes the Low-Income verified impact savings by program.

Table 4-1: Low-Income Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Low-Income	1,941.89	1,954.31	100.64%
Total Low-Income	**1,941.89**	**1,954.31**	**100.64%**

In PY2022, Avista completed and provided incentives for low-income gas measures in Idaho and achieved total natural gas savings of 1,954 Therms. The Low-Income Program met savings expectations based on reported savings with an achieved realization rate of 100.64%. Further details of the impact evaluation results by program are provided in the sections following.

4.1 Program-Level Impact Evaluation Results

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Low-Income sector in the section below.

4.1.1 Low-Income Program

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies ("Agencies") and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

Avista provides CAP agencies with the following approved measure list, which are reimbursed in full by Avista. Avista also provides a rebate list of additional energy saving measures the CAP agencies are able

to utilize which are partially reimbursed. The following table summarizes the measures offered under this program.

Table 4-2 summarizes the measures offered under this program.

Table 4-2: Low-Income Program Measures

Measure	Impact Analysis Methodology
Air Infiltration	Avista TRM
Air source heat pump	
Attic insulation	
Duct insulation	
Duct sealing	
Natural gas to air source heat pump	
Natural gas to ductless heat pump	
ENERGY STAR® door	
ENERGY STAR® refrigerator	
ENERGY STAR® window	
Floor insulation	
Heat pump water heater	
LED lighting	
Wall insulation	
High efficiency furnace	
High efficiency tankless natural gas water heater	
Natural gas boiler	

Table 4-3 summarizes the verified natural gas savings for the Low-Income Program impact evaluation.

Table 4-3: Low-Income Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Air Infiltration	13	132.61	133.66	133.66	100.79%
G Duct Sealing	2	25.17	25.03	25.03	99.44%
ENERGY STAR® door	6	68.30	69.05	69.05	101.10%
ENERGY STAR® window	12	271.50	266.87	266.87	98.29%
G HE Boiler	2	159.84	158.90	158.90	99.41%
G HE Furnace	8	497.92	497.92	497.92	100.00%
G HE WH 50G	1	7.05	7.05	7.05	100.00%
G INS - Attic	6	340.02	348.21	348.21	102.41%
G INS - Duct	1	7.00	14.14	14.14	202.00%
G INS - Floor	7	342.48	348.21	348.21	101.67%
G INS - Wall	2	90.00	85.27	85.27	94.74%

Health And Safety	15	0.00	0.00	0.00	N/A
Total	**75**	**1,941.89**	**1,954.31**	**1,954.31**	**100.64%**

The Low-Income Program displayed verified savings of 1,954 Therms with a realization rate of 100.64% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 4-4: Low-Income Program Costs

Measure	Incentive Costs
G Air Infiltration	$1,050.14
G Duct Sealing	$289.00
ENERGY STAR® door	$5,279.30
ENERGY STAR® window	$35,774.29
G HE Boiler	$22,670.40
G HE Furnace	$44,560.59
G HE WH 50G	$4,516.80
G INS - Attic	$3,452.49
G INS - Duct	$252.11
G INS - Floor	$6,924.28
G INS - Wall	$1,432.83
Health And Safety	$39,767.77
Total	**$165,970.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Low-Income Program in the section below.

4.1.1.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Low-Income Program.

4.1.1.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Low-Income Program. The Evaluators selected a subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

During review, the Evaluators found that all the requested project information clearly outlined measure details and calculations. In addition, the Evaluators found database quantity information to be consistent with documents verified.

The Evaluators identified one instance in which verified savings from a duct insulation measure was double the reported savings. The reason for this deviation is unclear, however, the Evaluators recommend that Avista work to ensure Avista TRM rates are properly applied.

4.1.1.3 Verification Surveys

The Evaluators did not conduct verification surveys for the Low-Income Program.

4.1.1.4 Impact Analysis

This section summarizes the verified savings results for the Low-Income Program. The Evaluators calculated verified savings for Low-Income Program measures using the Avista TRM. However, a whole building billing analysis was completed to supplement the findings from the desk review.

4.1.1.5 Billing Analysis

The results of the billing analysis for the Low-Income Program are provided below.

The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolated each unique measure. In doing so, the Evaluators also isolate the measure effects using the customer's consumption billing data. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators were unable to estimate measure-level savings through billing analysis.

The Evaluators instead conducted a whole-home billing analysis for all the natural gas measures combined in order to estimate savings for the average household participating in the program, across all measures. The Evaluators successfully created a matched cohort for the natural gas measure households. Customers were matched on zip code (exact match) and their average pre-period seasonal usage, including summer, fall, winter, and spring for each control and treatment household. The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers.

Table 4-5 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Low-Income Program as it provided the highest adjusted R-squared among the regression models. However, savings for this model are not statistically significant at the 90% level, indicated by the lower 90% confidence bound at 0 Therms saved per year. The customers considered for billing analysis include customers in both Washington and Idaho service territories to gather the maximum number of customers possible for precise savings estimates.

Table 4-5: Measure Savings, Low-Income Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
All Gas Measures (Therms)	69	593	9.84*	0	25.12	0.89	Model 2: PPR

*Not statistically significant

Due to lack of statistical significance from the billing analysis results, The Evaluators did not apply these regression savings estimates to the program. Instead, the Evaluators estimated savings through the program by applying Avista TRM values to verified quantities. Further details of the billing analysis can be found in Appendix A.

4.1.1.6 Verified Savings

Due to lack of significance in the billing analyses, the Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program savings for those measures. Adjusted savings were

estimated using the Avista TRM. The Low-Income Program in total displays a realization rate of 100.64% with 1,954 Therms verified natural gas savings in the Idaho service territory, as displayed in Table 4-3.

The Evaluators note that there were few notable deviations between the expected and verified savings leading to a realization rate close to 100%. The Evaluators did identify one instance in which verified savings from a duct insulation measure was two times the reported savings. The reason for this deviation is unclear, however, the Evaluators recommend that Avista work to ensure Avista TRM rates are properly applied.

5. Nonresidential Impact Evaluation Results

The Evaluators completed an impact evaluation on Avista's Non-Residential portfolio to verify program-level and measure-level energy savings for PY2022. The following sections summarize findings for each natural gas impact evaluation in the Non-Residential Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM 2022, RTF, IPMVP, supplemental sources and billing analysis of participants to evaluate savings. The approach selected for each program allowed for the strongest estimate of achieved savings practical for each program, dependent on each program's delivery method, magnitude of savings, number of participants, and availability of data. Table 5-1 summarizes the Non-Residential verified impact savings by program.

Table 5-1: Non-Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
HVAC	5,081.68	5,081.68	5,081.68	100.00%
Food Service Equipment	12,910.00	12,910.00	12,910.00	100.00%
Shell	260.00	260.00	260.00	100.00%
Site-Specific	9,255.77	9,255.77	19,709.00	212.94%
Total	**27,507.45**	**27,507.45**	**37,960.68**	**138.00%**

In PY2022, Avista completed and provided incentives for non-residential natural gas measures in Idaho and reported total natural gas energy savings of 37,960.680 Therms. All programs exceeded savings claims, leading to an overall achievement of 138.00% of the expected savings for the non-residential programs. Further details of the impact evaluation results by program are provided in the sections following.

5.1 Verification Results

Before conducting the impact analyses, the Evaluators conducted a database review for all prescriptive programs. The Evaluators selected a random subset of rebate applications and associated documents from participating customers to cross-verify tracking data inputs. These documents included invoices, rebate applications, pictures, AHRI certificates and similar types of documents for the following programs:

- HVAC Program
- Food Service Equipment Program
- Shell Program

This sample of documents was used to cross-verify tracking data inputs. In the case the Evaluators found any deviations between the tracking data and application values, the Evaluators reported and summarized those differences in the appropriate report chapters.

The Evaluators developed a sampling plan that achieves a sampling precision of ±10% at 90% statistical confidence – or "90/10 precision" – to estimate the percentage of projects for which the claimed savings are verified or require some adjustment.

Table 5-2 displays program populations, sample sizes for document verification and resulting precision.

Table 5-2: Non-Residential Program-level Verification Precision

Program	Population	Sampled	Precision
HVAC	40	27	±9.14%
Food Service Equipment	6	6	±0%
Shell	1	1	±0%

5.1.1 On-Site Verification

Unlike Residential measures, non-residential measures typically have a 100% installation rate or a deemed in-service rate (ISR) included in RTF and Avista TRM UES. The exception to this rule are custom projects, such as those in the Site-Specific programs. For this the Evaluators conducted one on-site visit to verify full installation and equipment operation as described in the project scope.

5.2 Program-Level Impact Evaluation Results

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, for the Non-Residential sector in the section below.

5.2.1 Prescriptive HVAC Program

The Prescriptive Natural Gas HVAC Program encourages customers to select highly efficient natural gas heating equipment solutions for their business. Installing high efficiency equipment helps lower operating costs and save energy. The prescriptive rebate approach issues payment to the customer after the measure has been installed. Commercial customers who heat with Avista natural gas are eligible for this program. Customers must submit a completed rebate form, invoices, and an AHRI certificate within 90 days after the installation has been completed.

Table 5-3 summarizes the measures rebated in PY2022 under this program.

Table 5-3: Prescriptive HVAC Program Measures

Measure	Impact Analysis Methodology
Natural Gas Boiler	Avista TRM 2022 UES
Multi-Stage Furnace	Avista TRM 2022 UES
Single-Stage Furnace	Avista TRM 2022 UES
Unit Heater	Avista TRM 2022 UES

The following table displays the claimed, adjusted and verified savings from the Prescriptive HVAC program.

Table 5-4: Prescriptive HVAC Program Verified Natural Gas Savings

Measure	PY2022 Participation (Projects)	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
95 Percent or greater AFUE NG single stage furnace 225	6	1,849.68	1,849.68	1,849.68	100.00%
90 - 94.9 Percent AFUE NG single stage furnace 225	3	482.16	482.16	482.16	100.00%
90 Percent AFUE or greater NG boiler 300	1	631.40	631.40	631.40	100.00%
95 Percent AFUE or greater NG multi stage furnace 225	6	2,118.44	2,118.44	2,118.44	100.00%
Total	**16**	**5,081.68**	**5,081.68**	**5,081.68**	**100.00%**

The following table summarizes the incentives associated with the program.

Table 5-5: Prescriptive HVAC Program Incentives

Measure	Incentive Costs
95 Percent or greater AFUE NG single stage furnace 225	5,544.00
90 - 94.9 Percent AFUE NG single stage furnace 225	840.00
90 Percent AFUE or greater NG boiler 300	1,980.00
95 Percent AFUE or greater NG multi stage furnace 225	6,526.00
Total	**14,890.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Prescriptive HVAC Program in the section below.

5.2.1.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Prescriptive HVAC Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1. Verification of project documents included data points such as input BTUs, efficiency levels and costs of the equipment.

Table 5-6 shows the project population, the number of projects checked and the overall precision.

Table 5-6: Prescriptive HVAC Program Verification Precision

Population	Sampled	Precision
16	14	±8.03%

The Evaluators did not find any substantive deviations between project applications and program tracking data. The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive HVAC Program.

5.2.1.2 Impact Analysis

This section summarizes the verified savings results for the Prescriptive VFD Program. The Evaluators calculated verified savings for furnace and boiler measures using the Avista TRM. The RTF does not currently offer a section for non-residential furnaces; however the RTF does currently provide savings estimates for non-residential boilers. The Evaluators attempted to use the RTF to calculate verified savings for boilers, but found project documentation to be insufficient to determine key characteristics necessary to assign RTF UES. Specific characteristics required are building type: 'Grocery, Restaurant, and Lodging,' 'Medical – Hospital and Outpatient' or 'All Other.' The Evaluators attempted to ascertain this information from detailed project-level documents but were unable to make determinations. A recommendation is made below to address this. Final verified savings were calculated by applying the appropriate TRM UES to a census of measures.

5.2.1.3 Verified Savings

The Evaluators reviewed and applied the current TRM UES values for the Attic and Wall insulation measures along with verified tracking data to estimate net program savings for this measure. The verified savings for the program is 5,081.68 Therms with a realization rate of 100%, as displayed in Table 5-4.

5.2.2 Food Service Equipment Program

The Food Service Equipment Program offers incentives for commercial customers who purchase or replace food service equipment with ENERGY STAR-qualified equipment. This prescriptive rebate approach issues payment to the customer after the measure has been installed. Commercial customers who use Avista natural gas to operate the equipment submitted for a rebate are eligible for this program. Customers must submit a completed rebate form and invoices within 90 days after the installation has been completed. Avista will send incentive checks to the customers or their designees after each project is approved. The website is also used to communicate program requirements, incentives, and forms.

Table 3-8 summarizes the measures rebated in PY2022 under this program.

Table 5-7: Prescriptive Food Service Equipment Program Measures

Measure	Impact Analysis Methodology
Convection oven	RTF, Convection Oven v4.2
Combination oven	RTF, Commercial Cooking RTF Combination Ovens v4.2
Griddle	RTF, Griddles v1.2
Rack oven	RTF, Rack Ovens v1.2
Dishwasher	Avista TRM, Non-Res Dishwashers (multiple)
Energy Star ice machine	RTF, Commercial ENERGY STAR™ Ice Makers v1.3
Fryer	RTF, Commercial Cooking Fryer v4.2
Hot food holding cart	RTF, Commercial Cooking Hot Food Cabinet v4.2
Steam cookers	RTF, Commercial Cooking Steamer v4.2
Pre-rinse sprayer	Avista TRM, Non-Res Pre-Rinse Sprayer (multiple)
Overwrapper	RTF, On-Demand Overwrappers v1.1

The following table summarizes the claimed, adjusted and verified Therms savings for the program.

Table 5-8: Prescriptive Food Service Equipment Program Verified Natural Gas Savings

Measure	PY2022 Participation (Projects)	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
Commercial Convection Oven Natural Gas full size	2	1,800.00	1,800.00	1,800.00	100.00%
Commercial Fryer Gas	14	11,110.00	11,110.00	11,110.00	100.00%
Total	**16**	**12,910.00**	**12,910.00**	**12,910.00**	**100.00%**

The following table summarizes the incentives associated with the program.

Table 5-9: Prescriptive Food Service Equipment Program Costs by Measure

Measure	Measure Count	Total Natural Gas Incentives	Total Partner Incentives
Commercial Convection Oven Natural Gas full size	4	$2,800.00	$6,800.00
Commercial Fryer Gas	22	$22,000.00	$23,400.00
Total	**26**	**$24,800.00**	**$30,200.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Prescriptive Food Service Equipment Program in the section below.

5.2.2.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Prescriptive Food Service Equipment Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1. Data points checked between project applications and program tacking include fuel type, capacity, ENERGYSTAR® status, quantity, and measure cost values.

Table 5-10 shows the project population, the number of projects checked and the overall precision.

Table 5-10: Prescriptive Food Service Equipment Program Verification Precision

Population	Sampled	Precision
16	14	±8.03%"

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive Food Service Equipment Program and did not find any substantive differences between program tracking and project documents.

5.2.2.2 Impact Analysis

Both measures that appear in the PY2022 program, there is no current RTF measure offering to supply UES, or the RTF measure does not include calculations for Therms savings. In these instances, the Evaluators used Avista TRM values. Evaluators did not find any deviations between claimed and verified TRM UES.

Final verified savings were calculated by applying the appropriate UES to a census of measures.

5.2.2.3 Verified Savings

The Evaluators reviewed and applied the appropriate UES values to verified tracking data to estimate program savings for these measures. The verified savings for the program is 12,910 kWh with a realization rate of 100%, as displayed in Table 5-8.

5.2.3 Prescriptive Shell Program

The Commercial Prescriptive Shell Program offers incentives to commercial customers who improve the envelopes of their existing buildings by adding insulation, which may make a business more energy-efficient and comfortable. Avista issues payment to the customer after the measure has been installed by a licensed contractor. Commercial customers must have an annual heating footprint for a fuel provided by Avista.

Customers must submit a completed rebate form, invoices, and an insulation certificate within 90 days after the installation has been completed. Avista will send incentive checks to customers or their designees after each project is approved. This program is promoted by trade allies, Avista account executives, the Avista website, and Avista marketing efforts. Avista's website is also used to communicate program requirements, incentives, and forms.

Table 5-11 summarizes the measures rebated in PY2022 under this program.

Table 5-11: Prescriptive Shell Program Measures

Measure	Impact Analysis Methodology
Attic Insulation	Avista TRM UES
Roof Insulation	Avista TRM UES
Wall Insulation	Avista TRM UES

The following table summarizes the claimed, adjusted and verified Therm savings for the program.

Table 5-12: Prescriptive Shell Program Verified Natural Gas Savings

Measure	PY2022 Participation (Projects)	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
Attic =< R11 to R45+	1	260.00	260.00	260.00	100.00%
Total	**1**	**260.00**	**260.00**	**260.00**	**100.00%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-13: Prescriptive Shell Program Costs by Measure

Measure	Measure Count (Square Feet Installed)	Incentive Costs
Attic =< R11 to R45+	$2,000.00	$1,700.00
Total	**$2,000.00**	**$1,700.00**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Prescriptive Shell Program in the section below.

5.2.3.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Prescriptive Shell Program. The Evaluators review all rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1. Data points checked between project applications and program tacking

include R-levels, square footage of installation, HVAC configuration and measure cost values. Below, Table 5-14 shows the project population, the number of projects checked and the overall precision.

Table 5-14: Prescriptive Shell Program Verification Precision

Population	Sampled	Precision
1	1	±0%

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive Shell Program and there were no substantive deviations between program tracking data and project documents.

5.2.3.2 Impact Analysis

This section summarizes the verified savings results for the Shell Program. The Evaluators calculated verified savings for the natural gas measures using the active Avista TRM values. The Evaluators calculated adjusted savings for each measure using the active Avista TRM values and verified tracking data. The Evaluators conducted a billing analysis for measures where participation allowed. However, the billing analysis results were not used due to unexpectedly low savings values. Therefore, the Avista TRM values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

5.2.3.3 Verified Savings

The Evaluators reviewed and applied the current TRM UES values for the Attic and Wall Insulation measures along with verified tracking data to estimate net program savings for this measure. The verified savings for the program is 260.00 Therms with a realization rate of 100.0%, as displayed in Table 5-11. Evaluators did not find any deviations from TRM UES.

5.2.4 Site-Specific Program

The Site-Specific Program provides calculated incentives to support the installation of qualifying energy efficiency equipment at commercial/industrial sites. These projects typically have a higher degree of complexity than the traditional prescriptive offerings and rely on custom calculations of savings and incentive levels. Examples of these projects include process improvements, upgrades to specialized equipment used in manufacturing, lighting installations that rely on specialized controls, and other measures designed around the customer's specific needs.

The program approach strives for a flexible response to energy efficiency projects that have demonstrable Therm savings within program criteria and are typically composed of custom HVAC, envelope, and industrial process load projects that do not fit the prescriptive path. In PY2022 four projects were completed, consisting of the replacement of heated pool covers and boiler replacements.

The following table summarizes the verified natural gas energy savings for the Site-Specific Program impact evaluation.

Table 5-15: Site-Specific Program Verified Natural Gas Savings

PY2022 Participation	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Verified Realization Rate
2	9,255.77	9,255.77	19,709.00	212.94%

The Site-Specific Program displayed verified savings of 19,709.00 Therms with a realization rate of 212.94% against the expected savings for the program.

Table 5-16: Site-Specific Program Costs

Incentive Costs
$32,395.20

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Site-Specific Program in the section below.

5.2.4.1 Sample Design

In their review, the Evaluators conducted reviews of both natural gas savings projects completed during the PY2022 program year. The Evaluators obtained the project-related documentation for review. These documents typically included spec sheets, building characteristics, calculators, invoices, project photos, and trending data. This information allowed the Evaluators to replicate claimed savings estimates and develop M&V plans to be used in assessing verified savings and collecting on-site data.

Using project-specific M&V plans, the Evaluators visited each sites to verify measure installation and operating parameters, as well as building parameters and other data necessary to determine verified savings. The Evaluators were able to conduct visits at both of the project sites.

5.2.4.2 Impact Approaches

Impact approaches varied by project but adhered to IPMVP option A for one project, and a whole-facility billing analysis (option C) was feasible and provided statistically robust savings estimates for the second. Specified methodology and inputs are discussed in individual site reports, located in Appendix C: Site-Specific Site Reports.

5.2.4.3 Site-Level Realization

Adjusted and verified savings were developed for each sampled site. The realization rates for sites within each stratum were then applied to the non-sampled sites within their respective stratum. Table 5-17 presents realization at the site level, with program-level savings.

Table 5-17: Site-Specific Expected, Adjusted and Verified Therm Savings by Project

Project ID	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
SSOP_106886	3,570.00	3,570.00	3,570.00	100.00%
SSOP_111467	5,685.77	5,685.77	16,139.00	283.85%
Total	**9,255.77**	**9,255.77**	**19,709.00**	**212.94%**

5.2.4.4 Discussion of Non-100% Realization

- **SSOP_111467 -** Measured savings are higher than ex ante predictions.

5.2.4.5 Verified Savings

The Site-Specific Program in total displays a realization rate of 213% with 22,372 Therms verified natural gas energy savings in the Idaho service territory, as displayed in Table 5-18.

Table 5-18: Site-Specific Impact Summary

Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
9,255.77	**9,255.77**	**19,709.00**	**212.94%**

6. Appendix A: Billing Analysis Results

This appendix provides additional details on the billing analyses conducted for each program.

6.1 Low-Income Program

The Evaluators conducted a whole-home billing analysis for all the natural gas measures combined in order to estimate savings for the average household participating in the program, across all measures. The Evaluators successfully created a matched cohort for the natural gas measure households. Customers were matched on their average pre-period seasonal usage, including summer, fall, winter, and spring for each control and treatment household.

The Evaluators were provided a considerable pool of control customers to draw upon, as shown in Table 6-1. The Evaluators used propensity score matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 6-1, are the impact of various restrictions on the number of treatment and control customers that were included in the final regression model. The "Starting Count" displays the beginning number of customers available prior to applying the data restrictions, while the "Ending Count" displays the number of customers after applying data restrictions and final matching.

Table 6-1: Cohort Restrictions, Low-Income Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
Whole home natural gas	Starting Count	164	1852
	Install Date Range: January 1, 2022 to June 30, 2022	72	1852
	Control Group Usage Outlier (>2X max treatment usage)	72	1819
	Incomplete Post-Period Bills (<6 months)	69	1718
	Incomplete Pre-Period Bills (<10 months)	69	1718
	Ending Count (Matched by PSM)	69	593

The distributions prior to matching appear to be less similar in summer, with control customers averaging higher usage. However, after matching, the pre-period usage distribution in summer is more similar between the groups. The remaining pre-period seasons (winter, summer, fall), closely overlap before and after matching, indicating little differences exist on average between the groups prior to matching and validating the initial selection of control customers.

Figure *6-1* and Figure *6-2* display the density of each variable employed in propensity score matching for the combined natural gas measures before and after conducting matching.

The distributions prior to matching appear to be less similar in summer, with control customers averaging higher usage. However, after matching, the pre-period usage distribution in summer is more similar between the groups. The remaining pre-period seasons (winter, summer, fall), closely overlap before and

after matching, indicating little differences exist on average between the groups prior to matching and validating the initial selection of control customers.

Figure 6-1: Covariate Balance Before Matching, Low Income Gas Measures

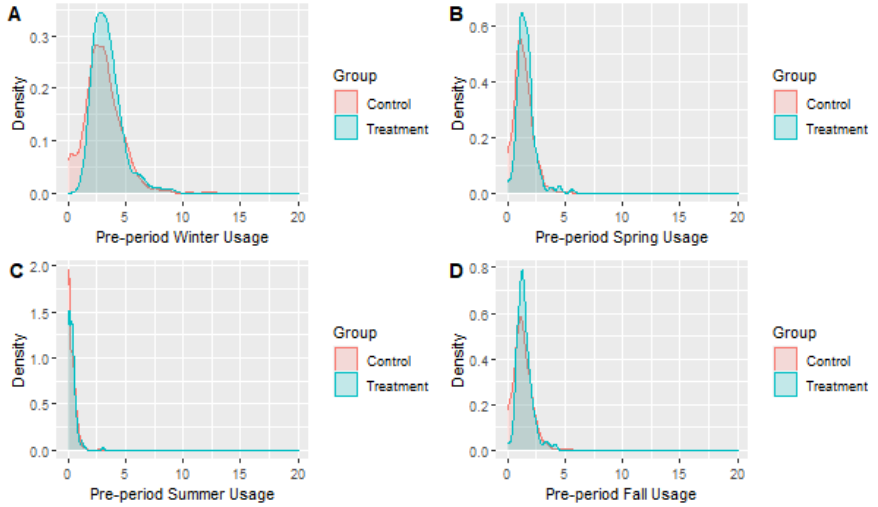
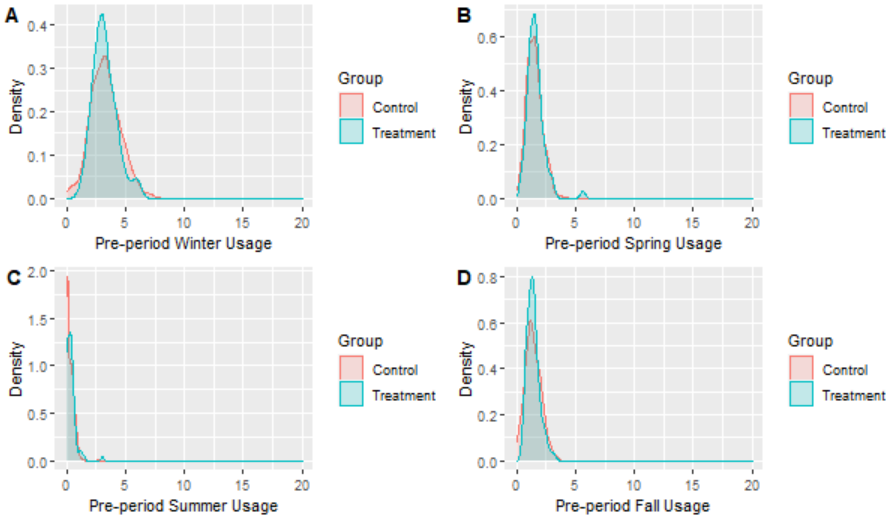


Figure 6-2: Covariate Balance After Matching, Low Income Gas Measures



The Evaluators performed three tests to determine the success of PSM:

1. *t*-test on pre-period usage by month
2. Joint chi-square test to determine if any covariates are imbalanced
3. Standardized difference test for each covariate employed in matching

All tests confirmed that PSM performed well for each measure. The t-test displayed no statistically significant differences at the 95% level in average daily consumption between the treatment and control groups for any month in the pre-period. In addition, the chi-squared test returned a p-value well over 0.05 for all measures, indicating that pre-period usage was balanced between the groups. Lastly, the standardized difference test returned values well under the recommended cutoff of 25, and always falling under 10, further indicating the groups were well matched on all included covariates.

Table 6-2 provides results for the *t*-test on pre-period usage between the treatment and control groups after matching for the Low-Income program. The P-Value is over 0.05 for each month, meaning pre-period usage between treatment and control groups is similar at the 95% confidence level.

Table 6-2: Pre-period Usage T-test for Gas Measures, Low-Income Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	3.37	3.20	1.70	0.10	0.09	No
Feb	3.24	3.08	1.50	0.10	0.13	No
Mar	2.33	2.27	0.70	0.09	0.48	No
Apr	1.61	1.53	1.04	0.07	0.30	No
May	0.86	0.87	-0.13	0.05	0.90	No
Jun	0.43	0.47	-0.78	0.05	0.43	No
Jul	0.27	0.29	-0.58	0.04	0.56	No
Aug	0.27	0.30	-0.67	0.04	0.50	No
Sep	0.44	0.49	-1.24	0.04	0.21	No
Oct	1.25	1.24	0.10	0.05	0.92	No
Nov	2.65	2.44	2.40	0.08	0.02	Yes
Dec	3.34	3.11	2.91	0.08	0.00	Yes

Table 6-3 provides customer counts for customers in the final regression model by assigned weather station ID for each measure. In addition, TMY HDD and CDD from the nearest available TMY weather station is provided as well as the weighted HDD/CDD for each measure. The HDD and CDD was weighted by the number of treatment customers assigned to a weather station.

Table 6-3: TMY Weather, Low-Income Program

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
All Gas Measures	720322	1	726985	4207	245	5956	414
	726817	4	726985	4207	245	5956	414
	727830	3	727830	5347	861	5956	414
	727834	3	727834	6773	343	5956	414
	727850	1	727850	6436	224	5956	414
	727856	49	727856	6052	437	5956	414
	727857	5	727857	6322	265	5956	414
	727870	3	727857	6322	265	5956	414

Table 6-4 provides annual savings/customer for the Low-Income program the program. Model 2 (PPR) was selected as the final model for the Low Income Program as it provided the highest adjusted R-squared among the regression models. Savings are statistically significant at the 90% level for all

measures and the adjusted R-squared shows the model provided an excellent fit for the data (adjusted R-squared > 0.90).

Table 6-4: Measure Savings for All Regression Models, Low-Income Program

Measure	Model	# of Treatment Customers	# of Control Customers	Annual Savings/Customer	90% Lower CI	90% Upper CI	Adjusted R-Squared
All Electric Measures	Diff-in-diff	69	593	65.8*	0	156.41	0.67
	PPR	69	593	9.84*	0	25.12	0.89
	Treatment Only (Gross)	69	593	21.2*	0	66.46	0.70

*Not statistically significant

The results of the billing analysis indicate no statistically significant savings were found for the gas measures.

7. Appendix B: Summary of Survey Respondents

This section summarizes additional insights gathered from the simple verification surveys deployed by the Evaluators for the impact evaluation of Avista's Residential and Low-Income Programs.

Survey respondents confirmed installing between one and three measures that were rebated by Avista, displayed in Table 7-1.

Table 7-1: Type and Number of Measures Received by Respondents

Measure Category	Total	Percent (n=305)
No Measures	36	4.80%
One Measure	84	11.10%
Two Measures	390	51.70%
Three Measures	168	22.20%
Four Measures	56	7.40%
Five or more measures	119	*15.80%*
HVAC	171	22.60%
Water Heater	99	13.10%
Smart Thermostat	201	26.60%
Clothes Washer	84	11.10%
Clothes Dryer	73	9.70%

The Evaluators asked respondents to provide information regarding their home, as displayed in Table 7-2. Similar to ADM's 2020 survey, the majority of respondents noted owning a single-family home between 1,000-3,000 square feet with central air conditioning.

Table 7-2: Survey Respondent Home Characteristics[11]

Question	Response	Percent
Do you rent your home? (n=755)	Own	94.30%
	Rent	1.30%
	Own and rent to someone else	0.90%
	I don't know	0%
	Prefer not to answer	3.40%
Which of the following best describes your home? (n=755)	Single-family house detached	87.20%
	Single-family house attached to one or more other houses	3.30%

[11] Four contractors or construction companies were not asked these questions.

	Mobile or manufactured home	6.20%
	Apartment	*0.60%*
	Other	1.90%
	I don't know	0.30%
	Prefer not to say	0.50%
Does your home have central air conditioning? (n=755)	Yes	74.40%
About how many square feet is your home? (n=629)	Less than 1,000ft^2	4.10%
	1,000-1,999ft^2	14.90%
	2,000-2,999ft^2	6.80%
	3,000-3,999ft^2	3.30%
	4,000ft^2 or more	2.50%
When was your home built? (n=719)	Before 1950	19.90%
	1950 to 1959	11.00%
	1960 to 1969	6.80%
	1970 to 1979	16.30%
	1980 to 1989	6.80%
	1990 to 1999	15.30%
	2000 to 2009	12.80%
	2010 to 2019	5.00%
	2020 to Present	5.70%
	I don't know	0.40%

8. Appendix C: Site-Specific Site Reports

This section displays site reports for each sampled project in the Site-Specific Program.

Project Number SSOP_106886

Project Background

The participant is a public recreation facility that received incentives from Avista for installing pool covers on (2) pools which are heated by natural gas. The Evaluators verified the participant had installed:

- Pool Cover on lap pool, approximately 3,876 sqft
- Pool Cover on activities pool, approximately 7,033 sqft

Both pools are located outdoors and are heaters to approximately 80^0.

M&V Methodology

The Evaluators reviewed all project documentation including plans, photos, and invoices, to verify the installation of rebated equipment. The Evaluators also conducted an onsite visit to the facility to verify installation and assumed operating parameters.

The Evaluators obtained natural gas metered billing data for the facility, but were unable to obtain statistically valid savings estimates.

Expected savings were calculated using proprietary modeling software, so the Evaluators examined inputs and model assumptions for accuracy and appropriateness. A brief benchmark study of commercial pool covers in similar climates was conducted and found to produce similar results to those claimed, corroborating therm savings claims.

Results

For project SSOP_106886 the therm realization rate is 100.0%.

Table 8-1: Verified Gross Savings, Realization Rates & Adjustments

Measure	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
Pool Covers	3,570	3,570	100.0%
Total	**3,570**	**3,570**	**100.0%**

Project Number SSOP_111467

Project Background

The participant is a school district that received incentives from Avista for replacing two inefficient boilers with a single efficient model at a junior high school. The Evaluators verified the participant had replaced:

- (2) Bryan 85% efficient natural gas boilers with (1) 96.1% efficient natural gas boiler

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment. Savings for the boiler measure was calculated using a weather-optimized billing analysis. The regression used one full year of pre-project natural gas billing data, one full year of post-project billing data and TM3 data, with HDD based on a fitted, optimized heating point.

The yearly operation does not vary over time. Equipment setpoints and maintenance schedules will also remain unchanged.

Savings Calculations

Using data described above, the Evaluators calculated lighting savings as follows:

Table 8-2: HDD and Model Fit

HDD base	'Pre' model R^2	'Post 'Model R^2
50	0.98	0.94

Table 8-3: Pre/Post Use and Therm Savings

Expected Therm Savings	Annual Pre Usage (Therms)	Annual Post Usage (Therms)	Verified Therm Savings	Realization Rate
5,686	41,988	25,849	16,139	283.8%

Results

For project #111467 the therm realization rate is 283.8%.

Table 8-4: Verified Gross Savings, Realization Rates & Adjustments

Measure	Adjusted Therm Savings	Verified Therm Savings	Therm Realization Rate
One (1) 96.1% NG boiler replacing two (2) 85% NG boilers	16,139	16,139	283.8%
Total	**16,139**	**16,139**	**283.8%**

Measured savings are higher than ex ante predictions.

APPENDIX C – COST-EFFECTIVENESS TABLES

Electric

Electric Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 17,127,964	$ 9,597,254	1.78
Utility Cost Test (UCT)	$ 6,508,365	$ 5,078,273	1.28
Participant Cost Test (PCT)	$ 15,213,059	$ 8,199,774	1.86
Ratepayer Impact (RIM)	$ 6,466,695	$ 16,610,540	0.39

Electric Portfolio (without Low-Income)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 16,940,411	$ 9,178,384	1.85
Utility Cost Test (UCT)	$ 6,383,168	$ 4,566,147	1.40
Participant Cost Test (PCT)	$ 14,778,833	$ 8,033,747	1.84
Ratepayer Impact (RIM)	$ 6,383,168	$ 15,923,470	0.40

Residential (Prescriptive and MDFI)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,801,050	$ 2,026,982	1.38
Utility Cost Test (UCT)	$ 1,130,938	$ 772,086	1.46
Participant Cost Test (PCT)	$ 2,745,017	$ 1,589,625	1.73
Ratepayer Impact (RIM)	$ 1,130,938	$ 3,182,374	0.36

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 14,139,361	$ 7,151,402	1.98
Utility Cost Test (UCT)	$ 5,252,230	$ 3,794,061	1.38
Participant Cost Test (PCT)	$ 12,033,816	$ 6,444,122	1.87
Ratepayer Impact (RIM)	$ 5,252,230	$ 12,741,096	0.41

Multifamily Direct Install

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 384,330	$ 48,875	7.86
Utility Cost Test (UCT)	$ 7,663	$ 48,875	0.16
Participant Cost Test (PCT)	$ 37,826	$ 17,528	2.16
Ratepayer Impact (RIM)	$ 7,663	$ 69,173	0.11

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,416,720	$ 1,978,107	1.22
Utility Cost Test (UCT)	$ 1,123,275	$ 723,211	1.55
Participant Cost Test (PCT)	$ 2,707,191	$ 1,572,097	1.72
Ratepayer Impact (RIM)	$ 1,123,275	$ 3,113,201	0.36

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 187,553	$ 418,870	0.45
Utility Cost Test (UCT)	$ 125,197	$ 512,126	0.24
Participant Cost Test (PCT)	$ 434,226	$ 166,027	2.62
Ratepayer Impact (RIM)	$ 83,527	$ 687,070	0.12

Natural Gas

Natural Gas Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,510,353	$ 3,704,474	0.68
Utility Cost Test (UCT)	$ 2,510,352	$ 1,838,898	1.37
Participant Cost Test (PCT)	$ 6,141,666	$ 3,417,110	1.80
Ratepayer Impact (RIM)	$ 2,470,584	$ 6,429,030	0.38

Natural Gas Portfolio (without Low-Income)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,449,185	$ 3,500,605	0.70
Utility Cost Test (UCT)	$ 2,449,184	$ 1,641,630	1.49
Participant Cost Test (PCT)	$ 5,968,941	$ 3,284,309	1.82
Ratepayer Impact (RIM)	$ 2,449,184	$ 6,185,238	0.40

Residential (Prescriptive and MDFI)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,223,790	$ 3,292,497	0.68
Utility Cost Test (UCT)	$ 2,223,789	$ 1,445,359	1.54
Participant Cost Test (PCT)	$ 5,491,488	$ 3,198,687	1.72
Ratepayer Impact (RIM)	$ 2,223,789	$ 5,585,299	0.40

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 225,395	$ 208,108	1.08
Utility Cost Test (UCT)	$ 225,395	$ 196,271	1.15
Participant Cost Test (PCT)	$ 477,453	$ 85,622	5.58
Ratepayer Impact (RIM)	$ 225,395	$ 599,939	0.38

Multifamily Direct Install

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 9,008	$ 10,655	0.85
Utility Cost Test (UCT)	$ 8,964	$ 7,359	1.22
Participant Cost Test (PCT)	$ 24,870	$ 10,277	2.42
Ratepayer Impact (RIM)	$ 8,964	$ 25,249	0.36

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,214,782	$ 3,281,842	0.67
Utility Cost Test (UCT)	$ 2,214,825	$ 1,438,000	1.54
Participant Cost Test (PCT)	$ 5,466,618	$ 3,188,410	1.71
Ratepayer Impact (RIM)	$ 2,214,825	$ 5,560,050	0.40

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 61,168	$ 203,869	0.30
Utility Cost Test (UCT)	$ 61,168	$ 197,268	0.31
Participant Cost Test (PCT)	$ 172,725	$ 132,801	1.30
Ratepayer Impact (RIM)	$ 21,400	$ 243,792	0.09

APPENDIX D – ENERGY EFFICIENCY EXPENDITURES BY PROGRAM

Program	Electric	Natural Gas	Total
Energy Efficiency			
Low-Income			
Low-Income	$ 432,979	$ 206,414	$ 639,393
Residential			
HVAC	$ 314,946	$ 1,032,374	$ 1,347,320
Multifamily Direct Install	$ 33,434	$ –	$ 33,434
AeroBarrier	$ –	$ 18,328	$ 18,328
Multifamily/Small Home Weatherization	$ 16,439	$ 7,314	$ 23,753
Shell	$ 141,212	$ 208,336	$ 349,547
Water Heating	$ 9,432	$ 155,910	$ 165,343
ENERGY STAR Homes	$ 36,242	$ –	$ 36,242
Fuel-Efficiency	$ 177,776	$ –	$ 177,776
Appliances	$ 45,493	$ 4,348	$ 49,841
Commercial/Industrial			
HVAC	$ 3,502	$ 43,778	$ 47,280
Food Service Equipment	$ 2,189	$ 72,914	$ 75,103
Grocer	$ 3,752	$ –	$ 3,752
Shell	$ 3,030	$ 4,998	$ 8,028
Green Motors	$ 2,240	$ –	$ 2,240
Site-Specific	$ 1,953,152	$ 95,244	$ 2,048,396
Interior Lighting	$ 991,693	$ –	$ 991,693
Exterior Lighting	$ 398,461	$ –	$ 398,461
Sign Lighting	$ 32,346	$ –	$ 32,346
Energy Efficiency Total	**$ 4,598,319**	**$ 1,849,958**	**$ 6,448,277**
Market Transformation			
Northwest Energy Efficiency Alliance	$ 1,507,782.41	$ 607,596.97	$ 2,115,379.38
Brio Eastside Market Transformation	$ 75,300.00	$ –	$ 75,300.00
Market Transformation Total	**$ 1,583,082.41**	**$ 607,596.97**	**$ 2,190,679.38**
Other Programs and Activities			
General Implementation	$ 71,690.07	$ 36,978.03	$ 108,668.10
Labor Costs	$ 937,749.97	$ 165,902.85	$ 1,103,652.82
Marketing Costs	$ 272,134.29	$ 30,199.68	$ 302,333.96
Third Party Implementation	$ 77,063.78	$ 26,316.91	$ 103,380.69
Pilot Programs	$ 7,465.96	$ 13,431.62	$ 20,897.57
EM&V/CPA	$ 161,561.25	$ 77,995.22	$ 239,556.47
Other Programs and Activities Total	**$ 1,527,665.30**	**$ 350,824.31**	**$ 1,878,489.61**
Grand Total	**$ 7,709,066.49**	**$ 2,808,379.08**	**$ 10,517,445.57**

APPENDIX E – ENERGY EFFICIENCY ACTIVITY BY PROGRAM

	Electric					Natural Gas				
Energy Efficiency Program	**Participants**		**Evaluated Savings (kWh)**		**Utility Cost**	**Participants**		**Evaluated Savings (Therms)**		**Utility Cost**
Low-Income										
Weatherization	36	Homes	20,462	$	94,182	49	Homes	1,290	$	67,724
HVAC	17	Units	65,082	$	278,380	10	Units	657	$	83,614
Water Heating	–	Units	–		–	1	Unit	7	$	5,617
Lights	16	Units	96	$	466	–	N/A	–		–
Health and Safety	10	HHS	–	$	59,951	15	HHS	–	$	49,458
Low-Income Total	**79**		**85,639**	**$**	**432,979**	**75**		**1,954**	**$**	**206,414**
Residential										
HVAC	311	Furnace, Tstat	517,702	$	314,946	3,040	Furnace, Tstat	216,236	$	1,032,374
Multifamily Direct Install	1,115	Homes	17,478	$	33,434	–	Homes	–		–
AeroBarrier	–	Units	N/A	$	0	14	Units	TBD	$	18,328
Multifamily/Small Home Weatherization	22	Units (Measures)	18,754	$	16,439	20	Units (Measures)	955	$	7,314
Shell	119	Windows, Insulation	137,338	$	141,212	354	Windows, Insulation	20,360	$	208,336
Water Heating	23	Units (Measure)	27,769	$	9,432	395	Units (Measure)	28,408	$	155,910
ENERGY STAR Homes	19	Units (Measures)	55,400	$	36,242	–	Units (Measures)	–		–
Fuel-Efficiency	40	Units	326,625	$	177,776	–	Units	–		–
Appliances	326	Washer/ Dryer	32,467	$	45,493	84	Washer/ Dryer	457	$	4,348
Residential Total	**1,975**		**1,133,532**	**$**	**774,974**	**3,907**		**266,415**	**$**	**1,426,610**
Commercial/Industrial										
HVAC	4	Projects	14,308	$	3,502	16	Projects	4,689	$	43,778
Food Service Equipment	2	Units	10,537	$	2,189	16	Units	12,910	$	72,914
Grocer	4	Projects	36,468	$	3,752	–	Projects	–		–
Shell	1	Project	4,490	$	3,030	1	Project	260	$	4,998
Green Motors	2	Motor Rewinds	9,822	$	2,240	–	N/A	–		–
Site-Specific	31	Units	7,216,254	$	1,953,152	2	Units	19,709	$	95,244
Exterior Lighting	222	Projects	1,794,504	$	398,461	–	N/A	–		–
Interior Lighting	591	Projects	4,491,242	$	991,693	–	N/A	–		–
Sign Lighting	53	Projects	130,539	$	32,346	–	N/A	–		–
Commercial/Industrial Total	**857**		**13,708,164**	**$**	**3,358,020**	**35**		**37,961**	**$**	**216,934**
Energy Efficiency Total	**2,911**		**14,927,335**	**$**	**4,565,973**	**4,017**		**306,330**	**$**	**1,849,958**

Mineral Ridge, Lake Coeur d'Alene, Idaho