2022 Washington Annual Conservation Report

May 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.

Front cover: Steptoe, Washington

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Whitman County, Washington

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 Avista's efforts to support customer energy needs, particularly for customers from Named Communities as well as for our commercial customers. 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.

The *2022 Annual Conservation Report* is intended to acknowledge the verified savings recognized by Avista for meeting the targets set forth in RCW 19.285.040(1) and is consistent with WAC 480-109-120(3), which outlines requirements for annual reporting and planning.

Throughout 2022, the lingering effects of COVID-19 continued to impact Avista's 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 impacted efficiency project decisions and timelines. As in 2021 and years prior, Avista programs continued to focus on affordability and flexibility so that opportunities remained available to customers who wished to pursue efficiency in their home 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.

Avista also continued to develop and implement programs to meet goals outlined in the company's Clean Energy Implementation Plan (CEIP), which was the first in the state to be approved by the Washington State Utilities and Transportation Commission in July 2022. The company continued to convene its equity advisory group, consulting group members for input on program design attributes and outreach efforts. Non-energy impact values (NEIs) continued to be integrated into cost-effective calculations for the 2022 and 2023 plans.

In addition to Avista's portfolio of company and third-party implemented programs, the company 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 Washington electric and natural gas (aggregate) tariff rider balances were overfunded by approximately $432,000. Approximately $20.4 million in tariff rider revenue was collected to fund energy efficiency during the year, while around $18 million went to operate energy-efficiency programs. The $2.8 million excess of collections over expenditures includes approximately $4.7 million in excess revenue on the electric side, as well as an approximately $1.9 million underfunded balance for natural gas programs. Combined, these ending balances resulted in a net overfunded balance of $2,800,161 by the end of the year.

Table 1 illustrates 2022 tariff rider activity by fuel type.

TABLE 1 – TARIFF RIDER ACTIVITY

	Electric	Natural Gas	Total
Beginning Balance (Underfunded)/Overfunded	**$ 2,339,530**	**$ (1,907,129)**	**$ 432,401**
Energy-Efficiency Funding Collected in 2022	$ 14,333,819	$ 6,087,700	$ 20,421,519
Total Funding Available in 2022	$ 16,673,349	$ 4,180,571	$ 20,853,920
Energy-Efficiency Expenditures	$ 12,013,736	$ 6,040,023	$ 18,053,759
Ending Balances (Underfunded)/Overfunded	**$ 4,659,613**	**$ (1,859,452)**	**$ 2,800,161**

WASHINGTON ACHIEVEMENTS

- ***Electric Conservation:*** For 2022, Avista's electric Energy Efficiency Program achieved 23,021 MWh of conservation from local programs and cost-effectiveness ratios of 1.6 for total resource cost (TRC) and 3.07 for utility cost test (UCT). Including savings from NEEA's programs, the overall savings achieved in 2022 was 28,154 MWh.

TABLE 2 – WASHINGTON ELECTRIC ACHIEVEMENTS

	Savings Achieved (MWh)
Commercial/Industrial	20,901
Residential	1,760
Low-Income	358
Total Local Program	**23,021**
NEEA	5,133
Total	**28,154**

- ***Natural Gas Conservation:*** For 2022, Avista's natural gas Energy Efficiency Program achieved 545,610 therms of conservation from local programs and cost-effectiveness ratios of 1.30 for TRC and 2.49 for UCT. After including savings from NEEA's programs, the overall savings achieved in 2022 was 612,149 therms.

TABLE 3 – WASHINGTON NATURAL GAS ACHIEVEMENTS

	Savings Achieved (Therms)
Commercial/Industrial	58,819
Residential	475,245
Low-Income	11,705
Total Local Program	**545,769**
NEEA	66,379
Total	**612,149**

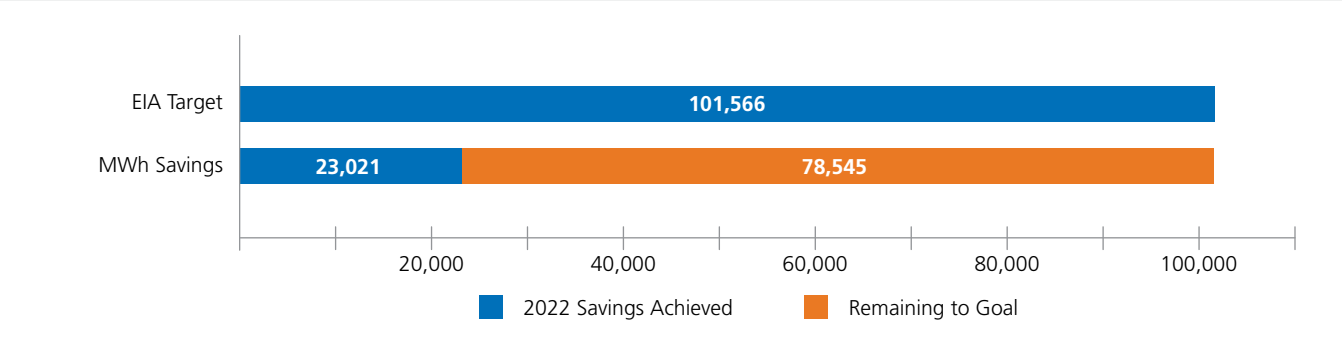
For the 2022-23 biennium, Avista's Washington Energy Independence Act (EIA) penalty threshold is 91,054 MWh, which is derived from several target elements, including the conservation potential from the company's conservation potential assessment (CPA) and excluding savings derived from the NEEA program. The utility-specific conservation goal is 96,132 MWh, which also includes Avista's 5 percent decoupling commitment. Table 4 summarizes the target calculation.

TABLE 4 – 2022–23 ENERGY INDEPENDENCE ACT TARGET

Category	MWh
Pro Rata Share of 10-year Conservation Potential	101,566
EIA Target	**101,566**
Decoupling Penalty Threshold	5,078
Total Utility Conservation Goal	**106,644**
Excluded Programs (NEEA)	(10,512)
Utility-Specific Conservation Goal	**96,132**
EIA Penalty Threshold	**91,054**

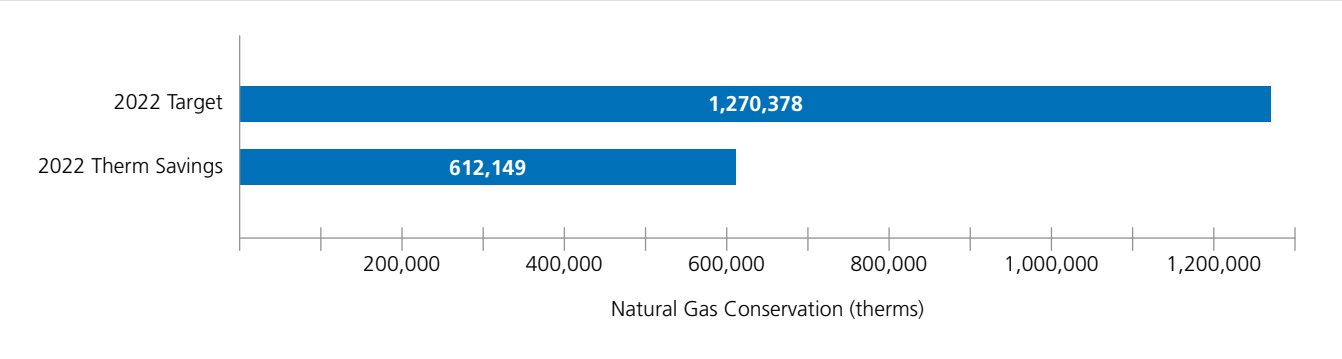
In 2022, Avista met 23 percent of its electric conservation target, achieving 23,021 MWh through conservation programs.

FIGURE 2 – 2022 CONSERVATION ACHIEVED VS ENERGY INDEPENDENCE ACT PENALTY THRESHOLD



Avista's natural gas conservation target is set according to the company's 2022 natural gas *Integrated Resource Plan* (*IRP*). Based on this study, the conservation potential for 2022 was estimated to be 1,270,378 therms. During the 2022 program year, Avista's natural gas program achieved 612,149 therms, which is 48 percent of the IRP target. The 2022 achievement includes savings from the NEEA program.

FIGURE 3 – 2022 NATURAL GAS SAVINGS VS IRP TARGET



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. Washington State COVID-19 emergency orders ended October 31, 2022, resulting in some lingering barriers preventing 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 adapt its energy efficiency programs to provide support for customers to help them navigate these new challenges.

Portfolio Trends

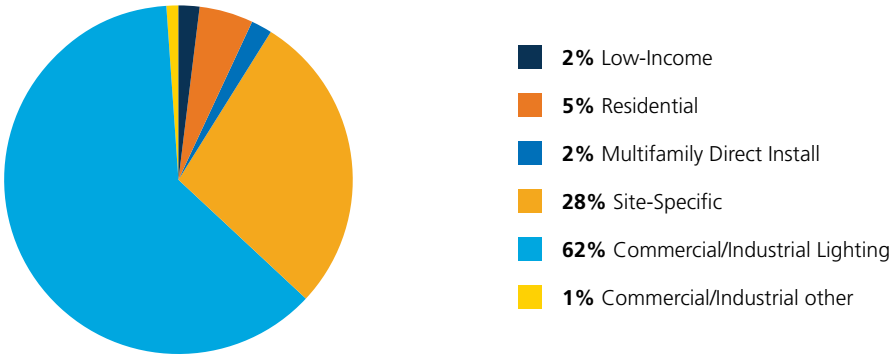
As shown in Table 5, Avista achieved lower energy savings in 2022 than in 2021 (23,020,657 kWh vs 30,618,153 kWh). This decline is attributable to a decline in commercial/industrial savings of 27 percent and an increase in residential savings of 13 percent.

TABLE 5 – ELECTRIC ENERGY SAVINGS (KWH)

Program Segment	2021	2022
Residential (including Low-Income Programs)	1,874,877	2,119,973
Commercial/Industrial	28,743,276	20,900,684
Total	**30,618,153**	**23,020,657**

Of Avista's overall electric portfolio in 2022, the commercial/industrial Prescriptive Lighting Program achieved 60 percent of savings and site-specific programs achieved 21 percent. Residential programs comprised 7 percent of savings. All other programs combined achieved the remaining 6 percent (see Figure 4).

FIGURE 4 – ELECTRIC SAVINGS PORTFOLIO



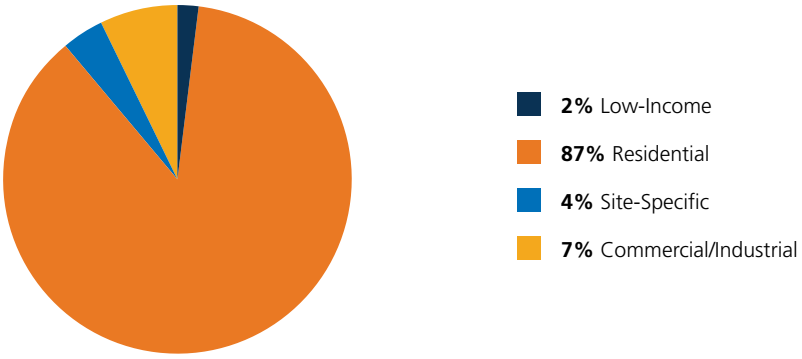
As shown in Table 6, Avista's natural gas portfolio experienced an overall decrease in savings in 2022 compared to the prior year. While residential savings saw a 13 percent increase, commercial/industrial savings saw an 82 percent decrease.

TABLE 6 – NATURAL GAS ENERGY SAVINGS (THERMS)

	2021	2022
Residential (including Low-Income Programs)	442,852	486,950
Commercial/Industrial	327,595	58,819
Total	**770,447**	**545,769**

Residential programs obtained 87 percent of the natural gas savings portfolio in 2022. This is attributed primarily to high-efficiency natural gas furnace measures, which were installed in 2,997 homes and achieved 304,784 therms. Commercial/industrial prescriptive programs achieved 7 percent of the overall savings total, with low-income and site-specific programs achieving the remaining 6 percent (see Figure 5).

FIGURE 5 – NATURAL GAS SAVINGS PORTFOLIO



Verified Savings

As part of the Evaluation, Measurement, and Verification (EM&V) process, Avista's evaluators review the reported savings provided by the company and adjust savings where necessary. The details of these adjustments are included in the impact evaluation reports that have been appended to this report. In 2022, the electric portfolio reported savings of 22,973 MWh and achieved evaluated savings of 23,021 MWh, resulting in a realization rate of 100 percent. The natural gas portfolio reported 523,829 therms and achieved evaluated savings of 545,769 therms, resulting in a 104 percent realization rate.

Tables 7 and 8 illustrate the reported and evaluated savings and the resulting realization rates.

TABLE 7 – ENERGY-EFFICIENCY SAVINGS BY SECTOR – ELECTRIC

	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Commercial/Industrial	20,572,926	20,900,684	102%
Residential	2,018,422	1,761,536	87%
Low-Income	381,378	358,437	94%
Total	**22,972,726**	**23,020,657**	**100%**

TABLE 8 – ENERGY-EFFICIENCY SAVINGS BY SECTOR – NATURAL GAS

	Reported Savings (Therms)	Gross Evaluated Savings (Therms)	Realization Rate
Commercial/Industrial	56,057	58,819	105%
Residential	456,117	475,245	104%
Low-Income	11,655	11,705	100%
Total	**523,829**	**545,769**	**104%**

The primary factors contributing to a lower-than-expected realization rate for residential electric programs are differences between the Avista Technical Reference Manual (TRM) categories and Regional Technical Forum (RTF) Unit Energy Savings (UES) assumptions. In several instances, the Avista TRM utilizes an average range of RTF UES values rather than specific values for a number of project attributes – including, for example, equipment efficiency values; housing types; heating zones; and fuel types. Avista will consider adding granularity of measures to its TRM for 2023; however, the company believes that granularity of data should be balanced with potential additional administrative burden for both the company and for program participants.

Expenditures

While the 2022 Annual Conservation Plan, filed with the Washington Utilities and Transportation Commission in November 2021, provides an expectation for operational planning, Avista is required to pursue all cost-effective measures under Tariff Schedules 90 and 190. Because of this requirement, variances may exist between planned and actual spending. For 2022, the program saw a lower level of participation than estimated, which resulted in actual spending being lower than planned.

Since customer incentives are the largest component of expenditures, customer demand can easily affect the funding level of the tariff riders. Table 9 provides a detailed comparison of budgeted to actual energy-efficiency expenditures by fuel type.

TABLE 9 – ANNUAL CONSERVATION PLAN BUDGET TO ACTUAL EXPENDITURES COMPARISON

	Electric	Natural Gas
2022 Annual Conservation Plan		
Incentives Budget	$ 12,225,298	$ 4,606,953
Non-Incentives and Labor	$ 3,634,420	$ 376,314
MT, CPA, EM&V	$ 1,748,369	$ 611,314
Total Budgeted Expenditures	**$ 17,608,087**	**$ 5,594,581**
Actual 2022 Expenditures		
Incentives	$ 6,253,790	$ 4,790,276
Non-Incentives and Labor	$ 3,554,246	$ 1,125,872
MT, CPA, EM&V	$ 1,946,467	$ 756,075
Total Actual Expenditures	**$ 11,754,502**	**$ 6,672,223**
Variance	**$ (5,853,585)**	**$ 1,077,642**

Table 10 illustrates the top five programs with the highest impact on the expenditure variance across both fuel types. As expected, the largest variance occurred in programs that have historically had the most incentive expenditures. The Site-Specific Program had the highest variance, with program expenditures under budget by $4,141,570.

TABLE 10 – PROGRAMS WITH THE HIGHEST IMPACT ON EXPENDITURE VARIANCE

Program	Planned	Actual	Variance	Variance Percentage
Site-Specific (elec)	$ 5,966,011	$ 1,824,441	$ 4,141,570	69%
Commercial/Industrial Lighting Exterior	$ 2,154,869	$ 1,005,979	$ 1,148,890	53%
Low-Income (elec)	$ 2,085,410	$ 1,583,719	$ 501,691	24%
Multifamily Direct Install (elec)	$ 803,745	$ 506,479	$ 297,266	37%
Commercial/Industrial Lighting Interior	$ 2,805,296	$ 3,108,132	($302,836)	(11)%

On a percentage variance basis, the Commercial/Industrial Lighting Interior Program exceeded its estimated level of conservation, which drove the variance between planned and actual expenses.

EVALUATION APPROACH

Because evaluation is a critical component of any successful energy conservation program, Avista employs EM&V protocols to validate and report verified energy savings related to its energy-efficiency measures and programs. Those protocols include 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.)

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. The 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 incorporates recommendations to improve program performance, enact changes to programs, and make decisions to phase out programs and measures.

Recommendations from third-party evaluations, as well as the application of lessons learned through each program year, are incorporated into Avista's annual business planning process to further refine program design and improve their chances of success.

For 2022, Avista retained ADM to conduct impact and process evaluations of electric and natural gas programs in the utility's Washington program portfolio. Evaluations took a portfolio-wide approach to provide a benchmark against which future years can be compared. Impact and process evaluations for most programs were also completed at the program level, so that customer experience could be better delineated and realization rates understood.

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 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 in consideration of their inclusion in Avista's energy-efficiency portfolio. In its electric portfolio, Avista 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 related to energy efficiency and conservation. To contribute to regional efforts, one Avista employee has a voting role and a second a corresponding member role on the Regional Technical Forum (RTF) – the advisory committee to the Northwest Power and Conservation Council (NPCC) and a primary source of information regarding the standardization of energy savings and measurement processes for electric applications in the Pacific Northwest. This 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 several pilot projects and subcommittee evaluations; portions of the energy-efficiency savings acquired through the latter's regional programs are attributable to Avista's portfolio.

COST-EFFECTIVENESS

Avista's portfolio offerings are evaluated throughout implementation and at the conclusion of the program year to gauge the level of cost-effectiveness. Cost-effectiveness tests determine whether that program is beneficial 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) test, the Participant Cost Test (PCT), and the Ratepayer Impact (RIM) test. 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. The RIM test measures impact to customer bills or rates due to changes in utility revenues and operating costs related to the program portfolio. This test indicates the direction and magnitude of the expected change in customer bills or rate levels. For Washington electric programs, the TRC is the most important; the UCT is most important for natural gas programs. Avista's cost-effectiveness goal for both the electric and natural gas program portfolios is a TRC and a UCT above 1.00, which indicates that the benefits to the utility exceed the costs of implementing the program. In 2022, UCT ratios were 3.07 for electric and 2.49 for natural gas. TRC benefit/cost ratios were 1.6 for electric and 1.30 for natural gas.

2022 marks the first year that Avista included non-energy impacts (NEIs) in its cost-effectiveness calculations. These impacts contributed to overall increases in TRC and UTC ratios for the entire portfolio.

TABLE 11 – PORTFOLIO COST-EFFECTIVENESS RESULTS – ELECTRIC

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
TRC	$ 33,440,303	$ 20,905,591	1.60
UCT	$ 26,136,977	$ 8,500,693	3.07
PCT	$ 32,091,719	$ 19,288,638	1.66
RIM	$ 26,136,977	$ 34,641,900	0.75

TABLE 12 – PORTFOLIO COST-EFFECTIVENESS RESULTS – NATURAL GAS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
TRC	$ 13,374,347	$ 10,301,947	1.30
UCT	$ 9,862,181	$ 3,953,226	2.49
PCT	$ 61,577,523	$ 9,855,280	6.25
RIM	$ 9,868,946	$ 126,522,796	0.08

Colfax, Washington

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 the prescriptive program path – and/or that does not meet its parameters – is automatically eligible for treatment through the site-specific program path.

The prescriptive program path is selected for straightforward equipment installations that generally have similar operating characteristics (such as lighting, simple HVAC systems, food service equipment, and variable frequency drives). Projects can range in size from small to very large.

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-based approach is used.

- ***1,779 commercial/industrial electric measures in 2022:*** Total savings of 20,901 MWh, a decrease of 27 percent from the previous year (28,743 MWh).
- ***71 commercial/industrial natural gas measures in 2022:*** Total savings of 58,819 therms in 2022, a decrease of 93 percent from the previous year (327,595 therms).

TABLE 13 – COMMERCIAL/INDUSTRIAL VERIFIED SAVINGS BY PROGRAM

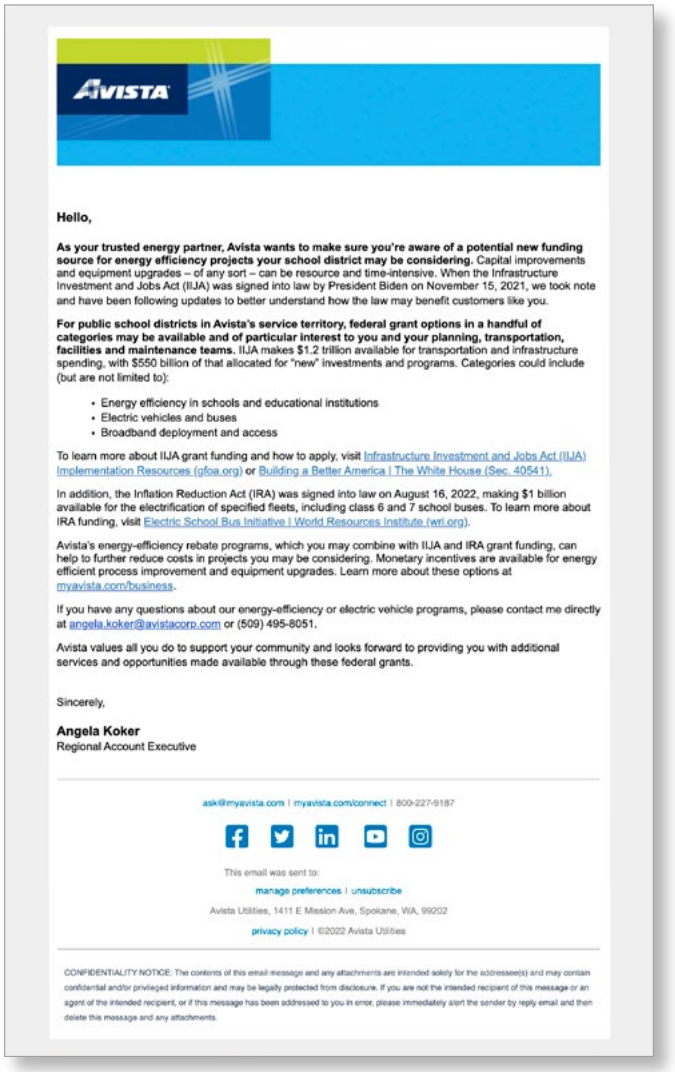
Program	Electric Savings (kWh)	Natural Gas Savings (Therms)
Lighting	14,213,498	–
HVAC	15,637	13,863
Food Service Equipment	31,611	13,613
Grocer	141,653	–
Shell	87,530	8,972
Green Motors	17,752	–
Site-Specific	6,393,005	22,372
Total Commercial/Industrial	**20,900,684**	**58,819**

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 saving 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 was sent to indoor agricultural customers and vendors to build awareness about Avista's lighting rebate programs. A follow-up message was sent a month later, in an effort to engage those who may have missed the first outreach. 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 6 – COMMERCIAL/INDUSTRIAL INCREASE ENERGY EFFICIENCY IN YOUR SCHOOLS EMAIL



Hello,

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 angela.koker@avistacorp.com or (509) 495-8051.

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,

Angela Koker
Regional Account Executive

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

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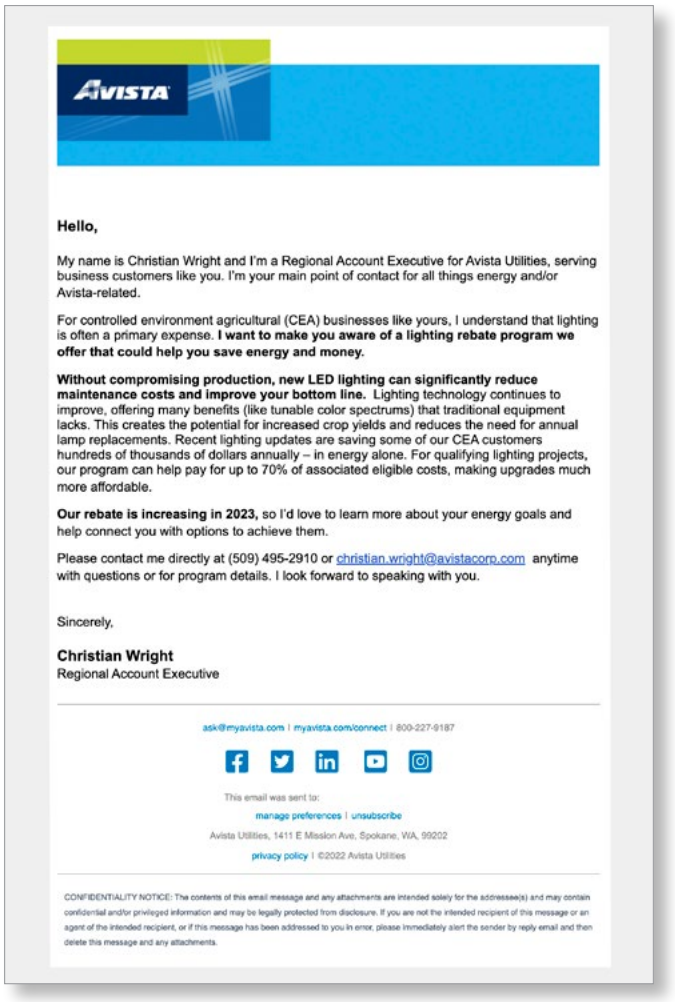
FIGURE 7 – COMMERCIAL/INDUSTRIAL LIGHTING REBATES FOR CONTROLLED ENVIRONMENT AGRICULTURE EMAIL



Hello,

My name is Christian Wright and I'm a Regional Account Executive for Avista Utilities, serving business customers like you. I'm your main point of contact for all things energy and/or Avista-related.

For controlled environment agricultural (CEA) businesses like yours, I understand that lighting is often a primary expense. **I want to make you aware of a lighting rebate program we offer that could help you save energy and money.**

Without compromising production, new LED lighting can significantly reduce maintenance costs and improve your bottom line. Lighting technology continues to improve, offering many benefits (like tunable color spectrums) that traditional equipment lacks. This creates the potential for increased crop yields and reduces the need for annual lamp replacements. Recent lighting updates are saving some of our CEA customers hundreds of thousands of dollars annually – in energy alone. For qualifying lighting projects, our program can help pay for up to 70% of associated eligible costs, making upgrades much more affordable.

Our rebate is increasing in 2023, so I'd love to learn more about your energy goals and help connect you with options to achieve them.

Please contact me directly at (509) 495-2910 or christian.wright@avistacorp.com anytime with questions or for program details. I look forward to speaking with you.

Sincerely,

Christian Wright
Regional Account Executive

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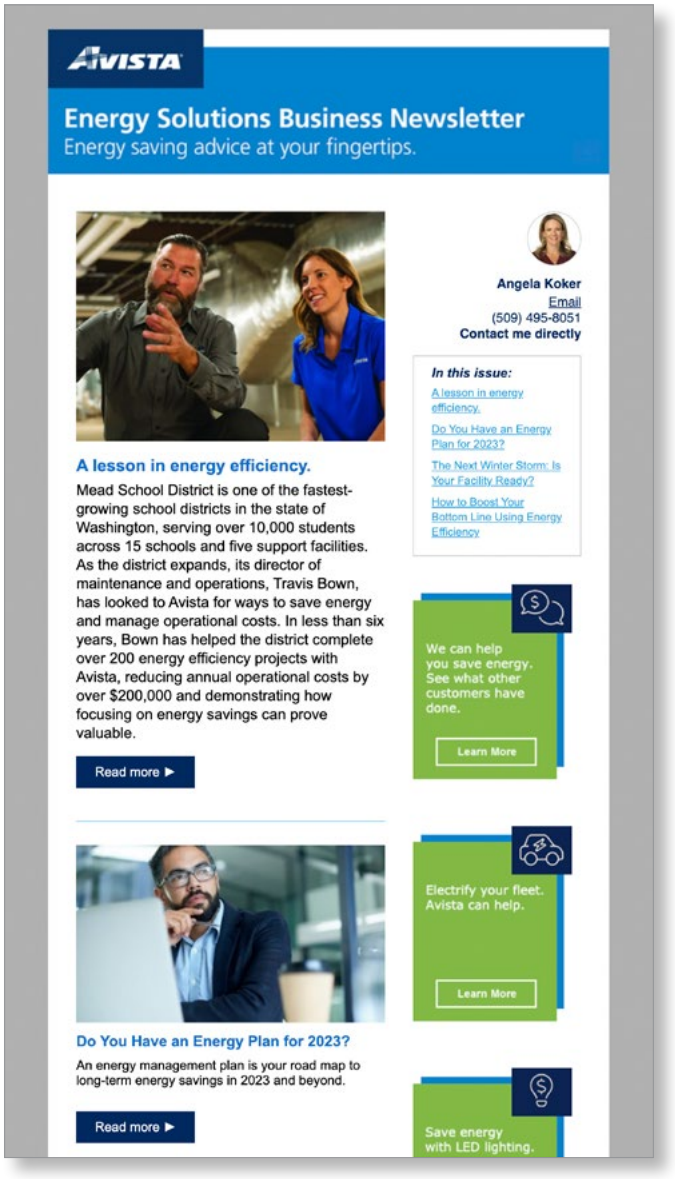
Avista reimagined its longstanding business customer newsletter, Energy Solutions, adding space for program promotion boxes that direct viewers to myavista.com. An Avista lead article was also added to the template, providing a consistent opportunity for energy efficiency storytelling. The newsletter goes out monthly to a customer list managed by each regional account executive.

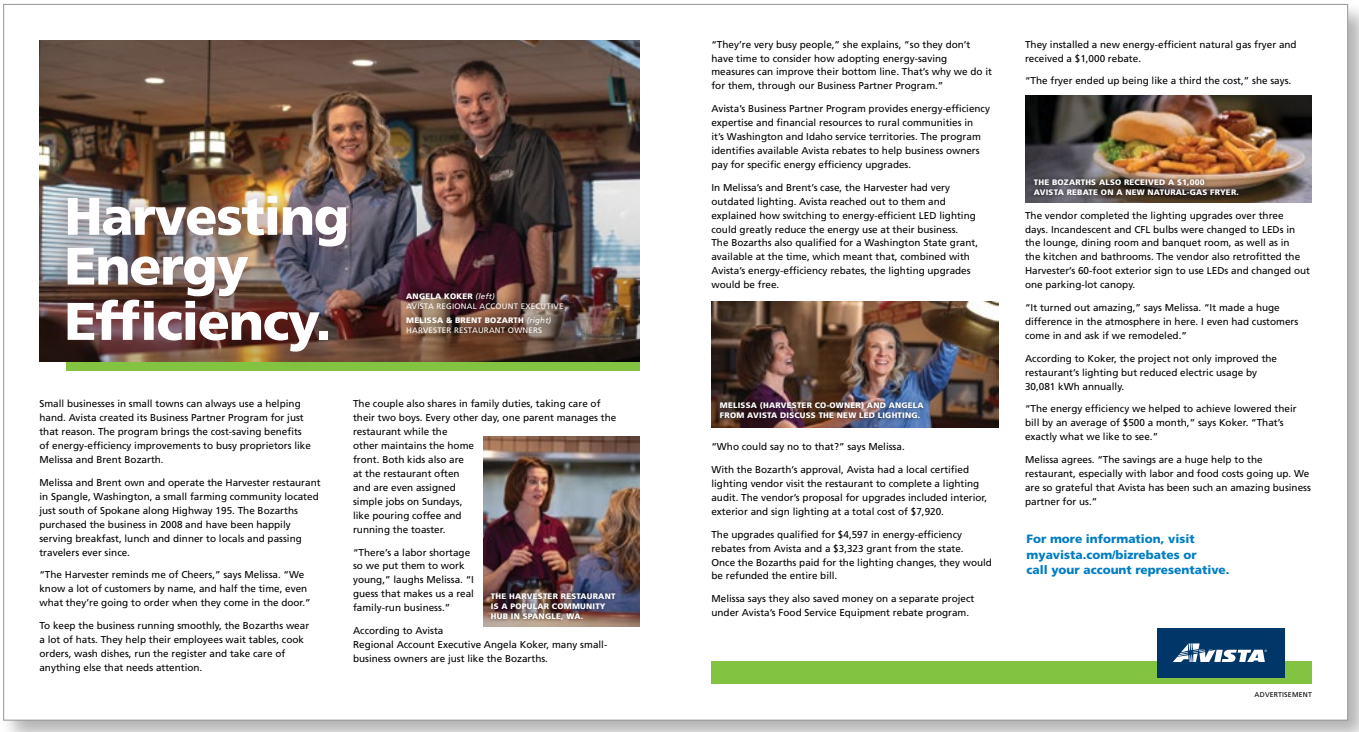
FIGURE 8 – COMMERCIAL/INDUSTRIAL AVISTA UTILITIES ENERGY SOLUTIONS EMAIL



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, 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 2000 per month. The fall campaign topped 5,840,000 impressions.

FIGURE 9 – COMMERCIAL/INDUSTRIAL HARVESTER RESTAURANT PRINT ADVERTORIAL



Harvesting Energy Efficiency.

ANGELA KOKER *(left)*
AVISTA REGIONAL ACCOUNT EXECUTIVE
MELISSA & BRENT BOZARTH *(right)*
HARVESTER RESTAURANT OWNERS

Small businesses in small towns can always use a helping hand. Avista created its Business Partner Program for just that reason. The program brings the cost-saving benefits of energy-efficiency improvements to busy proprietors like Melissa and Brent Bozarth.

Melissa and Brent own and operate the Harvester restaurant in Spangle, Washington, a small farming community located just south of Spokane along Highway 195. The Bozarths purchased the business in 2008 and have been happily serving breakfast, lunch and dinner to locals and passing travelers ever since.

"The Harvester reminds me of Cheers," says Melissa. "We know a lot of customers by name, and half the time, even what they're going to order when they come in the door."

To keep the business running smoothly, the Bozarths wear a lot of hats. They help their employees wait tables, cook orders, wash dishes, run the register and take care of anything else that needs attention.

The couple also shares in family duties, taking care of their two boys. Every other day, one parent manages the restaurant while the other maintains the home front. Both kids also are at the restaurant often and are even assigned simple jobs on Sundays, like pouring coffee and running the toaster.

THE HARVESTER RESTAURANT IS A POPULAR COMMUNITY HUB IN SPANGLE, WA.

"There's a labor shortage so we put them to work young," laughs Melissa. "I guess that makes us a real family-run business."

According to Avista Regional Account Executive Angela Koker, many small-business owners are just like the Bozarths.

"They're very busy people," she explains, "so they don't have time to consider how adopting energy-saving measures can improve their bottom line. That's why we do it for them, through our Business Partner Program."

Avista's Business Partner Program provides energy-efficiency expertise and financial resources to rural communities in it's Washington and Idaho service territories. The program identifies available Avista rebates to help business owners pay for specific energy efficiency upgrades.

In Melissa's and Brent's case, the Harvester had very outdated lighting. Avista reached out to them and explained how switching to energy-efficient LED lighting could greatly reduce the energy use at their business. The Bozarths also qualified for a Washington State grant, available at the time, which meant that, combined with Avista's energy-efficiency rebates, the lighting upgrades would be free.

MELISSA (HARVESTER CO-OWNER) AND ANGELA FROM AVISTA DISCUSS THE NEW LED LIGHTING.

"Who could say no to that?" says Melissa.

With the Bozarth's approval, Avista had a local certified lighting vendor visit the restaurant to complete a lighting audit. The vendor's proposal for upgrades included interior, exterior and sign lighting at a total cost of $7,920.

The upgrades qualified for $4,597 in energy-efficiency rebates from Avista and a $3,323 grant from the state. Once the Bozarths paid for the lighting changes, they would be refunded the entire bill.

Melissa says they also saved money on a separate project under Avista's Food Service Equipment rebate program.

They installed a new energy-efficient natural gas fryer and received a $1,000 rebate.

"The fryer ended up being like a third the cost," she says.

THE BOZARTHS ALSO RECEIVED A $1,000 AVISTA REBATE ON A NEW NATURAL-GAS FRYER.

The vendor completed the lighting upgrades over three days. Incandescent and CFL bulbs were changed to LEDs in the lounge, dining room and banquet room, as well as in the kitchen and bathrooms. The vendor also retrofitted the Harvester's 60-foot exterior sign to use LEDs and changed out one parking-lot canopy.

"It turned out amazing," says Melissa. "It made a huge difference in the atmosphere in here. I even had customers come in and ask if we remodeled."

According to Koker, the project not only improved the restaurant's lighting but reduced electric usage by 30,081 kWh annually.

"The energy efficiency we helped to achieve lowered their bill by an average of $500 a month," says Koker. "That's exactly what we like to see."

Melissa agrees. "The savings are a huge help to the restaurant, especially with labor and food costs going up. We are so grateful that Avista has been such an amazing business partner for us."

For more information, visit myavista.com/bizrebates or call your account representative.

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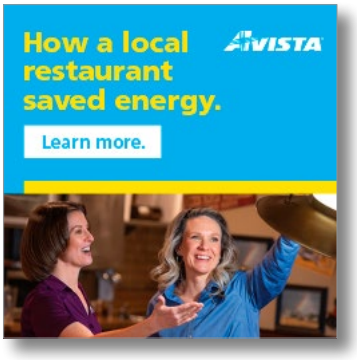
FIGURE 10 – COMMERCIAL/INDUSTRIAL HARVESTER RESTAURANT BROADCAST

FIGURE 11 – COMMERCIAL/INDUSTRIAL HARVESTER RESTAURANT DIGITAL ADS



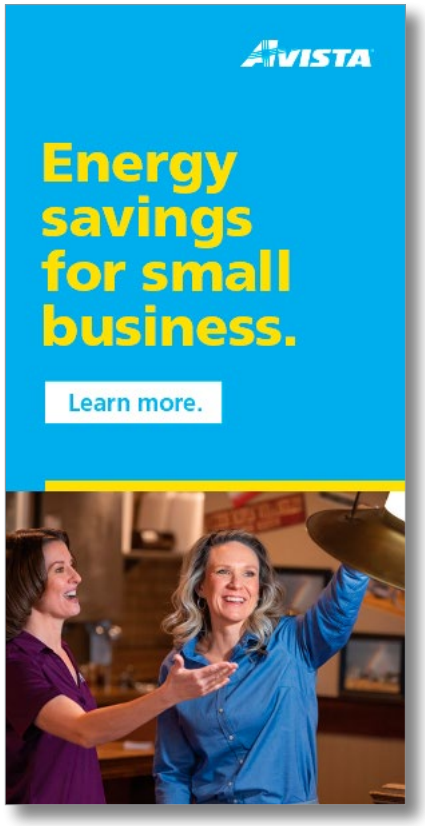


FIGURE 12 – COMMERCIAL/INDUSTRIAL MEAD SCHOOL DISTRICT PRINT ADVERTORIAL

A lesson in energy efficiency.

TRAVIS BOWN *(left)*
MEAD SCHOOL DISTRICT
BRYCE ESCHENBACHER *(middle)*
AVISTA
KIM VOLLAN *(right)*
AVISTA

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.

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FIGURE 13 – COMMERCIAL/INDUSTRIAL MEAD SCHOOL DISTRICT DIGITAL ADS

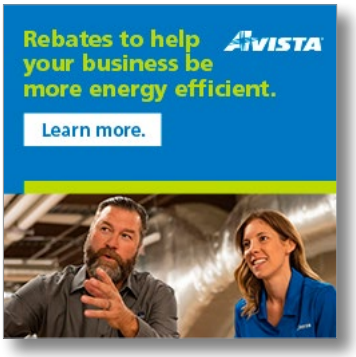


FIGURE 14 – COMMERCIAL/INDUSTRIAL MEAD SCHOOL DISTRICT BROADCAST

Business Partner Program

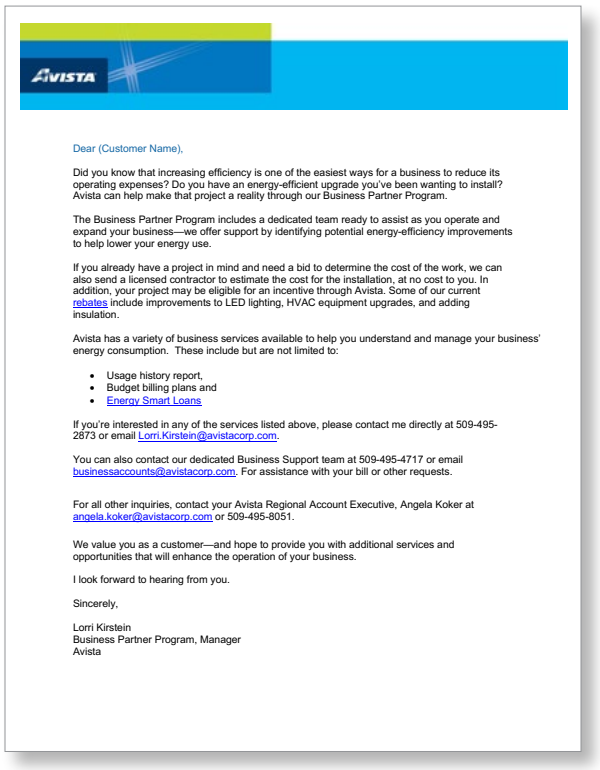
The Business Partner Program (BPP) began in fall 2019 as an outreach effort designed to target small business customers in Avista's rural service territories. The BPP brings awareness of Avista's services to rural small business customers in Washington and Idaho, and includes information on energy audits,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

To further support communities through the COVID-19 pandemic, Avista was able to leverage funding from the Community Energy Efficiency Program (CEEP) to match incentive funding for energy-efficiency improvements for businesses in rural communities. In 2022, 16 properties received CEEP match funding for energy-efficiency projects. CEEP match funding totaled nearly $146,000. Keeping these businesses operating with lower energy costs allowed them to continue to support their communities as they emerged from the pandemic.

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 35 small business customers in Washington.

FIGURE 15 – COMMERCIAL/INDUSTRIAL BUSINESS PARTNER PROGRAM LETTER



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 and
- Energy Smart Loans

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, Angela Koker at angela.koker@avistacorp.com or 509-495-8051.

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

Performance and Savings Goals

Overall, the commercial/industrial sector achieved 20,901 MWh, or 53 percent of the savings goal. While the sector did not meet the combined prescriptive and site-specific program paths' electric savings goal of 39,200 MWh, it maintained a high level of cost-effectiveness for both the TRC and UCT. These ratios indicate that more flexibility can be taken in future program designs. For natural gas programs, the commercial/industrial sector achieved 58,819 therms, or 14 percent of the sector savings goal of 405,983 therms.

Cost-Effectiveness

Tables 14 and 15 show the commercial/industrial sector cost-effectiveness results by fuel type.

TABLE 14 – COMMERCIAL/INDUSTRIAL COST-EFFECTIVENESS RESULTS – ELECTRIC

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
TRC	$ 29,071,571	$ 17,766,539	1.64
UCT	$ 22,466,473	$ 6,056,699	3.71
PCT	$ 27,989,968	$ 16,178,532	1.73
RIM	$ 22,466,473	$ 28,879,360	0.78

TABLE 15 – COMMERCIAL/INDUSTRIAL COST-EFFECTIVENESS RESULTS – NATURAL GAS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
TRC	$ 1,401,496	$ 487,108	2.88
UCT	$ 814,494	$ 428,260	1.90
PCT	$ 5,626,701	$ 199,380	28.22
RIM	$ 820,459	$ 428,260	1.92

Commercial/Industrial Site-Specific Program

TABLE 16 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM METRICS

Site-Specific – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		48
Overall kWh Savings		6,393,005
Incentive Spend	$	1,275,463
Non-Incentive Utility Costs	$	548,978
Washington Energy-Efficiency Rider Spend	$	1,824,441
Site-Specific – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		5
Overall Therm Savings		22,372
Incentive Spend	$	26,556
Non-Incentive Utility Costs	$	67,831
Washington Energy-Efficiency Rider Spend	$	94,386

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 help identify 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 processes, motors (non-prescriptive), shell, and lighting, with the majority being HVAC, lighting, and shell.

Program Activities

- ***Electric:*** Savings of 6,393,005 kWh, or 42 percent of the overall electric savings – a decrease of approximately 50 percent from 2021 (12,733,816 kWh). Of the overall savings, 72 percent was derived from site-specific lighting projects.
- ***Natural Gas:*** Savings of 22,372 therms, or 41 percent of the overall natural gas savings. The program achieved 92 percent less therms than in 2021 (290,463).

Measure type and savings are listed in Figures 16 and 17.

FIGURE 16 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC INCENTIVE DOLLARS BY MEASURE – ELECTRIC

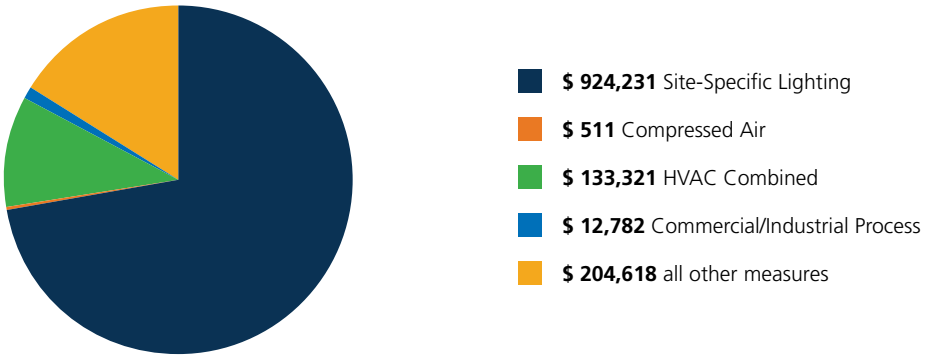
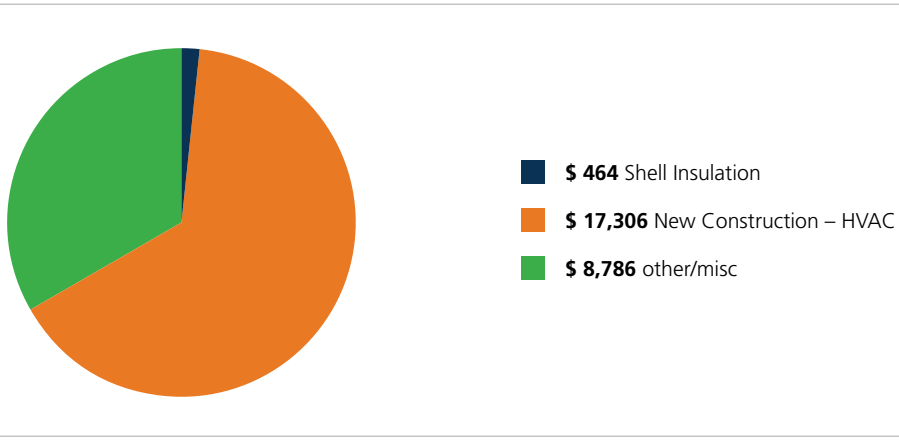


FIGURE 17 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC INCENTIVE DOLLARS BY MEASURE – NATURAL GAS



Program Changes

In 2022, Avista increased the incentive levels to $0.26 per kWh and $3.50 per therm savings for the Site-Specific Program path. The company continues to offer an incentive for any qualifying electric or natural gas energy-saving improvements that are cost-effective with a 15-year simple payback or less.

Plans for 2023

Avista plans to continue to offer the Site-Specific Program path in Washington 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. The CEEP grant program will no longer be offered after May 1, 2023.

Commercial/Industrial Prescriptive Lighting Program

TABLE 17 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM METRICS

Prescriptive Lighting		2022
Participation, Savings, and Costs		
Conservation Projects		1,701
Overall kWh Savings		14,213,498
Incentive Spend	$	3,166,849
Non-Incentive Utility Costs	$	1,013,339
Washington Energy-Efficiency Rider Spend	$	4,180,189

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. This 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 the most 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

2022 savings for prescriptive lighting was 14,213,498 kWh, or 68 percent of portfolio savings. The level of savings was a 9 percent decrease compared to 2021's 15,649,562 kWh. As a response to the obstacles in implementing energy-efficiency projects that business customers and trade allies are facing, Avista carried over the increased incentive rate structure for this program that was implemented in July 2021. As seen in Figure 18, apart from the typical surge seen each December, these increased incentives created a steadier stream of savings throughout the year.

FIGURE 18 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM SAVINGS BY MONTH

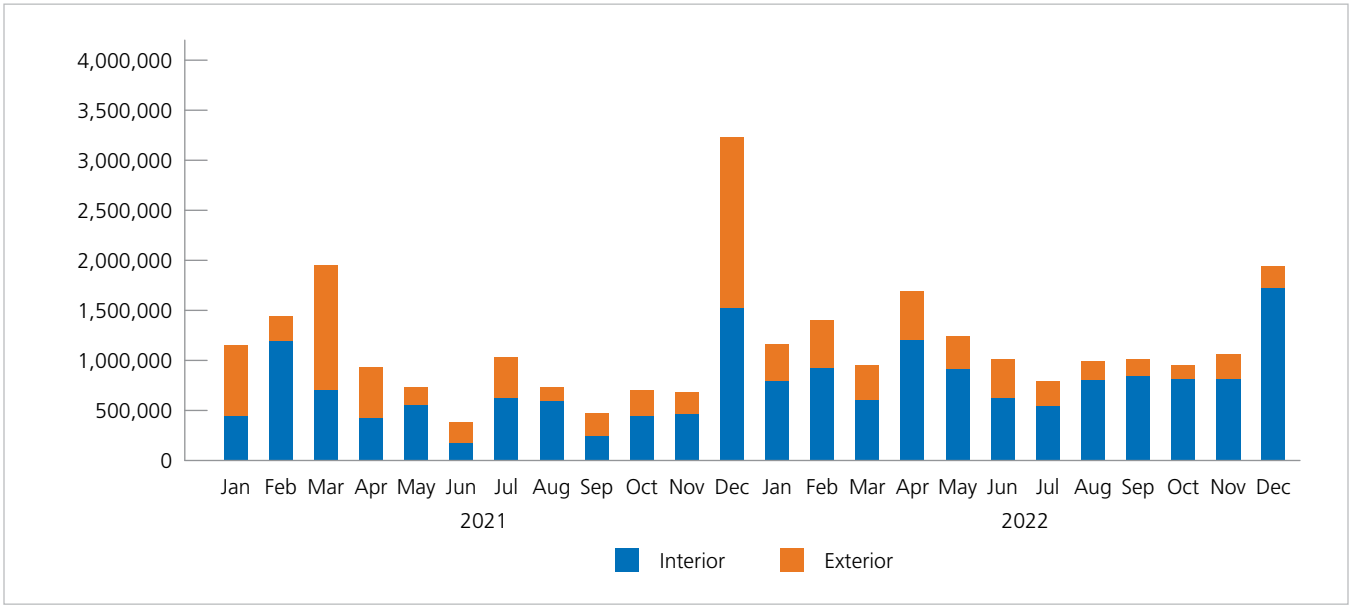


FIGURE 19 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE INTERIOR LIGHTING KWH SAVINGS BY MEASURE

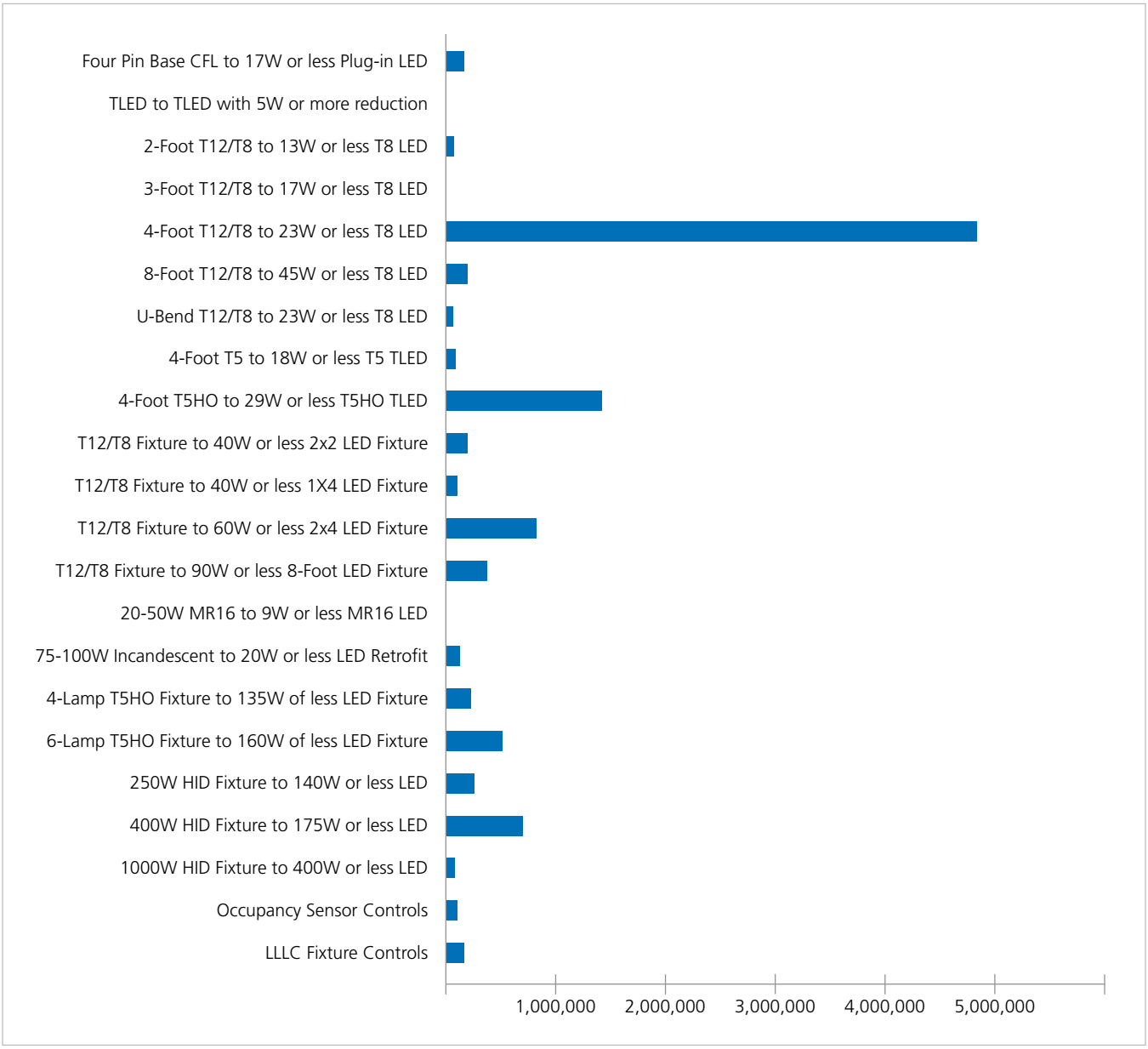
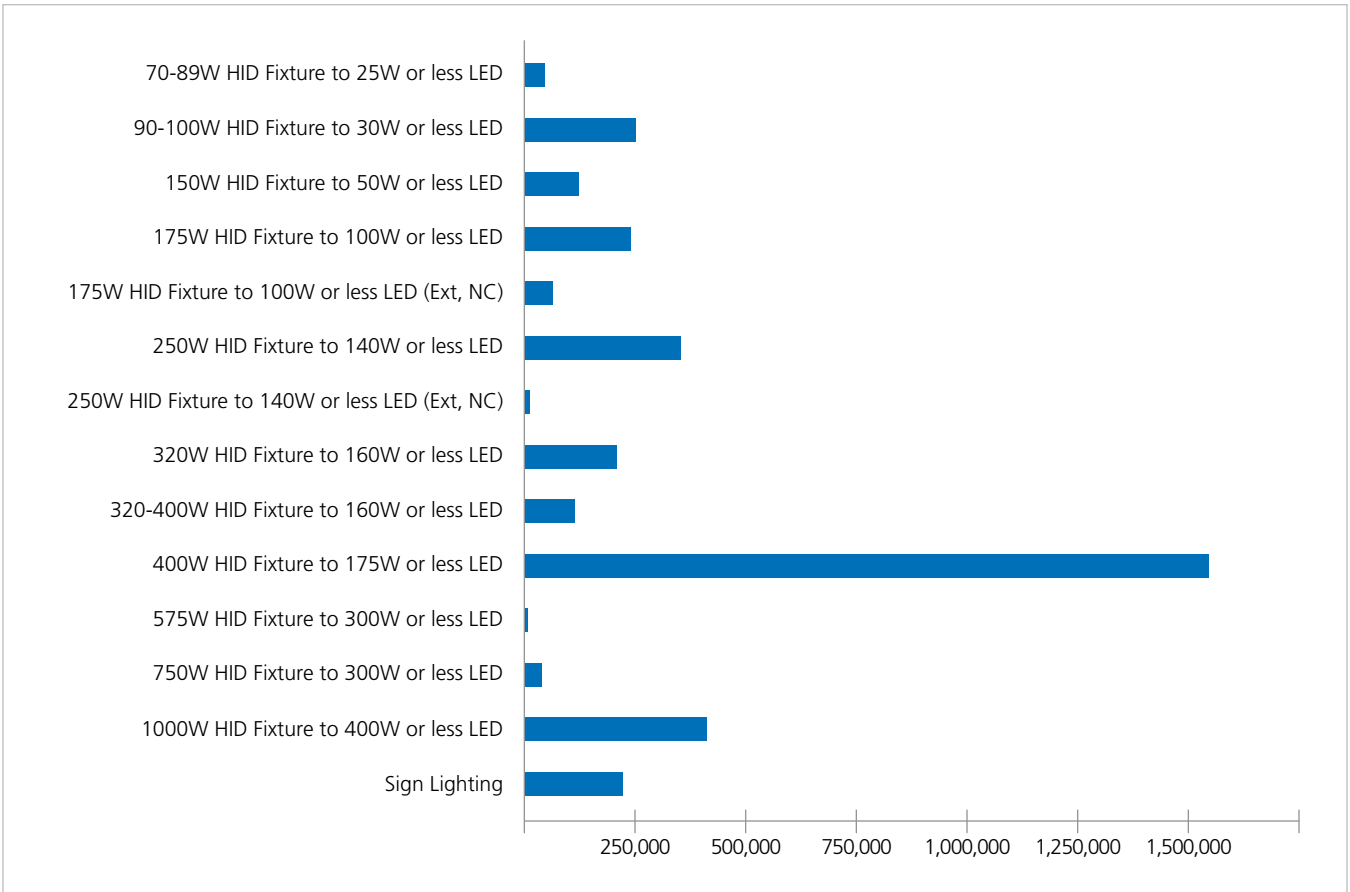


FIGURE 20 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE EXTERIOR LIGHTING KWH SAVINGS BY MEASURE



Program Changes

Table 18 shows the changes Avista made to the program in 2022.

TABLE 18 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM CHANGES

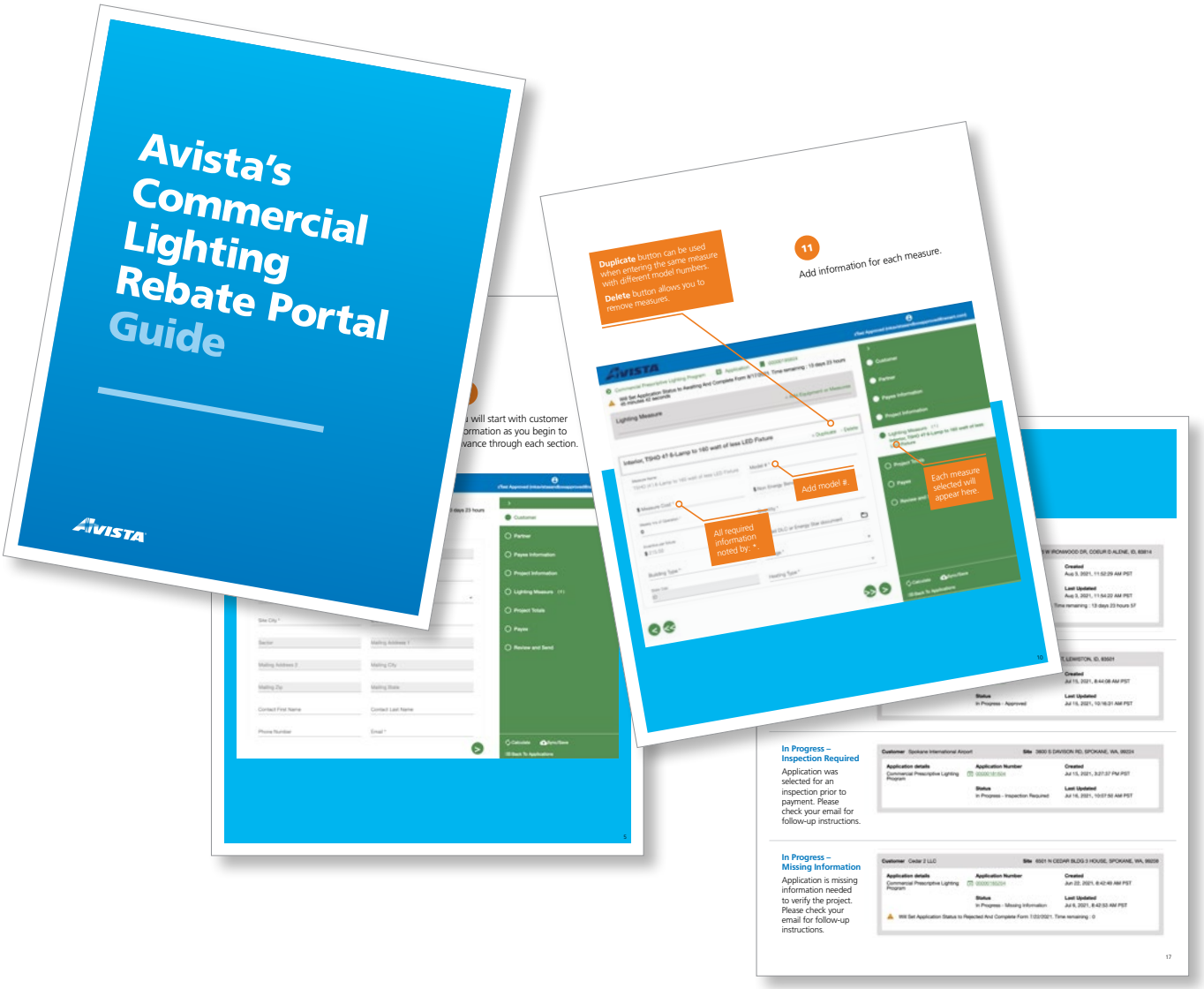
2022 Changes to Commercial Lighting Rebates	2021	2022
Exterior Lighting		
Replacement HID Lighting (Pole, Wallpack, or Canopy) Requires at Least 4,288 Hours of Use per Year – Must Be DLC or ENERGY STAR-Rated		
70-89W HID Fixture to ≤ 25W LED Fixture or Lamp	$ 70.00	$ 75.00
90-100W HID Fixture to ≤ 30W 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 Two-Foot TLED	$ 15.00	$ 7.50
T12/T8 Fluorescent to ≤ 17W T8 Three-Foot TLED	$ 15.00	$ 10.00
T12/T8 Fluorescent to ≤ 23W T8 Four-Foot TLED	$ 13.50	$ 12.50
T12/T8 Fluorescent to ≤ 45W T8 Eight-Foot TLED	$ 12.00	$ 23.00
T12/T8 Fluorescent to ≤ 23W T8 U-Bend TLED	$ 16.00	$ 13.50
T5HO Fluorescent to ≤ 29W T5HO Four-Foot TLED	$ 22.00	$ 25.00
T5 Fluorescent to ≤ 18W T5 Four-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 Eight-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

Program Marketing

Key to the success of the Prescriptive Lighting Program is clear communication to lighting 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.

FIGURE 21 – COMMERCIAL/INDUSTRIAL LIGHTING REBATE WEB PORTAL



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 Small Business Lighting Program. Additionally, Avista plans to increase customer self-service by launching a web interface that allows customers to submit their incentive applications.

Commercial/Industrial Prescriptive Non-Lighting Program

TABLE 19 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM METRICS

Prescriptive Non-Lighting – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		31
Overall kWh Savings		294,183
Incentive Spend	$	27,198
Non-Incentive Utility Costs	$	28,727
Washington Energy-Efficiency Rider Spend	$	55,924
Prescriptive Non-Lighting – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		67
Overall Therm Savings		36,447
Incentive Spend	$	113,976
Non-Incentive Utility Costs	$	246,158
Washington Energy-Efficiency Rider Spend	$	360,134

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, we added a measure to this program for compressed air leak detection. A preliminary acoustic imaging detector audit provides a report for leaks, leaks are repaired, and a second audit is done to verify 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 Program – The Commercial Natural Gas HVAC Program encourages Avista commercial natural gas customers to save energy by choosing to install energy-efficient natural gas furnaces, boilers and unit heaters. It offers six 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 equipment eligibility.

Green Motors Rewind – The Green Motors Rewind Program offers Avista commercial/industrial 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 horsepower and be used in an industrial capacity. The program pays $1 per HP to the service center and another $1 per HP off the invoiced price to the customer. Green Motors Practices Group is the third-party that manages this program 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 colder 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 orders cords for customers from Hotstart and delivers 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 energy-saving retrofit 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 apply for an incentive by submitting a rebate form with associated invoicing and providing proof of purchase and installation within 90 days. Incentives are disbursed after receipt of documentation and verification of equipment eligibility.

Commercial HVAC VFD Retrofit Program – The Commercial HVAC Variable Frequency Drive (VFD) Program is offered to encourage customers to increase the energy efficiency of their HVAC fan or pump applications with a variable frequency drive. Installing a VFD on existing 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 within 90 days. 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 that 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, savings from planned improvements must be identified as at least 10 percent of the building's baseline kWh or therm consumption. Manufacturing/Industrial processes are excluded under 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 294,183 kWh, a decrease of 18 percent from the 2021 savings achievement of 359,897 kWh. The majority of electric savings came from the Commercial Grocer Program, followed by the Food Service Equipment Program.
- ***Natural Gas:*** Savings of 36,447 therms in 2022. This is a 2 percent decrease in savings relative to the 37,132 therms achieved in 2021. Insulation and commercial HVAC equipment accounted for the majority of therm savings achieved.

FIGURE 22 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE INCENTIVE DOLLARS BY MEASURE – ELECTRIC

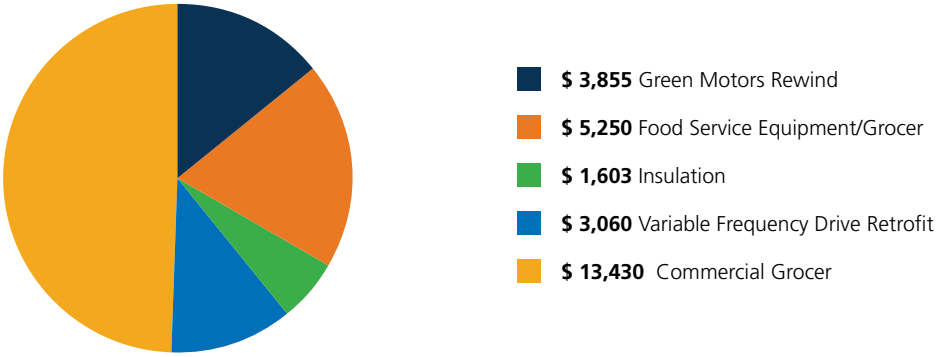
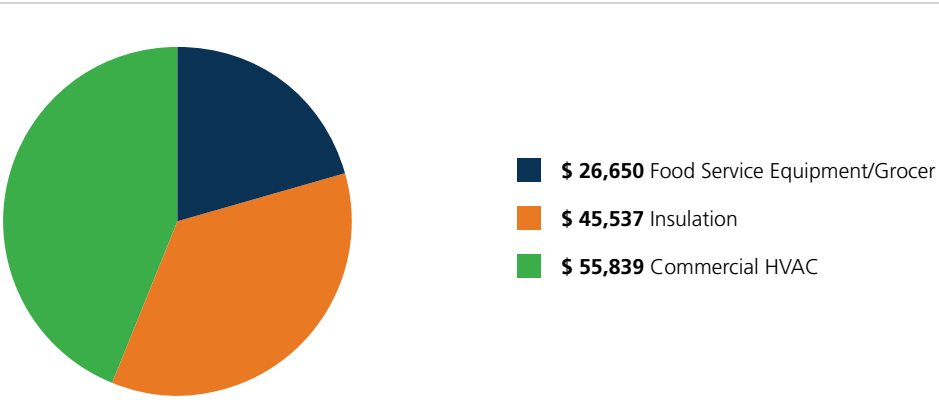


FIGURE 23 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE INCENTIVE DOLLARS BY MEASURE – NATURAL GAS



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 20 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 five projects are expected to be completed in 2023.

TABLE 20 – 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 Gas Steamer	$ 1,700	$ 1,300	Measure Decrease
6 Pan Electric and Gas Steamer	$ 2,600	$ 2,200	Measure Decrease
7-12 Pan Electric and Gas Steamer	$ 3,200	$ 2,488	Measure Decrease
Electric Convection Oven	$ 220	$ 200	Measure Decrease
Ice Machines 799 lbs/day and under	$ 160	N/A	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
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 to 15W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Shaded Pole 16 to 20W output power	New	$ 50	Measure Added
Medium Temp ECM replacing Shaded Pole 20+W output power	New	$ 50	Measure Added

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

2022 Changes to Prescriptive Non-Lighting Rebates	2021	2022	Notes
Walk-In Cooler Evaporator Fan Motor 1/15 HP Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/15 HP Shaded Pole to 1/20 HP ECM	New	$ 100	Measure Added
Walk-In Cooler Evaporator Fan Motor 1/15 HP Shaded Pole to 1/15 HP 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 1/20 HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/20 HP Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/20 HP Shaded Pole to 1/20 HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/20 HP Shaded Pole to 1/15 HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/15 HP Shaded Pole to 20W ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/15 HP Shaded Pole to 1/20 HP ECM	New	$ 100	Measure Added
Walk-In Freezer Evaporator Fan Motor 1/15 HP Shaded Pole to 1/15 HP 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 to 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 to 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

Program Marketing

Avista account executives market these programs, as do external trade allies. All commercial programs are also featured on the Avista efficiency website. Account executives worked to educate customers affected by Washington State's Clean Buildings Standard (HB1257) on the programs and services Avista offers that can help them achieve compliance.

Plans for 2023

Avista will reassess all program measures and incentive levels in 2023.

RESIDENTIAL SECTOR

Nine Mile Reservoir, Washington

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 a select distribution of low-cost lighting and weatherization materials, direct-installation programs, and a multifaceted, multichannel outreach and customer engagement effort.

Over $4.2 million in rebates and direct benefits were provided to Washington residential customers to offset the cost of implementing these energy-efficiency measures in 2022. All programs within the residential sector portfolio combined contributed 1,760,247 kWh and 475,085 therms to overall efficiency achievements.

TABLE 21 – RESIDENTIAL SAVINGS BY PROGRAM

Program	Electric Savings (kWh)	Natural Gas Savings (Therms)
ENERGY STAR Homes	66,555	535.92
Multifamily Direct Install	558,895	1,879.50
HVAC	522,790	370,728
Water Heat	136,058	33,696
Shell	264,602	62,356
AeroBarrier	1,077	322
Multifamily/Small Home Weatherization	129,232	4,756
Appliances	82,327	972.28
Total Residential	**1,761,536**	**475,245**

Marketing

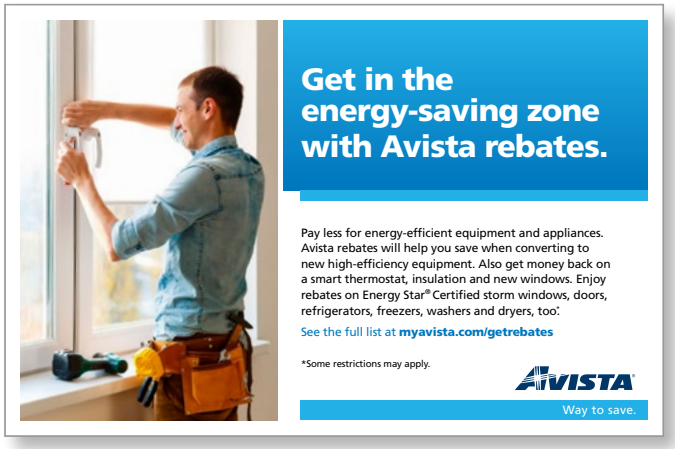
Meeting customers where they are, with information that's valuable to them, drives Avista's energy efficiency marketing strategies to increase awareness of and engagement with its energy efficiency programs and resources. In 2022, the company's energy efficiency campaigns underwent a creative refresh. 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 24 – RESIDENTIAL REBATES SUMMER BILL INSERT

FIGURE 25 – RESIDENTIAL ENERGY-EFFICIENCY PRINT ADS



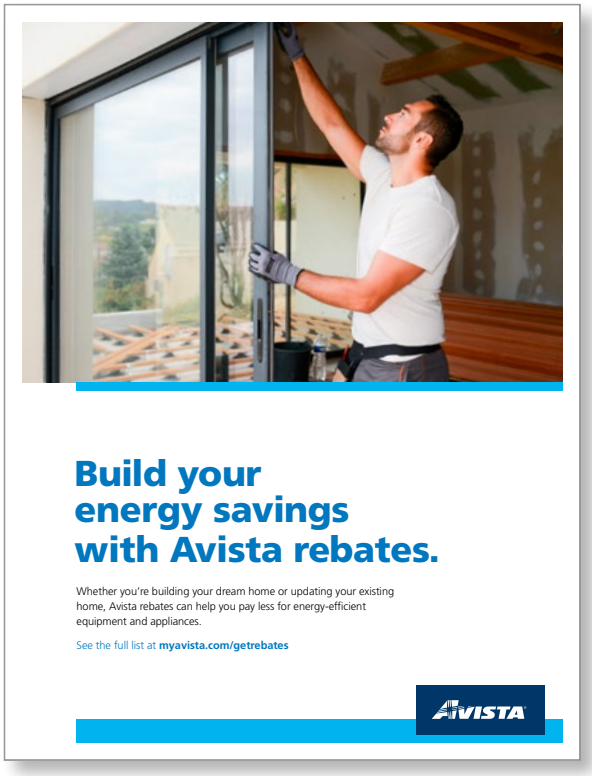


FIGURE 26 – RESIDENTIAL BEAT THE HEAT STAY COOL AND SAVE ENERGY THIS SUMMER EMAIL

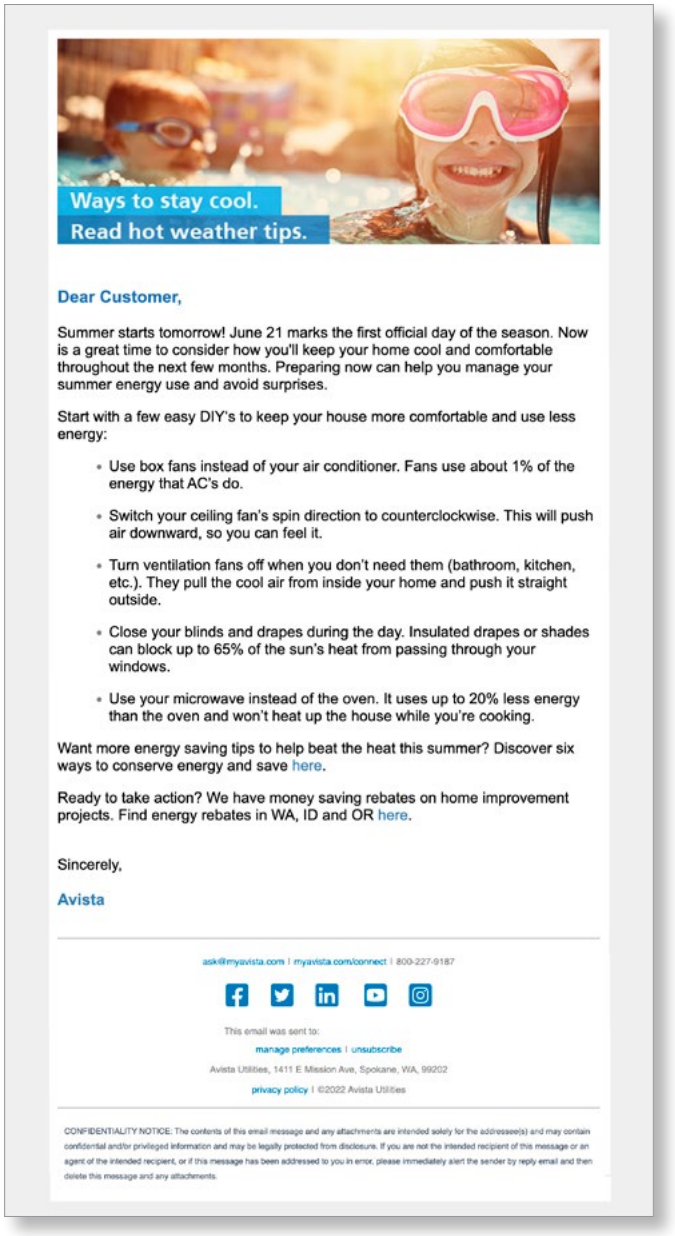


FIGURE 27 – RESIDENTIAL SUMMER BILL FACEBOOK POST

FIGURE 28 – 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:

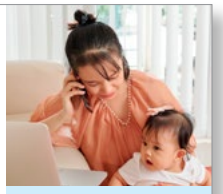
- Use white paint to mark the zone where you plan to dig.
- Call 811 and wait for the utility representative to mark the facilities owned by Avista.
- Maintain and respect these locate marks.
- If your located ticket expires, you must call in for a new locate.
- Hand dig within the 24-inch tolerance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

AVISTA

FIGURE 29 – RESIDENTIAL WINTER BILL INSERT

FIGURE 30 – 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 31 – RESIDENTIAL WINTER BILL GOOGLE DISPLAY ADS

FIGURE 32 – RESIDENTIAL WINTER BILL VIDEO

FIGURE 33 – RESIDENTIAL WINTER BILL PRINT AD, SPANISH

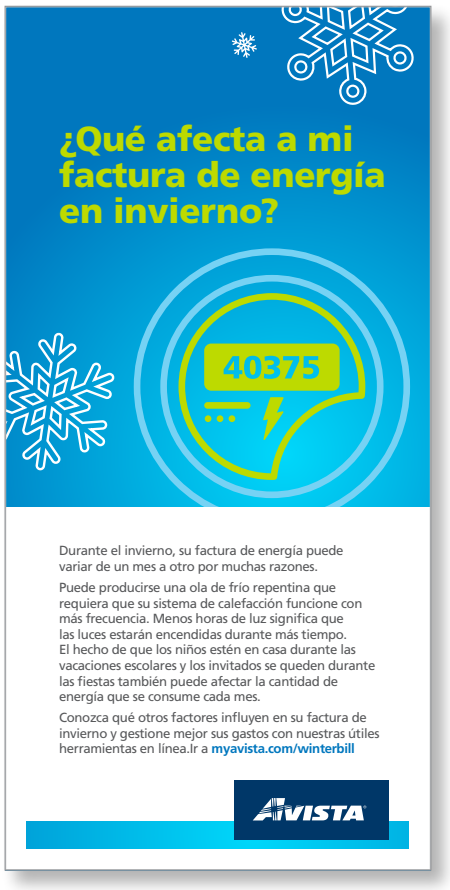


FIGURE 34 – RESIDENTIAL WINTER BILL GOOGLE DISPLAY ADS, SPANISH

FIGURE 35 – 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 36 – RESIDENTIAL AT HOME WITH LISA GOOGLE DISPLAY ADS

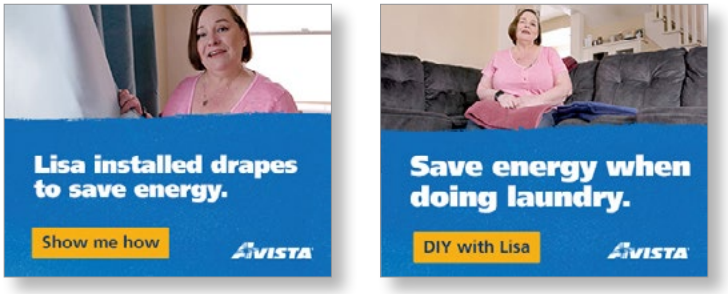
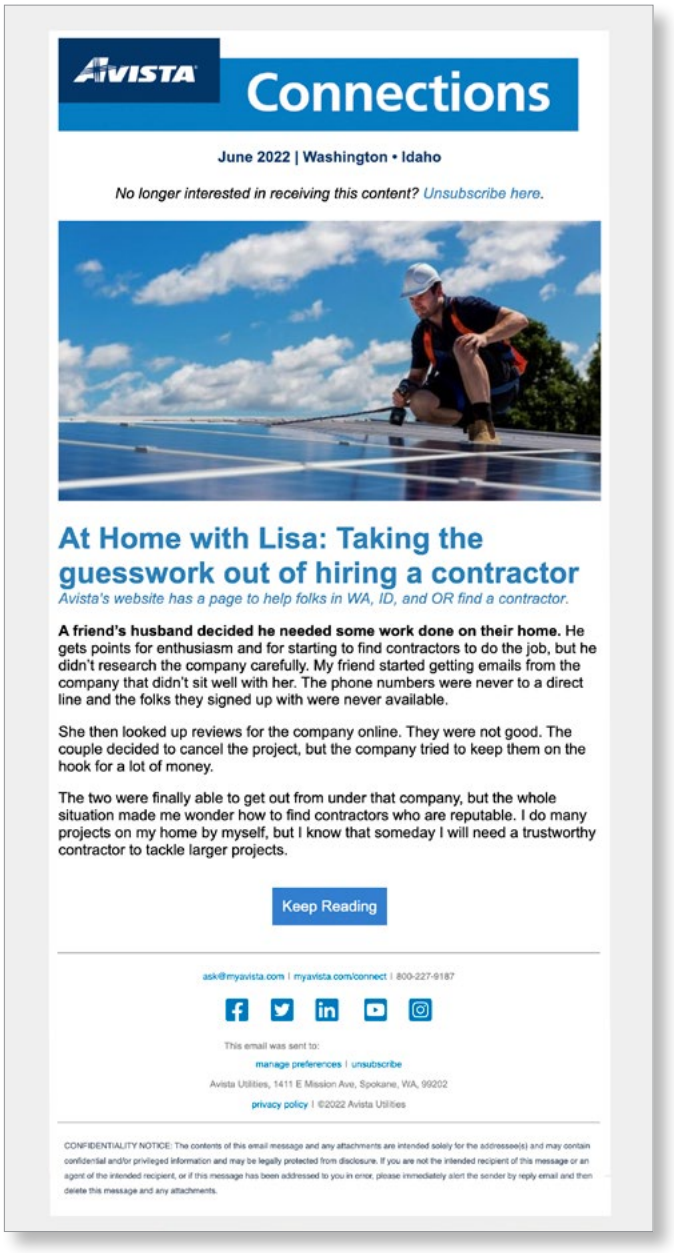


FIGURE 37 – RESIDENTIAL AT HOME WITH LISA MONTHLY AVISTA NEWSLETTER EMAIL



Avista Connections

June 2022 | Washington • Idaho

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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.

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FIGURE 38 – RESIDENTIAL AT HOME WITH LISA BILL INSERT

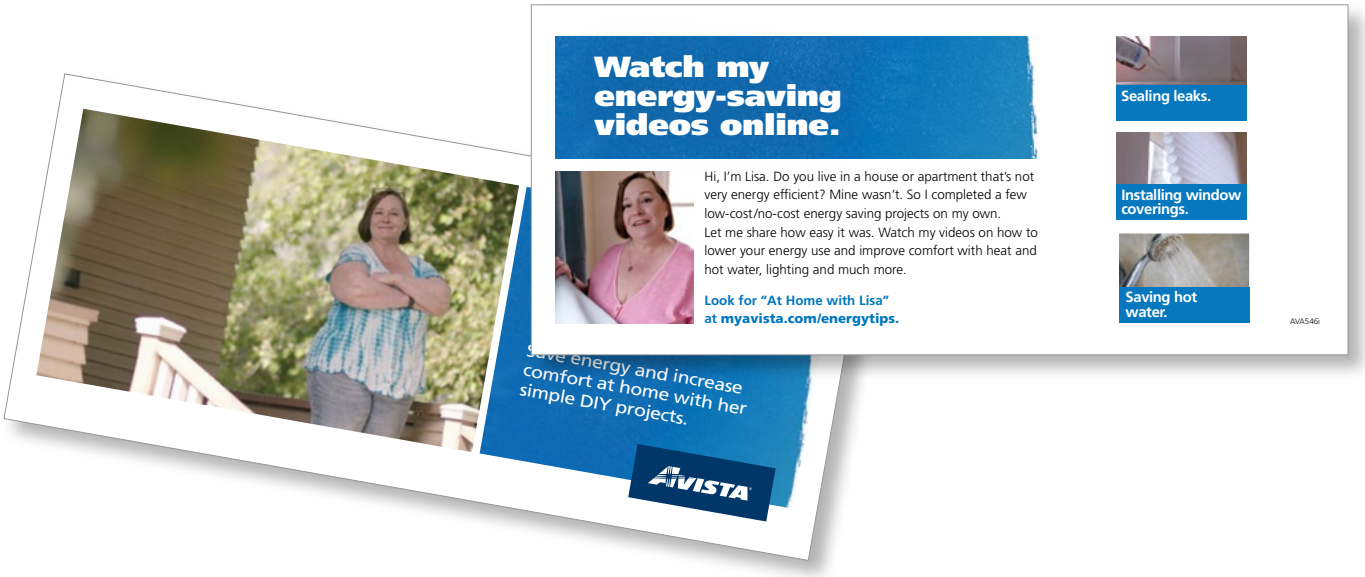


FIGURE 39 – RESIDENTIAL AT HOME WITH LISA FACEBOOK POSTS

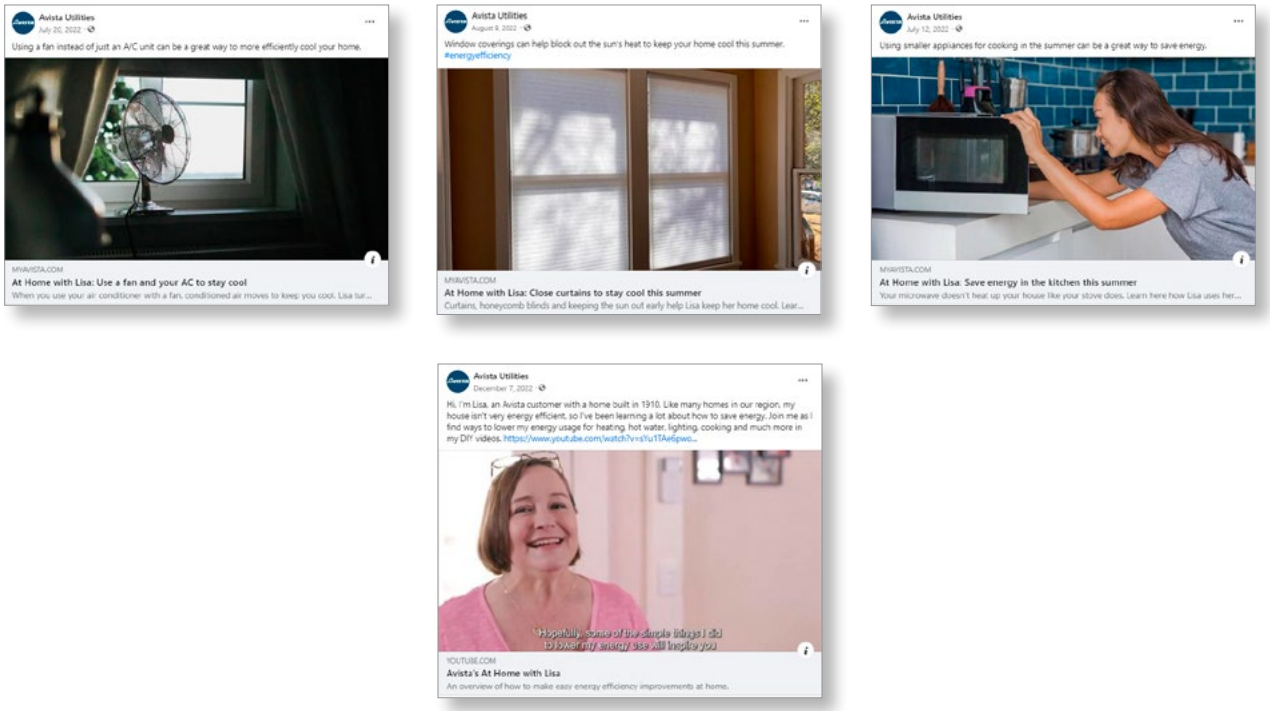


FIGURE 40 – RESIDENTIAL AT HOME WITH LISA VIDEO SERIES

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

Performance and Savings Goals

The electric program achieved 1,761,536 kWh in 2022 – a 12 percent increase from 2021 (1,568,411 kWh). This increase is likely due to the resumption of the MFDI program, which was halted in 2020 and for the duration of 2021.

The natural gas program achieved 475,245 therms, an increase of 10 percent over 2020's savings (430,397 therms).

- HVAC measures formed the largest percentages of savings for natural gas and second largest for electric programs.
- Multifamily Direct Install contributed the largest proportion of savings for electric programs.
- Shell measures also contributed significantly to savings from electric programs.

Table 22 shows savings goals assigned to Avista's residential sector programs for 2022, as well as verified savings and the goal portion achieved in 2022.

TABLE 22 – RESIDENTIAL PROGRAMS REPORTED SAVINGS – ELECTRIC

Program	Savings Goals (kWh)	Verified Savings (kWh)	Percentage of Goal
Water Heat	73,770	136,058	184%
HVAC	855,156	522,790	61%
Shell	886,447	264,602	30%
ENERGY STAR Homes	72,930	66,555	91%
Multifamily/Small Home Weatherization	413,976	129,232	31%
Appliances	50,450	82,327	163%
AeroBarrier	N/A	1,077	N/A
Multifamily Direct Install	1,311,023	558,895	43%
Residential Total	**3,663,751**	**1,761,536**	**48%**

The natural gas segment of the portfolio achieved 109 percent of the goal for 2022. Table 23 shows savings goals assigned to Avista's residential sector programs for 2022, as well as verified savings and the goal percentage achieved in 2022.

TABLE 23 – RESIDENTIAL PROGRAMS REPORTED SAVINGS – NATURAL GAS

Program	Savings Goals (Therms)	Verified Savings (Therms)	Percentage of Goal
Water Heat	33,403	33,696	101%
HVAC	559,849	370,728	66%
Shell	63,170	62,356	99%
ENERGY STAR Homes	1,340	536	40%
Multifamily/Small Home Weatherization	63,784	4,756	7%
Appliances	N/A	972	N/A
AeroBarrier	N/A	322	N/A
Multifamily Direct Install	N/A	1,880	N/A
Residential Total	**721,546**	**475,245**	**66%**

The residential program consists of measures that aim to maximize the inclusion of all customers while remaining cost-effective. For 2022, Avista's residential prescriptive program provided 5,615 rebates to more than 4,323 customers. (A customer can participate in more than one rebate at a time.)

In an effort to include customers who historically didn't meet minimum annual energy use requirements of the single-family Shell and HVAC programs, Avista began offering incentives tailored for these types of homes in 2021 through the Multifamily/Small Home Weatherization program. Results from the 2021 impact evaluation concluded that savings were adequate to continue to offering these measures while considering additional measures as well. In 2022, however, customers with small homes found the program participation pathways to be confusing. Beginning in 2023, the multifamily program 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.

Cost-Effectiveness

Tables 24 and 25 show the residential sector cost-effectiveness results by fuel type.

TABLE 24 – RESIDENTIAL COST-EFFECTIVENESS RESULTS – ELECTRIC

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 3,690,105	$ 2,441,953	1.51
Utility Cost Test (UCT)	$ 3,053,570	$ 1,746,895	1.75
Participant Cost Test (PCT)	$ 3,141,824	$ 1,526,387	2.06
Ratepayer Impact (RIM)	$ 3,053,570	$ 4,467,453	0.68

TABLE 25 – RESIDENTIAL COST-EFFECTIVENESS RESULTS – NATURAL GAS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 11,945,017	$ 9,807,343	1.22
Utility Cost Test (UCT)	$ 9,022,383	$ 3,517,470	2.57
Participant Cost Test (PCT)	$ 55,770,936	$ 9,648,613	5.78
Ratepayer Impact (RIM)	$ 9,023,183	$ 125,767,140	0.07

Residential HVAC Program

TABLE 26 – RESIDENTIAL HVAC PROGRAM METRICS

HVAC – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		409
Overall kWh Savings		522,790
Incentive Spend	$	164,667
Non-Incentive Utility Costs	$	237,661
Washington Energy Efficiency Rider Spend	$	402,328
HVAC – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		5,441
Overall Therm Savings		370,728
Incentive Spend	$	2,526,511
Non-Incentive Utility Costs	$	119,528
Washington Energy Efficiency Rider Spend	$	2,646,039

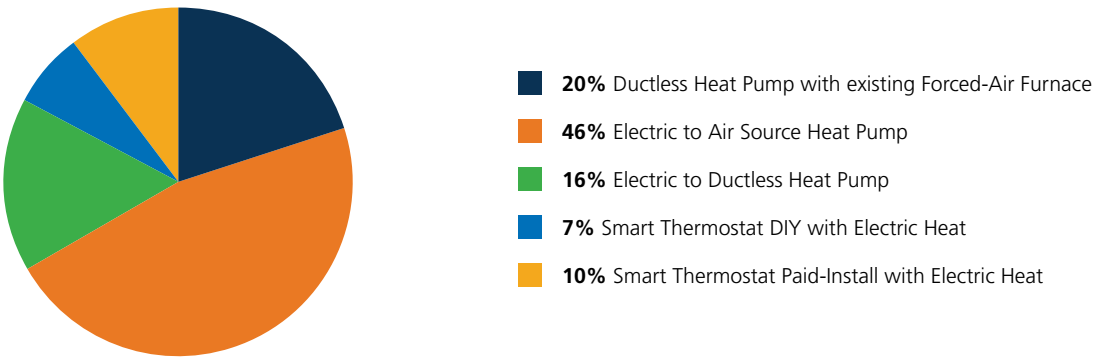
Description

Avista encourages customers to select a high-efficiency solution when making heating upgrades to their homes. Washington 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 kilowatt hours or more (and less than 340 therms if natural gas is also available) of heating use. Washington 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 522,790 kWh in 2022, 30 percent of the overall savings achieved in Avista's residential portfolio. The program had a 2 percent decrease from the 535,629 kWh achieved in 2021.
- ***Natural Gas:*** Savings of 370,728 therms in 2022 (78 percent of the overall residential savings), a 17 percent increase relative to the 306,026 therms achieved in 2021.

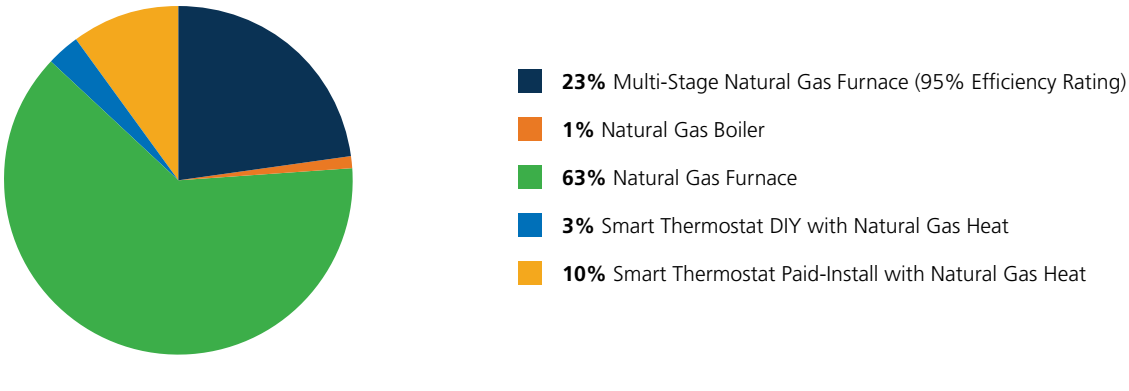
FIGURE 41 – RESIDENTIAL HVAC INCENTIVE DOLLARS BY MEASURE – ELECTRIC



There were a significant number of HVAC projects completed in 2022 despite the plethora of supply chain challenges and other lingering pandemic-related issues. Overall, 5,850 projects were completed in 2022, an increase of 15 percent over the 5,067 projects completed in 2021.

Air-source heat pumps comprised approximately 46 percent of the residential HVAC electric incentives; 82 percent of HVAC incentives were in the air-source or ductless heat pump category.

FIGURE 42 – RESIDENTIAL HVAC 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 approximately 86 percent of Avista's 2022 residential HVAC incentives (including multi-stage furnaces, which were a new measure offering in 2022). While smart thermostats continued to be popular, installed numbers were down significantly in 2022, compared with 2021 (945 were installed in the company's Washington service territory in 2022 and 2,829 were installed in 2021).

Program Marketing

The program was included in the winter heating campaign to increase awareness and drive program participation. See pages 39-46. 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.

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 time to adjust to the new program.

Residential Shell Program

TABLE 27 – RESIDENTIAL SHELL PROGRAM METRICS

Shell – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		270
Overall kWh Savings		264,602
Incentive Spend	$	157,184
Non-Incentive Utility Costs	$	281,492
Washington Energy-Efficiency Rider Spend	$	438,676
Shell – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		1,101
Overall Therm Savings		62,356
Incentive Spend	$	597,496
Non-Incentive Utility Costs	$	27,068
Washington Energy-Efficiency Rider Spend	$	624,563

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, Washington 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 Washington 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 264,602 kWh in 2022 (15 percent of the overall residential savings), a 32 percent decrease from the 390,726 kWh achieved in 2021.
- ***Natural Gas:*** Savings of 62,356 therms in 2022, or 13 percent of the overall residential savings. The program had a 19 percent decrease in savings relative to the 76,639 therms achieved in 2021.

As in 2021, savings derived from the Residential Shell Program for both natural gas and electric are primarily attributed to window replacements. For Avista's electric program, the difference in savings as compared to 2021 is due to the variance between expected and verified savings for storm windows, window replacements, and wall insulation. The company anticipated 427,798 kWh of savings for its electric shell program as a whole; however, verified savings were 264,602 kWh. For the natural gas program, expected savings were 75,568 therms; verified savings were 62,356 therms.

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.

Program Marketing

The program was included in the winter heating campaign to increase awareness and drive participation. See pages 39-46. Marketing efforts build awareness of opportunities in the home and drive customers to the website for rebate information. Additional communication methods that encourage program participation include promotion on Avista's website and bill inserts.

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 and are dissatisfied by the lack of rebate options for this category.

Residential Water Heating Program

TABLE 28 – RESIDENTIAL WATER HEATING PROGRAM METRICS

Water Heating – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		105
Overall kWh Savings		136,058
Incentive Spend	$	52,500
Non-Incentive Utility Costs	$	44,906
Washington Energy-Efficiency Rider Spend	$	97,406
Water Heating – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		486
Overall Therm Savings		33,696
Incentive Spend	$	162,200
Non-Incentive Utility Costs	$	9,896
Washington Energy-Efficiency Rider Spend	$	172,096

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:*** Residential water heating program savings were 136,058 kWh in 2022, a 31 percent increase over the 103,798 kWh of savings achieved in 2021, accounting for 8 percent of residential electric savings.
- ***Natural Gas:*** Overall savings were 33,696 therms, a decrease of 23 percent over 2021's savings of 43,696. Water heating savings accounted for 7 percent of residential therm savings.

The program saw a large increase in participation, from 83 units in 2021 to 591 in 2022. This change may be a result of an increased incentive and may also reflect a recovery in supply chains for the equipment included in this program.

Program 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. 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.

Plans for 2023

All three water heater products will be available in 2023, with an increase both to the incentives for and to 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 29 – RESIDENTIAL ENERGY STAR/NEEM MANUFACTURED HOMES PROGRAM METRICS

ENERGY STAR/NEEM Manufactured Homes – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		38
Overall kWh Savings		66,555
Incentive Spend	$	34,000
Non-Incentive Utility Costs	$	45,466
Washington Energy-Efficiency Rider Spend	$	79,466
ENERGY STAR/NEEM Manufactured Homes – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		5
Overall Therm Savings		536
Incentive Spend	$	2,980
Non-Incentive Utility Costs	$	162
Washington Energy-Efficiency Rider Spend	$	3,142

Description

Any Washington 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 Washington, 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:*** Savings of 66,555 kWh in 2022 (4 percent of the overall residential savings), a 26 percent decrease compared to the savings of 90,133 kWh achieved in 2021.
- ***Natural Gas:*** Savings of 536 therms in 2022. The program had a 22 percent increase in savings relative to the 438 therms achieved in 2021.

Program Changes

There were no substantial program changes in 2022.

Residential Multifamily/Small Home Program

TABLE 30 – RESIDENTIAL MULTIFAMILY/SMALL HOME PROGRAM METRICS

Multifamily/Small Home – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		108
Overall kWh Savings		129,232
Incentive Spend	$	48,504
Non-Incentive Utility Costs	$	94,087
Washington Energy-Efficiency Rider Spend	$	142,591
Multifamily/Small Home – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		69
Overall Therm Savings		4,756
Incentive Spend	$	34,966
Non-Incentive Utility Costs	$	1,476
Washington Energy-Efficiency Rider Spend	$	36,443

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 2021, 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.

Results from the 2021 impact evaluations, as well as implementation review, demonstrated that 199,562 kWh savings and 2,912 therms were achieved with this program, prompting consideration toward adding additional measures for these homes in the future.

Program Activities

The Residential Multifamily/Small Homes Program accounted for 7 percent of program savings for electric and 1 percent of savings for natural gas programs.

- ***Electric:*** Savings of 129,232 kWh in 2022, a decrease of 35 percent compared to 199,562 kWh achieved in 2021.
- ***Natural Gas:*** Savings of 4,756 therms in 2022, an increase of 63 percent over the 2,912 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.

Plans for 2023

Customers with small homes were confused by the inclusion of their homes within the multifamily segment. Beginning in 2023, multifamily 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 31 – RESIDENTIAL APPLIANCES PROGRAM METRICS

Appliances – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		627
Overall kWh Savings		82,327
Incentive Spend	$	43,900
Non-Incentive Utility Costs	$	26,583
Washington Energy-Efficiency Rider Spend	$	70,483
Appliances – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		192
Overall Therm Savings		972
Incentive Spend	$	9,400
Non-Incentive Utility Costs	$	168
Washington Energy-Efficiency Rider Spend	$	9,568

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 82,327 kWh in 2022, nearly double the 30,506 kWh in 2021. Program participation also nearly doubled, with 627 projects in 2022 compared to 327 projects in 2021.
- ***Natural Gas:*** Savings of 972 therms in 2022, a 26 percent increase over 721 therms achieved in 2021. Participation increased slightly at 192 projects compared to 185 projects 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.

Residential Multifamily Direct Install Program and Supplemental Lighting Program

TABLE 32 – RESIDENTIAL MULTIFAMILY DIRECT INSTALL PROGRAM AND SUPPLEMENTAL LIGHTING PROGRAM METRICS

Multifamily Direct Install – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		8,650
Overall kWh Savings		558,895
Incentive Spend	$	321,571
Non-Incentive Utility Costs	$	184,908
Washington Energy-Efficiency Rider Spend	$	506,479
Multifamily Direct Install – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		625
Overall Therm Savings		1,879.50
Incentive Spend	$	7,288
Non-Incentive Utility Costs	$	370
Washington Energy-Efficiency Rider Spend	$	7,658

Note that the MFDI program has been tracked by total measures installed, which include LED lamps, faucet aerators, showerheads, and smart strips.

Description

The Multifamily Direct Install program (MFDI) is designed to help hard-to-reach customers save energy. Field installers coordinate with property managers of multifamily complexes of five units or more to directly install small energy savers such as LED lamps, faucet aerators, showerheads, and smart power strips, as well as vending misers in common areas. During the first site visit with properties, installers audit the complex not only for tenant needs, but also for any eligible common area lighting, which would include stairwell lighting used 24/7, exterior lamps and fixtures on a daylight sensor, and conversions from interior fluorescent T12s and T8s to LEDs used 24/7. Direct installations are completed at the complex and the supplemental lighting information is passed on to lighting contractors contracted to work in various areas. Lighting contractors communicate with the property managers to audit and put together project data that is sent to SBW, the program implementer, and Avista to ensure the project is cost-effective, after which the project is completed.

Program Activities

The MFDI Program began in 2018 and ran as designed until March 2020, at which time it was paused due to the COVID-19 pandemic. Amid safety restrictions on entering tenant units, Avista tried several ways to reach customers in fall 2020, including a "trunk or treat" model in which residents were invited outside to pick up free products – LED lamps, faucet aerators, showerheads, et al. – as well as a drop-off model, in which the program implementer dropped off kits for residents to self-install. Neither of these methods was effective. For 2021, the focus pivoted to supplemental lighting projects that could be completed in common areas as well as exterior lighting projects. In April 2022, the program resumed direct installation as originally designed. To drive marketing and outreach efforts for 2022, Avista leveraged customer-specific estimates of the energy burden. This data is newly available to program staff due to CETA and CEIP-related activities.

FIGURE 43 – RESIDENTIAL MULTIFAMILY DIRECT INSTALL PROGRAM FLYER

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

Plans for 2023

This program is currently scheduled to run through 2023 as originally planned.

Rosalia, Washington

LOW-INCOME SECTOR

Program-by-Program Summaries

Low-Income Program

TABLE 33 – LOW-INCOME PROGRAM METRICS

Low-Income – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		326
Overall kWh Savings		358,437
Incentive Spend	$	1,147,284
Non-Incentive Utility Costs	$	436,435
Washington Energy-Efficiency Rider Spend	$	1,583,719
Low-Income – Natural Gas		**2022**
Participation, Savings, and Costs		
Conservation Projects		1,023
Overall Therm Savings		11,705
Incentive Spend	$	1,292,900
Non-Incentive Utility Costs	$	424,114
Washington Energy-Efficiency Rider Spend	$	1,717,014

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 partners with seven Community Action Agencies (CAAs) and one Tribal Housing Authority to deliver low-income energy-efficiency programs throughout the company's service territory. All these organizations have the infrastructure in place to income-qualify customers as well as provide access to a variety of funding sources to make energy-efficiency improvements to their homes. An annual funding amount of $3 million is allocated across the organizations and is based on meter count in the counties they serve.

The agencies may spend their contract amount at their discretion on either electric or natural gas efficiency measures. The home must demonstrate a minimum level of energy use of either Avista electricity or natural gas for space heating purposes to be eligible for improvements. Eligible measures include the home's shell (e.g., doors, insulation, or windows) as well as space and water heating systems. The annual funding allocation includes a 30 percent reimbursement for both administrative (10 percent) and program support (20 percent) costs. Agencies may also choose to use up to 30 percent of their 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 utility cost-effective and allow for full reimbursement of the installation.

A list of acceptable measures allows for partial reimbursement of those efficiency improvements that may not be cost-effective 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 improvement. To allow additional flexibility with their funds, the agencies may use the health, safety, and repair dollars to fully fund the remaining cost of the qualified measure.

Program Activities

In 2022, the program achieved 358,437 kWh of reported electric savings and 11,705 therms of natural gas savings. Tables 34 and 35 show Avista savings goals for the low-income sector for 2022, as well as verified savings and the percentage of goal achieved.

TABLE 34 – LOW-INCOME VERIFIED SAVINGS – ELECTRIC

Program	Savings Goals (kWh)	Verified Savings (kWh)	Percentage of Goal
Low-Income	789,744	358,437	45%
Low-Income – Total	**789,744**	**358,437**	**45%**

TABLE 35 – LOW-INCOME VERIFIED SAVINGS – NATURAL GAS

Program	Savings Goals (Therms)	Verified Savings (Therms)	Percentage of Goal
Low-Income	24,275	11,705	48%
Low-Income – Total	**24,275**	**11,705**	**48%**

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 36). The company deemed these measures cost-effective during the development of the 2022 Annual Conservation Plan.

TABLE 36 – LOW-INCOME PROGRAM APPROVED MEASURE LIST

Electric Measures	Natural Gas Measures
Air infiltration	
Air-source heat pump	Air infiltration
Attic insulation	Attic insulation
Doors (ENERGY STAR-rated)	Boiler (96%)
Duct insulation	Doors (ENERGY STAR-rated)
Duct sealing	Duct insulation
Floor insulation	Duct sealing
LED lamps	Floor insulation
Wall insulation	Furnace (95%)
Windows (ENERGY STAR-rated)	Wall Insulation
Electric to air-source heat pump	Water heater – storage <55 gallon .65
Electric to ductless heat pump	Water heater – tankless .82 EF
Heat Pump Water Heater (Tier 2-3)	Windows (ENERGY STAR-rated)
Refrigerators (ENERGY STAR-rated)	

Agencies could receive partial reimbursement for the installation of measures that are on the acceptable measures list but that did not meet the cost-effectiveness test. The amount of reimbursement is equal to the avoided cost-energy value of the improvement. This approach focused agencies toward installing measures that had the greatest cost-effectiveness from the utility's evaluation. To allow for additional flexibility, agencies may choose to use their health and safety dollars to fully fund the cost of the measures on the acceptable measure list.

TABLE 37 – LOW-INCOME PROGRAM ACCEPTABLE MEASURE LIST

Electric Measures	Natural Gas Measures
Air-source heat pump (9 HSPF)	(none currently)

Program Changes

While the agencies have been actively working with customers since July 2020, many challenges persist, including finding willing and eligible participants, navigating continued increases in labor and material costs, and delays in receiving products. While a couple of the agencies were able to fully spend their funds, others did not have the same success. Avista will continue to collaborate with partner agencies to develop strategies to overcome these barriers.

In addition to providing the traditional path to serving income-qualified customers with energy efficiency, Avista also continued to partner with a local community action agency in Spokane County to provide no-cost weatherization services to all residents of a resident-owned mobile home community. This program is described in more detail on page 85.

The company continues to gather information and data about where these customer groups reside and how the weatherization message is best delivered. This occurs through a variety of ways, including input from the company's Equity Advisory Group, use of its Named Communities Map derived from the Department of Health's Health Disparities Map, and the use of data to assist in locating Avista customers with a high energy burden.

Customer Outreach

Customers who participate in the low-income weatherization program are often referred through Avista's partner community action agencies as recipients of various bill assistance programs. Avista often provides referrals each year from its customer service department and the company's Customer Assistance Referral and Evaluation Services program (CARES), which provides 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 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. In a typical year, 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 included 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. In addition to receiving a free energy kit, they could also request a free energy use guide (pictured on page 77) as well as the "Avista Kids" children's energy savings activities book (pictured on page 80).

With the program delivery modifications, Avista conducted only one energy assistance day in 2022 with limited participation and a small number of workshops. Nevertheless, the team conducted and participated in 60 events that reached 5,980 Washington residents. Table 38 shows an overview of the different activities in Washington.

TABLE 38 – VULNERABLE CUSTOMERS OUTREACH ACTIVITIES AND LED GIVEAWAY SUMMARY

Description	Number of Events/ Activities	Contacts	LEDs
Energy Fairs	1	924	924
General Outreach	35	2,287	4,279
Mobile Outreach	16	2,435	2,380
Workshops	8	244	498
Total	**60**	**5,890**	**9,081**

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 44 – LOW-INCOME VILLAGE WEATHERIZATION PROGRAM FLYERS

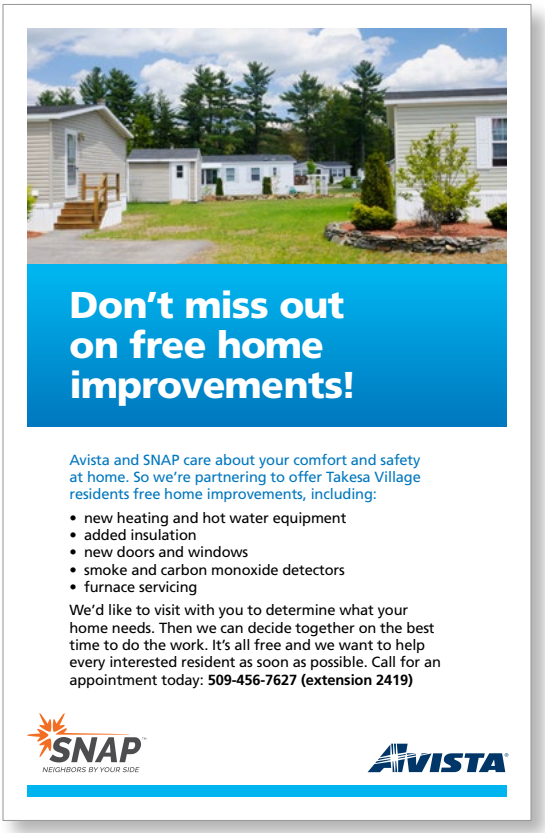


FIGURE 45 – LOW-INCOME VILLAGE WEATHERIZATION PROGRAM WE STOPPED BY DOOR HANGERS

Sorry we missed you.

Don't miss out on free home improvements!

Avista and SNAP care about your comfort and safety at home. So we're partnering to offer Takesa Village residents free home improvements, including:

- new heating and hot water equipment
- added insulation
- new doors and windows
- smoke and carbon monoxide detectors
- furnace servicing

We'd like to visit with you to determine what your home needs. Then we can decide together on the best time to do the work. It's all free and we want to help every interested resident as soon as possible. Call for an appointment today: **509-456-7627 (extension 2419)**

SNAP NEIGHBORS BY YOUR SIDE

AVISTA

Lamentamos no haberle encontrado.

¡No se pierda las mejoras gratuitas para el hogar!

Avista y SNAP se preocupan por su comodidad y seguridad en el hogar. Por ello, nos hemos aliado para ofrecerles a los residentes de Takesa Village mejoras gratuitas para sus hogares, entre ellas:

- nuevos equipos de calefacción y agua caliente
- agregar más aislamiento
- nuevas puertas y ventanas
- detectores de humo y monóxido de carbono
- mantenimiento de hornos de calefacción

Nos gustaría visitarle para determinar qué necesita su casa. Entonces podremos decidir juntos el mejor momento para realizar el trabajo. Todo es gratuito y queremos ayudar a todos los residentes interesados lo antes posible. Llame hoy mismo para pedir una cita: **509-456-7627 (extension 2419)**

SNAP NEIGHBORS BY YOUR SIDE

AVISTA

FIGURE 46 – LOW-INCOME ENERGY-EFFICIENCY POSTCARD

To learn more, contact:
KLICKITAT AND SKAMANIA COUNTIES
Community Action Council of Lewis, Mason and Thurston Counties
(In coordination with the Washington Gorge Action Programs serving Klickitat and Skamania Counties)
3020 Willamette Dr NE
Lacey, WA 98516
360-438-1100 x2100
cacmt.org

Para mayor información, contáctese con:
CONDADOS DE KLICKITAT Y SKAMANIA
Consejo de Acción Comunitaria de los condados de Lewis, Mason y Thurston
(En coordinación con los Programas de Acción de Washington Gorge que sirven a los condados de Klickitat y Skamania)
3020 Willamette Dr NE
Lacey, WA 98516
360-438-1100 x2100
cacmt.org

AVISTA
1411 E Mission
MSC 15
Spokane, WA 99252

Energy Efficiency Program for Income-Eligible Households

Avista provides funding to area community action agencies to offer energy-efficiency services to income-qualified households. These services include free improvements to help reduce energy consumption such as insulation upgrades or installing new windows.

After confirming your income eligibility with a community action agency, they will provide a home-energy audit to identify efficiency improvements that would benefit your home. If you currently receive assistance to pay your Avista bill, you're likely eligible to participate in this program.

See other side for information on your local community action agency.

Each home is evaluated on a case by case basis.

Programa de Eficiencia Energética para Hogares con Ingresos que Califican para Ello

Avista financia a las agencias de acción comunitaria de la zona para que ofrezcan servicios de eficiencia energética a los hogares que cumplen los requisitos de ingresos. Estos servicios incluyen mejoras gratuitas para ayudar a reducir el consumo de energía, como la mejora del aislamiento o la instalación de ventanas nuevas.

Tras la confirmación por parte de una agencia de acción comunitaria de que sus ingresos son elegibles, ésta realizará una auditoría energética de su vivienda para identificar las mejoras de eficiencia que beneficiarían a la misma. Si actualmente recibe ayuda para pagar su factura de Avista, es probable que usted pueda participar en este programa.

Consulte el reverso para obtener información sobre su agencia de acción comunitaria local.

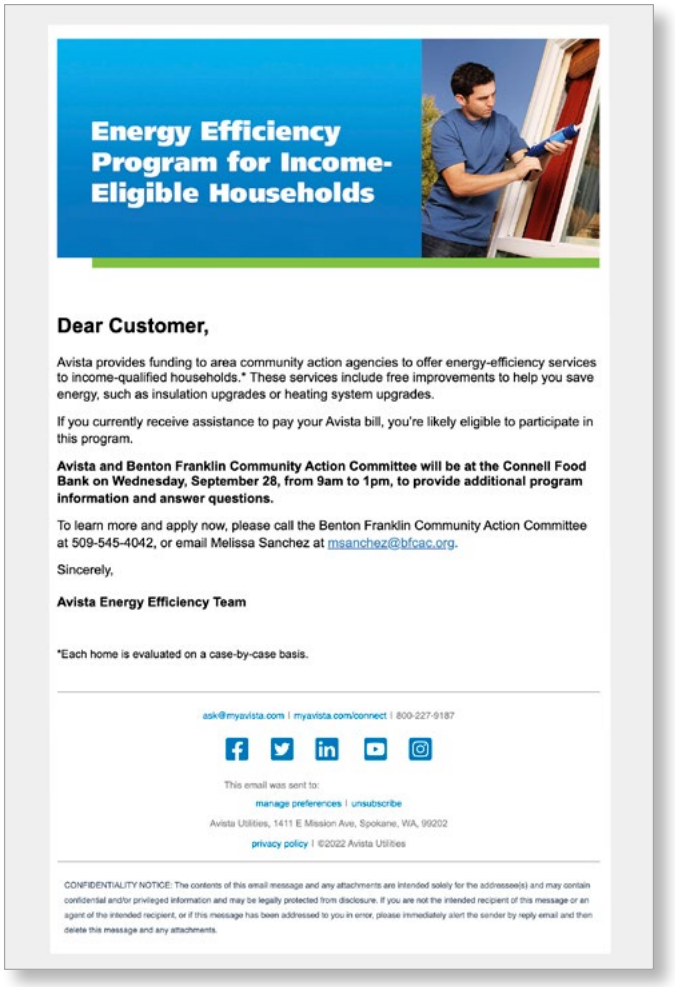
Cada vivienda se evalúa caso por caso.

AVISTA

FIGURE 47 – LOW-INCOME HOME ENERGY SAVINGS KIT BROCHURE

FIGURE 48 – LOW-INCOME BENTON FRANKLIN WEATHERIZATION FLYERS

FIGURE 49 – LOW-INCOME BENTON FRANKLIN ENERGY-EFFICIENCY PROGRAM FOR INCOME-ELIGIBLE HOUSEHOLDS EMAIL



Energy Efficiency Program for Income-Eligible Households

Dear Customer,

Avista provides funding to area community action agencies to offer energy-efficiency services to income-qualified households.* These services include free improvements to help you save energy, such as insulation upgrades or heating system upgrades.

If you currently receive assistance to pay your Avista bill, you're likely eligible to participate in this program.

Avista and Benton Franklin Community Action Committee will be at the Connell Food Bank on Wednesday, September 28, from 9am to 1pm, to provide additional program information and answer questions.

To learn more and apply now, please call the Benton Franklin Community Action Committee at 509-545-4042, or email Melissa Sanchez at msanchez@bfcac.org.

Sincerely,

Avista Energy Efficiency Team

*Each home is evaluated on a case-by-case basis.

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

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Avista Utilities, 1411 E Mission Ave, Spokane, WA, 99202

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FIGURE 50 – LOW-INCOME ENERGY USE GUIDE

FIGURE 51 – LOW-INCOME ENERGY-RESOURCE VAN SECOND HARVEST FOOD BANK POSTER

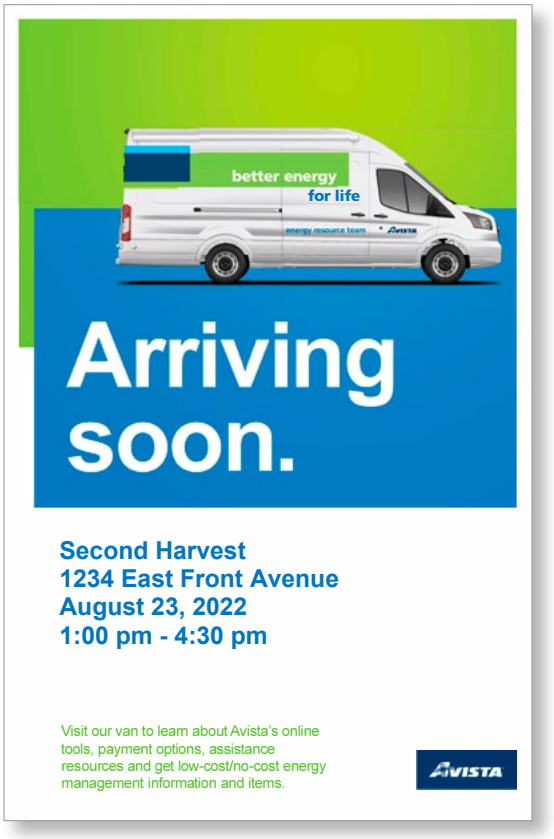

FIGURE 52 – LOW-INCOME BILL ASSISTANCE FLYERS

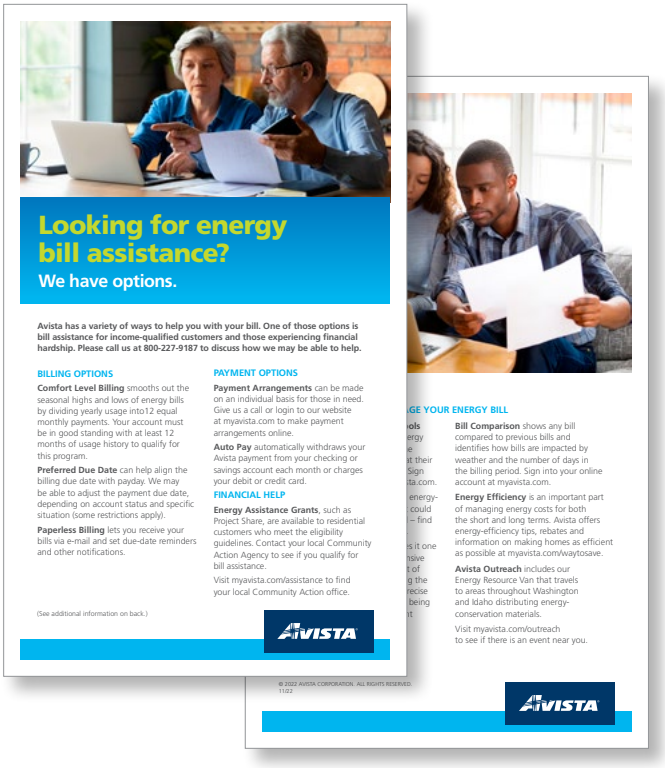

FIGURE 53 – LOW-INCOME BILL ASSISTANCE DIGITAL ADS

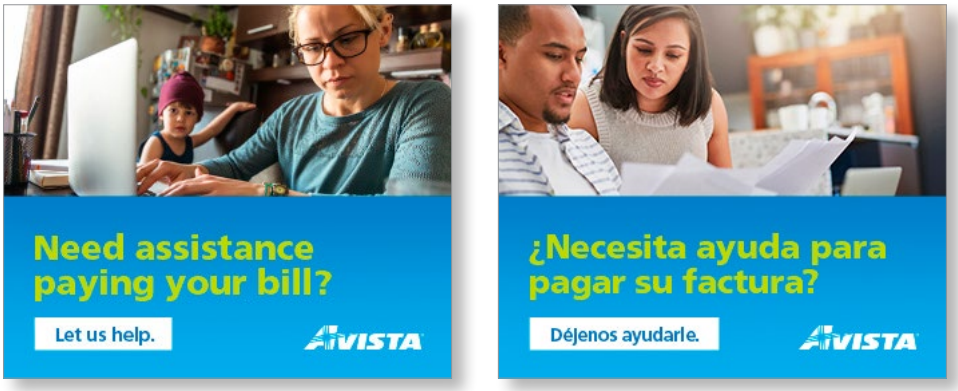

FIGURE 54 – KIDS CAN SAVE ENERGY TOO COLORING AND ACTIVITY BOOK

Cost-Effectiveness

Tables 39 and 40 show the low-income sector cost-effectiveness results by fuel type.

TABLE 39 – LOW-INCOME COST-EFFECTIVENESS RESULTS – ELECTRIC

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
TRC	$ 1,855,528	$ 1,583,719	1.17
UCT	$ 654,095	$ 1,583,719	0.41
PCT	$ 1,628,514	$ 1,147,284	1.42
RIM	$ 654,095	$ 2,149,701	0.30

TABLE 40 – LOW-INCOME COST-EFFECTIVENESS RESULTS – NATURAL GAS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
TRC	$ 1,128,387	$ 1,717,014	0.66
UCT	$ 273,404	$ 1,717,014	0.16
PCT	$ 2,538,173	$ 1,292,900	1.96
RIM	$ 273,888	$ 5,125,936	0.05

Plans for 2023

The agencies will continue to implement weatherization measures in the next 2-year contracting cycle, coinciding with the second year of Avista's Biennial Conservation Plan. As part of the eligibility review, each community action agency will continue to identify potential customers with a large energy burden. Avista will work with each agency to identify potential customers that may fall into the high-energy-burden category. 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. Except for the 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.

Community Energy-Efficiency Program

TABLE 41 – COMMUNITY ENERGY-EFFICIENCY PROGRAM METRICS

Community Energy-Efficiency – Electric		2022
Participation, Savings, and Costs		
Conservation Projects		16
Overall kWh Savings		94,819
Incentive Spend	$	146,081
Non-Incentive Utility Costs	$	91,668
Washington Energy-Efficiency Rider Spend	$	237,749

Note: CEEP accomplishments have been included within the Low-Income Program.

In addition to the company's Low-Income Program – delivered by community action agencies – Avista partners with the Community Energy Efficiency Program (CEEP) to deliver energy-efficiency programs for hard-to-reach markets such as rental properties, multifamily buildings, homes with alternative heat, low- to moderate-income households, and small businesses. Created by the Washington State Legislature in 2009, CEEP was initially funded by the American Recovery and Reinvestment Act. Since then, it has developed into a mature program with support from the Washington State Capital Budget. The Washington State University Energy Program executes and manages the program in conjunction with CEEP partners to provide support to homeowners and small businesses that may not benefit from traditional energy-efficiency programs.

Avista's current CEEP contract is for $1,000,000 and is matched with energy-efficiency tariff rider funds. Avista's CEEP projects focus on three components: low-income homes with alternative heat, multifamily energy-efficiency improvements, and an incentive match for energy-efficiency projects completed at rural businesses. The contract was extended due to the pandemic and will end June 2023. Three of the company's community action agency partners are assisting with delivering the two residential program components across three counties in Avista's service territory.

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CLEAN ENERGY TRANSFORMATION ACT (CETA) IMPLEMENTATION

Banks Lake, Washington

CLEAN ENERGY TRANSFORMATION ACT IMPLEMENTATION

In July 2022, Avista became the first investor-owned utility in the state to gain approval of its Clean Energy Implementation Plan (CEIP). The plan reflected extensive community input from both the Equity Advisory Group (EAG) and public and stakeholder meetings across the state. It included a number of innovative energy efficiency programs designed to help lower customers' energy burden while ensuring that community benefits, particularly for Named Communities, are recognized, and that progress on Customer Benefit Indicators (CBIs) is tracked. These programs and initiatives reflect the significant efforts and resources that Avista has committed to ensure that the benefits of the company's transition to cleaner energy are extended to all, especially those who are members of Named Communities. Avista committed to investing in energy efficiency projects in Named Communities as identified by its equity partners, most specifically the EAG, which was formed and first convened in late 2021. In its founding year, the EAG played a critical role in identifying CBIs and defining Vulnerable Populations.

Health and Safety for Mobile Homes

Building on a 2021 pilot program to provide no-cost weatherization services to selected members of a north Spokane County resident-owned mobile home community, the program was extended in 2022 to be offered to all residents of the community. In June of 2022, Avista and SNAP partnered to engage in bilingual outreach efforts to all residents, to offer participation to all who were interested. As In the 2021 program year, this program waived income requirements, and was funded in full through SNAP's existing partnership with Avista. By the end of 2022, Avista's partner agency, SNAP, had provided weatherization services as well as selective HVAC replacement to 41 households, with around a dozen slated to be completed in 2023. The program also included funding to replace two roofs, which were processed as part of the agency's health, safety, and repair allowance.

In 2023, Avista plans to continue this partnership with SNAP by identifying additional mobile home communities that could benefit from a no-cost weatherization program for residents.

Businesses that Serve Named Communities; Strengthening Tribal Partnerships

In 2022, Avista continued to partner with the Spokane Tribe of Indians to design a grid resiliency solution for critical emergency services buildings in Wellpinit, WA. This partnership, which is supported through Department of Commerce Clean Energy Fund IV design grant, expanded in 2022 to look broadly at the Tribe's energy needs. Through initial distribution circuit load analysis for the microgrid design project, Avista and the Tribe observed very high energy use, as well as high peak-loading, in the Spokane Tribal Administrative building, which serves as the headquarters for the Spokane Tribe. Avista was able to leverage CETA funding to cover costs, in full, of ASHRAE levels I and II energy audits for the building. The audits identified a significant number of opportunities for efficiency upgrades, which, if implemented in full, are expected to save approximately 340,000 kWh per year while offsetting 3,091 pounds of CO_2 due to replacement of aging equipment with outdated refrigerant.

In 2023, Avista will help the Tribe identify potential funding sources for these upgrades and will serve as a technical consultant on any forthcoming grant opportunities related to these opportunities. Avista also intends to leverage this model of offering funding for energy audits, in order to assist additional organizations and businesses that serve Named Communities identify opportunities for efficiency upgrades and related decarbonization projects.

Community Identified Projects

In addition to discussing and providing consult on various group development and CETA topics, the EAG identified and prioritized eight community-identified projects for the company to consider for enhancements of existing programs or the creation of new programs utilizing the energy-efficiency Named Communities Investment Funds (NCIF). Carryover of NCIF funds is permissible for one year; as such, funding that is not utilized in 2022 will be carried forward to support the execution or adoption of the EAG identified projects in 2023. Early in 2023, the company will hire a CETA energy efficiency program manager to design and implement new energy efficiency programs as specified in Avista's CEIP, which includes projects and programs identified by the EAG.

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Palouse, Washington

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 – and also aligning with efficiency requirements on commercial buildings – the Active Energy Management (AEM) pilot focuses on the exploration of clean energy transformation for commercial buildings. AEM can be defined in industry terms as a strategic energy management program that employs monitoring-based commissioning processes and the best fault detection and diagnostic tools.

For this pilot, Avista has partnered with Edo, a building efficiency and grid optimization business that is 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 nine customers and sixteen buildings participating. Two additional customers have pending applications and are expected to be fully enrolled in the second quarter of 2023. 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.

Clean Buildings Law Early Adopter Incentives

Washington State House Bill 1257 was codified into law late in 2019, with rulemaking underway throughout 2020. The new Clean Buildings Law requires existing commercial buildings over 50,000 square feet to comply with established performance standards. Requirements will be phased in starting in 2026, with 100 percent compliance by 2028.

Avista currently supports early adoption of the Clean Buildings Law by supporting the state's Early Adopter Incentive (EAI) Program. Avista offers energy efficiency incentives, ENERGY STAR Portfolio Manager services, the Clean Buildings Accelerator program, and engineering services to help customers make energy-efficiency improvements to comply with the new law.

Through the Clean Buildings Accelerator Program and marketing materials, Avista advertises the availability of the state's Early Adopter Incentive Program. However, in 2022, Avista received no EAI reservation applications from the commerce department for customers in the Avista service territory.

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. Avista targeted all builders in its Washington and Idaho service territory for this pilot and tracked 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 and concluded 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 second quarter of 2023 and will be discussed with Avista's fall EEAG meeting to determine next steps.

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. In early 2020, Avista gained support from the Energy Efficiency Advisory Group and commission staff for both Washington and Idaho 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 Washington and Idaho 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. 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 Washington and Idaho.

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.

Residential Always-On Behavioral Program

Description

To increase customer-facing value from the Washington Advanced Metering Infrastructure (AMI) deployment, Avista has launched a targeted load behavioral program using AMI-based non-intrusive load monitoring. By identifying the appliance-level electricity loads within a residence, Avista can offer customers personalized information to better inform them of energy savings opportunities.

The target load selected for the first phase will be always-on consumption. This target was selected because, on average, 24 percent of an Avista customer's bill can be attributed to always-on loads – and because calculations related to determining them are considered highly accurate. An additional benefit of targeting always-on loads is that significant improvements can be achieved with low- or no-cost behavioral interventions, such as turning off or adjusting power settings on computers when not in use.

Program Eligibility

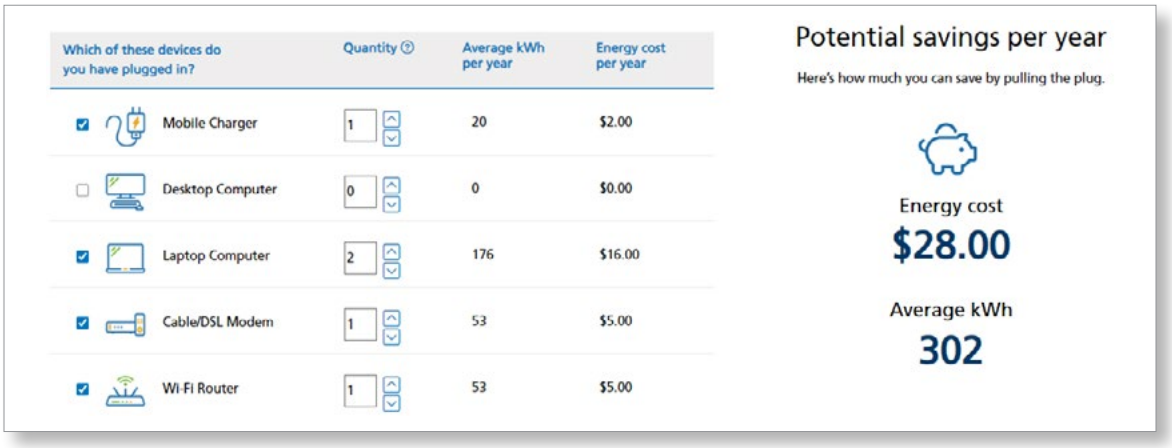
For the initial phase of the pilot, Washington residential electric customers with active AMI meters are eligible. Additionally, the targeted customer segment will be the highest one-third of always-on consumption tiers – those with approximately 120 kWh of always-on usage a month.

Program Implementation

The pilot launched in July 2022 with 75,000 customers who were randomly assigned to one of three equal customer groups: two treatment arms and one control group. Both treatment groups received information regarding their always-on usage and costs, and a subset of customers were eligible for a bill credit if they reduce their monthly usage.

Website content and tools for customers were created and added to myavista.com, including general information and tips as well as an always-on device calculator to help customers estimate their potential energy bill savings.

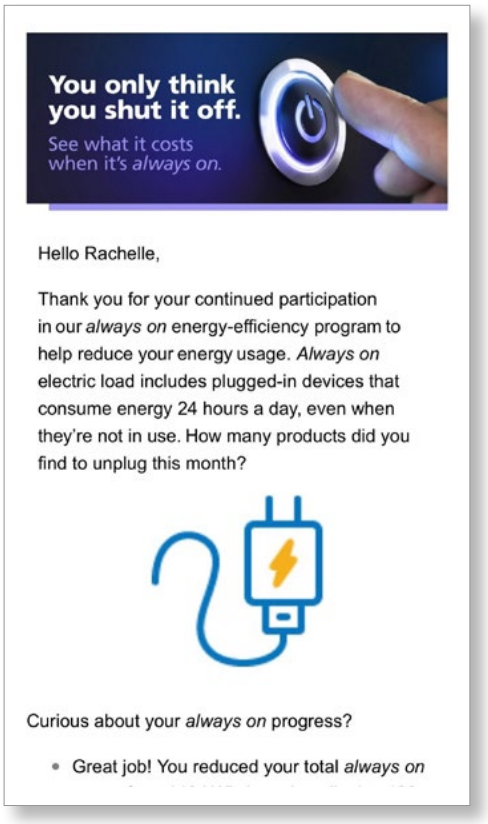
FIGURE 55 – MYAVISTA.COM ALWAYS-ON DEVICE CALCULATOR



Program Activities

An initial email to customers included their personalized information regarding always-on usage, associated costs, tips to reduce the load, and anticipated cost savings. Subsequent communications, sent monthly, updated customers on their progress compared to their own three-month historical calculated baseline.

FIGURE 56 – SAMPLE ALWAYS-ON CUSTOMER CAMPAIGN EMAIL



The first phase of the pilot ran for a six month term that ended on December 31, 2022. As a result of the pilot, Avista tracked and reported observed energy savings between the two treatment arms and against the control group.

Plans for 2023

After the participant survey responses were received and analyzed, a second, more refined phase of the always-on pilot will be designed and developed. Avista will look to expand this offering to more customers and determine the viability of launching a second targeted-load pilot program.

On-Bill Repayment Program

Description

Launched in the fall of 2021, the On-Bill Repayment Program (OBR) is a partnership between Avista and Puget Sound Cooperative Credit Union (PSCCU). The program enables residential and small-business customers in Washington to access Energy-Smart loans through PSCCU for their energy-efficiency projects. PSCCU's personalized underwriting practices and low interest rates allow participants to reap immediate benefits from energy-efficiency upgrades. The loan payments are convenient: installments are billed monthly as a line item on customers' Avista bills until the term of the loan is completed, or until Avista is otherwise instructed by PSCCU to remove the loan. Extra principal payments or early loan payoffs are made directly to PSCCU.

Avista's 2022 goal was to enroll 100 customers in the OBR service. The company used several channels to promote the program and bring awareness to customers. Several trade ally campaigns and promotional materials were executed throughout 2022, along with direct-to-customer, multi-channel Avista marketing efforts.

In 2022, 74 customers utilized this On-Bill Repayment Program to obtain Energy-Smart Loans. Savings associated with customer projects utilizing this program are 35,326 kWhs and 665 therm savings, net of other Avista energy efficiency rebate programs.

As interest rates rose during the last several months of 2022, Avista observed a noticeable increase in program participation. The program goal for 2023 will be an additional 100 Energy Smart loans.

FIGURE 57 – ON-BILL REPAYMENT PROGRAM ENERGY SMART LOANS BILL INSERT

FIGURE 58 – ON-BILL REPAYMENT PROGRAM ENERGY SMART LOANS TRADE ALLY CONTEST REMINDER

REMINDER: End-of-year projects can qualify for our grand-prize giveaway.

Customers looking to make energy-efficient equipment upgrades this time of year may have questions about how to fund their project(s). Avista's Energy-Smart Loan program may be the answer.

Earn (5) grand-prize drawing entries for each of your customers who receive loan approval and funding by December 31, 2022!*

Valued at over $2,000!

'Fore for Four' Coeur d'Alene Resort Golf & Dine Experience

- **$1,700 Hagadon Hospitality Experience Gift Card**
- **YETI Roadie 24 Cooler** *($250 value)*
- **YETI Rambler 12oz Colster Can Insulator x 4** *($100 value)*

***Open to Trade Ally companies only.** Each Trade Ally company may submit an entry form through their Avista Trade Ally Connect account at https://avistatradeallynetwork.force.com/tradeally/s/login/ (one form per office location). Each Trade Ally will receive five (5) additional entries for each of their customers who is approved for and funds their project with an Energy-Smart Loan. Entries will be accepted between October 1, 2022, and December 31, 2022. Drawing will be held February 1, 2023. Gift certificate may be redeemed for golf (both peak and off-peak seasons), dining, drinks, stays, and merchandise at any Hagadon facility. The winning Trade Ally company may distribute the prize package amongst its employee(s) at its discretion.*

Energy-Smart Loans offer zero-down, low-interest financing for everything from windows to insulation to heating and cooling projects —and a lot more.

Open to Avista's Washington residential and small business customers and made possible through our partnership with Puget Sound Cooperative Credit Union (PSCCU), Energy-Smart Loans provide opportunities where traditional funding sources fall short.

- **Eligible energy efficient equipment**: https://www.psccu.org/documents/miscellaneous/final-OBR-project-eligibility-list.aspx
- **Bid application:** Work with your customer to complete a bid for the equipment or measure, then email that bid, and any additional documents, to askus@PSCCU.org.
- **Loan application and process:** Your customer will apply for a loan at https://www.psccu.org/energysmart.aspx or, if preferred, via mail. PSCCU will review both the bid and the loan application and, within three business days, let them know about the credit and project decision.
- **Project begins:** PSCCU notifies you when the loan is ready for funding and work can begin. With your customer's permission, PSCCU may send you a partial payment of the total loan amount.
- **Project completed:** Once upgrades have been installed, submit your signed final invoice to PSCCU.
- **Final payment:** PSCCU will distribute the remaining loan balance to you.

Energy conservation is good for all of us. Learn more at myavista.com/energysmartloans or contact Leona Haley directly with questions at (509) 495-4289 or avistatradeally@avistacorp.com.

Small Business Lighting Direct Install

Description

Resource Innovations, the third party consultant hired to implement the Small Business Light 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 onsite 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 Washington and Idaho 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. Avista estimates that there are approximately 16,000 Washington customers served under Schedule 11, and approximately 9,000 Washington and 6,000 Idaho customers served under Schedule 12.

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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Tekoa, Washington

REGIONAL MARKET TRANSFORMATION

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.

It is not feasible for Avista to independently have a meaningful impact on regional or national markets. Consequently, utilities within the Pacific Northwest have worked together through NEEA to address opportunities that are beyond the ability or reach of individual utilities. Avista has been participating in and funding NEEA since it was founded in 1997.

Table 42 shows the 2022 NEEA savings and the associated costs for Washington, which exclude internal administrative costs associated with participation in the various NEEA activities and studies.

TABLE 42 – NEEA ENERGY SAVINGS AND PARTICIPATION COSTS

Fuel Type	2022 NEEA Energy Savings	2022 NEEA Participation Costs	Avista 2020-2024 Funding Share
Electric	5,133MWh (0.59 aMW)	$ 1,507,782	3.95%
Natural Gas	66,379 therms	$ 607,597	8.49%

Avista and 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

Values provided in NEEA's 2022 annual report represent the amounts 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 latter approach, the funding share for Avista is split: 70 percent for Avista Washington and 30 percent for Avista Idaho. 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 market transformation portfolio calls for it 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 delivering cost-effective resources to the company's service territory and remains confident that NEEA will continue to offer cost-effective electric market transformation in the foreseeable future. The company 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 began investigating new market transformation efforts with a specific focus on energy-efficiency measures and solutions that work well in eastern Washington and northern Idaho. 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 is piloting the application of a market transformation approach that focuses on mid- and upstream interventions to remove market barriers and create lasting change.

While 2023 will focus on pilot execution and initial assessment of an eastside market transformation approach, much of the groundwork for these efforts began in 2020-21. In 2022, the team conducted a competitive bid process to identify market partners to support the pilot. The team negotiated partnerships with two major manufacturers and their distribution channels to invest additional resources and dollars aimed at removing market barriers associated with cost, awareness, and acceptance using an approach tailored to eastside markets and customers. The team has created a market transformation strategy, captured pilot logic, identified key market indicators of success, and negotiated relevant data exchanges to track pilot success and continue to explore ductless heat pump potential and specific barriers to adoption found in Avista's and Idaho Power's service territories.

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GLOSSARY OF TERMS

Steptoe Butte, Washington

GLOSSARY OF TERMS

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

active energy management (AEM): The implementation of continuous building monitoring to improve building performance in real time.

adjusted market baseline (AMB): Based on the RTF guidelines; represents a measurement between the energy-efficient measure and the standard efficiency case that is characterized by current market practice or the minimum requirements of applicable codes or standards, whichever is more efficient. When applying an Adjusted Market Baseline, no net-to-gross factor would be applied since the resultant unit energy savings amount would represent the applicable savings to the grid.

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 through 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 of how efficiently a furnace or boiler uses its fuel.

Applied Energy Group (AEG): A consulting service that provides a wide range of energy efficiency and demand response-related management services to assist clients in designing and implementing programs for their customers.

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, that 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. Typically load on the system is measured at 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 can carry 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 agency (CAA): 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 because 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 (IRP) 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: A 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 set largely based 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 fixed costs and its set profit margin. If the actual sales exceed the forecast, the utility will earn extra profit.

deemed savings: Primarily referenced as unit energy savings, an estimate of an 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 and expressed in cubic feet, therms, Btus or multiples thereof, for a designated period 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 means 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 (e.g., space heating), or the type of energy-consuming equipment (e.g., 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): 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 later.

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.

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.

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

Integrated Resource Plan (IRP): An IRP is 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.

Low-Income Rate Assistance Program (LIRAP): LIRAP provides funding (collected from Avista's tariff rider) to community action agencies for distribution to Avista customers who are least able to afford their utility bill.

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 (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 non-energy impacts (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.

on-bill repayment/financing (OBR): A financing option in which a utility or private lender supplies capital to a customer to fund energy efficiency, renewable energy, or other generation projects. It's repaid through regular payments on an existing utility bill.

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, its portfolio includes electric and natural gas programs in all customer segments. Portfolio 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 of 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): The RIM test measures impact to customer bills or rates due to changes in utility revenues and operating costs related to the program portfolio. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.

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.

site-specific: A commercial/industrial 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 nonparticipant spillover (sometimes referred to as "free drivers"). Participant spillover is the additional energy savings that occur because 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 because of a program's influence.

Technical Reference Manual (TRM): An Avista-prepared resource document that contains Avista's (ex-ante) savings estimates, assumptions and sources for those assumptions, guidelines, and relevant supporting documentation for its natural gas and electricity energy-efficiency prescriptive measures. This document is populated and vetted by the RTF and third-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 most of the high-voltage, long-distance transmission lines.

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

Washington Utilities and Transportation Commission (WUTC): A three-member commission appointed by the governor and confirmed by the state Senate, whose mission is to protect the people of Washington by ensuring that investor-owned utility and transportation services are safe, available, reliable, and fairly priced.

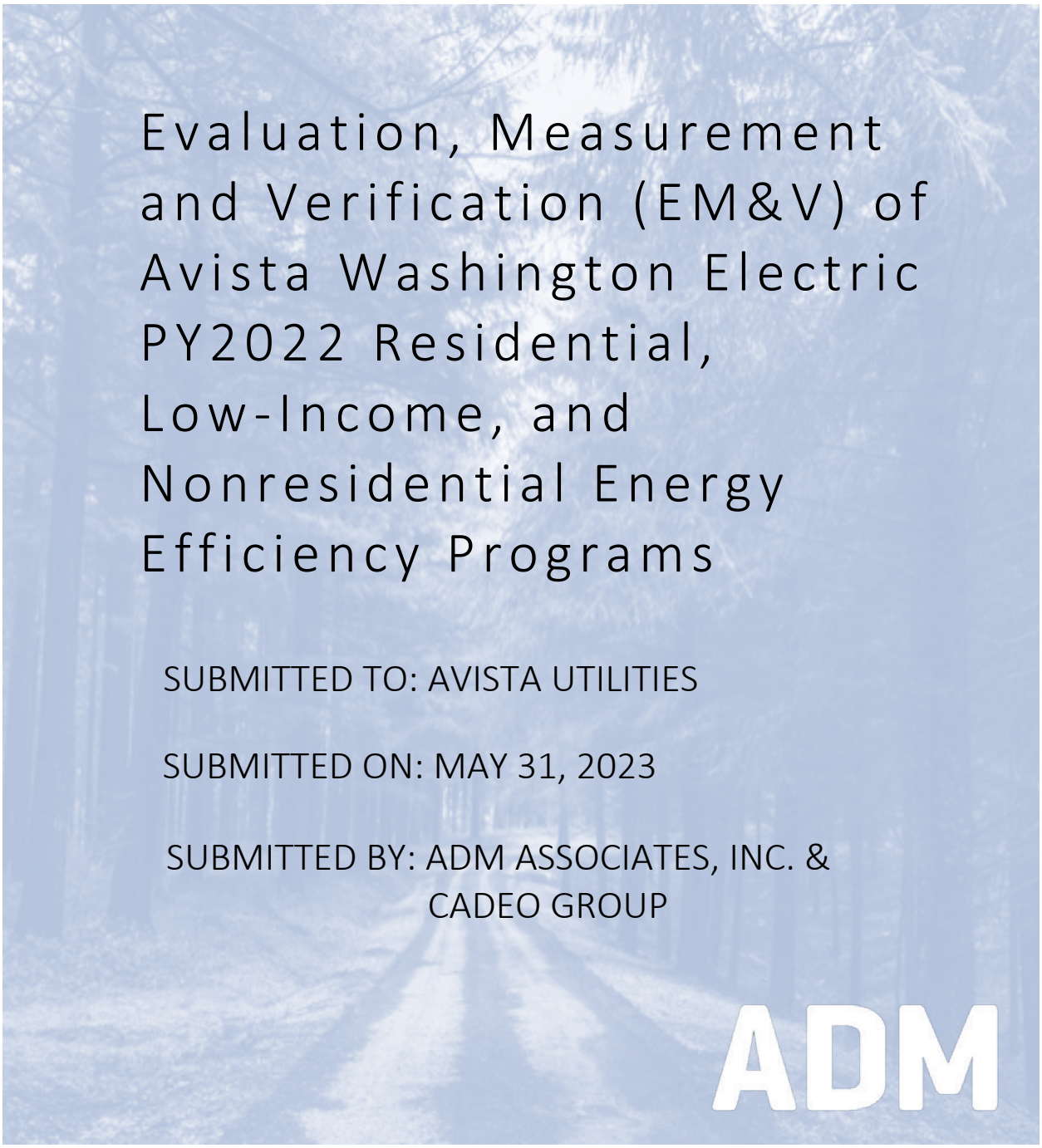
weighted average cost of capital (WACC): A calculation of a firm's cost of capital in which each category of capital is proportionately weighted. All sources of capital, including common stock, preferred stock, bonds, and any other long-term debt, are included in a WACC calculation.

8760: Total number of hours in a year.

APPENDICES AND SUPPLEMENTS

Uniontown, Washington

APPENDIX A – WASHINGTON 2022 ELECTRIC IMPACT EVALUATION REPORT



ADM Associates, Inc
3239 Ramos Circle
Sacramento, CA 95827

Avista Utilities
1411 E. Mission Ave.
Spokane, WA 99252

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1. Executive Summary

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

1.1 Savings & Cost-Effectiveness Results

The Evaluators conducted an impact evaluation for Avista's Residential, Low-Income, and Nonresidential programs for PY2022. The Residential portfolio savings amounted to 1,761,535 kWh with a 87.93% realization rate. The Low-Income portfolio savings amounted to 358,437 with a 93.98% realization rate. The Nonresidential portfolio savings amounted to 20,900,686 kWh with a 101.59% realization rate. The Evaluators summarize the Residential, Low-Income, and Nonresidential portfolio verified savings in Table 1-1 through Table 1-3, respectively.

The Residential portfolio reflects a TRC value of 1.51 and a UCT value of 1.75. The Low-Income portfolio reflects a TRC value of 1.17 and a UCT value of 0.41. The Nonresidential portfolio reflects a TRC value of 1.64 and a UCT value of 3.71. This leads to a total Portfolio TRC of 1.59 and a UCT of 2.79. Table 1-4 summarizes the evaluated TRC and UCT values with each the Residential, Low-Income, and Nonresidential portfolios.

Table 1-1: Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate	Total Costs
Water Heat	129,150	136,058	105.35%	$97,405.95
HVAC	615,743	522,790	84.90%	$402,328.44
Shell	427,798	264,602	61.85%	$438,675.89
ENERGY STAR Homes	112,539	66,555	59.14%	$79,466.26
Small Home & MF Weatherization	122,995	129,232	105.07%	$142,591.48
Appliances	105,512	82,327	78.03%	$70,483.15
AeroBarrier	5,648	1,077	19.07%	$9,465.15
Multifamily Direct Install	483,905	558,895	115.50%	$506,478.99
Total Res	**2,003,289**	**1,761,535**	**87.93%**	**$1,746,895.32**

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

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate	Total Costs
Low-Income	264,896	263,618	99.52%	$1,345,969.71
CEEP	116,482	94,819	81.40%	$237,749.35
Total Low-Income	**381,378**	**358,437**	**93.98%**	**$1,583,719.06**

Table 1-3: Nonresidential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate	Total Costs
Lighting	14,229,477	14,213,498	99.89%	$4,180,188.71
HVAC	15,637	15,637	100.00%	$4,511.70
Food Service Equipment	31,596	31,611	100.05%	$7,190.86
Grocer	141,653	141,653	100.00%	$24,505.92
Shell	9,793	87,530	893.81%	$12,005.82
Green Motors	17,752	17,752	100.00%	$3,854.95
Site-Specific	6,127,019	6,393,005	104.34%	$1,824,441.16
Total Non-Residential:	**20,572,926**	**20,900,686**	**101.59%**	**$6,056,699.12**

Table 1-4: Cost-Effectiveness Summary

Sector	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Residential	$3,690,105	$2,441,953	1.51	$3,053,570	$1,746,895	1.75
Residential Low Income	$1,855,528	$1,583,719	1.17	$654,095	$1,583,719	0.41
Nonresidential	$29,084,234	$17,766,539	1.64	$22,477,985	$6,056,699	3.71
Total	**$34,629,867**	**$21,792,211**	**1.59**	**$26,185,650**	**$9,387,313**	**2.79**

Table 1-5 summarizes the electric programs offered to residential and low-income customers in the Washington Avista service territory in PY2022 as well as the Evaluators' evaluation tasks and impact methodology for each program.

Table 1-5: 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	ENERGY STAR® Homes	✓		RTF UES
Residential	Small Home & MF Weatherization	✓	✓	RTF UES
Residential	Appliances	✓	✓	RTF UES
Residential	AeroBarrier	✓		RTF UES
Residential	Multifamily Direct Install	✓		RTF UES with adjustments
Low-Income	Low-Income	✓		SBW TRM
Low-Income	Community Energy Efficiency Program (CEEP)	✓		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 and Low-Income 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, and Nonresidential Portfolios.

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 1,761,535 kWh with a realization rate of 88%. The Evaluators also conducted a cost-benefit analysis in order to estimate the Residential portfolio's cost-effectiveness. The resulting TRC value for this sector is 1.51 while the UCT value is 1.75. In cost effectiveness calculations, the Evaluators referenced Avista's Annual Conservation Report NEI values developed in 2022. Further details on cost-effectiveness methodology can be found in Appendix C.
- The Residential Portfolio impact evaluation resulted in a realization rate of 88% 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 Washington 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 Shell, which contributes 15% of the expected savings, resulted in a realization rate of 62% whereas each of the other programs resulted in a combined 94% realization rate. The Shell Program contributed to a 7% decrease in the overall residential sector, which displayed a realization rate of 87%.
- 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. The Evaluators recommend that Avista update the E

Water Heat measure to mimic RTF savings for the <55 gallon tank size, which more accurately reflects distribution of observed tank sizes claimed throughout the program.

- 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 as well as an average across heating types, 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 vary largely based on home type (single family vs. multifamily). The appropriate categories in the RTF led to a 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 data lead to a low realization rate for attic insulation, wall insulation and window measures. The expected savings also appeared to 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. 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 62% for the Shell Program.
- In the ENERGY STAR Homes Program, the Evaluators found that realization rates differed from 100% 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 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. 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.
- 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 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 and low realization rates across each measure. The Evaluators recommend Avista verify home type prior to applying Avista TRM values in order to ensure proper categorization of measure savings.

- In the Multifamily Direct Install Program, the per unit savings value for the lighting measures did not align with the per unit value in SBW's methodology or the RTF UES values. The precise reason for these discrepancies was unclear. The Evaluators applied SBW TRM values to estimate verified savings for each quantity of each measure claimed. These discrepancies led to deviations from 100% realization rate for the lighting measures. The Evaluators evaluated the faucet and kitchen aerator values using RTF UES values and found there was no discrepancy between the savings values in the tracking database and the RTF UES values leading to a realization rate of 100% for these measures.
- In the Appliance Program, the Evaluators found that for the fridge-freezer and upright freezer measures, all projects were verified to be ENERGY STAR-qualified, but not ENERGY STAR Most Efficient (ESME)-qualified. The low realization rate is due to the difference in Avista TRM and RTF 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.
- The Evaluators completed an AeroBarrier Pilot impact evaluation in PY2022. The Evaluators reviewed the expected savings calculation workbooks for each project. The projects documented air changes per hour (ACH) pre, post, and home square footage. The expected savings were calculated by Avista had used the sensible heat loss equation. The Evaluators, however, estimated verified savings using RTF SEEM models utilized in the RTF's residential weatherization workbook. The SEEM models used to estimate air infiltration reduction was used to estimate the average kWh reductions per square foot, per ACH(50) reduction for each primary heating equipment type and heating zone. The Evaluators deem this methodology to be more appropriate, as it displays the modeled interactive effects of homes in this region, rather than theoretical values based on the laws of heat transfer alone. This led to nearly 20% realization rate across the program.

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 358,437 kWh with a realization rate of 94%. The Evaluators also conducted a cost-benefit analysis in order to

estimate the Low-Income portfolio's cost-effectiveness. The resulting TRC value for this sector is 1.17 while the UCT value is 0.41. These values are expected, as the Low-Income portfolio is not expected to meet cost-effectiveness but are implemented in order to provide energy efficiency benefits to low-income customers. In cost effectiveness calculations, the Evaluators referenced Avista's Annual Conservation Report NEI values developed in 2022. Further details on cost-effectiveness methodology can be found in Appendix C.

- The Low-Income Portfolio impact evaluation resulted in a 94% realization rate. The Low-Income Program and CEEP individually resulted in a 100% and 81% realization, respectively. The realization rates for each program deviate from 100% due to differences between the Avista TRM values applied to the quantities displayed in the tracking data. The Evaluators note several instances in which the tracking data displayed correct quantity values, but the expected savings calculated for the project did not indicate Avista TRM values were applied properly to the quantities. The Evaluators applied the correct Avista TRM values for the Low-Income Program and CEEP. For the Low-Income Program, the Evaluators applied a realization rate from a sample of rebates after verifying documentation for quantity and efficiency of measures.
- 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. The results of the billing analysis indicated non-statistically significant results. Therefore, the Avista TRM was utilized to estimate verified savings for the Low-Income Program.
- The Evaluators received a lower number of project documents than intended due to turnover in Low-Income and CEEP project managers at Avista. Therefore, the resulting precision for these programs did not meet the 90/10 goals. The Evaluators expect to once again receive all requested projects in PY2023 when a new project manager has had time to build communications with the CAP agencies. The resulting precision at the 90% confidence level for Low-Income and CEEP are ±11.59% and ±20.56%.
- 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. In addition, the Evaluators found some instances in which the 20% savings cap was not applied to claimed measures. The Evaluator applied appropriate project-level savings caps, which led to another downward adjustment in savings.
- CEEP contained 16 unique customers across all measures. Due to the requirement of a sufficient number of pre/post billing month and the requirement that customers do not participate in more than one program, the Evaluators determined that a billing analysis was not feasible. Instead, verified savings was estimated using Avista TRM values.

- The Evaluators were able to verify 5 of the 16 CEEP projects due to turnover in CEEP project managers at Avista. The Evaluators expect to once again receive all requested projects in PY2023 when a new project manager has had time to build communications with the CAP agencies. The Evaluators note that CEEP will close July 2023.
- In CEEP, the Evaluators note that of the 16 projects completed in CEEP, eight of the 11 conversion projects did not align with the expected savings indicated in the Avista TRM, leading to significantly low realization rate for these projects. The calculations behind these expected savings are unclear, however, the Evaluators applied Avista TRM values where appropriate to the documented number of equipment indicated in the documentation. In addition, the LED bulbs incented through the program had calculated expected savings much higher than the Avista TRM indicated for the number of light bulbs installed. These changes led to an overall downward adjustment and realization rate of 82% for CEEP.

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 20,900,686 kWh with a realization rate of 101.59%.
- The Evaluators also conducted a cost-benefit analysis in order to estimate the Non-Residential portfolio's cost-effectiveness. The resulting TRC value for this sector is 1.64 while the UCT value is 3.71. In cost effectiveness calculations, the Evaluators referenced Avista's Annual Conservation Report NEI values developed in 2022. Further details on cost-effectiveness methodology can be found in Appendix C.
- Verified savings for the Prescriptive Lighting Program are 14,213,498 kWh, 99.89% of claimed savings. Expected savings calculations did not incorporate In-Service Rates effects into calculations. These were included in verified savings calculations, resulting in lower verified savings. One project's claimed savings were calculated using an incorrect input for annual hours of operation, which resulted in a 17,317 kWh difference in expected and verified savings.
- Verified savings for the HVAC VFD Program is 15,637 kWh with a realization rate of 100.0%.
- Verified savings for the Food Service Equipment Program is 31,611 kWh with a realization rate of 100.0%. 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 141,653 kWh with a realization rate of 100.0%.
- The verified savings for the Shell Program is 87,530 kWh with a realization rate of 893.81%. Upon analysis, the Evaluators found that UES used to develop claimed savings did not correspond to UES found in the 2022 Avista TRM. Using correct multipliers resulted in higher verified savings.

- The verified savings for the Green Motor Rewind Program is 17,752 kWh with a realization rate of 100.0%.
- The Site-Specific program completed 47 projects in PY2022. Verified savings are 6,393,005 kWh, 104.34% of claimed savings.
- Five of the 14 sampled sites' realization varied from 100% due to the following reasons:
    - Discrepancies between listed and verified lighting wattage
    - Discrepancies between listed and verified lighting hours of operation
    - Discrepancies between listed and verified HVAC configurations
    - Discrepancies between listed and verified VFD efficiency, and adjustments in VFD operating assumptions
    - Adjustments to fan operating characteristics and power factor

1.2.2 Recommendations

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

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 note several instances 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 a handful of instances where the rebated equipment did not meet the program minimum requirements for efficiency. The Evaluator recommend Avista check the source AHRI document to verify efficiency prior to incentivizing installation of the measure.
- The Evaluators found that space heating type and water heating type indicated on the household's characteristics in the CC&B database did not consistently match the values indicated on the rebate application forms. This may be due to lack of customer knowledge about the household, or due to change in space and/or water heating type without Avista knowledge. The Evaluators recommend verifying space and water heating values with the customer and updating the CC&B database to reflect the most updated information for the home.
- 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 1 kWh per square foot for most projects. 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.
- The ENERGY STAR Homes rebates depend on heating zone and cooling zone specifications to calculate RTF savings. In addition, the savings applied largely depends on space heating type. The program realization rate differs from 100% due to changes in heating zone/cooling zone savings assignment as well as verified space heating type (electric vs. natural gas). The Evaluators recommend verifying space heating type prior to claiming savings for each ENERGY STAR homes project and specifying separate savings for heating zone and cooling zone in the Avista TRM.
- 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 found that the RTF found negative savings for the top loading clothes washers. The Evaluators recommend Avista remove this measure from its program offerings.

- 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.
- 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. The Evaluators recommend that Avista update the E Water Heater measure to mimic RTF savings for the <55 gallon tank size, which more accurately reflects distribution of observed tank sizes claimed throughout the program.
- 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.
- The AeroBarrier Pilot evaluation indicated that verified savings referenced from RTF SEEM models are much lower than Avista expected savings. The Evaluators recommend that in future savings claimed for the project that the kWh per square foot per ACH reduction developed by the Evaluators, reflected in Table 3-37, is used to estimate project-level savings rather than the sensible heat loss equation. The Evaluators selected this method as more reasonable due to inclusion of interactive effects included in the thousands of SEEM models, which are not possible to capture in the sensible heat loss equation alone.

1.2.2.2 Low-Income Programs

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

- The Evaluators found that most deviations from 100% realization rate for the Low-Income Program is due to errors in application of the Avista TRM values. The Evaluators recommend that Avista conduct quality control for the applied Avista TRM values in the tracking dataset.
- The Evaluators found that the remaining deviations from 100% realization rate for the Low-Income Program is due to incomplete application of the 20% annual savings cap across projects. The Evaluators conducting additional quality control to ensure these caps are applied appropriately.
- The Evaluators note that all conversion project and LED lighting project savings in CEEP did not align with the expected savings indicated in the Avista TRM, leading to significantly low realization rate for these projects. The calculations behind these expected savings are unclear,

however, the Evaluators applied Avista TRM values where appropriate to the documented number of equipment indicated in the documentation. The Evaluators recommend that Avista apply savings values consistent with the Avista TRM or the RTF when calculating expected savings.

1.2.2.3 Non Residential 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, collect 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 1-5. 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)
- Document verification (review project documentation)
- Deemed savings (RTF UES and Avista TRM values)
- Whole facility billing analysis (IPMVP Option C)
- Appropriate IPMVP Option (for Site-Specific, depending on project)

The Evaluators completed the above impact tasks for each the electric impacts and the natural gas impacts for projects completed in the Washington 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.

1.3 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).

1.4 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 1-5. 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 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 *Semi-Custom* approach, used for the Prescriptive Lighting program, where savings are quantified by a standard engineering algorithm with key performance parameter(s), such as pre/post wattage, quantity and annual hours of use. This approach aligns with IPMVP Option A.
- 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, 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 electric measure participants in the Water Heat, HVAC, Small Home & MF Weatherization, Appliances, and Low-Income programs. The Evaluators applied billing analysis results where statistically significant 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 Program incorporates billing analysis results for some measures.

1.4.1 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.

1.4.2 Verification Methodology

1.4.2.1 Sampling Methodology

1.4.2.2 Sampling Methodology for Most 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.

1.4.2.3 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.

1.4.2.4 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 (res)
- Shell Program (res)
- ENERGY STAR® Homes Program
- Small Home & MF Weatherization Program
- Multifamily Direct Install Program
- Appliances Program
- Low-Income 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

- 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 1.6 and Section 1.7.

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	105	42	90% ± 9.88%
Residential	HVAC	409	68	90% ± 9.12%
Residential	Shell	270	57	90% ± 9.69%
Residential	ENERGY STAR® Homes	38	34	90% ± 4.64%
Residential	Small Home & MF Weatherization	108	51	90% ± 8.41%
Residential	Appliances	630	66	90% ± 9.59%
Residential	AeroBarrier	3	3	90% ± 0%
Residential	Multifamily Direct Install	9,181	N/A	N/A
Low-Income	Low-Income	310	42	90% ± 11.82%**
Low-Income	CEEP	16	5	90% ± 31.5%**
Residential	Water Heat	105	42	90% ± 9.88%
Nonresidential	HVAC	2	2	±0%
Nonresidential	Food Service Equipment	6	6	±0%
Nonresidential	Grocer	9	9	±0%
Nonresidential	Shell	6	6	±0%
Nonresidential	Green Motors	8	8	±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 Evaluators were unable to meet 90% confidence at 10% precision for the Low-Income Program and CEEP due to turnover in project managers overseeing this program implementation. The Evaluators expect to meet these confidence/precision goals in PY2023 as the project manager develops consistent communications with CAP agencies.

The table above represents the number of rebates in Washington 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.

1.4.2.5 Survey-Based Verification

The Evaluators conducted survey-based verification for the Water Heat Program and HVAC 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 shown in Table 2-2 for the Water Heat and HVAC for the Washington Electric Avista projects. The Evaluators developed a sampling plan that achieved a sampling precision of ±1.64% 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*	105	9	90% ± 26.34%
Residential	HVAC	409	68	90% ± 9.12%
Residential	Small Home & MF Weatherization*	108	7	90% ± 30.2%
Residential	Appliances	630	127	90% ± 6.53%
Non-Residential	Lighting*	870	4	90% ± 41.05%
Total		**2,283**	**200**	**90% ± 1.64%**

*These programs did not achieve 90/10 precision. However, responses indicated 100% ISRs

The Evaluators implemented a web-based survey to complete the verification surveys. The Evaluators to reach the 90/10 precision goal. 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 1.5.

1.4.2.6 On-Site Visits

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 WA, a total of 11 visits were conducted to verify electric measures. Further details are available in the Site-Specific chapter.

1.4.3 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.

1.4.3.1 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.

1.4.3.2 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 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)[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, 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.

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

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 are affected by the stay-at-home orders that had taken effect starting March 2020 in Washington. 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.

1.4.4 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).

1.4.5 Cost-Effectiveness Tests

The Evaluators calculated each program's cost-effectiveness, avoided energy costs, and implementation costs. The Evaluators used our company-developed cost-effectiveness tool to provide cost-effectiveness assessments for the Residential, Low-Income, and Nonresidential Portfolio by program, fuel type, program year, and measure, for each state.

As specified in this solicitation, the Evaluators determined the economic performance with the following cost-effectiveness tests:

- Total Resource Cost (TRC) test;
- Utility Cost Test (UCT);
- Participant Cost Test (PCT); and
- Rate Impact Measure (RIM).

1.4.6 Non-Energy Benefits

The Evaluators used the non-energy impact (NEI) values estimated and filed in Avista's 2022 Annual Conservation Plan. 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 1.12.

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 Washington 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 3-2 summarizes the Residential portfolio's cost-effectiveness.

Table 3-1: Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Water Heat	129,150	136,058	105.35%
HVAC	615,743	522,790	84.90%
Shell	427,798	264,602	61.85%
ENERGY STAR Homes	112,539	66,555	59.14%
Small Home & MF Weatherization	122,995	129,232	105.07%
Appliances	105,512	82,327	78.03%
AeroBarrier	5,648	1,077	19.07%
Multifamily Direct Install	483,905	558,895	115.50%
Total Res	**2,003,289**	**1,761,535**	**87.93%**

Table 3-2: Residential Portfolio Cost-Effectiveness Summary

Sector	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Residential	$3,690,105	$2,441,953	1.51	$3,053,570	$1,746,895	1.75

In PY2022, Avista completed and provided incentives for residential electric measures in Washington and reported total electric energy savings of 1,761,535 kWh. All programs except the HVAC Program, ENERGY STAR® Homes Program, and appliances prescriptive rebates exceeded savings goals based on reported savings, leading to an overall achievement of 87.93% of the expected savings for the residential programs. The Evaluators estimated the TRC value for the Residential portfolio is 1.51 while the UCT value is 1.75. Further details of the impact evaluation results by program are provided in the sections following.

1.5 Simple Verification Results

The Evaluators surveyed 755 unique customers that participated in Avista's residential energy efficiency program in October 2022 and in 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 HVAC, Water Heater, and Small Home & MF Weatherization, and Appliances Programs.

Table 3-3: 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%

1.5.1 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, 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 5.8% precision across the programs surveyed for the electric measures in Avista's service territory, summarized in Table 3-4.

Table 3-4: Simple Verification Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	109	8	±28.1%*
Residential	HVAC	648	77	±8.8%
Residential	Small Home & MF Weatherization	93	6	±32.7%*
Residential	Appliances	479	86	±8.0%
Total		**1,329**	**177**	**±5.8%**

*These programs did not achieve 90/10 precision. However, responses indicated 100% ISRs

The measure-level ISRs determined from the verification survey for each program in which simple verification was conducted is presented in Table 3-5 through Table 3-8.

Table 3-5: 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	7	100%	7	100%	Assume 100%*

*ISR, not enough responses to meet 90/10 precision

Table 3-6: 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	15	100%	15	100%	State-specific ISR
E Electric To Air Source Heat Pump	17	100%	17	100%	State-specific ISR
E Electric to Ductless Heat Pump	0	100%	0	100%	State-specific ISR
E Smart Thermostat DIY with Electric Heat	16	100%	16	100%	State-specific ISR
E Smart Thermostat Paid Install with Electric Heat	20	100%	20	100%	State-specific ISR

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

*ISR, not enough responses to meet 90/10 precision

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	46	100%	46	100%	State-specific ISR
E Energy Star Certified Upright Freezer	8	100%	8	100%	State-specific ISR
E Energy Star Rated Clothes Dryer	41	100%	41	100%	State-specific ISR
E Energy Star Rated Front Load Washer	31	100%	31	100%	State-specific ISR

These ISR values were utilized in the desk reviews for the Water Heat, HVAC, Small Home & MF Weatherization, and Appliances Programs in order to calculate verified savings. Additional insights from the survey responses are summarized in Appendix B.

1.6 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.

1.6.1 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	105	129,150	129,098	136,058	105.35%
Total	**105**	**129,150**	**129,098**	**136,058**	**105.35%**

The Water Heat Program displayed verified savings of 136,058 kWh with a realization rate of 105.35% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-11: Water Heat Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E Heat Pump Water Heater	$52,500.00	$44,905.95	$97,405.95
Total	**$52,500.00**	**$44,905.95**	**$97,405.95**

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.

1.6.1.1 Database Review & Verification

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

1.6.1.2 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 1.4.2.4.

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.

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.

1.6.1.3 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. The responses to these additional questions can be found in Appendix B.

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

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	105	7	90% ± 26.34%	100%

The Evaluators contacted HVAC participants in the program to calculate in-service rates for the measures. Although 90/10 precision was not achieved through the census of web surveys for this program, the responses received from this measure (7 responses for E Heat Pump Water Heater measure) indicated 100% in-service rates. 100% in-service rates were assumed. The Evaluators applied these ISRs to each rebate to quantify verified savings for each measure.

1.6.1.4 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 goals 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.

1.6.1.5 Billing Analysis

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

1.6.1.6 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 136,058 kWh with a realization rate of 105.35%, 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. 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.

1.6.2 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 3-13 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	Billing Analysis

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	64	169,974	172,640	162,981	95.89%
E Electric To Air Source Heat Pump	77	234,840	237,949	177,593	75.62%
E Electric to Ductless Heat Pump	50	45,400	45,400	51,394	113.20%
E Smart Thermostat DIY with Electric Heat	106	80,892	79,341	65,880	81.44%
E Smart Thermostat Paid Install with Electric Heat	112	84,637	83,832	64,942	76.73%
Total	**409**	**615,743**	**619,162**	**522,790**	**84.90%**

The HVAC Program displayed verified savings of 522,790 kWh with a realization rate of 84.90% against the expected savings for the program.

Table 3-15: HVAC Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E Ductless Heat Pump with Existing Forced Air Furnace	$33,600.00	$69,981.54	$103,581.54
E Electric To Air Source Heat Pump	$76,000.00	$89,636.60	$165,636.60

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E Electric to Ductless Heat Pump	$26,050.00	$21,869.99	$47,919.99
E Smart Thermostat DIY with Electric Heat	$12,067.45	$28,287.86	$40,355.31
E Smart Thermostat Paid Install with Electric Heat	$16,950.00	$27,885.00	$44,835.00
Total	**$164,667.45**	**$237,660.99**	**$402,328.44**

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

1.6.2.1 Database Review & Verification

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

1.6.2.2 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 1.4.2.4.

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 1 of the 33 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.

1.6.2.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 1.4.2.5. 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 Washington electric territory alone. The ISRs resulted in 9.12% 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	64	15	90% ±9.12%	100%
E Electric To Air Source Heat Pump	77	17		100%
E Electric to Ductless Heat Pump	50	0		100%
E Smart Thermostat DIY with Electric Heat	106	16		100%
E Smart Thermostat Paid Install with Electric Heat	112	20		100%

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 3-16 to each rebate to quantify verified savings for each measure.

1.6.2.4 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 goals 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.

1.6.2.5 Billing Analysis

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

1.6.2.6 Verified Savings

The HVAC Program in total displays a realization rate of 84.90% with 522,790 kWh verified electric energy savings in the Washington 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 E Smart Thermostat DIY with Electric Heat realization rate is 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. The appropriate categories in the RTF led to a lower-than-expected savings for the direct install and retail rebates for this measure. Measure-level ISRs were applied to these savings values, which did not affect the realization rate, as ISRs displayed were 100% for all measures in the HVAC program.

1.6.3 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 3-17 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 Energy Star Certified Insulated Door	Replace door with ENERGY STAR rated door in homes heated with electricity	RTF UES
E Floor Insulation with Electric Heat	Floor insulation for 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	46	113,188	85,941	78,196	69%
E Energy Star Certified Insulated Door	18	13,332	16,361	16,664	125%
E Floor Insulation with Electric Heat	6	9,197	9,197	9,197	100%
E Storm Window with Electric Heat	1	2,424	2,507	1,308	54%
E Wall Insulation with Electric Heat	21	60,358	46,319	30,179	50%
E Window Replc from Double Pane W Electric Heat	1	445	440	160	36%
E Window Replc from Single Pane W Electric Heat	177	228,853	295,826	128,898	56%
Total	**270**	**427,798**	**456,591**	**264,602**	**61.85%**

The Shell Program displayed verified savings of 264,602 kWh with a realization rate of 61.85% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-19: Shell Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E Attic Insulation with Electric Heat	$42,970.50	$83,794.50	$126,765.00
E Energy Star Certified Insulated Door	$2,700.00	$16,470.16	$19,170.16
E Floor Insulation with Electric Heat	$6,897.75	$9,855.47	$16,753.22
E Storm Window with Electric Heat	$653.40	$733.45	$1,386.85
E Wall Insulation with Electric Heat	$23,051.25	$32,339.71	$55,390.96
E Window Replc from Double Pane W Electric Heat	$160.00	$171.46	$331.46
E Window Replc from Single Pane W Electric Heat	$80,751.40	$138,126.84	$218,878.24
Total	**$157,184.30**	**$281,491.59**	**$438,675.89**

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

1.6.3.1 Database Review & Verification

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

1.6.3.2 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 1.4.2.4.

The Evaluators reviewed each measure number of units, square footage, and insulation where available. The Evaluators found that for one sampled measure, the tracking data accounted for one Energy Star certified door while the documentation reviewed showed that two were installed. These differences led to a higher than 100% realization rate for the measures mentioned.

The Evaluators used the Avista TRM to determine adjusted savings and RTF UES values for verified savings. The Evaluators found that verified attic insulation, wall insulation, and window measure 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 unique heating type, R-values and climate zone. The lack of granularity in the Avista TRM data lead to a low realization rate for attic insulation, wall insulation and window measures. The expected savings also appeared to 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. 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 and heating type into Avista's TRM.

The Evaluators imputed home type (single family home vs. manufactured 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 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.

1.6.3.3 Verification Surveys

The Evaluators conducted a verification survey for the Energy Star door measure and found that the in-service rate was 100%. The Evaluators did not conduct verification surveys for the other measures in the Shell Program since weatherization measures historically have high verification rates.

1.6.3.4 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.

1.6.3.5 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.

1.6.3.6 Verified Savings

The Shell Program in total displays a realization rate of 61.85% with 264,602 kWh verified electric energy savings in the Washington service territory, as displayed in Table 3-18. The realization rate for the electric savings in the Shell Program deviate from 100% due primarily 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.

1.6.4 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 for ENERGY STAR® Eco-rated homes. Table 3-20 summarizes the measures offered under this program.

Table 3-20: ENERGY STAR® Homes Program Measures

Measure	Description	Impact Analysis Methodology
G ENERGY STAR Home - Manufactured, Gas & Electric	ENERGY STAR-rated manufactured home with gas and electric	RTF UES
E ENERGY STAR Home - Manufactured, Furnace	ENERGY STAR-rated manufactured home with electric furnace	RTF UES
E ENERGY STAR Home - Manufactured, Furnace	ENERGY STAR-rated manufactured home with heat pump	RTF UES
E 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 3-21: 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	21	69,615	69,615	60,781	87.31%
E Energy Star Home - Manufactured, Gas & Electric	9	29,664	29,835	219	0.74%
E Energy Star Home - Manufactured, Heat Pump	4	13,260	13,260	5,555	41.89%
G Energy Star Home - Manufactured, Natural Gas	4	0	0	0	0.00%
Total	**38**	**112,539**	**112,710**	**66,555**	**59.14%**

The ENERGY STAR® Homes Program displayed verified savings of 66,555 kWh with a realization rate of 59.14% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-22: ENERGY STAR® Homes Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E Energy Star Home - Manufactured, Furnace	$21,000.00	$41,522.09	$62,522.09
E Energy Star Home - Manufactured, Gas & Electric	$9,000.00	$149.61	$9,149.61
E Energy Star Home - Manufactured, Heat Pump	$4,000.00	$3,794.56	$7,794.56
G Energy Star Home - Manufactured, Natural Gas*	N/A	N/A	N/A
Total	**$34,000.00**	**$45,466.26**	**$79,466.26**

*The costs associated with this measure are claimed in the Washington Gas Impact Evaluation Report

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.

1.6.4.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the ENERGY STAR® Homes Program.

1.6.4.2 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 1.4.2.4.

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

1.6.4.3 Verification Surveys

The Evaluators did not conduct verification surveys for the ENERGY STAR® Homes Program.

1.6.4.4 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 goals 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.

1.6.4.5 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 59.14% with 66,555 kWh verified electric energy savings in the Washington service territory, as displayed in Table 3-21. 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 a downward 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 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 verified that all dual fuel homes were heated primarily with natural gas. Therefore, the Evaluators assigned electric savings from the RTF associated with a fully natural gas-heated home at 43 kWh saved per year.

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

1.6.5 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 program encourages consumer to complete energy efficient home upgrades such as attic, floor, or wall insulation, replacing windows with high efficiency windows, or upgrading thermostats to increase energy efficiency in these homes.

This section summarizes the impact results of the evaluation results for the Small Home & MF Weatherization Program. Table 3-23 summarizes the measures offered under this program.

Table 3-23: 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 Program impact evaluation.

Table 3-24: Small Home & MF Weatherization Program Verified Electric Savings

Measure	PY2022 Units	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Multifamily Ductless Heat Pump Replac Existing Baseboard	17	15,436	22,100	19,181	124.26%
E Multifamily Heat Pump Water Heater	30	36,900	36,885	39,420	106.83%
E Multifamily Smart Thermostat DIY	4	2,897	2,600	1,944	67.12%
E Multifamily WIFI Thermostat with Baseboard Electric Heat	2	183	183	240	131.15%
E Multifamily Energy Star Rated Insulated Door With El Heat	1	606	4	56	9.22%
E Multifamily Wall Insulation With Electric Heat	5	13,670	14	8,430	61.67%
E Multifamily Attic Insulation With Electric Heat	7	10,918	7	8,397	76.91%
E Multifamily Smart Thermostat Paid install	1	749	650	939	125.37%
E Multifamily Air Source Heat Pump replac existing baseboard	1	3,090	3,090	4,566	147.77%
E Multifamily Window Replc With Electric Heat	40	38,547	18,064	46,058	119.49%
Total	**108**	**122,995**	**83,597**	**129,232**	**105.07%**

The Small Home & MF Weatherization Program displayed verified savings of 129,232 kWh with a realization rate of 105.07% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-25: Small Home & MF Weatherization Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E Multifamily Ductless Heat Pump Replac Existing Baseboard	$8,925.00	$8,235.97	$17,160.97
E Multifamily Heat Pump Water Heater	$15,000.00	$14,741.18	$29,741.18
E Multifamily Smart Thermostat DIY	$420.07	$834.92	$1,254.99
E Multifamily WIFI Thermostat with Baseboard Electric Heat	$100.00	$103.05	$203.05
E Multifamily Energy Star Rated Insulated Door With El Heat	$100.00	$55.21	$155.21
E Multifamily Wall Insulation With Electric Heat	$4,861.50	$9,033.92	$13,895.42
E Multifamily Attic Insulation With Electric Heat	$4,094.25	$8,998.33	$13,092.58
E Multifamily Smart Thermostat Paid install	$150.00	$403.19	$553.19

E Multifamily Air Source Heat Pump replac existing baseboard	$1,000.00	$2,326.07	$3,326.07
E Multifamily Window Replc With Electric Heat	$13,853.28	$49,355.54	$63,208.82
Total	**$48,504.10**	**$94,087.38**	**$142,591.48**

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.

1.6.5.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Small Home & MF Weatherization Program.

1.6.5.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for Small Home & MF Weatherization Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 1.4.2.4.

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. In addition, for the one E Multifamily Energy Star Rated Insulated Door With El Heat project claimed, the Evaluators verified lower square footage than indicated in the tracking data. These two changes together resulted in 9% realization for this measure.

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

1.6.5.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 1.4.2.5. 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 3-26 displays the ISRs for each of the Small Home & MF Weatherization measures for Washington electric territory only. The ISRs resulted in 32.7% precision at the 90% confidence interval for the program.

Table 3-26: Small Home & MF Weatherization Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Multifamily Air Source Heat Pump replac existing baseboard	1	N/A	90% ±30.2%	N/A
E Multifamily Attic Insulation With Electric Heat	7	N/A		N/A
E Multifamily Ductless Heat Pump Replac Existing Baseboard	17	0		100%
E Multifamily Energy Star Rated Insulated Door With El Heat	1	1		100%
E Multifamily Heat Pump Water Heater	30	0		100%
E Multifamily Smart Thermostat DIY	4	0		100%
E Multifamily Smart Thermostat Paid install	1	N/A		N/A
E Multifamily Wall Insulation With Electric Heat	5	0		N/A
E Multifamily WIFI Thermostat with Baseboard Electric Heat	2	0		100%
E Multifamily Window Replc With Electric Heat	40	6		N/A

The Evaluators contacted all participants in the program to calculate in-service rates for the measures. Although 90/10 precision was not achieved through the census of web surveys for this program, the responses received from these measures also indicated 100% in-service rates. 100% in-service rates were assumed. The Evaluators applied the ISRs listed in Table 3-26 to each rebate to quantify verified savings for each measure.

1.6.5.4 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 goals for the program was finalized.

1.6.5.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. Small Home & MF Weatherization Program displayed 105.07% realization with 129,232 kWh saved, as displayed in Table 3-24.

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 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 and low realization rates across each measure. The Evaluators recommend Avista verify home type prior to applying Avista TRM values in order to ensure proper categorization of measure savings.

1.6.6 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 3-27 summarizes the measures offered under this program along with the impact evaluation methods for each measure.

Table 3-27: Multifamily Direct Install Program Measures

Measure	Impact Analysis Methodology
Faucet aerators	RTF UES, Aerators_v1_1/SBW TRM
Kitchen Aerators	RTF UES, Aerators_v1_1/SBW TRM
Screw-in LED lamp (A-line 60W)	SBW TRM
Screw-in LED lamp (A-line 40W)	SBW TRM
Screw-in LED lamp (BR30)	SBW TRM
Screw-in LED lamp (3.8)	SBW TRM
Screw-in LED lamp (G25)	SBW TRM
Screw-in LED lamp (PAR30)	SBW TRM
Screw-in LED lamp (PAR38)	SBW TRM
Screw-in LED lamp (4.8)	SBW TRM
Vending misers in common areas	Avista TRM/SBW TRM
Lighting (common area)	SBW TRM

The following table summarizes the verified electric energy savings for the Multifamily Direct Install Program impact evaluation.

Table 3-28: Multifamily Direct Install Program Verified Electric Savings

Measure	PY2022 Units	Expected Savings (kwh)	Verified Savings (kWh)	Realization Rate
Screw-in LED lamp (A-line 60W)	5,737	259,508	312,763	120.52%
Screw-in LED lamp (A-line 40W)	2	1,071	1,034	96.53%
Screw-in LED lamp (BR30)	274	19,602	21,034	107.30%
Screw-in LED lamp (3.8)	57	10,419	11,451	109.90%
Screw-in LED lamp (G25)	338	41,045	55,455	135.11%
Screw-in LED lamp (PAR30)	2	915	870	95.06%
Screw-in LED lamp (PAR38)	1	419	398	95.06%
Screw-in LED lamp (4.8)	58	12,263	17,228	140.48%
Faucet aerator (1 GPM)	1,520	112,308	112,308	100.00%
Kitchen Aerator	660	25,740	25,740	100.00%
Vending Miser	1	614	614	100.00%
Total	**8,650**	**483,905**	**558,895**	**115.50%**

The Multifamily Direct Install Program displayed verified savings of 558,895 kWh with a realization rate of 115.50% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-29: Multifamily Direct Install Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Cost
Screw-in LED lamp (A-line 60W)	$236,504.00	$100,475.98	$336,979.98
Screw-in LED lamp (A-line 40W)	$306.00	$332.08	$638.08
Screw-in LED lamp (BR30)	$8,822.00	$6,757.30	$15,579.30
Screw-in LED lamp (3.8)	$5,019.00	$3,678.65	$8,697.65
Screw-in LED lamp (G25)	$37,893.00	$17,815.08	$55,708.08
Screw-in LED lamp (PAR30)	$140.00	$279.55	$419.55
Screw-in LED lamp (PAR38)	$320.00	$127.96	$447.96
Screw-in LED lamp (4.8)	$5,670.00	$5,534.48	$11,204.48
Faucet aerator (1 GPM)	$21,392.00	$40,542.97	$61,934.97
Kitchen Aerator	$5,280.00	$9,292.09	$14,572.09
Vending Miser	$225.00	$71.86	$296.86
Total	**$321,571.00**	**$184,907.99**	**$506,478.99**

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

1.6.6.1 Database Review & Verification

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

1.6.6.2 Database Review & Document Verification

The program administrators do not track data separately from the tracking data. Therefore, there were no documents for the Evaluators to cross-verify for the Multifamily Direct Install Program.

To verify savings, the Evaluators reviewed the tracking data and verified savings using Avista TRM values, RTF UES values, and SBW saving methodology.

The Evaluators found that in many cases, the per unit savings value for the lighting measures did not align with the per unit value in SBW's methodology or the RTF UES values. The tracking data contained multiple savings baselines for savings including one value for savings above code (EISA) and another value for savings above existing installed lighting. These values did not always align as expected with the reported savings for above code sometimes being higher and other times lower than the savings from installed existing lighting. The precise reason for these discrepancies was unclear. These discrepancies led to deviations from 100% realization rate for the lighting measures.

The Evaluators evaluated the faucet and kitchen aerator values using RTF UES values. The Evaluators found no discrepancy between the savings values in the tracking database and the RTF UES values leading to a realization rate of 100% for these measures. However, more granularity in per unit savings values could be achieved if the tracking data included data about space heating type for each unit. The Evaluators recommend verifying space heating type in the tracking data in order to apply more specific savings values to each project.

The Evaluators did not conduct survey verification for the Multifamily Direct Install Program since the MFDI measure savings values have in-service rates embedded.

1.6.6.3 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 RTF workbook, Avista TRM, and SBW methodology in place at the time the savings goals for the program were finalized.

1.6.6.4 Verified Savings

The Evaluators reviewed the Avista TRM values along with tracking data to estimate net verified program savings for those measures. The Multifamily Direct Install Program displayed 115.50% realization with 558,895 kWh saved, as displayed in Table 3-28.

The difference between calculated expected savings and verified savings are due to the application of the SBW TRM. The lighting measures displayed discrepancies in kWh/unit values used to calculate savings. The reason for the discrepancies was unclear. These discrepancies led to deviations from 100% realization rate for the lighting measures. The Evaluators evaluated the faucet and kitchen aerator values using RTF UES values and found there was discrepancy between the savings values in the tracking database and the RTF UES values leading to a realization rate of 100% for these measures. However, more granularity in per unit savings values could be achieved if the tracking data included data about space heating type for each unit. The Evaluators recommend verifying space heating type in the tracking data to apply more specific savings values to each project.

1.6.7 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 3-30 summarizes the measures offered under this program.

Table 3-30: Appliances Program Measures

Measure	Description	Impact Analysis Methodology
E Energy Star Certified Refrigerator and Refrigerator-Freeze	ENERGY STAR-certified refrigerator or refrigerator with freezer for residential homes	RTF UES
E Energy Star Certified Upright Freezer	ENERGY STAR-certified standard or compact freezers 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 front loading clothes washer for residential homes	RTF UES
E Energy Star Rated To Load Washer	ENERGY STAR-certified top loading clothes washer for residential homes	RTF UES

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

Table 3-31: Appliances Program Verified Electric Savings

Measure	PY2022 Units	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Energy Star Certified Refrigerator and Refrigerator-Freeze	242	30,132	30,008	3,119	10.35%
E Energy Star Certified Upright Freezer	46	3,082	3,082	1,122	36.42%
E Energy Star Rated Clothes Dryer	189	55,390	54,753	56,653	102.28%
E Energy Star Rated Top Load Washer	17	442	442	0	0.00%
E Energy Star Rated Front Load Washer	136	16,466	16,320	21,433	130.17%
Total	**630**	**105,512**	**104,605**	**82,327**	**78.03%**

The Appliances Program displayed verified savings of 82,327 kWh with a realization rate of 78.03% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-32: Appliances Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs

E Energy Star Certified Refrigerator and Refrigerator-Freeze	$24,200.00	$1,111.79	$25,311.79
E Energy Star Certified Upright Freezer	$2,300.00	$562.87	$2,862.87
E Energy Star Rated Clothes Dryer	$9,600.00	$17,323.17	$26,923.17
E Energy Star Rated Top Load Washer	$850.00	$0.00	$850.00
E Energy Star Rated Front Load Washer	$6,950.00	$7,585.33	$14,535.33
Total	**$43,900.00**	**$26,583.15**	**$70,483.15**

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

1.6.7.1 Database Review & Verification

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

1.6.7.2 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 Section 1.4.2.4.

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

1.6.7.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 1.4.2.5. The Evaluators included questions such as:

- What type of clothes washer/dryer did this clothes washer/dryer replace?
- Is your home space heating 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 3-33 displays the ISRs for each of the Appliances measures for the Washington electric territory alone. The ISRs resulted in 8.0% precision at the 90% confidence interval for the program.

Table 3-33: Appliances 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	242	46	90% ±6.53%	100%
E Energy Star Certified Upright Freezer	46	8		100%
E Energy Star Rated Clothes Dryer	189	41		100%
E Energy Star Rated Top Load Washer	17	0		N/A
E Energy Star Rated Front Load Washer	136	31		100%

The Evaluators applied the ISRs listed in Table 3-33 to each rebate to quantify verified savings for each measure.

1.6.7.4 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 goals for the program was finalized.

1.6.7.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. The Appliances Program displayed 78.03% realization with 82,327 kWh saved, as displayed in Table 3-31.

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-Freeze 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.

1.6.8 AeroBarrier Pilot

The AeroBarrier Pilot provides incentives for customers or builders with new construction single family homes to complete envelope sealing improvements using the AeroBarrier product, a convenient, cost-effective approach that seal homes in less than three hours and provides documented results.

This section summarizes the estimated savings Avista has calculated for the AeroBarrier Pilot. The Evaluators conducted the first impact evaluation for the measures in this program for PY2022. Table 3-34 summarizes the measures offered under this program.

Table 3-34: AeroBarrier Program Measures

Measure	Description	Impact Analysis Methodology
E AeroBarrier Rebate	Whole home insulation with AeroBarrier	RTF with adjustments

The following table summarizes the estimated electric energy savings for the Appliances Program impact evaluation.

Table 3-35: AeroBarrier Program Verified Electric Savings

Measure	PY2022 Units	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E AeroBarrier Rebate	5	5,648	10,093	1,077	19.07%
Total	**5**	**5,648**	**10,093**	**1,077**	**19.07%**

The AeroBarrier Program displayed estimated savings of 656 kWh. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-36: AeroBarrier Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E AeroBarrier Rebate	$9,002.72	$462.43	$9,465.15
Total	**$9,002.72**	**$462.43**	**$9,465.15**

The Evaluators describe the impact evaluation tasks completed for this Pilot in the subsections below.

1.6.8.1 Database Review & Verification

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

1.6.8.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the AeroBarrier Pilot. The Evaluators selected the census of rebates to cross-verify tracking data inputs, summarized in in Section 1.4.2.4.

The Evaluators found all five E AeroBarrier Rebates had proper project documentation with the associated AeroBarrier seal reports and household information in either the CC&B web rebate data or mail-in rebate applications, which allowed the Evaluators to easily verify equipment specifications to

assign savings values to each sampled project. The critical values included in these documents were: Air Changes per Hour (ACH)-pre, ACH post, and square footage in the appropriate AeroBarrier seal reports. The Evaluators note that primary and auxiliary heating type data was missing on some rebate applications.

1.6.8.3 Verification Surveys

The Evaluators did not conduct verification surveys for the AeroBarrier Pilot since weatherization measures historically have high verification rates.

1.6.8.4 Impact Analysis

This section summarizes the verified savings results for the AeroBarrier Pilot. The Evaluators attempted to conduct a billing analysis for the AeroBarrier projects, but the data required to match a valid counterfactual group to new construction homes was unavailable.

The Evaluators reviewed the expected savings calculation workbooks for each project. The expected savings were calculated by Avista had used the sensible heat loss equation, with the following inputs: change in cubic feet per minute (CFM), density of air, specific heat of air, inside air temperature, outside air temperature, primary heating equipment efficiency, auxiliary heating equipment efficiency, and cooling equipment efficiency.

The Evaluators estimated verified savings using RTF SEEM models utilized in the RTF's residential weatherization workbook. The SEEM models used to estimate air infiltration reduction was used to estimate the average kWh reductions per square foot, per ACH(50) reduction for each primary heating equipment type and heating zone. The Evaluators deem this methodology to be more appropriate, as it displays the modeled interactive effects of homes in this region, rather than theoretical values based on the laws of heat transfer alone. This led to nearly 20% realization rate across the program. This result is similar to results using RTF air infiltration reduction measure, as expected, due to the use of the same SEEM model results. Therefore, the Evaluators calculated verified savings for the AeroBarrier measure using the RTF workbook in place at the time the savings goals for the program was finalized.

The Evaluators recommend that Avista utilize SEEM model results summarized by the Evaluators to estimate all AeroBarrier rebate savings for any future redemptions. Based on cost effectiveness, the Evaluators recommend Avista determine whether the pilot will be implemented into a full program.

1.6.8.5 Billing Analysis

The Evaluators did not conduct a billing analysis for the AeroBarrier measure due to lack of required data for sufficient control group matching.

1.6.8.6 Verified Savings

The AeroBarrier Pilot in total displays a realization rate of 19.07% with 1,077 kWh verified electric energy savings in the Washington service territory, as displayed in Table 3-14. The realization rate for the electric savings in the AeroBarrier Program deviate from 100% due to the differences between the applied Avista TRM prescriptive savings value and the adjusted RTF air sealing 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 workbook SEEM model results for the electric measures along with verified tracking data to estimate net program verified savings for this measure. The Evaluators summarize the adjusted savings values developed from the RTF SEEM models in the table below.

Table 3-37: AeroBarrier RTF Adjusted UES

Measure	Savings Component	kWh Savings (kWh/ SQFT/ ACH(50) Reduction	Therms Savings (Therms/ SQFT/ ACH(50) Reduction
ACH50 reduction - Heating Zone 1 (Gas FAF - Condensing)	Gas Heating & Cooling	0.00410	0.0022
ACH50 reduction - Heating Zone 2/3 (Gas FAF - Condensing)	Gas Heating & Cooling	0.00621	0.0025
ACH50 reduction - Heating Zone 1 (Gas FAF - Non-Condensing)	Gas Heating & Cooling	0.00410	0.0026
ACH50 reduction - Heating Zone 2/3 (Gas FAF - Non-Condensing)	Gas Heating & Cooling	0.00621	0.0029
ACH50 reduction - Heating Zone 1 (Gas FAF - Any)	Gas Heating & Cooling	0.00410	0.0024
ACH50 reduction - Heating Zone 2/3 (Gas FAF - Any)	Gas Heating & Cooling	0.00621	0.0027
ACH50 reduction - Heating Zone 1 (Electric FAF)	Electric Heating & Cooling	0.02581	0.0000
ACH50 reduction - Heating Zone 2/3 (Electric FAF)	Electric Heating & Cooling	0.03665	0.0000
ACH50 reduction - Heating Zone 1 (Zonal or DHP)	Electric Heating & Cooling	0.05254	0.0000
ACH50 reduction - Heating Zone 2/3 (Zonal or DHP)	Electric Heating & Cooling	0.05203	0.0000
ACH50 reduction - Heating Zone 1 (Heat Pump)	Electric Heating & Cooling	0.00741	0.0000
ACH50 reduction - Heating Zone 2/3 (Heat Pump)	Electric Heating & Cooling	0.00746	0.0000

The realization rate for the Pilot is low because the expected savings were calculated using the theoretical sensible heat transfer equation, with weather-related inputs, while the Evaluators utilized RTF-developed SEEM model outputs in which ACH(50) reductions were estimated on modeled homes relative to the Pacific Northwest region. This method includes interactive effects that are no possible to capture with the sensible heat transfer equation. These SEEM models are used to estimate RTF weatherization UES; therefore, the Evaluator recommends that Avista estimate AeroBarrier project savings using the RTF-adjusted values. The appropriate adjusted UES in the RTF led to a lower-than-expected savings for the measure.

4. Low-Income Impact Evaluation Results

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Washington 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 Washington 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 4-2 summarizes the Low-Income portfolio cost-effectiveness results.

Table 4-1: Low-Income Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Low-Income	264,896	263,618	99.52%
CEEP	116,482	94,819	81.40%
Total Low-Income	**381,378**	**358,437**	**93.98%**

Table 4-2: Low-Income Portfolio Cost-Effectiveness Summary

Sector	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Low Income	$1,855,528	$1,583,719	1.17	$654,095	$1,583,719	0.41

In PY2022, Avista completed and provided incentives for low-income electric measures in Washington and achieved total electric energy savings of 358,437 kWh. The Low-Income Program exceeded savings expectations based on reported savings while the Community Energy Efficiency Program (CEEP) did not meet savings expectations. However, the low-income sector had achieved 93.98% of the savings expectations. The Evaluators estimated the TRC value for the Low-Income portfolio is 1.17 while the UCT value is 0.41. Further details of the impact evaluation results by program are provided in the sections following.

1.7 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.

1.7.1 Low-Income Program

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Washington 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. Weatherization measures under this program may also be funded by CEEP. Table 4-3 summarizes the measures offered under this program.

Table 4-3: Low-Income Program Measures

Measure	Impact Analysis Methodology
Air Infiltration	Avista TRM
Air source heat pump	
Attic insulation	
Duct insulation	
Duct sealing	
Ductless heat pump	
Electric to air source heat pump	
Electric to ductless heat pump	
ENERGY STAR® door	
ENERGY STAR® refrigerator	
ENERGY STAR® window	
Floor insulation	
Heat pump conversion	
Heat pump water heater	
LED lighting	
Wall insulation	
High efficiency furnace	
High efficiency tankless natural gas water heater	
Natural gas boiler	

Table 4-4 summarizes the verified electric energy savings for the Low-Income Program impact evaluation.

Table 4-4: Low-Income Program Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Air Infiltration	35	17,699	16,986	16,986	95.97%
E Duct Sealing	3	1,334	1,085	1,085	81.36%
E Ductless Heat Pump	17	40,841	40,744	40,744	99.76%
E Electric to Air Source Heat Pump	2	1,571	1,571	1,571	99.99%
E ENERGY STAR® Doors	41	6,493	9,753	9,753	150.22%
E ENERGY STAR® Refrigerator	1	39	39	39	100.00%
E ENERGY STAR® Windows	46	15,869	15,866	15,866	99.98%
E INS - Attic	16	7,456	7,035	7,035	94.35%
E INS - Duct	4	1,232	1,144	1,144	92.85%
E INS - Floor	40	30,388	29,865	29,865	98.28%
E INS - Wall	2	3,422	3,435	3,435	100.38%
E To Heat Pump Conversion	40	137,569	135,978	135,978	98.84%
Health And Safety	47	16	0	0.00	NA
LED Bulbs	16	967	116	116.00	12.00%
Total	**310**	**264,896**	**263,618**	**263,618**	**99.52%**

The Low-Income Program displayed verified savings of 263,618 kWh with a realization rate of 99.52% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 4-5: Low-Income Program Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
E Air Infiltration	$47,435.44	$16,230.47	$63,665.91
E Duct Sealing	$3,948.82	$1,354.37	$5,303.19
E Ductless Heat Pump	$89,769.00	$38,583.39	$128,352.39
E Electric To Air Source Heat Pump	$2,540.50	$1,501.35	$4,041.85
E Energy Star Doors	$54,324.67	$21,451.88	$75,776.55
E Energy Star Refrigerator	$769.00	$40.07	$809.07
E Energy Star Windows	$150,607.68	$37,836.18	$188,443.86
E INS - Attic	$36,793.12	$16,774.99	$53,568.11
E INS - Duct	$7,931.79	$2,728.61	$10,660.40
E INS - Floor	$153,535.06	$71,218.35	$224,753.41
E INS - Wall	$3,981.16	$8,191.20	$12,172.36
E To Heat Pump Conversion	$274,538.98	$128,766.51	$403,305.49
Health And Safety	$173,953.05	$0.00	$173,953.05
LED Bulbs	$1,074.46	$89.59	$1,164.05
Total	**$1,001,202.73**	**$344,766.98**	**$1,345,969.71**

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

1.7.1.1 Database Review & Verification

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

1.7.1.2 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 1.4.2.4.

The Evaluators were able to collect and review the measure-level quantity and efficiencies for 42 of the 247 projects due to challenges in collecting additional documentation and found the project data to be consistent with the documentation. The Evaluators received a lower number of project documents than intended due to turnover in Low-Income project managers at Avista. Therefore, the resulting precision did not meet the 90/10 goals. The Evaluators expect to once again receive all requested projects in PY2023 when a new project manager has had time to build communications with the CAP agencies. The resulting confidence and precision estimates are presented in the table below.

Table 4-6: Low-Income Resulting Confidence/Precision Estimates

Program	Population	Sampled	Confidence/Precision
Low-Income	247	42	90% ± 11.59%

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 the household, leading to low realization rates for some projects in the program.

The Evaluators found two instances where Energy STAR door measures had expected savings that were significantly higher than the verified savings for unknown reasons. This lead to a realization rate of 150.22% for Energy STAR door measures.

The Evaluators also 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 instances of downward adjustment led to a realization rate of 99.52% for the Low-Income Program.

1.7.1.3 Verification Surveys

The Evaluators did not conduct verification surveys for the Low-Income Program.

1.7.1.4 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.

1.7.1.5 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 4-7 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 4-7: 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.

1.7.1.6 Verified Savings

Due to lack of statistically significant estimates from 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. Verified savings were estimated using the Avista TRM savings values to each measure along with adjustments found during document verification of the sampled projects. The Low-Income Program in total displays a realization rate of 99.52% with 263,618 kWh verified electric energy savings in the Washington service territory, as displayed in Table 4-4.

The Evaluators note that the majority of deviations from 100% realization rate is due to some instances in which 20% savings cap was not applied to all measures found to be installed in the household.

1.7.2 Community Energy Efficiency Program (CEEP)

The Community Energy Efficiency Program was created from the Washington State Legislature in 2009 to tackle hard to reach markets in both the residential and commercial sectors by encouraging energy efficiency improvements. The CEEP pilot was funded by the U.S. Department of Energy's State Energy Program and the American Recovery and Reinvestment Act. CEEP partners are selected by a competitive request for proposals and independent review committee. Avista has been a CEEP recipient since 2014.

Three community action agencies have partnered with Avista to implement the CEEP funds under two programs: energy efficiency improvements for multifamily housing and converting income qualified homes with alternative heat sources (e.g. wood, oil) to a heat pump system. In addition, CEEP funds are being used to match utility rebates for energy efficiency work done in small businesses in rural communities. Avista has decided to discontinue CEEP in Q4 of 2022.

This section summarizes the impact results of the evaluation results for CEEP. Table 4-8 summarizes the measures offered under this program.

Table 4-8: CEEP Measures

Measure	Description	Impact Analysis Methodology
CEEP Multi Family - E Ductless Heat Pump Conversion Zonal	Ductless heat pump for multi-family units	Avista TRM
CEEP Multi Family - E Windows	Window replacement for multi-family units	Avista TRM
CEEP Multi Family - E Air Infiltration	Air infiltration for multi-family units	Avista TRM
CEEP Multi Family - E Attic Insulation	Attic insulation for multi-family units	Avista TRM
CEEP Multi Family - E Ductless Heat Pump Conversion	Ductless heat pump for multi-family units	Avista TRM
CEEP Multi Family - E Line Voltage Thermostat	Line voltage thermostats for multi-family units	Avista TRM
CEEP Multi Family - G Boiler	Boiler replacement for multi-family units	Avista TRM
CEEP Multi Family - E Health & Safety	Health and safety improvements for multi-family units	Avista TRM
CEEP Multi Family - E Lighting	Efficient lighting giveaways for multi-family units	Avista TRM
CEEP Single Family - E Alternative Heat Conversion	Alternative fuel conversion to electric in multi-family units	Avista TRM
CEEP Multi Family - E Floor Insulation	Floor insulation for multi-family units	Avista TRM
CEEP Single Family - E Ductless Heat Pump	Ductless heat pump for single-family homes	Avista TRM
CEEP Single Family - E Lighting	Efficient lighting giveaways for single-family units	Avista TRM

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

Table 4-9: CEEP Verified Electric Savings

Measure	PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
CEEP Single Family - E Alternative Heat Conversion	11	113,039	94,046	94,046	83.20%

CEEP Single Family - E Health & Safety	1	-	-	-	N/A
CEEP Single Family - E Lighting	2	2,052	24	24	1.17%
CEEP Single Family - E Windows	2	1,391	749	749	53.84%
Total	**16**	**116,482**	**94,819**	**94,819**	**81.40%**

CEEP displayed verified savings of 94,819 kWh with a realization rate of 81.40% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 4-10: CEEP Costs by Measure

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
CEEP Single Family - E Alternative Heat Conversion	$119,273.99	$89,863.51	$209,137.50
CEEP Single Family - E Health & Safety	$5,391.03	$0.00	$5,391.03
CEEP Single Family - E Lighting	$6,445.75	$18.54	$6,464.29
CEEP Single Family - E Windows	$14,970.51	$1,786.02	$16,756.53
Total	**$146,081.28**	**$91,668.07**	**$237,749.35**

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

1.7.2.1 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for CEEP. The Evaluators requested additional documentation for the census of CEEP participants in order to cross-verify tracking data inputs, summarized in Section 1.4.2.4.

The Evaluators were able to collect and review the measure-level quantity and efficiencies for five of the sixteen projects due to challenges in collecting additional documentation and found the project data to be consistent with the documentation. The Evaluators received a lower number of project documents than intended due to turnover in CEEP project managers at Avista. Therefore, the resulting precision did not meet the 90/10 goals. The Evaluators expect to once again receive all requested projects in PY2023 when a new project manager has had time to build communications with the CAP agencies. The resulting confidence and precision estimates are presented in the table below.

Table 4-11: CEEP Resulting Confidence/Precision Estimates

Program	Population	Sampled	Confidence/Precision
CEEP	15	8	90% ± 20.56%

The Evaluators note that of the 16 projects completed in CEEP, the eight of the 11 heat conversion projects expected savings did not align with the expected savings indicated in the Avista TRM, leading to significantly low realization rate for these projects. One alternative heat conversion project displayed expected savings 4.5 times higher than the Avista TRM for one unit. The calculations behind these expected savings are unclear, however, the Evaluators applied Avista TRM values where appropriate to the documented number of equipment indicated in the documentation. The Evaluators recommend that Avista apply savings values consistent with the Avista TRM or the RTF when calculating expected savings.

Finally, the LED bulbs incented through the program had calculated expected savings that were vastly higher than the Avista TRM indicates for the number of light bulbs installed. The calculations behind these expected savings are unclear, however, the Evaluators applied Avista TRM values for this project appropriate to the documented number of equipment indicated in the documentation.

These downward adjustments lead to a realization rate of 81.40% for CEEP overall.

1.7.2.2 Verification Surveys

The Evaluators did not conduct verification surveys for CEEP.

1.7.2.3 Impact Analysis

This section summarizes the verified savings results for CEEP. 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.

1.7.2.4 Billing Analysis

The program contained 11 unique customers across all measures. Due to the requirement of a sufficient number of pre/post billing month and the requirement that customers do not participate in more than one program, the Evaluators determined that a billing analysis was not feasible.

1.7.2.5 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 adjusted program savings for those measures. Final verified savings were estimated using the RTF UES values associated with each measure. CEEP displayed an 81.40% realization with 94,819 kWh saved, as displayed in Table 4-9.

The Evaluators note that most deviations from 100% realization rate is due to unsubstantiated and large expected savings for the conversion measures and the LED lighting measures. The Evaluators applied the Avista TRM values with the appropriate categories to calculate verified savings.

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 electric impact evaluation in the Non-Residential Portfolio in the Washington 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 5-2 summarizes the Non-Residential portfolio's cost-effectiveness.

Table 5-1:Non-Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Lighting	14,229,477	14,205,856	14,213,498	99.89%
HVAC	15,637	15,637	15,637	100.00%
Food Service Equipment	31,596	31,596	31,611	100.05%
Grocer	141,653	141,653	141,653	100.00%
Shell	9,793	87,530	87,530	893.81%
Green Motors	17,752	17,752	17,752	100.00%
Site-Specific	6,127,019	6,393,925	6,393,005	104.34%
Total Non-Residential:	**20,572,926**	**20,893,949**	**20,900,686**	**101.59%**

Table 5-2:Non-Residential Portfolio Cost-Effectiveness Summary

Program	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Nonresidential	$29,071,571	$17,766,539	1.64	$22,466,473	$6,056,699	3.71

In PY2022, Avista completed and provided incentives for non-residential electric measures in Washington and reported total electric energy savings of 20,900,686 kWh. All programs except the Prescriptive Lighting Program exceeded savings claims based on reported savings, leading to an overall achievement of 101.59% of the expected savings for the non-residential programs. The Evaluators estimated the TRC value for the Non-Residential portfolio is 1.64 while the UCT value is 3.71. Further details of the impact evaluation results by program are provided in the sections following.

1.8 Verification Results

1.8.1 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 Section 1.4.2.4

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 5-3 displays program populations, sample sizes for document verification and resulting precision.

Table 5-3: Prescriptive Program Verification Precision

Program	Population	Sampled	Precision
Lighting	870	70	±9.43%
HVAC (VFD)	2	2	±0%
Food Service Equipment	6	6	±0%
Grocer	9	9	±0%
Shell	6	6	±0%
Green Motors	8	8	±0%

1.8.2 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:

1.8.2.1 Prescriptive Lighting Verification

To access Prescriptive Lighting ISRs the Evaluators conducted a survey of program participants. A total of 870 projects included a contact email, of which 103 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 ±40.52% precision across the Prescriptive Lighting Program in Avista's Washington service territory, summarized in Table 5-4.

Table 5-4: Survey Verification

Population	Respondents	ISR	Precision at 90% CI
103	4	100%	±40.52%

All respondents reported that their rebated equipment was currently installed and operating.

1.8.2.2 Site-Specific Verification

For the Site-Specific program, the Evaluators conducted 14 on-site visits to verify full installation and equipment operation as described in the project scope, as well as collect any data necessary for analyses. This is discussed further in the Site-Specific chapter.

Table 5-5: On-Site Verification

Program	Population	On-Site Visits	Precision at 90% CI (by claimed savings)
Site-Specific	47	14	9.76%

1.9 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.

1.9.1 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 69% of the expected non-residential portfolio.

Table 5-6 summarizes the measures offered under this program.

Table 5-6: Prescriptive Lighting Program Measures

Location	Measure	Savings Source
Interior	LED tubes	Prescriptive Calculations with RTF Inputs
	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 5-7.

Table 5-7: Interior Prescriptive Lighting Program Verified Electric Savings

Measure	Number of Projects	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
1000 watt HID Fixture to 400 watt or less LED Fixture	5	89,804	89,804	89,804	100.00%
1000 watt HID Fixture to 400 watt or less LED Fixture or Retrofit (Ext)	20	408,733	408,733	408,733	100.00%
150 watt HID Fixture to 50 watt or less LED Fixture or Retrofit (Ext)	27	119,672	119,671	119,671	100.00%

175 watt HID Fixture to 100 watt or less LED Fixture (Ext, NC)	25	64,466	64,466	64,466	100.00%
175 watt HID Fixture to 100 watt or less LED Fixture or Retrofit (Ext)	79	238,508	238,508	238,508	100.00%
2, 3, 4-Lamp T12/T8 Fixture to LED Qualified 2x4 Fixture	120	835,123	835,123	835,123	100.00%
20-50 watt MR16 to MR16 LED 2-9 watt	5	7,476	7,476	7,476	100.00%
250 watt HID Fixture to 140 watt or less LED Fixture (Ext, NC)	3	10,493	10,493	10,493	100.00%
250 watt HID Fixture to 140 watt or less LED Fixture or Retrofit (Ext)	83	349,918	349,918	349,918	100.00%
250-watt HID Fixture to 140-watt or less LED Fixture	15	258,794	258,794	258,794	100.00%
2-Lamp T12/T8 Fixture to LED Qualified 1x4 Fixture	55	110,321	110,321	110,321	100.00%
2-Lamp T12/T8 Fixture to LED Qualified 2x2 Fixture	35	200,506	200,506	200,506	100.00%
320 and 400 watt HID Fixture to 160 or less watt LED Fixture (Ext, NC)	30	113,323	113,323	113,323	100.00%
320 watt HID Fixture to 160 watt or less LED Fixture or Retrofit (Ext)	35	207,545	207,545	207,545	100.00%
400 watt HID Fixture to 175 watt or less LED Fixture	54	708,216	708,216	708,216	100.00%
400 watt HID Fixture to 175 watt or less LED Fixture or Retrofit (Ext)	138	1,528,678	1,528,678	1,528,678	100.00%
575 watt HID Fixture to 300 watt or less LED Fixture or Retrofit (Ext)	2	8,610	8,610	8,610	100.00%
70-89 watt HID Fixture to 25 watt or less LED Fixture or Retrofit (Ext)	19	45,309	45,309	45,309	100.00%
750 watt HID Fixture to 300 watt or less LED Fixture or Retrofit (Ext)	3	35,511	35,511	35,511	100.00%
75-100 watt Incandescent Can to less than 20 watt LED Fixture Retrofit	40	132,487	132,487	132,487	100.00%
90-100 watt HID Fixture to 30 watt or less LED Fixture or Retrofit (Ext)	38	248,168	230,851	230,851	93.02%
DLC Qualified LLLC Fixture	26	167,478	167,478	167,478	100.00%
Four Pin Base CFL to 17 watt or less Plug in LED	44	167,466	167,466	167,466	100.00%
Occupancy sensors built-in relays	15	103,667	96,025	103,667	100.00%
Sign Lighting	97	220,771	222,111	222,111	100.61%
T12/T8 (2') Lamp to 1-Lamp less than 13 watt T8 TLED	16	72,748	72,748	72,748	100.00%
T12/T8 (3') Lamp to 1-Lamp less than 17 watt T8 TLED	7	12,382	12,382	12,382	100.00%
T12/T8 (4') Lamp to 1-Lamp less than 23 watt T8 TLED	435	4,844,381	4,844,381	4,844,381	100.00%
T12/T8 8' Fixture to 90 watt or less 8' LED fixture	33	377,222	377,221	377,221	100.00%
T12/T8 Eight-Foot to LED	77	202,167	202,167	202,167	100.00%
T12/T8 U-Bend to less than 23 watt T8 LED	30	64,079	64,079	64,079	100.00%
T5 Lamp to 1-Lamp less than 18 watt T5 TLED	8	95,821	95,821	95,821	100.00%
T5HO (4') 4-Lamp to 135 watt of less LED Fixture	8	229,177	229,177	229,177	100.00%
T5HO (4') 6-Lamp to 160 watt of less LED Fixture	15	514,832	514,832	514,832	100.00%
T5HO Lamp to 1-Lamp less than 29 watt T5HO TLED	56	1,428,228	1,428,228	1,428,228	100.00%
TLED (4') Lamp to TLED (4') Lamp with 5 watt or more reduction	3	7,395	7,395	7,395	100.00%
Totals:	**1,701**	**14,229,477**	**14,205,856**	**14,213,498**	**99.89%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-8: Interior Lighting Prescriptive Lighting Program Costs by Measure

Measure	Measure Count (savings units)	Total Electric Incentives	Measure Costs	Total Co
HID Fixture to 400 watt or less LED Fixture	28	$12,600.00	$6,453.46	$19,053
HID Fixture to 400 watt or less LED Fixture or t)	119	$89,666.17	$29,372.18	$119,038
ID Fixture to 50 watt or less LED Fixture or Retrofit	173	$26,321.25	$8,599.78	$34,921
ID Fixture to 100 watt or less LED Fixture (Ext, NC)	91	$13,418.49	$4,632.64	$18,051
ID Fixture to 100 watt or less LED Fixture or t)	351	$55,778.12	$17,139.53	$72,917
p T12/T8 Fixture to LED Qualified 2x4 Fixture	2,842	$156,006.01	$58,704.99	$214,711
MR16 to MR16 LED 2-9 watt	98	$833.00	$525.54	$1,358.
ID Fixture to 140 watt or less LED Fixture (Ext, NC)	13	$2,535.00	$754.08	$3,289.
ID Fixture to 140 watt or less LED Fixture or t)	431	$84,891.26	$25,145.66	$110,036
ID Fixture to 140-watt or less LED Fixture	391	$85,667.35	$18,191.91	$103,859
2/T8 Fixture to LED Qualified 1x4 Fixture	867	$30,345.00	$7,755.04	$38,100
2/T8 Fixture to LED Qualified 2x2 Fixture	1,164	$34,920.00	$14,094.57	$49,014
0 watt HID Fixture to 160 or less watt LED Fixture	120	$26,400.00	$8,143.57	$34,543
ID Fixture to 160 watt or less LED Fixture or t)	191	$46,849.68	$14,914.49	$61,764
ID Fixture to 175 watt or less LED Fixture	773	$207,059.54	$49,784.01	$256,843
ID Fixture to 175 watt or less LED Fixture or t)	1,082	$349,852.20	$109,853.15	$459,705
ID Fixture to 300 watt or less LED Fixture or t)	5	$1,750.00	$618.76	$2,368.
HID Fixture to 25 watt or less LED Fixture or t)	134	$9,539.95	$3,255.95	$12,795
ID Fixture to 300 watt or less LED Fixture or t)	12	$7,122.96	$2,551.86	$9,674.
t Incandescent Can to less than 20 watt LED ofit	741	$36,914.16	$9,313.19	$46,227
t HID Fixture to 30 watt or less LED Fixture or t)	503	$50,283.16	$16,589.32	$66,872
ed LLLC Fixture	1,560	$109,200.00	$18,778.21	$127,978
se CFL to 17 watt or less Plug in LED	1,985	$29,775.00	$11,771.99	$41,546
sensors built-in relays	724	$28,781.55	$11,623.44	$40,404
g	4,862	$53,010.42	$13,066.58	$66,077
Lamp to 1-Lamp less than 13 watt T8 TLED	1,551	$11,632.50	$5,113.84	$16,746
Lamp to 1-Lamp less than 17 watt T8 TLED	161	$1,610.00	$870.41	$2,480.
Lamp to 1-Lamp less than 23 watt T8 TLED	82,850	$1,024,485.98	$340,535.67	$1,365,02
ixture to 90 watt or less 8' LED fixture	866	$47,630.00	$26,516.75	$74,146
nt-Foot to LED	2,116	$45,391.97	$14,211.31	$59,603

end to less than 23 watt T8 LED	1,078	$14,553.00	$4,504.40	$19,057
1-Lamp less than 18 watt T5 TLED	1,587	$21,521.29	$6,735.75	$28,257
-Lamp to 135 watt of less LED Fixture	408	$34,482.00	$16,109.97	$50,591
-Lamp to 160 watt of less LED Fixture	663	$122,655.00	$36,190.12	$158,845
to 1-Lamp less than 29 watt T5HO TLED	12,365	$292,091.46	$100,397.26	$392,488
mp to TLED (4') Lamp with 5 watt or more	319	$1,276.00	$519.86	$1,795.
	123,224	**$3,166,849.47**	**$1,013,339.24**	**$4,180,18**

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.

1.9.1.1 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 1.8.1. Data points checked between project applications and program tacking including quantity, pre/post wattages, model qualification, cost, facility type and hours. Below, Table 5-9 shows the project population, the number of projects checked and the overall precision.

Table 5-9: Prescriptive Lighting Program Verification Precision

Population	Sampled	Precision
870	70	±9.43%

Below, Table 5-10 shows the count of discrepancies found between program tracking and project-level data.

Table 5-10: Prescriptive Lighting Program Verification Findings

Count Correction	Location Correction	Hours Correction	Wattage Correction
0	3	6	9

Most discrepancies did not affect savings, however in one project the annual hours recorded in program tracking data and used in expected savings calculations was 43,888 hours, where the verified value was 4,388. Also, three measures had 'existing' and 'proposed' wattage reversed entries reversed.

1.9.1.2 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

1.9.1.3 Verified Savings

The verified savings for the program is 14,213,498 kWh with a realization rate of 99.89%, as displayed in Table 5-7. One project's claimed savings were calculated using an incorrect input for annual hours of operation, which resulted in a 17,317 kWh difference in expected and verified savings.

1.9.2 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 5-11 summarizes the measures rebated in PY2022 under this program.

Table 5-11: 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 5-12: Prescriptive HVAC VFD Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
VFD on Supply Fan or Supply Air Handler	1	5,928	5,928	5,928	100.00%
VFD on VAV Packaged or Rooftop HVAC Unit	1	9,709	9,709	9,709	100.00%
Totals	**2**	**15,637**	**15,637**	**15,637**	**100.00%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-13: Prescriptive HVAC VFD Program Costs by Measure

Measure	Measure Count (VFDs)	Measure Count (Horsepower)	Total Electric Incentive	Measure Costs	Total Costs
VFD on Supply Fan or Supply Air Handler	2	6	$1,160.00	$531.73	$1,691.73
VFD on VAV Packaged or Rooftop HVAC Unit	3	10	$1,900.00	$919.97	$2,819.97
Totals	**5**	**15**	**$3,060.00**	**$1,451.70**	**$4,511.70**

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.

1.9.2.1 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 1.8.1. Verification of project documents included data points such as quantity, motor horsepower, installation location and costs of the equipment. Table 5-14 shows the project population, the number of projects checked and the overall precision.

Table 5-14: 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.

1.9.2.2 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.

1.9.2.3 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 15,637 kWh with a realization rate of 100.00%, as displayed in Table 5-12.

1.9.3 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 5-15 summarizes the measures rebated in PY2022 under this program.

Table 5-15: 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 5-16: Prescriptive Food Service Equipment Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
Commercial Combination Oven Electric (5-14 pans)	3	19,266	19,266	19,281	100.08%
Commercial Dishwasher High Temp Electric Hot Water	3	12,330	12,330	12,330	100.00%
Totals	**6**	**31,596**	**31,596**	**31,611**	**100.05%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-17: Prescriptive Food Service Equipment Program Costs by Measure

Measure	Measure Count	Total Electric Incentives	Total Non-Incentive Costs	Total Costs
Commercial Combination Oven Electric (5-14 pans)	3	3,000.00	$1,100.97	$4,100.97
Commercial Dishwasher High Temp Electric Hot Water	3	2,250.00	$839.89	$3,089.89
Totals	**6**	**5,250.00**	**$1,940.86**	**$7,190.86**

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.

1.9.3.1 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 1.8.1. Data points checked between project applications and program tacking include fuel type, capacity, ENERGYSTAR® status, quantity and measure cost values.

Table 5-17 shows the project population, the number of projects checked and the overall precision.

Table 5-18: Prescriptive Food Service Equipment Program Verification Precision

Population	Sampled	Precision
6	6	±0%"

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive Food Service Equipment Program.

1.9.3.2 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.

1.9.3.3 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 31,611 kWh with a realization rate of 100.05%, as displayed in Table 5-16. 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.

1.9.4 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 5-19 summarizes the measures rebated in PY2022 under this program.

Table 5-19: 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 5-20: Grocer Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
Low Temp ECM	3	40,492	40,492	40,492	100.00%
Med Temp ECM	4	85,405	85,405	85,405	100.00%
Case Light	2	15,756	15,756	15,756	100.00%
Totals:	**9**	**141,653**	**141,653**	**141,653**	**100.00%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-21: Grocer Program Costs by Measure

Measure	Measure Count	Total Electric Incentives	Total Non-Incentive Costs	Total Costs

Low Temp_ECM replacing Shaded Pole_20+ W output power	53	$2,650.00	$3,356.07	$6,006.07
Medium Temp_ECM replacing Shaded Pole_20+ W output power	155	$7,750.00	$7,078.57	$14,828.57
MT Case: T8 to Low Power LED Inside Lamp	303	$3,030.00	$641.28	$3,671.28
Totals:	**511**	**$13,430.00**	**$11,075.92**	**$24,505.92**

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

1.9.4.1 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 1.8.1. Data points checked between project applications and program tacking including measure specification, quantity and measure cost values.

Table 5-22 shows the project population, the number of projects checked and the overall precision.

Table 5-22: Verification Precision

Population	Sampled	Precision
9	9	±0%"

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

1.9.4.2 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.

1.9.4.3 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 141,653 kWh with a realization rate of 100.00%, as displayed in Table 5-21.

1.9.5 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 5-23 summarizes the measures rebated in PY2022 under this program.

Table 5-23: 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 5-24: Prescriptive Shell Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
Attic =< R11 to R30-R44	2	3,731	42,279	42,279	1133.33%
Attic =< R11 to R45+	1	151	1,619	1,619	1069.23%
Wall =< R4 to 19+	3	5,911	43,632	43,632	738.15%
Totals	**6**	**9,793**	**87,530**	**87,530**	**893.81%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-25 Prescriptive Shell Program Costs by Measure

Measure	Measure Count (Square Feet Installed)	Incentive Costs	Non-Incentive Costs	Total Costs
Attic =< R11 to R30-R44	41,450	$1,025.71	$5,024.93	$6,050.64
Attic =< R11 to R45+	1,165	$32.67	$192.46	$225.13
Wall =< R4 to 19+	10,616	$544.34	$5,185.71	$5,730.05
Totals	**53,231**	**$1,602.72**	**$10,403.10**	**$12,005.82**

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.

1.9.5.1 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 1.8.1. Data points checked between project applications and program tacking include R-levels, square footage of installation, HVAC configuration and measure cost values. Below, Table 5-26 shows the project population, the number of projects checked and the overall precision.

Table 5-26: Prescriptive Shell Program Verification Precision

Population	Sampled	Precision
6	6	±0%"

In one project, the Evaluators found the both the beginning R and final R values differed between the application and the program tracking data. After correction, no adjustments to savings were necessary.

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Prescriptive Shell Program.

1.9.5.2 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 2022 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.

1.9.5.3 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 87,530 kWh with a realization rate of 893.81%, as displayed in Table 5-24.

Upon analysis, the Evaluators found that UES used to develop claimed savings did not correspond to UES found in the 2022 Avista TRM. For this measure, savings is given by multiplying a savings factor by the square feet of insulation installed. Using correct multipliers resulted in higher verified savings. Table 5-27 below shows the measure, the claimed savings UES and the verified (TRM) UES multipliers.

Table 5-27: Prescriptive Shell Program Ex Ante and Ex Post Savings Multipliers

Measure	Claimed Savings Multiplier	Adjusted and Verified Savings Multiplier
Attic =< R11 to R30-R44	0.09	1.02
Attic =< R11 to R45+	0.19	1.39
Wall =< R4 to 19+	0.39	4.11

1.9.6 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 5-28 summarizes the measures rebated in PY2022 under this program.

Table 5-28: Green Motors Program Measures

Measure	Impact Analysis Methodology
Motor Rewind (Industrial)	RTF Ind_and_Ag_GreenMotorRewind_v3_1

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

Table 5-29: Green Motors Program Verified Electric Savings

Measure	PY2022 Participation (Projects)	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
50 HP Ind	2	2,412	2,412	2,412	100.00%
75 HP Ind	1	1,305	1,305	1,305	100.00%
150 HP Ind	3	7,098	7,098	7,098	100.00%
200 HP Ind	1	3,138	3,138	3,138	100.00%
250 HP Ind	1	3,799	3,799	3,799	100.00%
Totals	**8**	**17,752**	**17,752**	**17,752**	**100.00%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-30: Green Motors Program Costs by Measure

Measure	Measure Count	Total Non-Incentive Costs	Total Costs
50 HP Ind	2	$431.66	$431.66
75 HP Ind	1	$275.34	$275.34
150 HP Ind	3	$1,581.71	$1,581.71
200 HP Ind	1	$701.38	$701.38
250 HP Ind	1	$864.87	$864.87
Totals	**8**	**$3,854.95**	**$3,854.95**

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

1.9.6.1 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 1.8.1. Data points checked between project applications and program tacking including operating hours, RPM, motor horsepower and measure cost values.

Table 5-31 shows the project population, the number of projects checked and the overall precision.

Table 5-31: Green Motors Program Verification Precision

Population	Sampled	Precision
8	8	±0%"

The Evaluators found all rebate equipment met or exceeded the measure efficiency requirements for the Green Motors Program.

1.9.6.2 Impact Analysis

The Evaluators reviewed and applied the appropriate UES values to verified tracking data to estimate program savings for these measures. The Evaluators did not find any deviations from TRM UES. Final verified savings were calculated by applying the appropriate UES to a census of measures.

1.9.6.3 Verified Savings

The verified savings for the program is 17,752 kWh with a realization rate of 100.0%, as displayed in Table 5-29.

1.9.7 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 5-32: Site-Specific Program Verified Electric Savings

PY2022 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
47	6,127,018	6,393,925	6,393,005	104.34%

The Site-Specific Program displayed verified savings of 6,393,005 kWh with a realization rate of 104.3% against the expected savings for the program.

Table 5-33: Site-Specific Program Costs

Incentive Costs	Non-Incentive Costs	Total Costs
$1,275,463.13	$548,978.03	$1,824,441.16

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.

1.9.7.1 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 Section 1.4.2.3. 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 5-34 summarizes the strata boundaries and sample frames for the Site-Specific Program.

Table 5-34: Site-Specific Program Sample Design

Statistic Description	Stratum 1	Stratum 2	Stratum3	Stratum 4	Stratum 5	Totals
Strata boundaries (kWh)	< 10,000	10,001 - 50,000	50,001 - 200,000	200,001 - 900,000	> 900,001	
Number of projects	12	18	7	8	2	**47**
Total kWh savings	66,953.00	473,139.00	544,333.00	2,959,023.0	2,083,570.	**6,127,018**
Average kWh Savings	5,579.42	26,285.50	77,761.86	369,877.88	1,041,785.	**130,362.0**
Standard deviation of kWh	3,047.45	12,339.59	21,801.43	28,511.70	172,895.79	**240,152.1**
Coefficient of variation	0.546	0.469	0.280	0.317	0.166	**0.000**
Final design sample	**3**	**3**	**2**	**4**	**2**	**14**

Two of the highest-savings sites (both in the 5th stratum) were also specifically selected for verification and analysis. Verified sampling precision is 9.76% at 90%.

Table 5-35: Site-Specific Program Sample Summary

# Sites in Population	Review Sample Size	Precision
47	14	9.76% at 90%

1.9.7.2 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 11 of the 14 sampled projects[8].

1.9.7.3 Impact Approaches

The majority (10/14) 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

[8] Two projects were located at the same site, necessitating only a single visit.

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.

1.9.7.4 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 5-36 presents realization at the site level, with Table 5-37 presenting results at the stratum level.

Table 5-36: Site-Specific Expected, Adjusted and Verified kWh Savings by Project

Project ID	Expected kWh Savings	Adjusted kWh Savings	Verified kWh Savings	Realization Rate
SSLP_78914	2,357	1,665	1,665	70.64%
SSOP_80123	4,329	4,329	4,329	100.00%
SSLP_80221	9,911	9,911	9,911	100.00%
SSLP_80228	13,706	13,706	13,706	100.00%
SSLP_81498	31,957	31,957	31,957	100.00%
SSOP_81307	46,896	44,971	44,791	95.51%
SSLP_73540	64,210	42,960	42,960	66.91%
SSLP_81110	105,941	110,414	110,414	104.22%
SSOP_80906	305,324	292,920	292,920	95.94%
SSLP_79403	404,758	404,758	404,758	100.00%
SSLP_79400	411,133	411,133	411,133	100.00%
SSOP_74252	579,656	783,591	783,591	135.18%
SSLP_79505	919,529	919,529	919,529	100.00%
SSLP_79504	1,164,041	1,164,041	1,164,041	100.00%

Table 5-37: Site-Specific Summary of kWh Savings by Sample Stratum

Stratum	Expected kWh Savings	Adjusted kWh Savings	Verified kWh Savings	Realization Rate
1	66,953	64,159	64,159	95.83%
2	473,139	463,299	462,379	97.73%
3	544,333	490,664	490,664	90.14%
4	2,959,023	3,292,233	3,292,233	111.26%
5	2,083,570	2,083,570	2,083,570	100.00%
Total	**6,127,018**	**6,393,925**	**6,393,005**	**104.34%**

1.9.7.5 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%.

- **SSOP_81307** - Differences between Ex Ante Savings and Ex Post savings are due to discrepancies in bulb wattages used in ex ante calculations and bulb wattages found using reported bulb model numbers and referencing spec sheets for the bulbs.
- **SSLP_73540** - Ex ante calculations assumed 5,200 annual lighting operating hours, however verified lighting hours of operating are 3,520 (4am-5:30pm, M-F, less three holidays). Claimed savings were adjusted using 3,520 hours, resulting in 20,749 less kWh.
- **SSLP_81110 -** Ex ante calculations were premised on electric heating and air conditioning. However, during the verification visit it was determined that the facility is heated by a propane heater and is not air conditioned. Ex post calculations did not include the interactive effects, resulting in slightly higher verified kWh savings and no heating penalty.
- **SSOP_80906** - Ex ante calculation used an assumed power factor, ex post calculations used the rated motor power factor. Ex ante calculations didn't use a VFD efficiency, ex post calculations assumed 98% VFD efficiency. These changes lowered the realization rate.

  Ex ante calculations used the maximum kW draw over the monitoring period to determine the peak demand reduction. The ex post calculations used the average kW draw for peak demand calculations, assuming that the demand is consistent throughout the day and doesn't fluctuate seasonally. This created a large jump in savings as compared to the ex ante resulting in a high realization rate for peak demand reduction.
- **SSOP_74252** - The baseline fan curve was slightly different in the ex-ante calculations. The ex-ante docs claimed inlet guide vane control was in use but didn't specify what type of blades the fan used. ADM graphed the ex-ante fan curve and compared it to UMP curves and found that there wasn't an exact match but the Inlet Guide Vane with BI and Airfoil fans was close (see M&V Methodology section). Since the ex-ante curve for the baseline system was slightly more efficient than the ex-post baseline curve, the ex-post savings were higher.

  In addition, the ex-ante used a power factor based on the (ex-ante) post-install site visit findings. ADMs site visit confirmed the VFD UMP curve is a representative model for boiler load and power consumption. Since the ex-ante assumed lower fan loads at the same steam demand levels, this discrepancy lowers the realization rate.

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.

1.9.7.6 Verified Savings

The Site-Specific Program in total displays a realization rate of 104.3% with 6,393,005 kWh verified electric energy savings in the Washington service territory, as displayed in Table 5-32.

6. Appendix A: Billing Analysis Results

This appendix provides additional details on the billing analyses conducted for each program.

1.10Low-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, 2020 to June 30, 2021	37	4717
	Control Group Usage Outlier (>2X max treatment usage)	37	4665
	Incomplete Post-Period Bills (<4 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

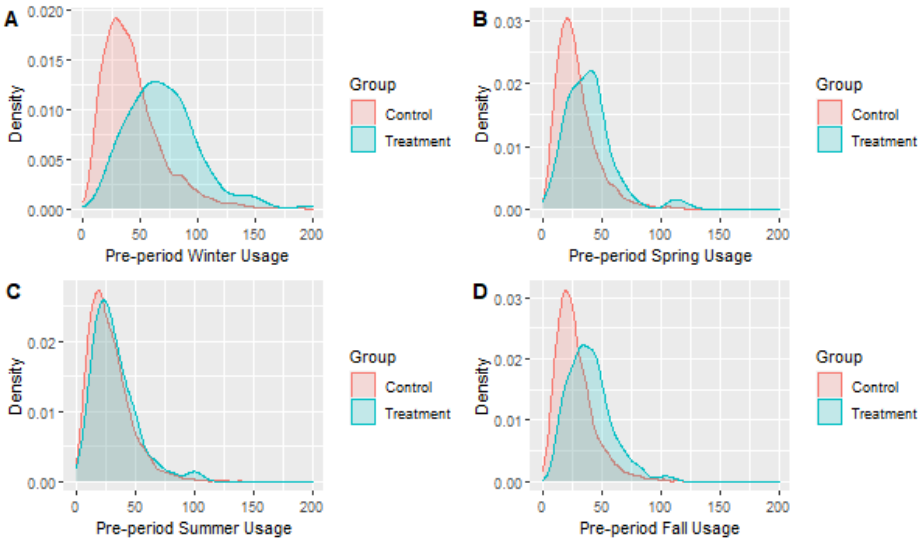
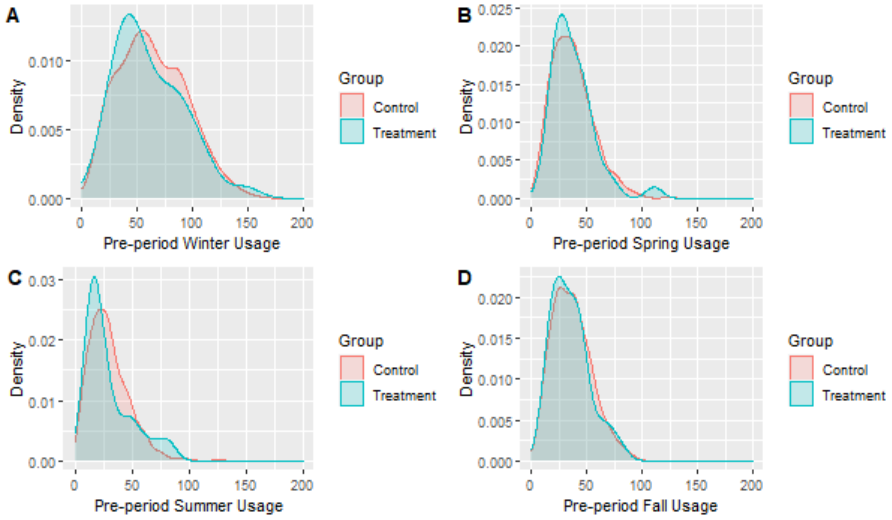


Figure 6-2: Covariate Balance After Matching, Low-Income Electric Measures



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	727827	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
	727855	17	727856	6052	437	5829	376
	727856	7	727857	6322	265	5829	376
	727857	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_78914

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:

- (8) 2L F96T12HO-Es were replaced by (5) 1L 105W LED high bay 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 based on verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-1: Savings Inputs

Space Type	HVAC Configuration	Annual Hours
Interior/Area Lighting	Gas Heat, No AC	2,204

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					
2L F96T12HO-E to 1L 105W LED High Bay	8	5	160	105	2,204	2,357	1,665	1,665	70.6%
Totals:						**2,357**	**1,665**	**1,665**	**70.6%**

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				
2L F96T12HO-E to 1L 105W LED High Bay	8	5	160	105	0.61	0.61	0.61	100.0%
Totals:					**0.61**	**0.61**	**0.61**	**100.0%**

Results

For project #78914 the kWh realization rate is 70.6% 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
2L F96T12HO-E to 1L 105W LED High Bay	1,665	0.61	70.6%	100.0%	-692	0.01	-32
Totals:	**1,665**	**0.61**	**70.6%**	**100.0%**	**-692**	**0.01**	**-32**

Ex ante calculations assumed 3,120 annual hours of lighting operation, however on site it was found that actual hours are 2,204 (8AM-4:30PM, weekdays). This was accounted for in calculations and savings was adjusted -692 kWh.

Project Number SSOP_80123

Project Background

The participant is automotive repair facility that received incentives from Avista for retrofitting high performance (better insulating) windows. The Evaluators verified the participant had installed:

- 109 Sq ft of new windows with a U value of .027

M&V Methodology

The Evaluators reviewed all project documentation including, plans, photos and invoices, as well as conducted on on-site visit to verify the installation of rebated equipment and total square footage installed. Expected savings calculations were examined and were found to be accurate with appropriate assumptions made. A regression analysis was conducted using metered billing data, however no statistically significant results could be obtained. The results that were obtained did corroborate claimed savings. The Evaluators compared claimed savings with a brief benchmark study of the same measure in similar buildings/climate zones, finding similar savings estimates.

Savings Calculations

Table 8-5: Window Retrofit kWh Savings Calculations

Measure	Total SqFt Replaced	Pre U-Value	Post U-Value	Pre SC	Post SC	Pre SHGC	Post SHGC	Expected kWh Savings	Verified kWh Savings	Realization Rate
High Efficiency Windows	109	1.00	0.27	0.87	0.35	0.87	0.30	4,329	4,329	100.0%

Results

For project # SSOP_80123, the kWh realization rate is 100.0%.

Table 8-6: Verified Gross Savings & Realization Rates

Measure	Expected kWh Savings	Verified kWh Savings	Realization Rate
High Efficiency Windows	4,329	4,329	100.0%

Project Number SSLP_80221

Project Background

The participant is a community college that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (30) 2L F32T8s were replaced by (60) 11.5W LED tubes

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.

Parameters used in calculating savings are presented in the table below.

Table 8-7: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Other	Gas Heat, Air Conditioned	8,760

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-8: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
2L F32T8 to 11.5W LED tubes	30	60	58	12	8,760	9,911	9,911	9,911	100.0%
Totals:						**9,911**	**9,911**	**9,911**	**100.0%**

Table 8-9: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
2L F32T8 to 11.5W LED tubes	30	60	58	12	0.91	1.13	1.13	124.2%
Totals:					**0.91**	**1.13**	**1.13**	**124.2%**

Results

For project # SSLP_80221 the kWh realization rate is 100.0% and the kW realization rate is 124.2%.

Table 8-10: 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 F32T8 to 11.5W LED tubes	9,911	1.13	100.0%	124.2%	0	0.22	-176
Totals:	**9,911**	**1.13**	**100.0%**	**124.2%**	**0**	**0.22**	**-176**

Ex ante calculations assumed an 80% chance that lighting would operate during times of peak demand. 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%, resulting in an increased 0.22 kW reduction.

Project Number SSLP_80228

Project Background

The participant is a hotel that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (52) 1L 80W incandescent lamps were replaced by (52) LED downlights

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 8-11: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Large Hotel	Gas Heat, Air Conditioned	4,132

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-12: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
1L 80W Inc to LED recessed can light	52	52	65	8	4,132	13,706	13,706	13,706	100.0%
Totals:						**13,706**	**13,706**	**13,706**	**100.0%**

Table 8-13: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
1L 80W Inc to LED recessed can light	52	52	65	8	2.65	2.65	2.65	100.0%
Totals:					**2.65**	**2.65**	**2.65**	**100.0%**

Results

For project #SSLP_80228 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-14: 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 80W Inc to LED recessed can light	13,706	2.65	100.0%	100.0%	0	0.00	-164
Totals:	**13,706**	**2.65**	**100.0%**	**100.0%**	**0**	**0.00**	**-164**

Project Number SSLP_81498

Project Background

The participant is an indoor agriculture facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (18) 1L HPS 1000s were replaced by (18) 680W agricultural 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 based upon verified actual hours of lighting operation.

The parameters used in calculating savings are presented in the table below.

Table 8-15: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Warehouse	No Heat, Air Conditioned	4,368

Savings Calculations

The Evaluators calculated lighting savings as follows:

Table 8-16: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
1L HPS 1000 to 680W LED Agricultural Fixture	18	18	1,080	675	4,368	31,957	31,957	31,957	100.0%
Totals:						**31,957**	**31,957**	**31,957**	**100.0%**

Table 8-17: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
1L HPS 1000 to 680W LED Agricultural Fixture	18	18	1,080	675	5.85	5.85	5.85	100.0%
Totals:					**5.85**	**5.85**	**5.85**	**100.0%**

Results

For project #SSLP_81498 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-18: 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 HPS 1000 to 680W LED Agricultural Fixture	31,957	5.85	100.0%	100.0%	0	0.00	0
Totals:	**31,957**	**5.85**	**100.0%**	**100.0%**	**0**	**0.00**	**0**

Project Number SSOP_81307

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:

- Steel Framed Wall Insulation: R19 batt and R10 continuous foam board
- (435) 2 ft x 2 ft LED Troffers
- (42) 1 ft x 4 ft LED Troffers
- (34) 2 ft x 4 ft LED Contemporary Architectural Troffers
- (11) LED Linear High Bay: 11.9”x45.5”
- (26) 4 ft LED Wrap

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment.

Insulation:

Savings for the insulation measure were also calculated using eQuest modeling software. The evaluator examined the eQuest input files and determined that most of the insulation measure looks accurate, however, the post-install R value looked understated for the mass walls.

There was an R value increase of 6 for the upper section of the building which aligns with the new insulation on the steel framed walls. For the mass walls, the R value increases by only 0.5 for the first-floor exterior walls. It was difficult to determine the exact scope of the insulation measure given the information that was available to the evaluator for this site. It is quite possible that this was modeled correctly and there were on-site restrictions to what insulation could be installed in the mass-walls. If there is any discrepancy in the model and what was installed, the model would be conservative.

Table 8-19: eQuest Model Outputs - Insulation

Measure	Baseline kBtu	Verified kBtu	kBtu Savings	Therms Savings	Baseline kWh	Post kWh	kWh Savings
Insulation	1,422,728	1,410,426	12,302	123	334,607	333,443	1,164

Lighting:

The portion of the project comprised of 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 values from the table above, the evaluators calculated savings as follows:

Table 8-20: kWh Savings Calculations

Measure	Baseline kW	Post kW	AOH	Baseline kWh	Post kWh	Expected kWh Savings	Verified kWh Savings	kWh Realization Rate
Insulation	N/A	N/A	N/A	334,607	333,443	1,164	1,164	100%

Table 8-21: kWh Savings Calculations

Measure	Location	Allowable LPD	Verified LPD	AOH	Expected kWh Savings	Verified kWh Savings	kWh Realization Rate
NC Lighting	Classroom	1	0.53	2,732	29,826	28,534	95.7%
	Gym	0.96	0.39	2,732	7,091	6,280	88.6%
	Kitchen	0.79	0.47	2,732	760	936	123.1%
	Library (Stacks)	1.37	0.78	2,732	2,113	2,008	95.0%
	Library (Reading Area)	0.74	-	2,732	1,055	1,055	100.0%
	Elec/Mech Lighting	0.76	0.39	2,732	1,546	1,685	109.0%
	Office	0.89	0.31	2,732	610	638	104.6%
	Office	0.89	0.70	2,732	197	169	85.7%
	Office	0.89	0.05	2,732	884	881	99.7%
	Office	0.89	1.53	2,732	(672)	(441)	65.6%
	Restroom	0.78	0.36	2,732	2,180	2,075	95.2%
	Staff Lounge	0.58	0.76	2,732	(193)	(224)	116.4%
	Storage	0.5	0.14	2,732	417	431	103.3%
	Storage	0.5	0.22	2,732	322	307	95.5%
	Storage	0.5	1.11	2,732	(703)	(895)	127.3%
	Storage	0.5	0.40	2,732	112	187	167.5%
Totals:					**45,732**	**43,627**	**95.4%**

Results

For project SSOP_81307 the kWh realization rate is 95.5% and the kW realization rate is 95.8%.

Table 8-22: 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
Insulation	1,164	0	100.0%	N/A	0	0	0
NC Lighting	43,627	15.97	95.4%	95.8%	-2,105	-0.70	-828
Totals:	**44,791**	**15.97**	**95.5%**	**95.8%**	**-21,250**	**0**	**-717.72**

Differences between ex ante savings and ex post savings are due to discrepancies in bulb wattages used in ex ante calculations and bulb wattages found using reported bulb model numbers and referencing spec sheets for the bulbs.

Project Number SSLP_73540

Project Background

The participant is a light manufacturing facility that received incentives from Avista for retrofitting energy efficient interior and exterior lighting. The Evaluators verified the participant had installed:

- (84) 4L F54T5HOs were replaced by (84) LED tubes
- (14) 4L F54T5HOs were replaced by (14) LED tubes

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 8-23: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Other	Gas Heat, No AC	3,479

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-24: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
4L F54T5HO to LED tubes	84	84	236	110	3,479	55,037	36,823	36,823	66.9%
4L F54T5HO to LED tubes	14	14	236	110	3,479	9,173	6,137	6,137	66.9%
Totals:						**64,210**	**42,960**	**42,960**	**66.9%**

Table 8-25: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
4L F54T5HO to LED tubes	84	84	236	110	8.46	8.46	8.46	100.0%
4L F54T5HO to LED tubes	14	14	236	110	1.41	1.41	1.41	100.0%
Totals:					**9.87**	**9.87**	**9.87**	**100.0%**

Results

For project #73540 the kWh realization rate is 66.9% and the kW realization rate is 100.0 %.

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
4L F54T5HO to LED tubes	36,823	8.46	66.9%	100.0%	-18,214	0.00	-615.19
4L F54T5HO to LED tubes	6,137	1.41	66.9%	100.0%	-3,036	0.00	-102.53
Totals:	**42,960**	**9.87**	**66.9%**	**100.0%**	**-21,250**	**0.00**	**-717.72**

Ex ante calculations assumed 5,200 annual lighting operating hours, however verified lighting hours of operating are 3,520 (4am-5:30pm, M-F, less three holidays). Claimed savings were adjusted using 3,520 hours, resulting in 20,749 less kWh.

Project Number SSLP_81110

Project Background

The participant is an indoor agriculture facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (40) 636W LED Agricultural Fixtures instead of (40) 1000W HPS 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 based upon verified actual hours of lighting operation.

The parameters used in calculating savings are presented in the table below.

Table 8-27: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Warehouse	Propane Heat, Not Air Conditioned	6,210

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		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
1L HPS 1000 to 636W LED Ag. Fixture	40	40	1,080	636	6,210	105,941	110,414	110,414	104.2%
Totals:						**105,941**	**110,414**	**110,414**	**104.2%**

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				
1L HPS 1000 to 636W LED Ag. Fixture	40	40	1,080	636	14.23	14.23	14.23	100.0%
Totals:					**14.23**	**14.23**	**14.23**	**100.0%**

Results

For project #SSLP_81110 the kWh realization rate is 104.2% 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
1L HPS 1000 to 636W LED Agricultural Fixtures	110,414	14.23	104.2%	100.0%	4,473	0.00	0
Totals:	**110,414**	**14.23**	**104.2%**	**100.0%**	**4,473**	**0.00**	**0**

Ex ante calculations were premised on electric heating and air conditioning. However, during the verification visit it was determined that the facility is heated by a propane heater and is not air conditioned. Ex post calculations did not include the interactive effects, resulting in slightly higher verified kWh savings and no heating penalty.

Project Number SSOP_80906

Project Background

The participant is a paper manufacturing facility that received incentives from Avista for retrofitting a pulp pump with a VFD. The Evaluators verified the participant had installed:

- (2) VFDs on (2) pulp pumps

M&V Methodology

The Evaluators reviewed all project documentation including, plans, photos and invoices, and performed a site visit to verify the installation of rebated equipment. Savings for the VFD measure were calculated using a custom 8760 analysis with trended pre and post motor data. Pre and post pump motor amperage data was provided in the ex ante analysis and used to estimate baseline and as-built pump energy. For each data point, the motor power was calculated using an estimated power factor. The production of the facility is consistent throughout the year so the average power from the baseline and post periods was assumed to be typical of the entire year.

The values used in calculating savings are presented in the table below.

Table 8-31: Custom Savings Parameters

Parameter	Baseline	As-Built	Savings
Uptime	94.6%	94.6%	0
Average kW	80.99	45.64	35.35
VFD EFF	n/a	98%	-2%

Savings Calculations

The evaluators calculated lighting savings as follows:

Table 8-32: VFD kWh Savings Calculations

Measure	Wattage		AOH	Uptime	Expected kWh Savings	Realized kWh Savings	Realization Rate
	Base	Post					
Pulp Pump VFD	80.99	45.64	8,286	94.6%	305,324	292,920	95.9%

Table 8-33: VFD kW Savings Calculations

Measure	Wattage		Expected kW Reduction	Realized kW Reduction	Realization Rate
	Base	Post			
HPS to LED wall packs	80.99	45.64	1.9	35.35	1860%

Results

For project SSOP_80906, the kWh realization rate is 95.6% and the kW realization rate is 1,860%.

Table 8-34: Verified Gross Savings & Realization Rates

Measure	Verified			
	kWh Savings	kW Savings	kWh Realization Rate	kW Realization Rate
Pump VFD	292,920	35.35	95.9%	1860%

Ex ante calculation used an assumed power factor, ex post calculations used the rated motor power factor. Ex ante calculations didn't use a VFD efficiency, ex post calculations assumed 98% VFD efficiency. These changes lowered the realization rate.

Ex ante calculations used the maximum kW draw over the monitoring period to determine the peak demand reduction. The ex post calculations used the average kW draw for peak demand calculations, assuming that the demand is consistent throughout the day and doesn't fluctuate seasonally. This created a large jump in savings as compared to the ex ante resulting in a high realization rate for peak demand reduction.

Table 8-35: Causes of Discrepancies

Issue	Ex Ante	Ex Post	Explanation
VFD Efficiency	100%	98%	Ex ante didn't include the VFD efficiency. Since the motor power data was gathered at the motor, a VFD efficiency of 98% was applied to the post-data. This lowered the energy savings by around 3%.
Motor Power Factor	.90	.89	The ex ante calculations assumed a power factor of 0.90 for the pump motor, however, the motor nameplate shows 0.89 as the rated power factor. This reduced the realization rate by around 1%.
Peak Demand	Max kW over monitoring period	Average kW over monitoring period	The ex ante calculated the peak demand reduction by finding the difference between baseline and post maximum kW demand. This isn't representative of the typical demand reduction so the ex post analysis uses the average kW over the monitoring periods instead. The kW is assumed to be consistent throughout the year and not dependent on weather or time of day.

Project Number SSLP_78403

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:

- (366) 4L F54T5HOs were replaced by (366) adjustable 112.6W LED fixtures
- (70) 4L F54T5HOs were replaced by (70) adjustable 106.9W LED fixtures
- (183) 4L F54T5HOs were replaced by (366) adjustable 112.6W LED fixtures
- (35) 4L F54T5HOs were replaced by (70) adjustable 106.9W 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 and peak coincidence factors are based verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-36: Savings Inputs

Space Type	HVAC Configuration	Annual Hours
Stand Alone Retail	Gas Heat, Air Conditioned	5,668
Stand Alone Retail	Gas Heat, Air Conditioned	3,068

During normal business hours (5,668) the newly installed lighting is set to 92% max illumination, and during stocking/overnight hours (3,068) the fixtures are lowered to 35% illumination. This is calculated as separate line items below, with wattages adjusted to reflect verified operating parameters.

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-37: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
4L F54T5HO to 112.6W LED fixture (set to 92% of max illumination)	366	366	219	96	5,668	286,878	286,878	286,878	100.0%
4L F54T5HO to 106.9W LED fixture (set to 92% of max illumination)	70	70	214	91	5,668	54,778	54,778	54,778	100.0%
4L F54T5HO to 112.6W LED fixture (set to 35% of max illumination)	183	366	219	68	3,068	52,768	52,768	52,768	100.0%

4L F54T5HO to 106.9W LED fixture (set to 35% of max illumination)	35	70	214	64	3,068	10,333	10,333	10,333	100.0%
Totals:						**404,758**	**404,758**	**404,758**	**100.0%**

Table 8-38: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
4L F54T5HO to 112.6W LED fixture (set to 92% of max illumination)	366	366	219	96	40.49	40.49	40.49	100.0%
4L F54T5HO to 106.9W LED fixture (set to 92% of max illumination)	70	70	214	91	7.73	7.73	7.73	100.0%
4L F54T5HO to 112.6W LED fixture (set to 35% of max illumination)	183	366	219	68	13.76	13.76	13.76	100.0%
4L F54T5HO to 106.9W LED fixture (set to 35% of max illumination)	35	70	214	64	2.69	2.69	2.69	100.0%
Totals:					**64.68**	**64.67**	**64.67**	**100.0%**

Results

For project #SSLP_78403 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-39: 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 F54T5HO to 112.6W LED fixture	286,878	40.49	100.0%	100.0%	0	0.00	-5,278
4L F54T5HO to 106.9W LED fixture	54,778	7.73	100.0%	100.0%	0	0.00	-1,008
4L F54T5HO to 112.6W LED fixture	52,768	13.76	100.0%	100.0%	0	0.00	-971
4L F54T5HO to 106.9W LED fixture	10,333	2.69	100.0%	100.0%	0	0.00	-190
Totals:	**404,758**	**64.67**	**100.0%**	**100.0%**	**0**	**0.00**	**-7,446**

Project Number SSLP_79400

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:

- (442) 4L F54T5HOs were replaced by (442) adjustable 106.9W 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 based on verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-40: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Stand Alone Retail	Gas Heat, Air Conditioner	5,668
Stand Alone Retail	Gas Heat, Air Conditioner	3,068

During normal business hours (5,668) the newly installed lighting is set to 92% max illumination, and during stocking/overnight hours (3,068) the fixtures are lowered to 35% illumination. This is calculated as two separate line items below, with wattages adjusted to reflect verified operating parameters.

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-41: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Pre AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
4L F54T5HO to 106.9W LED fixture (set to 92% of max illumination)	442	442	214	91	5,668	345,886	345,886	345,886	100.0%
4L F54T5HO to 106.9W LED fixture (set to 35% of max illumination)	221	442	214	64	3,068	65,247	65,247	65,247	100.0%
Totals:						**411,133**	**411,133**	**411,133**	**100.0%**

Table 8-42: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
4L F54T5HO to 106.9W LED fixture (set to 92% of max illumination)	442	442	214	91	48.82	48.82	48.82	100.0%
4L F54T5HO to 106.9W LED fixture (set to 35% of max illumination)	221	442	214	64	17.01	17.01	17.01	100.0%
Totals:					**65.83**	**65.83**	**65.83**	**100.0%**

Results

For project #SSLP_79400 the kWh realization rate is 100.0% and the kW realization rate is 100.0%.

Table 8-43: 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 F54T5HO to 106.9W LED fixture	345,886	48.82	100.0%	100.0%	0	0.00	-6,363
4L F54T5HO to 106.9W LED fixture	65,247	17.01	100.0%	100.0%	0	0.00	-1,200
Totals:	**411,133**	**65.83**	**100.0%**	**100.0%**	**0**	**0.00**	**-7,563**

Project Number SSOP_74252

Project Background

The participant is a university campus that received incentives from Avista for installing VFDs on the existing boiler intake fans. The Evaluators verified the participant had installed VFD controls on the intake fans for Boiler 3, Boiler 4, and Boiler 5.

M&V Methodology

The Evaluators reviewed all project documentation including plans, reports, 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 VFD measures were calculated using custom savings methods. Ex ante documents provided logged steam production data, boiler specs, and boiler fan specs. Steam production data was provided as a temperature bin table with annual summed hours and steam production rate for each temperature bin. A site visit documented the relationship between % fan speed and amperage. Performance curves for the baseline and as-built fan controls were selected from the UMP curves for fan control methods. These fan curves were applied to the logged steam production data to estimate the fan energy before and after the VFD upgrade (for each temperature bin). The total savings is the difference between the summed baseline energy and the summed post-install energy.

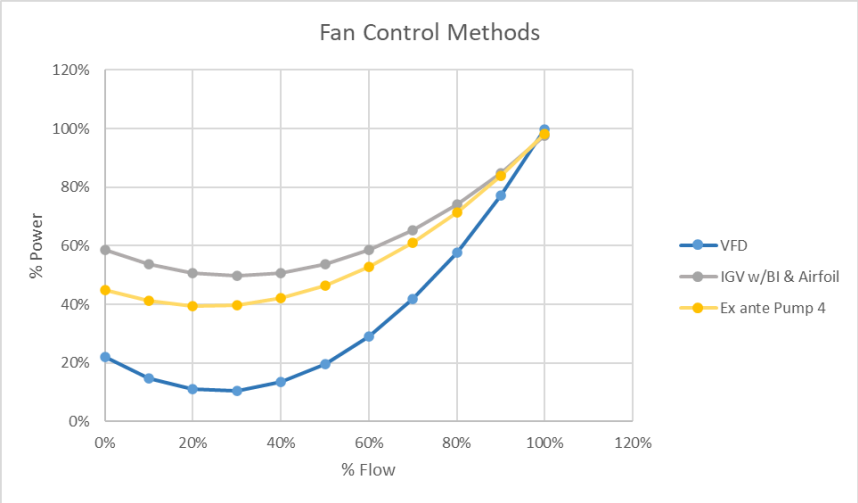
The values used in calculating savings are presented in the table below.

Table 8-44: Savings Inputs

Equipment	Pre Fan Control	Post Fan Control	Annual Hours
Boiler Fan #3	Inlet Guide Vane	VFD	3,785
Boiler Fan #4	Inlet Guide Vane	VFD	5,858
Boiler Fan #5	Inlet Guide Vane	VFD	5,418

The baseline fan performance was modeled slightly differently in the ex-ante analysis. The ex-ante report confirmed that Inlet Guide Vane controls were assumed in the baseline case, however, the performance curve used didn't quite match any UMP performance curves. The closest match among the UMP control types was Inlet Guide Vane Control using Backward Inclined & Airfoil fans (see graph below).

Figure 8-1: UMP and Ex-Ante Performance Curves



Savings Calculations

Using deemed values from the table above, the evaluators calculated lighting savings as follows:

Table 8-45: Boilers 3-5 Logged Data

Temp Bin (F)		Boiler 3		Boiler 4		Boiler 5	
Lower	Upper	Hrs at bin	Production (baesline) lbs/hr	Hrs at bin	Production (baesline) lbs/hr	Hrs at bin	Production (baesline) lbs/hr
97	104	0	0	17	41607	0	0
92	96	0	0	25	42007	6	44119
87	91	0	0	79	40338	40	45054
82	86	9	24598	110	41342	90	38781
77	81	21	23843	142	40237	135	36660
72	76	42	26368	217	36462	214	32993
67	71	61	27498	315	36828	309	33185
62	66	74	30231	394	37965	393	35155
57	61	99	34806	471	40674	523	38672
52	56	150	39829	534	43187	618	42942
47	51	227	41365	584	43940	608	44831
42	46	427	40685	721	45062	672	46803
37	41	668	38275	725	40803	470	43558
32	36	902	40917	786	41568	529	44190
27	31	506	45255	391	44330	308	47572
22	26	301	49398	186	48402	234	50624
17	21	205	52287	126	50203	176	52316
12	16	65	58546	29	58020	64	57968
7	11	22	62689	6	57832	23	61249
4	6	6	64356	0	0	6	63282

Table 8-46: Boiler 3-5 kWh Savings Calculations

Temp Bin		Boiler 3			Boiler 4			Boiler 5			Savings Calcs		kWh Savings
Lower	Upper	Hrs	Pre kW	Post kW	Hrs	Pre kW	Post kW	Hrs	Pre kW	Post kW	Pre kWh	Post kWh	
97	104	0	90.63	34.08	17	83.4	30.48	0	90.63	34.08	1418	518	900
92	96	0	90.63	34.08	25	83.7	31.07	6	85.40	34.39	2605	983	1622
87	91	0	90.63	34.08	79	82.5	28.69	40	86.21	35.96	9967	3704	6263
82	86	9	77.22	16.39	110	83.2	30.10	90	81.51	26.65	17185	5856	11329
77	81	21	77.24	16.26	142	82.4	28.55	135	80.31	24.16	24171	7657	16514
72	76	42	77.28	16.85	217	80.2	23.95	214	78.70	20.65	37492	10323	27169
67	71	61	77.39	17.27	315	80.4	24.35	309	78.77	20.81	54385	15153	39233
62	66	74	77.87	18.67	394	81.0	25.65	393	79.58	22.60	68961	20370	48591
57	61	99	79.42	22.26	471	82.7	29.15	523	81.44	26.51	89431	29798	59633
52	56	150	82.17	28.00	534	84.6	32.88	618	84.43	32.50	109699	41842	67857
47	51	227	83.24	30.13	584	85.2	34.09	608	86.01	35.58	120975	48380	72595
42	46	427	82.75	29.16	721	86.2	35.97	672	87.82	39.08	156515	64650	91866
37	41	668	81.21	26.02	725	82.8	29.33	470	84.93	33.47	154219	54379	99840
32	36	902	82.92	29.49	786	83.4	30.42	529	85.46	34.50	185539	68763	116775
27	31	506	86.39	36.31	391	85.6	34.73	308	88.58	40.52	104455	44433	60022
22	26	301	90.47	44.12	186	89.4	42.13	234	91.82	46.68	65349	32041	33309
17	21	205	93.76	50.33	126	91.3	45.79	176	93.79	50.40	47238	24957	22281
12	16	65	102.14	65.91	29	101.4	64.49	64	101.29	64.35	16061	10273	5789
7	11	22	108.63	77.82	6	101.1	63.98	23	106.29	73.54	5441	3787	1653
4	6	6	111.45	82.98	0	90.6	34.08	6	109.62	79.63	1326	976	351

Results

For project SSOP_74252 the kWh realization rate is 135% and there were no kW savings.

Table 8-47: Verified Gross Savings, Realization Rates & Adjustments

Measure	Expected kWh Savings	Expected kW Reduction	Verified kWh Savings	Verified kW Reduction	kWh RR	kW RR	Therm Penalty
Boiler Fan VFDs	579,656	0	783,591	n/a	135%	n/a	n/a

The realization rate is due to a couple of differences in calculation assumptions.

The baseline fan curve was slightly different in the ex-ante calculations. The ex-ante docs claimed inlet guide vane control was in use but didn't specify what type of blades the fan used. ADM graphed the ex-ante fan curve and compared it to UMP curves and found that there wasn't an exact match but the Inlet Guide Vane with BI and Airfoil fans was close (see M&V Methodology section). Since the ex-ante curve for the baseline system was slightly more efficient than the ex-post baseline curve, the ex-post savings were higher.

In addition, the ex-ante used a power factor based on the (ex-ante) post-install site visit findings. ADMs site visit confirmed the VFD UMP curve is a representative model for boiler load and power consumption. Since the ex-ante assumed lower fan loads at the same steam demand levels, this discrepancy lowers the realization rate.

Project Number SSLP_79505

Project Background

The participant is an indoor agriculture facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (107) 1L HPS 1000s were replaced by (107) 680W Agricultural LED fixtures
- (155) 1L MH 1000s were replaced by (155) 520W Agricultural 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 based upon verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-48: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Warehouse	Gas Heat, Air Conditioned	4,368
Warehouse	Gas Heat, Air Conditioned	8,760

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-49: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
1L HPS 1000 to 680W Agricultural LED fixtures	107	107	1,080	709	4,368	173,978	173,978	173,978	100.0%
1L MH 1000 to 520W Agricultural LED fixtures	155	155	1,070	523	8,760	745,551	745,551	745,551	100.0%
Totals:						**919,529**	**919,529**	**919,529**	**100.0%**

Table 8-50: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
1L HPS 1000 to 680W Agricultural LED fixtures	107	107	1,080	709	31.86	31.86	31.86	100.0%
1L MH 1000 to 520W Agricultural LED fixtures	155	155	1,070	523	68.09	85.11	85.11	125.0%
Totals:					**99.95**	**116.97**	**116.97**	**117.0%**

Results

For project #SSLP_79505 the kWh realization rate is 100.0% and the kW realization rate is 117.0%.

Table 8-51: 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 HPS 1000 to 680W Agricultural LED fixtures	173,978	31.86	100.0%	100.0%	0	0.00	-3,955
1L MH 1000 to 520W Agricultural LED fixtures	745,551	85.11	100.0%	125.0%	0	17.02	-16,947
Totals:	**919,529**	**116.97**	**100.0%**	**117.0%**	0	**17.02**	**-20,902**

Ex ante calculations assumed an 80% chance that lighting would operate during times of peak demand. The second set of 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%, resulting in an increased kW reduction by 17.02 kW.

Project Number SSLP_79504

Project Background

The participant is an indoor agriculture facility that received incentives from Avista for retrofitting energy efficient interior lighting. The Evaluators verified the participant had installed:

- (426) 1L HPS 1000s were replaced by (426) 680W Agricultural LED fixtures
- (98) 1L MH 1000s were replaced by (98) 520W Agricultural 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 based upon verified actual hours of lighting operation.

The values used in calculating savings are presented in the table below.

Table 8-52: Savings Inputs

Facility or Space Type	HVAC Configuration	Annual Hours
Indoor Agriculture	Gas Heat/Air Conditioned	4,368
Indoor Agriculture	Gas Heat/Air Conditioned	8,760

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-53: Lighting Retrofit kWh Savings Calculations

Measure	Quantity (Fixtures)		Wattage		AOH	Expected kWh	Adjusted kWh	Verified kWh	kWh Realization Rate
	Base	Post	Base	Post					
1L HPS 1000 to 680W Agricultural LED fixtures	426	426	1,080	709	4,368	692,660	692,660	692,660	100.0%
1L MH 1000 to 520W Agricultural LED fixtures	98	98	1,070	523	8,760	471,381	471,381	471,381	100.0%
Totals:						**1,164,041**	**1,164,041**	**1,164,041**	**100.0%**

Table 8-54: Lighting Retrofit kW Savings Calculations

Measure	Quantity (Fixtures)		Wattage		Expected kW	Adjusted kW	Verified kW	kW Realization Rate
	Base	Post	Base	Post				
1L HPS 1000 to 680W Agricultural LED fixtures	426	426	1,080	709	126.86	126.86	126.86	100.0%
1L MH 1000 to 520W Agricultural LED fixtures	98	98	1,070	523	43.05	53.81	53.81	125.0%
Totals:					**169.91**	**180.67**	**180.67**	**106.3%**

Results

For project #SSLP_79504 the kWh realization rate is 100.0% and the kW realization rate is 106.3%.

Table 8-55: 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 HPS 1000 to 680W Agricultural LED fixtures	692,660	126.86	100.0%	100.0%	0	0.00	-15,745
1L MH 1000 to 520W Agricultural LED fixtures	471,381	53.81	100.0%	125.0%	0	10.76	-10,715
Totals:	**1,164,041**	**180.67**	**100.0%**	**106.3%**	0	**10.76**	**-26,460**

Ex ante calculations assumed an 80% chance that lighting would operate during times of peak demand. The second set of 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%, resulting in an increased 10.76 kW reduction.

9. Appendix D: Cost Benefit Analysis Results

The Evaluators estimated the cost-effectiveness for the Avista Residential and Low-Income Programs using evaluated savings results, economic inputs provided by Avista, and incremental costs and non-energy impacts from the RTF. The table below presents the cost-effectiveness results for the PY2022 portfolio.

Table 9-1: Cost-effectiveness Results

Program	TRC	UCT	RIM	PCT	TRC Net Benefits
Residential	1.51	1.75	0.68	2.06	$1,248,152
Residential Low Income	1.17	0.41	0.30	N/A*	$271,809
Nonresidential	1.64	3.71	0.78	1.73	$11,317,696
Total	**1.59**	**2.79**	**0.74**	**N/A***	**$12,837,657**
***Low Income is offered at no cost to participants; PCT is not calculable.**					

1.11 Approach

The California Standard Practice Model was used as a guideline for the calculations. The cost-effectiveness analysis methods that were used in this analysis are among the set of standard methods used in this industry and include the Utility Cost Test (UCT)[10], Total Resource Cost Test (TRC), Ratepayer Impact Measure Test (RIM), and Participant Cost Test (PCT). All tests weigh monetized benefits against costs. These monetized amounts are presented as NPV evaluated over the lifespan of the measure. The benefits and costs differ for each test based on the perspective of the test. The definitions below are taken from the California Standard Practice Manual.

- The TRC measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs.
- The UCT measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. Costs are defined more narrowly.
- The PCT is the measure of the quantifiable benefits and costs to the customer due to participation in a program. 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.
- The RIM test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills will go up if revenues collected after program implementation is less than the total costs

[10] The UCT is also referred to as the Program Administrator Cost Test (PACT).

incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.

A common misperception is that there is a single best perspective for evaluation of cost-effectiveness. Each test is useful and accurate, but the results of each test are intended to answer a different set of questions. The questions to be addressed by each cost test are shown in the table below.[11]

Table 9-2: Questions Addressed by the Various Cost Tests

Cost Test	Questions Addressed
Participant Cost Test (PCT)	▪ Is it worth it to the customer to install energy efficiency?
	▪ Is it likely that the customer wants to participate in a utility program that promotes energy efficiency?
Ratepayer Impact Measure (RIM)	▪ What is the impact of the energy efficiency project on the utility's operating margin?
	▪ Would the project require an increase in rates to reach the same operating margin?
Utility Cost Test (UCT)	▪ Do total utility costs increase or decrease?
	▪ What is the change in total customer bills required to keep the utility whole?
Total Resource Cost Test (TRC)	▪ What is the regional benefit of the energy efficiency project (including the net costs and benefits to the utility and its customers)?
	▪ Are all of the benefits greater than all of the costs (regardless of who pays the costs and who receives the benefits)?
	▪ Is more or less money required by the region to pay for energy needs?

Overall, the results of all four cost-effectiveness tests provide a more comprehensive picture than the use of any one test alone. The TRC cost test addresses whether energy efficiency is cost-effective overall. The PCT, UCT, and RIM address whether the selection of measures and design of the program are balanced from the perspective of the participants, utilities, and non-participants. The scope of the benefit and cost components included in each test are summarized in the table below.[12]

[11] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf
[12] Ibid.

Table 9-3: Benefits and Costs Included in Each Cost-Effectiveness Test

Test	Benefits	Costs
PCT (Benefits and costs from the perspective of the customer installing the measure)	▪ Incentive payments ▪ Bill Savings ▪ Applicable tax credits or incentives	▪ Incremental equipment costs ▪ Incremental installation costs
UCT (Perspective of utility, government agency, or third party implementing the program	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Program overhead costs ▪ Utility/program administrator incentive costs
TRC (Benefits and costs from the perspective of all utility customers in the utility service territory)	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution ▪ Additional resource savings ▪ Monetized non-energy benefits	▪ Program overhead costs ▪ Program installation costs ▪ Incremental measure costs
RIM (Impact of efficiency measure on non-participating ratepayers overall)	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Program overhead costs ▪ Lost revenue due to reduced energy bills ▪ Utility/program administrator installation costs

1.12 Non-Energy Benefits

Non-energy Benefits (NEBs) were sourced from the 2022 Annual Conservation Plan developed by Avista. NEBs included avoided illness from air pollution, avoided calls to the utility, avoided fires/insurance damage, and other impacts relative to energy efficiency upgrades offered to customers in each of Avista's programs.

- Residential measures with NEBs included air source heat pumps, ductless heat pumps, windows, and insulation measures.
- Low Income NEBs included the NEBs described for Residential as well as a dollar-for-dollar benefit adder for health and safety spending.

1.13 Economic Inputs for Cost Effectiveness Analysis

The Evaluators used the economic inputs provided by Avista for the cost benefit analysis. Avista provided the Evaluators with avoided costs on the following basis:

- Hourly avoided commodity costs
- Modifications for the Clean Premium
- Avoided capacity costs
- Avoided transmission
- 10% Conservation Adder
- Line losses
- Discount rate (after tax Weighted Average Cost of Capital)

The values were aggregated to provide a single benefit multiplier on a kWh basis for every hour of the year (8,760). Savings by measure were then parsed out to the following load shapes provided by Avista:

- Residential Space Heating
- Residential Air Conditioning
- Residential Lighting
- Residential Refrigeration
- Residential Water Heating
- Residential Dishwasher
- Residential Washer/Dryer
- Residential Furnace Fan
- Residential Miscellaneous

The Evaluators in addition created a Residential Heat Pump load shape by weighting the relative magnitude of cooling versus heating savings from a heat pump and assigning these to weight the Residential Space Heating and Residential Air Conditioning load shapes.

1.14 Results

The tables below outline the results for each test, for both the programs and the portfolio as a whole. Summations may differ by $1 due to rounding.

Table 9-4: Cost-Effectiveness Results by Sector

Sector	TRC	UCT	RIM	PCT
Residential	1.51	1.75	0.68	2.06
Residential Low Income	1.17	0.41	0.30	N/A*
Nonresidential	1.64	3.71	0.78	1.73
Total	**1.59**	**2.79**	**0.74**	**N/A***
*Low Income is offered at no cost to participants; PCT is not calculable.				

Table 9-5: Cost-Effectiveness Benefits by Sector

Program	TRC Benefits	UCT Benefits	RIM Benefits	PCT Benefits
Residential	$3,690,105	$3,053,570	$3,053,570	$3,141,824
Residential Low Income	$1,855,528	$654,095	$654,095	$1,628,514
Nonresidential	$29,084,234	$22,477,985	$22,477,985	$28,003,984
Total	**$34,629,867**	**$26,185,650**	**$26,185,650**	**$32,774,321**

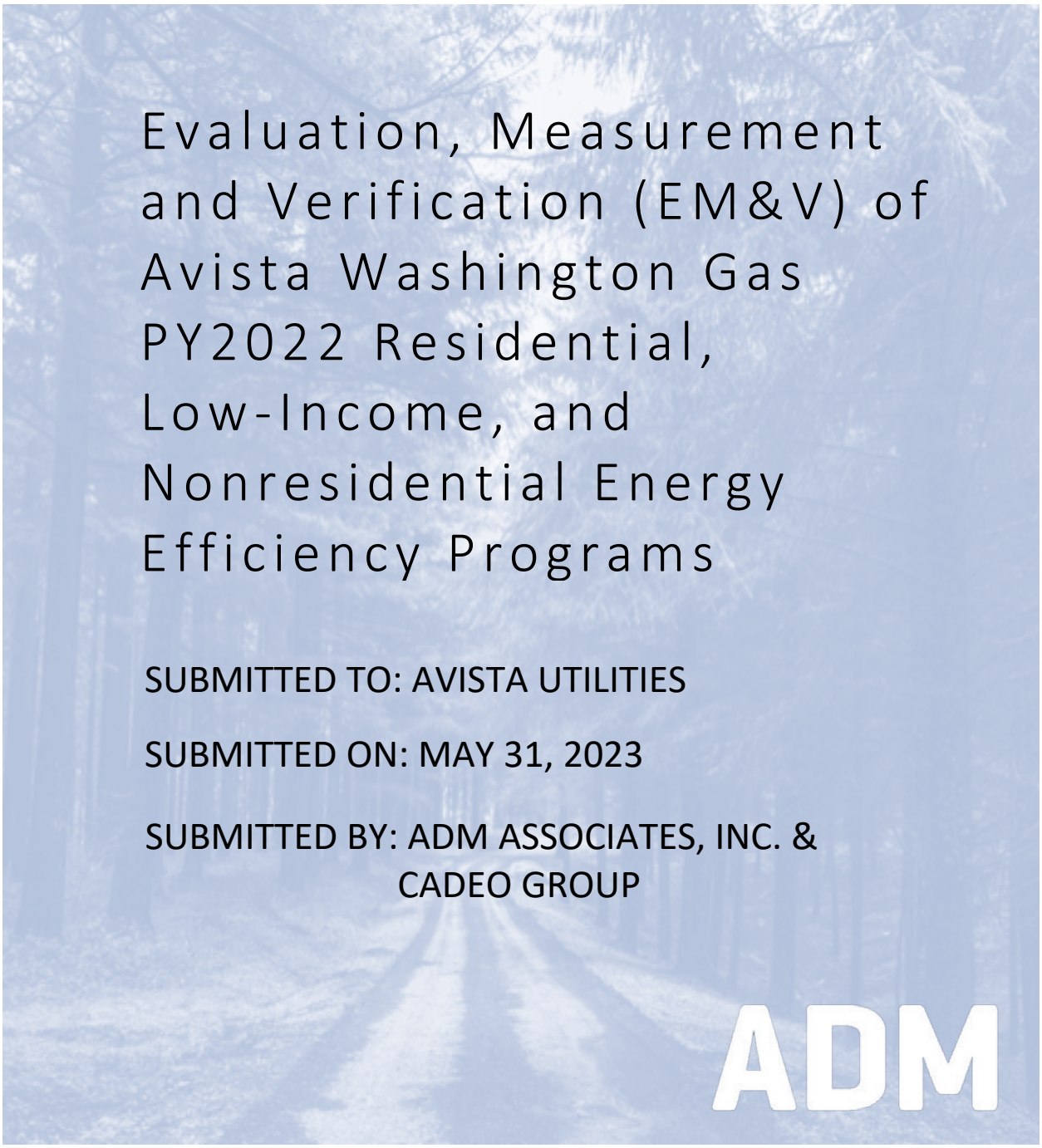
Table 9-6: Cost-Effectiveness Costs by Sector

Program	TRC Costs	UCT Costs	RIM Costs	PCT Costs
Residential	$2,441,953	$1,746,895	$4,467,453	$1,526,387
Residential Low Income	$1,583,719	$1,583,719	$2,149,701	$1,147,284
Nonresidential	$17,766,539	$6,056,699	$28,891,231	$16,178,532
Total	**$21,792,211**	**$9,387,313**	**$35,508,385**	**$18,852,204**

Table 9-7: Cost-Effectiveness Net Benefits by Sector

Program	TRC Net Benefits	UCT Net Benefits	RIM Net Benefits	PCT Net Benefits
Residential	$1,248,152	$1,306,675	($1,413,883)	$1,615,437
Residential Low Income	$271,809	($929,624)	($1,495,606)	$481,230
Nonresidential	$11,317,696	$16,421,286	($6,413,246)	$11,825,452
Total	**$12,837,657**	**$16,798,337**	**($9,322,735)**	**$13,922,118**

APPENDIX B – WASHINGTON 2022 NATURAL GAS IMPACT EVALUATION REPORT



ADM Associates, Inc
3239 Ramos Circle
Sacramento, CA 95827

Avista Utilities
1411 E. Mission Ave.
Spokane, WA 99252

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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 Washington service territory. The evaluation was administered by ADM Associates, Inc. and Cadeo Group, LLC (herein referred to as the "Evaluators").

1.1 Savings & Cost-Effectiveness Results

The Evaluators conducted an impact evaluation for Avista's Residential, Low-Income, and Nonresidential programs for PY2022. The Residential portfolio savings amounted to 475,244.75 Therms with a 104.19% realization rate. The Low-Income portfolio savings amounted to 11,705.26 Therms with a 100.43% realization rate. The Nonresidential portfolio savings amounted to 52,761.26 Therms with a 104.93% realization rate. The Evaluators summarize the Residential, Low-Income, and Nonresidential portfolio verified savings in Table 1-1 through Table 1-3, respectively.

The Residential portfolio reflects a TRC value of 1.22 and a UCT value of 2.57. The Low-Income portfolio reflects a TRC value of 0.66 and a UCT value of 0.16. The Nonresidential portfolio reflects a TRC value of 2.88 and a UCT value of 1.90. This led to a total Portfolio TRC of 1.21 and a UCT of 1.79. Table 1-4 summarizes the evaluated TRC and UCT values with each the Residential, Low-Income, and Nonresidential portfolios.

Table 1-1: Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate	Total Costs
Water Heat	34,547.60	33,695.56	97.53%	$172,095.87
HVAC	335,569.08	370,727.58	110.48%	$2,646,039.17
Shell	75,768.21	62,356.17	82.30%	$624,563.43
ENERGY STAR Homes	669.90	535.92	80.00%	$3,141.73
Small Home & MF Weatherization	4,841.70	4,755.56	98.22%	$36,442.58
Appliances	974.17	972.28	99.81%	$9,567.63
AeroBarrier	1,867.17	322.17	17.25%	$17,961.31
Multifamily Direct Install	1,879.50	1,879.50	100.00%	$7,657.88
Total Res	**456,117.33**	**475,244.75**	**104.19%**	**$3,517,469.59**

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

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate	Total Costs
Low-Income	11,654.58	11,705.26	100.43%	$1,292,900.15
CEEP	N/A	N/A	N/A	$0.00
Total Low-Income	**11,654.58**	**11,705.26**	**100.43%**	**$1,292,900.15**

Table 1-3: Nonresidential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate	Total Costs
HVAC	13,862.53	13,862.53	100.00%	$112,826.28
Food Service Equipment	13,613.00	13,613.00	100.00%	$86,427.77
Shell	8,971.45	8,971.45	100.00%	$161,079.34
Site-Specific	19,610.45	22,372.00	114.08%	$94,576.99
Total Nonresidential	**56,057.43**	**58,818.98**	**104.93%**	**$454,910.38**

Table 1-4: Cost-Effectiveness Summary

Sector	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Residential	$11,945,017	$9,807,343	1.22	$9,022,383	$3,517,470	2.57
Low-Income	$1,128,387	$1,717,014	0.66	$273,404	$1,717,014	0.16
Nonresidential	$1,401,496	$487,108	2.88	$814,494	$428,260	1.90
Total	**$14,474,899**	**$12,011,465**	**1.21**	**$10,110,282**	**$5,662,744**	**1.79**

Table 1-5 summarizes the gas programs offered to residential and low-income customers in the Washington Avista service territory in PY2022 as well as the Evaluators' evaluation tasks and impact methodology for each program.

Table 1-5: 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	AeroBarrier	✓		RTF with adjustments
Residential	Multifamily Direct Install	✓		SBW TRM
Low-Income	Low-Income	✓		Avista TRM
Low-Income	Community Energy Efficiency Program (CEEP)	✓		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 475,244.75 Therms with a realization rate of 104.19%. The Evaluators also conducted a cost-benefit analysis in order to estimate the Residential portfolio's cost-effectiveness. The resulting TRC value for this sector is 1.22 while the UCT value is 2.57. Further details on cost-effectiveness methodology can be found in Appendix C.
- The Residential Portfolio impact evaluation resulted in a realization rate of 104.19% due to slight differences between the applied Avista TRM values and the active Avista TRM value 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, and Appliance Programs. A total of 755 unique customers were surveyed between October 2022 and March 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%. The Evaluators found two instances in which a project savings deviated from the expected savings. The Evaluators found two rebates to incentivize installation of water heaters that did not meet minimum program requirements. This discrepancy alone led to less than 100% realization for the program.
- 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 110% with 370,728 Therms verified natural gas savings in the Washington 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. 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 Evaluators will explore additional billing analyses for these measures during program year 2022.
- The Shell Program displayed verified savings of 62,356 Therms with a realization rate of 82.30% 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 in quantities 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.
- The ENERGY STAR Homes Program displayed a realization rate of 80% at 536 Therms saved in PY2022. The Evaluators found expected savings to differ for one G ENERGY STAR Home – Manufactured, Gas rebate, as the Evaluators determined this home was not a new construction manufactured home. Therefore, savings for this rebate was removed. All other rebates in this program were determined to have 100% realization. The Evaluators believe this rebate was erroneously categorized as ENERGY STAR Homes rather than appliances.
- The Small Home & MF Weatherization Program in total displays a realization rate of 98% with 4,756 Therms verified natural gas energy savings in the Washington service territory. The realization rate for the program deviates from 100% due to differences between the attic insulation savings values assigned to the project quantities and the verified Avista TRM prescriptive savings value. The Evaluators found expected savings to differ significantly for the attic insulation measure. Avista used single family residential attic insulation – Avista TRM value (0.15 Therms/SQFT) instead of multifamily attic Avista TRM value (0.036 Therms/SQFT) for almost all projects. However, the Evaluators verified home type and determined that the majority of the attic insulation homes were multifamily. Therefore, the realization rate for this measure is low. The Evaluators recommend updating the Avista TRM to correct for this attic insulation measure savings value discrepancy.
- 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 Multifamily Direct Install Program displayed a realization rate of 100% at 1,880 Therms saved in PY2022. The Evaluators found no discrepancy between the savings values in the tracking database and the RTF UES values leading to a realization rate of 100% for these measures.
- The Appliance Program displayed a realization rate of 99.81% at 972 Therms saved in PY2022. The realization rate for the natural gas savings in the Appliance Program deviate from 100% due to errors in converting kWh to Therms savings for the clothes washers and erroneously applying Avista TRM values to the measure. The Evaluators estimated gas savings for these measures by converting measure RTF electric savings into Therms savings. 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 removed savings applied to the top load washer, as 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. The Avista TRM erroneously converted the electric savings for the front load clothes washer to 6 Therms/unit. The correct conversion leads to 4 Therms/unit.
- The Evaluators completed an AeroBarrier Pilot impact evaluation in PY2022. The Evaluators did not complete an impact analysis for the AeroBarrier Program. The projects documented air changes per hour (ACH) pre, post, and home square footage. The Evaluators reviewed the expected savings calculation workbooks for each project. The expected savings were calculated by Avista had used the sensible heat loss equation. The Evaluators, however, estimated verified savings using RTF SEEM models utilized in the RTF's residential weatherization workbook. The SEEM models used to estimate air infiltration reduction was used to estimate the average Therms reductions per square foot, per ACH(50) reduction for each primary heating equipment type and heating zone. The Evaluators deem this methodology to be more appropriate, as it displays the modeled interactive effects of homes in this region, rather than theoretical values based on the laws of heat transfer alone. This led to nearly 20% realization rate across the program.

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 11,705.26 Therms with a realization rate of 100.43%. The Low-Income Portfolio impact evaluation resulted verified savings that exceeded expected savings.
- The Evaluators conducted a cost-benefit analysis in order to estimate the Low-Income portfolio's cost-effectiveness. The resulting TRC value for this sector is 0.66 while the UCT value is 0.16. These values are expected, as the Low-Income portfolio is not expected to meet cost-effectiveness but are implemented in order to provide energy efficiency benefits to low-income customers. Further details on cost-effectiveness methodology can be found in Appendix C.

- 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 in order 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 100.43% from the desk review with Avista TRM values.
- The Evaluators note that the majority of deviations from 100% realization rate in the Low-Income were due to small differences in the reported savings and Avista TRM documentation 20% annual household energy caps not properly applied in a few instances.
- There were no Therms savings associated with any of the CEEP measures. Therefore, the Evaluators assigned electric savings to the project rather than gas savings, leading to 0 Therms savings claimed through the program.
- There were no natural gas saving measures rebated in CEEP in PY2022, and there are no Therms penalties for the electric measures presented above. Therefore, the total natural gas savings for CEEP is 0. In addition, the total incentive and non-incentive costs for the program is $0.

1.2.1.3 Nonresidential Programs

The Evaluators provide the following conclusions regarding Avista's Non-Residential natural gas programs:

- The Evaluators found the Non-Residential portfolio to demonstrate a total of 52,761.26 Therms with a realization rate of 104.93%. The difference can be attributed to the Site-Specific Program: In one project a correction was made to a calculation, and in the second measured savings, using a metered billing analysis, was higher than what had been calculated as expected savings.
- The Evaluators also conducted a cost-benefit analysis in order to estimate the Non-Residential portfolio's cost-effectiveness. The resulting TRC value for this sector is 2.88 while the UCT value is 1.90. Further details on cost-effectiveness methodology can be found in Appendix D: Cost Benefit Analysis Results.
- Verified savings for the HVAC Program are 13,862 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 13,613 Therms, 100.0% of claimed savings. For four of the five 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 8,971 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 four projects in PY2022. Verified savings are 22,372 Therms, 114.1% of claimed savings. Savings for one site was adjusted due to the use of an incorrect latent heat of water input in a savings calculation. Another site displayed 283.3% of expected savings when a metered billing analysis was performed. The two remaining sites' realization is 100%.

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.
- 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 a handful of instances where the rebated equipment did not meet the program minimum requirements for efficiency. The Evaluator recommend Avista check the source AHRI document to verify efficiency prior to incentivizing installation of the measure.
- The Small Home & MF Weatherization Program impact evaluation revealed that Avista used single family residential attic insulation – Avista TRM value (0.15 Therms/SQFT) instead of multifamily attic Avista TRM value (0.036 Therms/SQFT) for almost all projects. However, the Evaluators verified home type and determined that the majority of the attic insulation homes were multifamily. The Evaluators recommend updating the Avista TRM to the MF expected savings value of 0.036 Therms/SQFT to correct for this attic insulation measure savings value discrepancy.
- 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 found that the RTF found negative savings for the top loading clothes washers. The Evaluators recommend Avista remove this measure from its program offerings.
- 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.
- The AeroBarrier Pilot evaluation indicated that verified savings referenced from RTF SEEM models are much lower than Avista expected savings. The Evaluators recommend that in future savings claimed for the project that the Therms per square foot per ACH reduction developed by the Evaluators, reflected in Table 3-44, is used to estimate project-level savings rather than the sensible heat loss equation. The Evaluators selected this method as more reasonable due to

inclusion of interactive effects included in the thousands of SEEM models, which are not possible to capture in the sensible heat loss equation alone.

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 to slight deviations between the reported savings and the Avista TRM as well as some measures where 20% annual household energy caps were improperly applied. The Evaluators recommend verifying that the Avista TRM values and the 20% household cap are properly applied when calculating measure savings.

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 1-5. 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)
- Document verification (review project documentation)
- Deemed savings (RTF UES and Avista TRM values)
- Whole facility billing analysis (IPMVP Option C)
- Appropriate IPMVP Option (for Site-Specific, depending on project)

The Evaluators completed the above impact tasks for each the natural gas impacts for projects completed in the Washington 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:

[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.

- **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 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 1-5. 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.
- 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, 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 Low-Income 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[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 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 (res)
- Shell Program (res)
- ENERGY STAR® Homes Program
- Small Home & MF Weatherization Program
- Appliances
- Low-Income Program
- Community Energy Efficiency Program
- HVAC Program (non-res)
- Food Service Equipment Program
- Shell Program (non-res)

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.

[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

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	Gas Population	Sample (With Finite Population Adjustment)*	Precision at 90% CI
Residential	Water Heat	486	61	90% ± 9.86%
Residential	HVAC	5,441	73	90% ± 9.56%
Residential	Shell	1,101	66	90% ± 9.82%
Residential	ENERGY STAR® Homes	39	5	90% ± 34.79%
Residential	Small Home & MF Weatherization	69	36	90% ± 9.55%
Residential	Appliances	189	55	90% ± 9.36%
Residential	AeroBarrier	5	5	90% ± 0%
Residential	Multifamily Direct Install	69	N/A	N/A
Low-Income	Low-Income	962	64	90% ± 9.94%
Low-Income	Community Energy Efficiency Program (CEEP)	0	N/A	N/A
Non-Residential	HVAC	40	27	90% ±9.14%
Non-Residential	Food Service Equipment	6	6	90% ±0%
Non-Residential	Shell	1	1	90% ±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 both Washington service territory alone. 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 and HVAC 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 shown in Table 2-2 for the Water Heat, HVAC, and the Appliances Programs for the Washington Gas Avista projects. The Evaluators developed a sampling plan that achieved a sampling precision of ±4.65% 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	486	63	90% ± 9.68%
Residential	HVAC	5,441	193	90% ± 5.82%
Residential	Small Home & MF Weatherization	69	3	90% ± 46.78%*
Residential	Appliances	189	39	90% ± 11.76%
Total		**6,185**	**298**	**90% ±4.65%**

*This program did not meet 90% confidence at 10% precision goals and therefore 100% in-service rate was assumed for this program

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 On-Site Visits

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 WA, a total of three visits were conducted 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. For gas measures, this applies to the Therms penalties found in electric measures in the RTF.

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.

2.2.3.3 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)[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.

2.2.3.4 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).

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.

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

2.2.3.5 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.

2.2.3.6 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.

2.2.3.7 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

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

2.2.3.8 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

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

2.2.3.9 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 are affected by the stay-at-home orders that had taken effect starting March 2020 in Washington. 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 Cost-Effectiveness Tests

The Evaluators calculated each program's cost-effectiveness, avoided energy costs, and implementation costs. The Evaluators used our company-developed cost-effectiveness tool to provide cost-effectiveness assessments for the each the Residential, Low-Income, and Nonresidential Portfolio by program, fuel type, program year, and measure, for each state.

As specified in this solicitation, the Evaluators determined the economic performance with the following cost-effectiveness tests:

- Total Resource Cost (TRC) test;
- Utility Cost Test (UCT);
- Participant Cost Test (PCT); and
- Rate Impact Measure (RIM).

2.2.6 Non-Energy Benefits

The Evaluators used the non-energy impact (NEI) values estimated and filed in Avista's 2022 Annual Conservation Plan. 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 9.2.

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 Washington 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 3-2 summarizes the Residential portfolio's cost-effectiveness.

Table 3-1: Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Water Heat	34,547.60	33,695.56	97.53%
HVAC	335,569.08	370,727.58	110.48%
Shell	75,768.21	62,356.17	82.30%
ENERGY STAR Homes	669.90	535.92	80.00%
Small Home & MF Weatherization	4,841.70	4,755.56	98.22%
Appliances	974.17	972.28	99.81%
AeroBarrier	1,867.17	322.17	17.25%
Multifamily Direct Install	1,879.50	1,879.50	100.00%
Total Res	**456,117.33**	**475,244.75**	**104.19%**

Table 3-2: Residential Portfolio Cost-Effectiveness Summary

Sector	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Residential	$11,945,017	$9,807,343	1.22	$9,022,383	$3,517,470	2.57

In PY2022, Avista completed and provided incentives for residential natural gas measures in Washington and reported total natural gas savings of 475,244.75 Therms, leading to an overall achievement of 104.19% of the expected savings for the residential programs. The Evaluators estimated the TRC value for the Residential portfolio is 1.22 while the UCT value is 2.57. 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 and in March 2023 using an email survey approach. The Evaluators surveyed customers that received rebates for HVAC, Water Heater, and Appliance Programs.

Table 3-3: 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, Small Home & MF Weatherization, and Appliance Programs. 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 ±4.65% precision across the programs surveyed for the natural gas measures in Avista's service territory, summarized in Table 3-4.

Table 3-4: Simple Verification Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	486	63	90% ± 9.68%
Residential	HVAC	5,441	193	90% ± 5.82%
Residential	Small Home & MF Weatherization	69	3	90% ± 46.78%
Residential	Appliances	189	39	90% ± 11.76%
Total		**6,185**	**298**	**90% ±4.65%**

The measure-level ISRs determined from the verification survey for each program in which simple verification was conducted is presented in Table 3-5 through Table 3-7.

Table 3-5: 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	17	100%	23	100%	State-specific ISR
G Tankless Water Heater	46	100%	71	100%	State-specific ISR

Table 3-6: 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)	24	100%	24	100%	State-specific ISR
G Natural Gas Boiler	2	100%	3	100%	State-specific ISR
G Natural Gas Furnace	69	100%	128	100%	State-specific ISR
G Smart Thermostat DIY with Natural Gas Heat	39	95%	47	96%	State-specific ISR
G Smart Thermostat Paid Install with Natural Gas Heat	57	100%	89	100%	State-specific ISR

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
G Multifamily 50 Gallon Natural Gas Water Heater*	1	100%	1	100%	Assume 100% ISR
G Multifamily Attic Insulation With Natural Gas Heat*	N/A	N/A	1	N/A	Assume 100% ISR
G Multifamily Furnace 95%*	0	100%	0	100%	Assume 100% ISR
G Multifamily Smart Thermostat DIY*	1	100%	2	100%	Assume 100% ISR
G Multifamily Smart Thermostat Paid*	N/A	N/A	1	100%	Assume 100% ISR
G Multifamily Tankless Water Heater*	0	100%	0	100%	Assume 100% ISR
G Multifamily Window Replc With Natural Gas Heat*	1	N/A	2	N/A	Assume 100% ISR
G Multifamily Wall Insulation With Natural Gas Heat*	0	100%	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 3-8: 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	46	100%	74	100%	State-specific ISR
E Energy Star Certified Upright Freezer	8	100%	13	100%	State-specific ISR
E Energy Star Rated Clothes Dryer	41	100%	59	100%	State-specific ISR
E Energy Star Rated Front Load Washer	31	100%	45	100%	State-specific ISR
G Energy Star Rated Clothes Dryer	11	100%	17	100%	Mixed state ISR
G Energy Star Rated Front Load Washer	28	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.

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
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 3-10: 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	107	2,333	2,333	2,166	92.86%
G Tankless Water Heater	379	32,215	32,215	31,530	97.87%
Total	**486**	**34,547.60**	**34,547.60**	**33,695.56**	**97.53%**

The Water Heat Program displayed verified savings of 33,695.56 Therms with a realization rate of 97.53% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs from the program.

Table 3-11: Water Heat Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G 50 Gallon Natural Gas Water Heater	$10,600.00	$634.90	$11,234.90
G Tankless Water Heater	$151,600.00	$9,260.97	$160,860.97
Total	**$162,200.00**	**$9,895.87**	**$172,095.87**

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.

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, except for two rebates. One G 50 Gallon Natural Gas Water Heater and one G Tankless Water Heater did not qualify for savings due to insufficient efficiency level of the equipment.

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 the Washington territory alone.

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
G 50 Gallon Natural Gas Water Heater	107	17	90% ±9.68%	100%
G Tankless Water Heater	379	46		100%

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 3-13 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 G 50 Gallon Natural Gas Water Heater did not have sufficient participation to move forward with a billing analysis.

Table 3-13: 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 3-14.

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 3-14 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 models. However, savings for the G Tankless Water Heater are lower than RTF savings and therefore not used towards estimating verified savings for the measure.

Table 3-14: 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	23.82	10.1	37.55	0.91	Model 2: PPR

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 tankless water heater measure can be found Appendix A: Billing Analysis Results.

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 33,695.56 Therms with a realization rate of 97.53%, as displayed in Table 3-10.

The realization rate for the natural gas savings in the Water Heat Program deviated from 100% because one G 50 Gallon Natural Gas Water Heater and one G Tankless Water Heater did not qualify for savings due to insufficient efficiency level of the equipment. All other projects displayed 100% realization for this program.

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 3-15 summarizes the measures offered under this program.

Table 3-15: HVAC Program Measures

Measure	Description	Impact Analysis Methodology
G FURNACE 95% (Multi-stage)	Natural gas forced air furnace, multi-stage	IPMVP Option A with billing data
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	Self-installed connected Thermostats in natural gas-heated home	Avista TRM

The following table summarizes the verified natural gas savings for the HVAC Program impact evaluation.

Table 3-16: HVAC Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G FURNACE 95% (Multi-Stage)	726	70,150	70,422	78,177	111.44%
G Natural Gas Boiler	33	3,094	3,709	3,094	100.00%
G Natural Gas Furnace	2,271	197,403	185,459	226,607	114.79%
G Smart Thermostat DIY with Natural Gas Heat	690	18,701	18,383	16,625	88.90%
G Smart Thermostat Paid Install with Natural Gas Heat	1,721	46,220	45,851	46,224	100.01%
Total	**5,441**	**335,569.08**	**323,824.01**	**370,727.58**	**110.48%**

The HVAC Program displayed verified savings of 370,727.58 Therms with a realization rate of 110.48% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-17: HVAC Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G FURNACE 95% (Multi-Stage)	$577,200.00	$25,434.14	$602,634.14
G Natural Gas Boiler	$14,850.00	$1,010.13	$15,860.13
G Natural Gas Furnace	$1,592,750.00	$73,724.06	$1,666,474.06
G Smart Thermostat DIY with Natural Gas Heat	$82,630.01	$5,198.24	$87,828.25

G Smart Thermostat Paid Install with Natural Gas Heat	$259,081.19	$14,161.40	$273,242.59
Total	**$2,526,511.20**	**$119,527.97**	**$2,646,039.17**

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. In addition, the Evaluators asked participants how the COVID19 pandemic stay-at-home orders have affected their household's energy consumption. The responses to these additional questions can be found in Appendix A: Billing Analysis Results.

Table 3-18 displays the ISRs for each of the HVAC measures for Washington natural gas territory alone. The ISRs resulted in ±5.82% precision at the 90% confidence interval for the program.

Table 3-18: HVAC Verification Survey ISR Results

Measure	Number of Rebates*	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
G FURNACE 95% (Multi-Stage)	726	24	90% ±5.82%	100%
G Natural Gas Boiler	33	2		100%
G Natural Gas Furnace	2,271	69		100%
G Smart Thermostat DIY with Natural Gas Heat	690	39		95%
G Smart Thermostat Paid Install with Natural Gas Heat	1,721	57		100%

*This count includes rebates from Washington only

Survey respondents described equipment to be currently functioning, leading to a 100% ISR for all measures except the G Smart Thermostat DIY with Natural Gas Heat. Although less than 100%, the ISR for the referenced measure still exceeded ISRs of 95%. The Evaluators applied the ISRs listed in Table 3-18 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. 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 3-19 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 3-19: 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	✓
G FURNACE 95% (Multi-Stage)	✓	187	✓

*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 3-20.

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.

Table 3-20 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 3-20: 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	1053	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 contradicting and/or inconclusive, the Evaluators elected to utilize Avista TRM values to estimate verified savings for the smart Thermostat measures. The findings from the PY2022 billing analyses for these measures may have been impacted by the COVID19 pandemic.

However, the Evaluators explored a retrofit isolation analysis for the G FURNACE 95% (Multi-Stage) and G Natural Gas Furnace measures, which indicated statistically significant savings and were used for verifying savings for this measure. Details for this analysis are provided in the following section. Further details of the billing analysis can be found Appendix A: Billing Analysis Results.

3.2.2.6 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 3-21 provides annual 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. This verified value was applied to all associated rebates in the Washington gas service territory.

Table 3-21: 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

3.2.2.7 Verified Savings

The HVAC Program in total displays a realization rate of 110.48% with 370,727.58 Therms verified natural gas savings in the Washington service territory, as displayed in Table 3-16.

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 3-22 summarizes the measures offered under this program.

Table 3-22: 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 door replacement 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 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 3-23: 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	203	34,730	33,936	34,730	100.00%
G Energy Star Certified Insulated Door	47	1,277	2,130	1,278	100.01%
G Floor Insulation With Natural Gas Heat	18	746	746	746	100.00%
G Storm Windows with Natural Gas Heat	4	121	118	118	97.37%
G Wall Insulation With Natural Gas Heat	72	4,597	4,637	4,597	100.00%
G Window Replc With Natural Gas Heat	757	34,297	35,593	20,888	60.90%
Total	**1,101**	**75,768.21**	**77,160.72**	**62,356.17**	**82.30%**

The Shell Program displayed verified savings of 62,356.17 Therms with a realization rate of 82.30% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-24: Shell Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G Attic Insulation With Natural Gas Heat	$171,265.02	$15,105.73	$186,370.75
G Energy Star Certified Insulated Door	$6,200.00	$324.44	$6,524.44
G Floor Insulation With Natural Gas Heat	$9,324.19	$29.90	$9,354.08
G Storm Windows with Natural Gas Heat	$954.42	$1,999.32	$2,953.74
G Wall Insulation With Natural Gas Heat	$48,579.36	$9,085.12	$57,664.48
G Window Replc With Natural Gas Heat	$361,172.94	$523.00	$361,695.94
Total	**$597,495.93**	**$27,067.50**	**$624,563.43**

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 eight instances in which square footage quantity in the rebate application did not match the values presented in the project data for window replacement. The Evaluators used verified quantity to estimate savings through the program, leading a lower than 100% realization rate for window replacement measures as depicted in Table 3-23.

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.

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 a verification survey for Energy Star doors and found an in service rate of 100%. The Evaluators did not conduct verification surveys for the other measures in the Shell Program 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. 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.

3.2.3.5 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 3-25 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 WA alone.

Table 3-25: 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	✓	76 (104)	✓
G Energy Star Rated Insulated Door With Gas Heat	✓	13	
G Floor Insulation With Natural Gas Heat	✓	4	
G Storm Windows with Natural Gas Heat	✓	3	
G Wall Insulation With Natural Gas Heat	✓	23	
G Window Replc With Natural Gas Heat	✓	396	✓

*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 3-26.

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 3-26 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 3-26: 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	306	1758	19.89	0.00	48.47	0.93	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 19.89 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 82.30% with a verified natural gas savings of 62,356 Therms in the Washington service territory, as displayed in Table 3-23. The realization rate for the natural gas savings in the Shell Program is lower than 100% due primarily to differences in quantity between the tracking data and document verification for the window replacement measures.

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

3.2.4 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 for ENERGY STAR® Eco-rated homes. Table 3-27 summarizes the measures offered under this program.

Table 3-27: ENERGY STAR® Homes Program Measures

Measure	Description	Impact Analysis Methodology
G ENERGY STAR Home - Manufactured, Gas & Electric	ENERGY STAR-rated manufactured home with gas and electric	RTF UES/Avista TRM
G Energy Star Home - Manufactured, Natural Gas	ENERGY STAR-rated manufactured home with gas only	RTF UES/Avista TRM
E ENERGY STAR Home - Manufactured, Furnace	ENERGY STAR-rated manufactured home with natural gas Furnace	RTF UES
E ENERGY STAR Home - Manufactured, Gas & Electric	ENERGY STAR-rated manufactured home with gas and electric	RTF UES

The following table summarizes the verified natural gas savings for the ENERGY STAR® Homes Program impact evaluation.

Table 3-28: ENERGY STAR® Homes Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Energy Star Home - Manufactured, Gas & Electric	1	133.98	0.00	133.98	100.00%
G Energy Star Home - Manufactured, Natural Gas	4	535.92	535.92	401.94	75.00%
Total	**5**	**669.90**	**535.92**	**535.92**	**80.00%**

The ENERGY STAR® Homes Program displayed verified savings of 535.92 Therms with a realization rate of 80.00% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-29: ENERGY STAR® Homes Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G Energy Star Home - Manufactured, Gas & Electric	$1,000.00	$40.54	$1,040.54
G Energy Star Home - Manufactured, Natural Gas	$1,979.55	$121.63	$2,101.18
Total	**$2,979.55**	**$132.59**	**$3,141.73**

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.

3.2.4.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the ENERGY STAR® Homes Program.

3.2.4.2 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 2.2.2.1.

The Evaluators found expected savings to differ for one of the five ENERGY STAR Homes rebates. One G ENERGY STAR Home – Manufactured, Gas project was verified to have been miscategorized. The Evaluators determined this rebate to be erroneous as the home was built in 2006. Therefore, the Evaluators removed savings for this rebate, leading to 75% realization for the measure overall.

The Evaluators confirm that the Avista TRM and the application of Avista TRM values was correct for the remainder of gas rebates in the program.

3.2.4.3 Verification Surveys

The Evaluators did not conduct verification surveys for the ENERGY STAR® Homes Program.

3.2.4.4 Impact Analysis

This section summarizes the verified savings results for the ENERGY STAR® Homes Program. The Evaluators calculated verified savings for the natural gas measures using the most recent RTF workbook for the ENERGY STAR® Homes 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.

3.2.4.5 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 80.00% with 535.92 Therms verified natural gas energy savings in the Washington service territory, as displayed in Table 3-28. The realization rate for the natural gas savings in the ENERGY STAR® Homes Program deviate from 100% due to one project erroneously assigned ENERGY STAR Home savings. The remainder of the projects displayed 100% realization.

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

3.2.5 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 3-30 summarizes the measures offered under this program.

Table 3-30: 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 3-31: 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	4	736	0	478	65.02%
G Multifamily Smart Thermostat Paid	1	27	27	27	100.01%
G Multifamily Furnace 95%	20	1,705	1,746	1,832	107.45%
G Multifamily Smart Thermostat DIY	6	160	160	160	100.01%
G Multifamily Tankless Water Heater	15	1,245	1,148	1,226	98.50%
G Multifamily 50 Gallon Natural Gas Water Heater	3	65	65	65	100.00%

Measure	PY2022 Units	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Multifamily Wall Insulation With Natural Gas Heat	4	223	74	267	119.62%
G Multifamily Window Replc With Natural Gas Heat	16	681	475	700	102.80%
Total	**69**	**4,841.70**	**3,695.23**	**4,755.56**	**98.22%**

The Small Home & MF Weatherization Program displayed verified savings of 4,755.56 Therms with a realization rate of 98.22% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-32: Small Home & MF Weatherization Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G Multifamily Attic Insulation With Natural Gas Heat	$3,678.75	$208.08	$3,886.83
G Multifamily Smart Thermostat Paid	$150.00	$304.53	$454.53
G Multifamily Furnace 95%	$14,300.00	$8.16	$14,308.16
G Multifamily Smart Thermostat DIY	$746.90	$12.87	$759.77
G Multifamily Tankless Water Heater	$6,400.00	$465.22	$6,865.22
G Multifamily 50 Gallon Natural Gas Water Heater	$300.00	$49.98	$349.98
G Multifamily Wall Insulation With Natural Gas Heat	$2,220.75	$311.44	$2,532.19
G Multifamily Window Replc With Natural Gas Heat	$7,169.76	$116.13	$7,285.89
Total	**$34,966.16**	**$1,476.42**	**$36,442.58**

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.

3.2.5.1 Database Review & Verification

The following sections describe the Evaluator's database review and document verification findings for the Small Home & MF Weatherization Program.

3.2.5.2 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” 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.

The Evaluators found expected savings to differ significantly for the attic insulation measure. Avista used single family residential attic insulation – Avista TRM value (0.15 Therms/SQFT) instead of multifamily attic Avista TRM value (0.036 Therms/SQFT) for almost all projects. However, the Evaluators verified home type and determined that the majority of the attic insulation homes were multifamily. Therefore, the realization rate for this measure is low. The Evaluators recommend updating the Avista TRM to correct for this attic insulation measure savings value discrepancy.

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

3.2.5.3 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 3-12 displays the ISRs for each of the measures for the Washington territory alone.

Table 3-33: 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	3	1	90% ±46.78%	100%
G Multifamily Attic Insulation With Natural Gas Heat	4	N/A		N/A
G Multifamily Furnace 95%	20	0		0%
G Multifamily Smart Thermostat DIY	6	1		100%
G Multifamily Smart Thermostat Paid	1	N/A		N/A
G Multifamily Tankless Water Heater	15	0		0%
G Multifamily Window Replc With Natural Gas Heat	16	1		100%
G Multifamily Wall Insulation With Natural Gas Heat	4	0		0%

*This count includes rebates from Washington only

The response rate for this verification survey did not meet 90/10 precision goals. Therefore, the Evaluators assumed 100% in-service rate for these measures. However, survey respondents for each smart thermostat, water heater, or 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.

3.2.5.4 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.

3.2.5.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate adjusted program savings for each of the Small Home & MF Weatherization Program measures. In addition, the Evaluators reviewed and applied the current Avista TRM values for each measure along with verified tracking data to estimate net program savings.

The Small Home & MF Weatherization Program in total displays a realization rate of 98.22% with 4,755.56 Therms verified natural gas energy savings in the Washington service territory, as displayed in Table 3-31. 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. 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.

3.2.6 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 3-34 summarizes the measures offered under this program along with the impact evaluation methods for each measure.

Table 3-34: Multifamily Direct Install Program Measures

Measure	Impact Analysis Methodology
Faucet aerators	RTF UES, Aerators_v1_1/SBW TRM
Kitchen Aerators	RTF UES, Aerators_v1_1/SBW TRM
Screw-in LED lamp (A-line 60W)	SBW TRM
Screw-in LED lamp (A-line 40W)	SBW TRM
Screw-in LED lamp (BR30)	SBW TRM
Screw-in LED lamp (3.8)	SBW TRM
Screw-in LED lamp (G25)	SBW TRM
Screw-in LED lamp (PAR30)	SBW TRM
Screw-in LED lamp (PAR38)	SBW TRM
Screw-in LED lamp (4.8)	SBW TRM
Vending misers in common areas	Avista TRM/SBW TRM
Lighting (common area)	SBW TRM

The following table summarizes the verified natural gas savings for the Multifamily Direct Install Program (MFDI) Program impact evaluation.

Table 3-35: Multifamily Direct Install Program Verified Natural Gas Savings

Measure	PY2022 Units	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Faucet aerator (1 GPM)	457	1,560	1,560	100.00%
Kitchen Aerator	168	319	319	100.00%
Total	**625**	**1,879.50**	**1,879.50**	**100.00%**

The Multifamily Direct Install Program displayed verified savings of 1,879.50 Therms with a realization rate of 100.00% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-36: Multifamily Direct Install Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
Faucet aerator (1 GPM)	$5,944.00	$307.06	$6,251.06
Kitchen Aerator	$1,344.00	$62.82	$1,406.82
Total	**$7,288.00**	**$369.88**	**$7,657.88**

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.

3.2.6.1 Database Review & Verification

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

3.2.6.2 Database Review & Document Verification

The program administrators do not track data separately from the tracking data. Therefore, there were no documents for the Evaluators to cross-verify for the Multifamily Direct Install Program.

To verify savings, the Evaluators reviewed the tracking data and verified savings using RTF UES values. The Evaluators found no discrepancy between the savings values in the tracking database and the RTF UES values leading to a realization rate of 100% for these measures. However, more granularity in per unit savings values could be achieved if the tracking data included data about space heating type for each unit. The Evaluators recommend verifying space heating type in the tracking data in order to apply more specific 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.

3.2.6.3 Verification Surveys

The Evaluators did not conduct survey verification for the Multifamily Direct Install Program since the MFDI measure savings values have in-service rates embedded.

3.2.6.4 Impact Analysis

This section summarizes the verified savings results for the Multifamily Direct Install Program. The Evaluators calculated verified savings for the natural gas measures using the most recent RTF workbook for the Multifamily Direct Install Program measures. These RTF UES values were applied to all gas measure in the program data.

3.2.6.5 Verified Savings

The program administrators do not track data separately from the tracking data. Therefore, there were no documents for the Evaluators to cross-verify for the Multifamily Direct Install Program.

To verify savings, the Evaluators reviewed the tracking data and verified savings using RTF UES values. The Evaluators found no discrepancy between the savings values in the tracking database and the RTF UES values leading to a realization rate of 100% with 1,880 Therms saved for these measures as displayed in Table 3-35. However, more granularity in per unit savings values could be achieved if the tracking data included data about space heating type for each unit. The Evaluators recommend verifying space heating type in the tracking data in order to apply more specific savings values to each project.

The Evaluators did not conduct survey verification for the Multifamily Direct Install Program since the MFDI measure savings values have in-service rates embedded.

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 3-37 summarizes the measures offered under this program.

Table 3-37: 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 Front 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 3-38: 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	50	136	494	463	340.79%
G Energy Star Rated Top Load Washer	11	66	45	0	0.00%
G Energy Star Rated Front Load Washer	128	772	524	509	65.92%
Total	**189**	**974.17**	**1,063.65**	**972.28**	**99.81%**

The Appliance Program displayed verified savings of 972.28 Therms with a realization rate of 99.81% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-39: Appliance Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G Energy Star Rated Clothes Dryer	$2,500.00	$73.79	$2,573.79
G Energy Star Rated Top Load Washer	$550.00	$0.00	$550.00
G Energy Star Rated Front Load Washer	$6,350.00	$93.83	$6,443.83
Total	**$9,400.00**	**$167.63**	**$9,567.63**

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.

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 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.

Finally, 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.

Overall, the program displays a realization rate of 99.81% 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.

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. In addition, the Evaluators asked participants how the COVID19 pandemic stay-at-home orders have affected their household's energy consumption. The responses to these additional questions can be found in Appendix A.

Table 3-40 displays the ISRs for each of the Appliance measures for Idaho and Washington natural gas territory combined, as the Washington-only territory responses did not meet 90/10 precision goals. The ISRs resulted in ±9.65% precision at the 90% confidence interval for the program.

Table 3-40: 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	50	11	90% ±9.65%	100%
G Energy Star Rated Top Load Washer	11	0		100%
G Energy Star Rated Front Load Washer	128	28		100%

Survey respondents described equipment to be currently functioning, leading to a 100% ISR for all measures. The Evaluators applied the ISRs listed in Table 3-40 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 99.81% with 972 Therms verified natural gas savings in the Washington service territory, as displayed in Table 3-38. The realization rate for the natural gas savings in the Appliance Program deviate from 100% due to errors in converting kWh to Therms savings for the clothes washers and erroneously applying Avista TRM values to the measure. The Evaluators estimated gas savings for these measures by converting measure RTF electric savings into Therms savings.

3.2.8 AeroBarrier Program

The AeroBarrier Pilot provides incentives for customers or builders with new construction single family homes to complete envelope sealing improvements using the AeroBarrier product, a convenient, cost-effective approach that seal homes in less than three hours and provides documented results.

This section summarizes the estimated savings Avista has calculated for the AeroBarrier Pilot. The Evaluators conducted the first impact evaluation for the measures in this program for PY2022. Table 3-42 summarizes the measures offered under this program.

Table 3-41: AeroBarrier Program Measures

Measure	Description	Impact Analysis Methodology
G AeroBarrier Rebate	Whole home insulation with AeroBarrier	RTF UES with adjustments

The following table summarizes the estimated natural gas savings for the AeroBarrier Program impact evaluation.

Table 3-42: AeroBarrier Program Verified Natural Gas Savings

Measure	PY2022 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G AeroBarrier Rebate	16	1,867.17	1,886.09	322.17	17.25%
Total	**16**	**1,867.17**	**1,886.09**	**322.17**	**17.25%**

The AeroBarrier Program displayed verified savings of 322.17 Therms with a 17.25% realization rate. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-43: AeroBarrier Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G AeroBarrier Rebate	$17,897.91	$63.40	$17,961.31
Total	**$17,897.91**	**$63.40**	**$17,961.31**

The Evaluators describe the impact evaluation tasks completed for this Pilot in the subsections below.

3.2.8.1 Database Review & Verification

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

3.2.8.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the AeroBarrier Pilot. The Evaluators selected the census of rebates to cross-verify tracking data inputs, summarized in in Section 2.2.2.1.

The Evaluators found all sixteen E AeroBarrier Rebates had proper project documentation with the associated AeroBarrier seal reports and household information in either the CC&B web rebate data or mail-in rebate applications, which allowed the Evaluators to easily verify equipment specifications to

assign savings values to each sampled project. The critical values included in these documents were: Air Changes per Hour (ACH)-pre, ACH post, and square footage in the appropriate AeroBarrier seal reports. The Evaluators note that primary and auxiliary heating type data was missing on some rebate applications.

3.2.8.3 Verification Surveys

The Evaluators did not conduct verification surveys for the AeroBarrier Pilot since weatherization measures historically have high verification rates.

3.2.8.4 Impact Analysis

This section summarizes the verified savings results for the AeroBarrier Pilot. The Evaluators attempted to conduct a billing analysis for the AeroBarrier projects, but the data required to match a valid counterfactual group to new construction homes was unavailable.

The Evaluators reviewed the expected savings calculation workbooks for each project. The expected savings were calculated by Avista had used the sensible heat loss equation, with the following inputs: change in cubic feet per minute (CFM), density of air, specific heat of air, inside air temperature, outside air temperature, primary heating equipment efficiency, auxiliary heating equipment efficiency, and cooling equipment efficiency.

The Evaluators estimated verified savings using RTF SEEM models utilized in the RTF's residential weatherization workbook. The SEEM models used to estimate air infiltration reduction was used to estimate the average Therms reductions per square foot, per ACH(50) reduction for each primary heating equipment type and heating zone. The Evaluators deem this methodology to be more appropriate, as it displays the modeled interactive effects of homes in this region, rather than theoretical values based on the laws of heat transfer alone. This led to nearly 20% realization rate across the program. This result is similar to results using RTF air infiltration reduction measure, as expected, due to the use of the same SEEM model results. Therefore, the Evaluators calculated verified savings for the AeroBarrier measure using the RTF workbook in place at the time the savings goals for the program was finalized.

The Evaluators recommend that Avista utilize SEEM model results summarized by the Evaluators to estimate all AeroBarrier rebate savings for any future redemptions. Based on cost effectiveness, the Evaluators recommend Avista determine whether the pilot will be implemented into a full program.

3.2.8.5 Billing Analysis

The Evaluators did not conduct a billing analysis for the AeroBarrier measure due to lack of required data for sufficient control group matching.

3.2.8.6 Verified Savings

The AeroBarrier Pilot in total displays a realization rate of 17.25% with 322.17 Therms verified gas energy savings in the Washington service territory, as displayed in Table 3-16. The realization rate for

the electric savings in the AeroBarrier Program deviate from 100% due to the differences between the applied Avista TRM prescriptive savings value and the adjusted RTF air sealing 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 workbook SEEM model results for the electric measures along with verified tracking data to estimate net program verified savings for this measure. The Evaluators summarize the adjusted savings values developed from the RTF SEEM models in the table below.

Table 3-44: AeroBarrier RTF Adjusted UES

Measure	Savings Component	kWh Savings (kWh/ SQFT/ ACH(50) Reduction	Therms Savings (Therms/ SQFT/ ACH(50) Reduction
ACH50 reduction - Heating Zone 1 (Gas FAF - Condensing)	Gas Heating & Cooling	0.00410	0.0022
ACH50 reduction - Heating Zone 2/3 (Gas FAF - Condensing)	Gas Heating & Cooling	0.00621	0.0025
ACH50 reduction - Heating Zone 1 (Gas FAF - Non-Condensing)	Gas Heating & Cooling	0.00410	0.0026
ACH50 reduction - Heating Zone 2/3 (Gas FAF - Non-Condensing)	Gas Heating & Cooling	0.00621	0.0029
ACH50 reduction - Heating Zone 1 (Gas FAF - Any)	Gas Heating & Cooling	0.00410	0.0024
ACH50 reduction - Heating Zone 2/3 (Gas FAF - Any)	Gas Heating & Cooling	0.00621	0.0027
ACH50 reduction - Heating Zone 1 (Electric FAF)	Electric Heating & Cooling	0.02581	0.0000
ACH50 reduction - Heating Zone 2/3 (Electric FAF)	Electric Heating & Cooling	0.03665	0.0000
ACH50 reduction - Heating Zone 1 (Zonal or DHP)	Electric Heating & Cooling	0.05254	0.0000
ACH50 reduction - Heating Zone 2/3 (Zonal or DHP)	Electric Heating & Cooling	0.05203	0.0000
ACH50 reduction - Heating Zone 1 (Heat Pump)	Electric Heating & Cooling	0.00741	0.0000
ACH50 reduction - Heating Zone 2/3 (Heat Pump)	Electric Heating & Cooling	0.00746	0.0000

The realization rate for the Pilot is low because the expected savings were calculated using the theoretical sensible heat transfer equation, with weather-related inputs, while the Evaluators utilized RTF-developed SEEM model outputs in which ACH(50) reductions were estimated on modeled homes relative to the Pacific Northwest region. This method includes interactive effects that are no possible to capture with the sensible heat transfer equation. These SEEM models are used to estimate RTF weatherization UES; therefore, the Evaluator recommends that Avista estimate AeroBarrier project savings using the RTF-adjusted values. The appropriate adjusted UES in the RTF led to a lower-than-expected savings for the measure.

4. Low-Income Impact Evaluation Results

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Washington 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 Washington 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 4-2 summarizes the Low-Income portfolio cost-effectiveness results.

Table 4-1: Low-Income Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Low-Income	11,654.58	11,705.26	100.43%
CEEP	N/A	N/A	N/A
Total	**11,654.58**	**11,705.26**	**100.43%**

Table 4-2: Low-Income Portfolio Cost-Effectiveness Summary

Sector	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Low Income	$1,128,387	$1,717,014	0.66	$273,404	$1,717,014	0.16

In PY2022, Avista completed and provided incentives for low-income gas measures in Washington and achieved total natural gas savings of 11,705.26 Therms. The Low-Income Program met savings expectations based on reported savings with an achieved realization rate of 100.43%. The Evaluators estimated the TRC value for the Low-Income portfolio is 0.66 while the UCT value is 0.16. 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 Washington 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. Weatherization measures under this program may also be funded by CEEP. The following table summarizes the measures offered under this program.

Table 4-3 summarizes the measures offered under this program.

Table 4-3: 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 4-4 summarizes the verified natural gas savings for the Low-Income Program impact evaluation.

Table 4-4: 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	63	882	875	875	99.25%
G Duct Sealing	74	23	23	23	101.70%
G Energy Star Doors	98	1,328	1,298	1,298	97.72%
G Energy Star Windows	60	1,828	1,857	1,857	101.55%
G HE Furnace	2	3,640	3,714	3,714	102.05%
G HE WH 50G	38	12	15	15	131.86%
G INS - Attic	2	1,401	1,374	1,374	98.06%
G INS - Duct	34	62	62	62	100.08%
G INS - Floor	8	1,289	1,295	1,295	100.47%
G INS - Wall	18	232	231	231	99.80%
G Tankless Water Heater	76	959	961	961	100.24%
Health And Safety	550	0	0	0	N/A
Total	**1,023**	**11,654.58**	**11,705.26**	**11,705.26**	**100.43%**

The Low-Income Program displayed verified savings of 11,705.26 Therms with a realization rate of 100.43% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 4-5: Low-Income Program Costs

Measure	Incentive Costs	Non-Incentive Costs	Total Costs
G Air Infiltration	$80,131.93	$41,667.23	$121,799.16
G Duct Sealing	$1,744.18	$218.56	$1,962.74
G Energy Star Doors	$102,719.78	$16,158.82	$118,878.60
G Energy Star Windows	$259,728.52	$191,779.40	$451,507.92
G HE Furnace	$271,803.70	$47,519.91	$319,323.61
G HE WH 50G	$3,047.77	$390.24	$3,438.01
G INS - Attic	$59,899.44	$54,515.72	$114,415.16
G INS - Duct	$1,982.27	$1,507.45	$3,489.72
G INS - Floor	$128,340.83	$51,260.58	$179,601.41
G INS - Wall	$12,082.56	$9,916.36	$21,998.92
G Tankless Water Heater	$65,425.72	$9,179.72	$74,605.44
Health And Safety	$305,993.45	$0.00	$305,993.45
Total	**$1,292,900.15**	**$424,113.97**	**$1,717,014.12**

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 found that of the two high efficiency 50-gallon water heater measures had an expected savings value that was nearly half of the with the Avista TRM value. This led to a higher than 100% realization rate for that measure.

Avista also identified one project where the savings 20% savings cap was applied to the savings rather than applying the cap to the household's annual usage. This led to a lower verified savings value than the reported savings for all measures that the household participated in. The Evaluators recommend that Avista apply the 20% savings cap consistently to all households, applying it to the household annual usage and spreading the savings proportionally across the measures based on their original savings size.

The Evaluators reviewed the project documentation provided by Avista and identified very few instances in which there existed conflicting square footage or number of units between the aggregated project data from the CC&B and the rebate project documentation provided in the data request for document verification.

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 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 4-6 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 4-6: 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: Billing Analysis Results.

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 100.43% with 11,705 Therms verified natural gas savings in the Washington service territory, as displayed in Table 4-4.

The Evaluators note that the majority of deviations from 100% realization rate at measure level is due to the change in square footage or number of units verified in the project documentation as well as verifying 20% annual household energy caps were properly applied. The Evaluators updated the quantity based on new project data.

4.1.2 Community Energy Efficiency Program (CEEP)

The Community Energy Efficiency Program was created from the Washington State Legislature in 2009 to tackle hard to reach markets in both the residential and commercial sectors by encouraging energy efficiency improvements. The CEEP pilot was funded by the U.S. Department of Energy's State Energy Program and the American Recovery and Reinvestment Act. CEEP partners are selected by a competitive request for proposals and independent review committee. Avista has been a CEEP recipient since 2014.

Three community action agencies have partnered with Avista to implement the CEEP funds under two programs: energy efficiency improvements for multifamily housing and converting income qualified homes with alternative heat sources (e.g. wood, oil) to a heat pump system. In addition, CEEP funds are being used to match utility rebates for energy efficiency work done in small businesses in rural communities. Avista has decided to discontinue CEEP in Q4 of 2022.

This section summarizes the impact results for CEEP. Table 4-7 summarizes the measures offered under this program.

Table 4-7: CEEP Measures

Measure	Description	Impact Analysis Methodology
CEEP Multi Family - E Ductless Heat Pump Conversion Zonal	Ductless heat pump for multi-family units	Avista TRM
CEEP Multi Family - E Windows	Window replacement for multi-family units	Avista TRM
CEEP Multi Family - E Air Infiltration	Air infiltration for multi-family units	Avista TRM
CEEP Multi Family - E Attic Insulation	Attic insulation for multi-family units	Avista TRM
CEEP Multi Family - E Ductless Heat Pump Conversion	Ductless heat pump for multi-family units	Avista TRM
CEEP Multi Family - E Line Voltage Thermostat	Line voltage Thermostats for multi-family units	Avista TRM
CEEP Multi Family - G Boiler	Boiler replacement for multi-family units	Avista TRM
CEEP Multi Family - E Health & Safety	Health and safety improvements for multi-family units	Avista TRM
CEEP Multi Family - E Lighting	Efficient lighting giveaways for multi-family units	Avista TRM
CEEP Single Family - E Alternative Heat Conversion	Alternative fuel conversion to electric in multi-family units	Avista TRM
CEEP Multi Family - E Floor Insulation	Floor insulation for multi-family units	Avista TRM
CEEP Single Family - E Ductless Heat Pump	Ductless heat pump for single-family homes	Avista TRM
CEEP Single Family - E Lighting	Efficient lighting giveaways for single-family units	Avista TRM

There were no natural gas saving measures rebated in CEEP in PY2022, and there are no Therms penalties for the electric measures presented above. Therefore, the total natural gas savings for CEEP is 0. In addition, the total incentive and non-incentive costs for the program is $0.

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 Washington 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 3-1 summarizes the Non-Residential verified impact savings by program. Table 3-2 summarizes the Non-Residential portfolio's cost-effectiveness.

Table 5-1:Non-Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
HVAC	13,862.53	13,862.53	13,862.53	100.0%
Food Service Equipment	13,613.00	13,613.00	13,613.00	100.0%
Shell	8,971.45	8,971.45	8,971.45	100.0%
Site-Specific	19,610.45	18,694.45	22,372.00	114.1%
Totals	**56,057.43**	**55,141.43**	**58,818.98**	**104.9%**

Table 5-2:Non-Residential Portfolio Cost-Effectiveness Summary

Program	TRC			UCT		
	Benefits	Costs	B/C Ratio	Benefits	Costs	B/C Ratio
Nonresidential	$1,401,496	$487,299	2.88	$814,494	$428,451	1.90

In PY2022, Avista completed and provided incentives for non-residential natural gas measures in Washington and reported total natural gas energy savings of 44,956 Therms. All programs exceeded savings claims, leading to an overall achievement of 104.9% of the expected savings for the non-residential programs. The Evaluators estimated the TRC value for the Non-Residential portfolio is 2.88 while the UCT value is 1.90. 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 5-3 displays program populations, sample sizes for document verification and resulting precision.

Table 5-3: 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%
Site-Specific	4	4	±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 three on-site visits to verify full installation and equipment operation as described in the project scope. The results of these site visits are discussed further in the Site-Specific chapter.

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 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 5-4 summarizes the measures rebated in PY2022 under this program.

Table 5-4: 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

Table 5-5: 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	25	8,409.09	8,409.09	8,409.09	100.0%
90 Percent AFUE or greater NG boiler 300	2	616.12	616.12	616.12	100.0%
95 Percent AFUE or greater NG multi stage furnace 225	13	4,837.32	4,837.32	4,837.32	100.0%
Totals:	**40**	**13,862.53**	**13,862.53**	**13,862.53**	**100.0%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-6: Prescriptive HVAC Program Costs by Measure

Measure	Measure Count	Total Natural Gas Incentive	Measure Costs	Total Costs
95 Percent or greater AFUE NG single stage furnace 225	25	$23,694.00	$44,098.73	$67,792.73
90 Percent AFUE or greater NG boiler 300	2	$2,781.00	$2,884.36	$5,665.36
95 Percent AFUE or greater NG multi stage furnace 225	13	$15,314.00	$24,054.18	$39,368.18
Totals:	40	**$41,789.00**	**$71,037.28**	**$112,826.28**

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 5-7 shows the project population, the number of projects checked and the overall precision.

Table 5-7: Prescriptive HVAC Program Verification Precision

Population	Sampled	Precision
40	27	±9.14%

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 2022 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 13,863 Therms with a realization rate of 100%, as displayed in Table 5-5.

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 3-9 summarizes the measures rebated in PY2022 under this program.

Table 5-8: 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 5-9: 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	1	900.00	900.00	900.00	100.00%
Commercial Fryer Gas	17	12,625.00	12,625.00	12,625.00	100.00%
Commercial Griddle Natural Gas	1	88.00	88.00	88.00	100.00%
Totals	**19**	**13,613.00**	**13,613.00**	**13,613.00**	**100.00%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-10: Prescriptive Food Service Equipment Program Costs by Measure

Measure	Measure Count	Total Natural Gas Incentives	Total Non-Incentive Costs	Total Costs
Commercial Convection Oven Natural Gas full size	2	$1,400.00	$3,254.88	$4,654.88
Commercial Fryer Gas	25	$25,000.00	$56,056.42	$81,056.42

Commercial Griddle Natural Gas	1	$250.00	$466.47	$716.47
Totals	**28**	**$26,650.00**	**$59,777.77**	**$86,427.77**

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 5-11 shows the project population, the number of projects checked and the overall precision.

Table 5-11: Prescriptive Food Service Equipment Program Verification Precision

Population	Sampled	Precision
6	6	±0%

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

For four of the five 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 13,613 Therms with a realization rate of 100%, as displayed in Table 5-9.

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 5-12 summarizes the measures rebated in PY2022 under this program.

Table 5-12: 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 5-13: 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 R30-R44	4	4,582.80	4,582.80	4,582.80	100.0%
Attic =< R11 to R45+	1	151.45	151.45	151.45	100.0%
Wall =< R4 to 19+	3	4,237.20	4,237.20	4,237.20	100.0%
Totals	**8**	**8,971.45**	**8,971.45**	**8,971.45**	**100.0%**

The following table summarizes the incentive and non-incentive costs associated with the program.

Table 5-14: Prescriptive Shell Program Costs by Measure

Measure	Measure Count (Square Feet Installed)	Incentive Costs	Non-Incentive Costs	Total Costs
Attic =< R11 to R30-R44	50,920.00	$37,164.29	$59,021.17	$96,185.46
Attic =< R11 to R45+	1,165.00	$957.58	$1,950.50	$2,908.08
Wall =< R4 to 19+	11,770.00	$7,415.56	$54,570.24	$61,985.80
Totals	**63,855.00**	**$45,537.43**	**$115,541.91**	**$161,079.34**

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 5-15 shows the project population, the number of projects checked and the overall precision.

Table 5-15: 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 Prescriptive Shell Program. 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. Final verified savings were calculated by applying the appropriate UES to a census of measures.

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 8,971 Therms with a realization rate of 100%, as displayed in Table 5-13 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:

- Steam traps
- Boilers
- Windows
- Water Heaters

The following table summarizes the verified natural gas energy savings for the Site-Specific Program impact evaluation.

Table 5-16: Site-Specific Program Verified Natural Gas Savings

PY2022 Participation	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Verified Realization Rate
4	19,610.45	18,694.45	22,372.45	114.1%

The Site-Specific Program displayed verified savings of 22,372.45 Therms with a realization rate of 114.1% against the expected savings for the program.

Table 5-17: Site-Specific Program Costs

Incentive Costs	Non-Incentive Costs	Total Costs
$26,555.73	$68,021.26	$94,576.99

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 all four natural gas savings projects completed during the PY2022 program year. 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 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 three of the four project sites.

5.2.4.2 Impact Approaches

Impact approaches varied by project but adhered to IPMVP options A and C and used methods and inputs from established, reputable sources starting with the Regional Technical Forum, supplemented by the Illinois TRM 9.0. For three sites, whole-facility billing analyses were feasible and provided statistically robust savings estimates. For the remaining site, prescriptive calculations were conducted.

Specified methodology and inputs are discussed in individual site reports, located in Appendix C: Site-Specific Program Project Reports.

5.2.4.1 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 5-18 presents realization at the site level, with program-level savings.

Table 5-18: Site-Specific Expected, Adjusted and Verified Therm Savings by Project

Project ID	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
SSOP_71556	12,208.00	11,292.00	11,292.00	92.5%
SSOP_82019	2,007.00	2,007.00	5,685.00	283.3%
SSOP_80123	132.45	132.45	132.45	100.0%
SSOP_81307	5,263.00	5,263.00	5,263.00	100.0%
Totals	**19,610.45**	**18,694.45**	**22,372.45**	**114.1%**

5.2.4.2 Discussion of Non-100% Realization

- **SSOP_71556 -** Ex ante calculations used an approximation for latent heat of vaporization based on a gauge pressure of 5 psi. The actual gauge pressure is 100. Latent heat of vaporization was calculated using a saturated steam table.
- **SSOP_82019 -** Measured savings are higher than ex ante predictions.

Individual reports for each sampled site are included in Appendix C: Site-Specific Program Project Reports.

5.2.4.3 Verified Savings

The Site-Specific Program in total displays a realization rate of 114% with 22,372 Therms verified natural gas energy savings in the Washington service territory, as displayed in Table 5-19.

Table 5-19: Site-Specific Impact Summary

Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
19,610.45	18,694.45	22,372.45	114.1%

6. Appendix A: Billing Analysis Results

This appendix provides additional details on the billing analyses conducted for each program.

6.1 Shell Program

The results of the billing analysis for the Shell program are provided below. Table 6-1 shows 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. A billing analysis was completed for measures that had at least 75 customers with single-measure installations. This ensured that measures would have a sufficient sample size after applying PSM data restrictions (e.g. sufficient pre- and post-period data). The attic insulation billing analysis included participants in both in both Washington and Idaho service territories (104 total) in order to acquire the maximum number of customers possible.

Table 6-1: 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	✓	76 (104)	✓
G IGU Window Replc With Natural Gas Heat	✓	13	
G Floor Insulation With Natural Gas Heat	✓	4	
G Storm Windows with Natural Gas Heat	✓	3	
G Wall Insulation With Natural Gas Heat	✓	23	
G Window Replc With Natural Gas Heat	✓	396	✓

The Evaluators were successful in creating a matched cohort for each of the measures with sufficient participation. 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, as shown in Table 6-2. 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 6-2, 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 6-2: Cohort Restrictions, Shell Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
G Attic Insulation With Natural Gas Heat	Starting Count	104	29,646
	Install Date Range: January 1, 2022 to June 30, 2022	81	29,646
	Control Group Usage Outlier (>2X max treatment usage)	81	28,897

	Incomplete Post-Period Bills (<6 months)	74	27,339
	Incomplete Pre-Period Bills (<10 months)	74	26,973
	Ending Count (Matched by PSM)	74	486
G Window Replc With Natural Gas Heat	Starting Count	388	19,247
	Install Date Range: January 1, 2022 to June 30, 2022	329	19,247
	Control Group Usage Outlier (>2X max treatment usage)	329	18,935
	Incomplete Post-Period Bills (<6 months)	307	18,002
	Incomplete Pre-Period Bills (<10 months)	306	17,824
	Ending Count (Matched by PSM)	306	1,758
	Post-Period Date Range Restriction: 2021-07-01 through 2021-12-31	500	55,997
	Require Minimum Post Period: 5 Months	478	39,865
	Incomplete Pre-Period Bills	425	31,834
	Ending Count (Matched by PSM)	425	2,107

Figure 6-1 and Figure 6-2 display the density of each variable employed in propensity score matching for the attic insulation measure, before and after conducting matching. In addition, Figure 6-3 and Figure 6-4 display the density of each variable employed in propensity score matching for the window replacement measure, before and after conducting matching.

For the attic insulation measure, the covariate balance shows small differences between the treatment and control groups before and after matching. This is in part due to the small final number of treatment customers for the attic insulation measure (N=49). However, for the window replacement measure, the covariate distributions prior to matching and after matching are similar, 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, Shell Attic Insulation

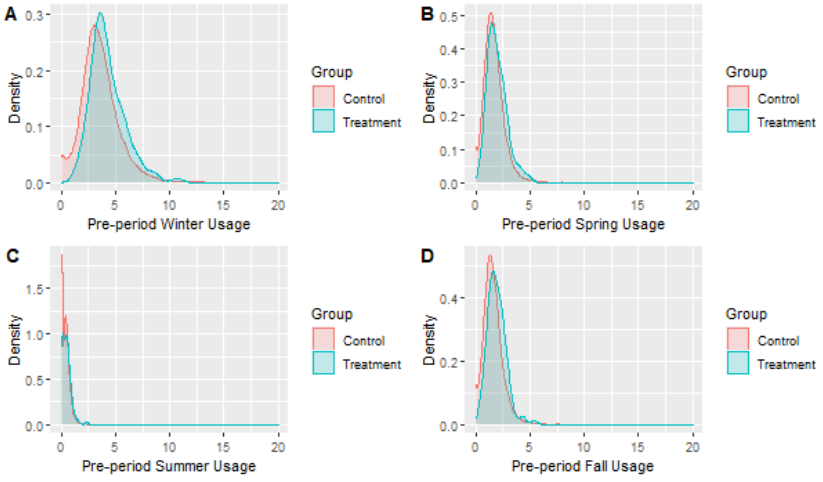


Figure 6-2: Covariate Balance After Matching, Shell Attic Insulation

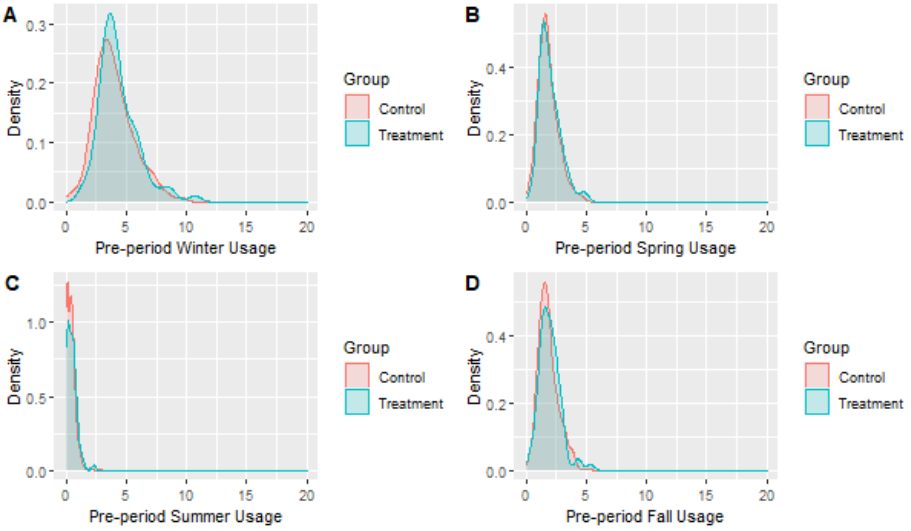


Figure 6-3: Covariate Balance Before Matching, Shell Window Replacement

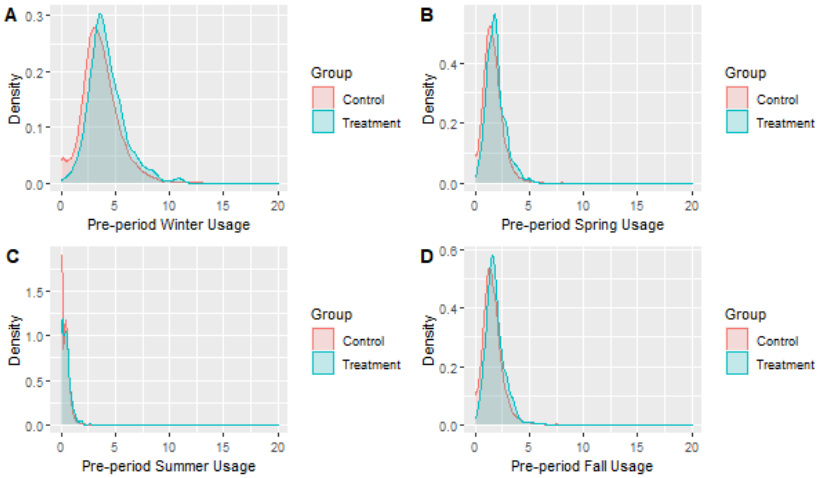
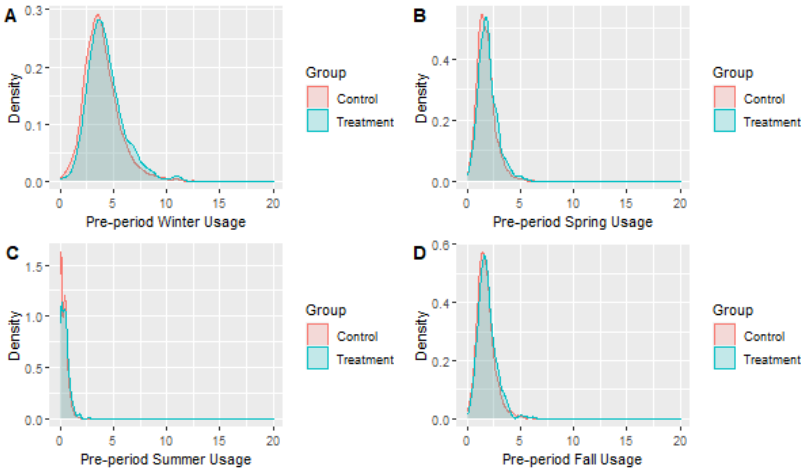


Figure 6-4: Covariate Balance After Matching, Shell Window Replacement



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, further indicating the groups were well matched on all included covariates.

Table 6-3 and Figure 6-5 provide results for the *t*-test on pre-period usage between the treatment and control groups after matching for the Shell 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 6-3: Pre-period Usage T-test for Attic Insulation, Shell Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	4.107	4.421	-1.968	0.159	0.049	Yes
Feb	3.937	4.202	-1.749	0.152	0.081	No
Mar	2.876	3.047	-1.396	0.123	0.163	No
Apr	1.980	2.084	-1.151	0.090	0.250	No
May	1.096	1.160	-0.973	0.066	0.331	No
Jun	0.567	0.626	-1.173	0.050	0.241	No
Jul	0.344	0.398	-1.722	0.032	0.085	No
Aug	0.345	0.405	-1.691	0.036	0.091	No
Sep	0.576	0.651	-1.626	0.046	0.104	No
Oct	1.643	1.727	-1.077	0.078	0.282	No
Nov	3.328	3.454	-0.925	0.136	0.355	No
Dec	4.059	4.314	-1.934	0.132	0.053	No

Table 6-4: Pre-period Usage T-test for Window Replacement, Shell Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	3.666	3.671	-0.038	0.131	0.969	No
Feb	3.553	3.528	0.195	0.127	0.846	No
Mar	2.656	2.623	0.320	0.102	0.749	No
Apr	1.879	1.832	0.585	0.080	0.559	No

May	1.079	1.054	0.422	0.058	0.673	No
Jun	0.568	0.567	0.031	0.036	0.975	No
Jul	0.350	0.367	-0.621	0.027	0.535	No
Aug	0.345	0.355	-0.366	0.026	0.714	No
Sep	0.580	0.550	0.859	0.035	0.391	No
Oct	1.521	1.484	0.547	0.067	0.584	No
Nov	2.938	2.912	0.225	0.114	0.822	No
Dec	3.619	3.618	0.005	0.108	0.996	No

Table 6-5 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 6-5: TMY Weather, Shell Program

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
G Attic Insulation With Natural Gas Heat	720322	1	726985	4207	245	5983	463
	726817	1	726985	4207	245	5983	463
	727827	1	727827	5301	724	5983	463
	727830	11	727830	5347	861	5983	463
	727834	5	727834	6773	343	5983	463
	727850	2	727850	6436	224	5983	463
	727856	43	727856	6052	437	5983	463
	727857	10	727857	6322	265	5983	463
G Window Replc With Natural Gas Heat	727827	2	727827	5301	724	6117	413
	727845	1	727845	4745	775	6117	413
	727850	6	727850	6436	224	6117	413
	727855	8	727855	7224	437	6117	413
	727856	248	727856	6052	437	6117	413
	727857	31	727857	6322	265	6117	413
	727870	10	727857	6322	265	6117	413

Table 6-6 provides annual savings per customer for the Shell program for each measure and regression model. The PPR model was selected for ex post savings because it provided the best fit for the data (highest adjusted R-squared).

Table 6-6: Measure Savings for All Regression Models, Shell Program

Measure	Model	# of Treatment Customers	# of Control Customers	Annual Savings/Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared

G Attic Insulation With Natural Gas Heat	Diff-in-diff	74	486	-28.83*	0.00	83.40	0.65
	PPR	74	486	63.75	22.59	104.91	0.92
	Treatment Only (Gross)	74	N/A	132.34	61.36	203.33	0.66
G Window Replc With Natural Gas Heat	Diff-in-diff	306	1758	-5.35*	-61.43	50.73	0.65
	PPR	306	1758	19.89*	0.00	48.47	0.93
	Treatment Only (Gross)	306	1758	19.66	57.38	-18.06	0.67

*Not statistically significant

Savings are statistically significant at the 90% level for Attic insulation and the adjusted R-squared shows the model provided an excellent fit for the data. The results of the billing analysis indicate no statistically significant savings were found for the window replacement measures.

Table 6-7: Measure Savings, Shell Program

Measure	# of Treatment Customers	# of Control Customers	Annual Savings/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	74	Model 2: PPR
G Window Replc With Natural Gas Heat	306	1758	19.89*	0.00	48.47	306	Model 2: PPR

Figure 6-5 and **Error! Reference source not found.** provide monthly TMY savings per customer for the S hell program. As expected for gas weatherization measures, the greatest savings occur during the winter months.

Figure 6-5: Attic Insulation Monthly Savings, Shell Program

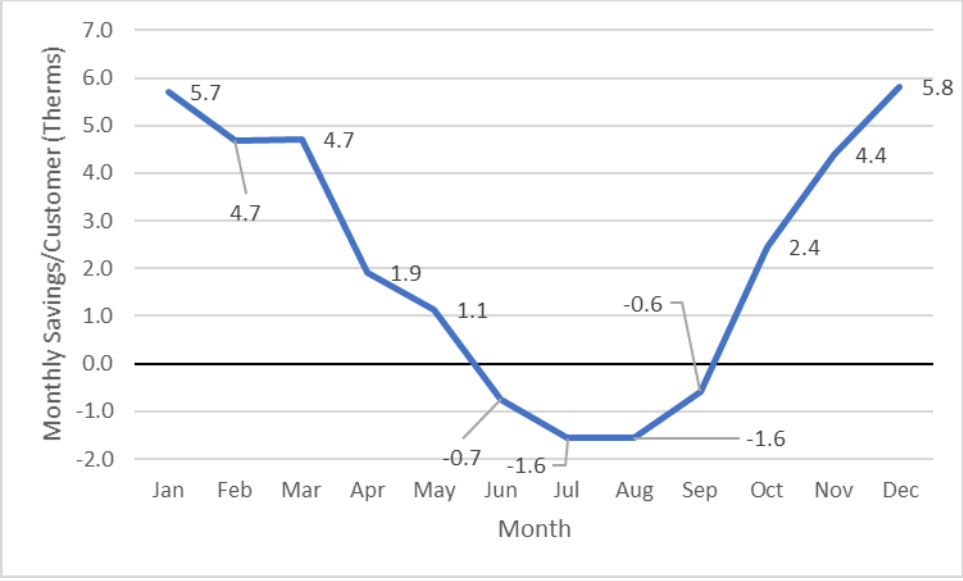
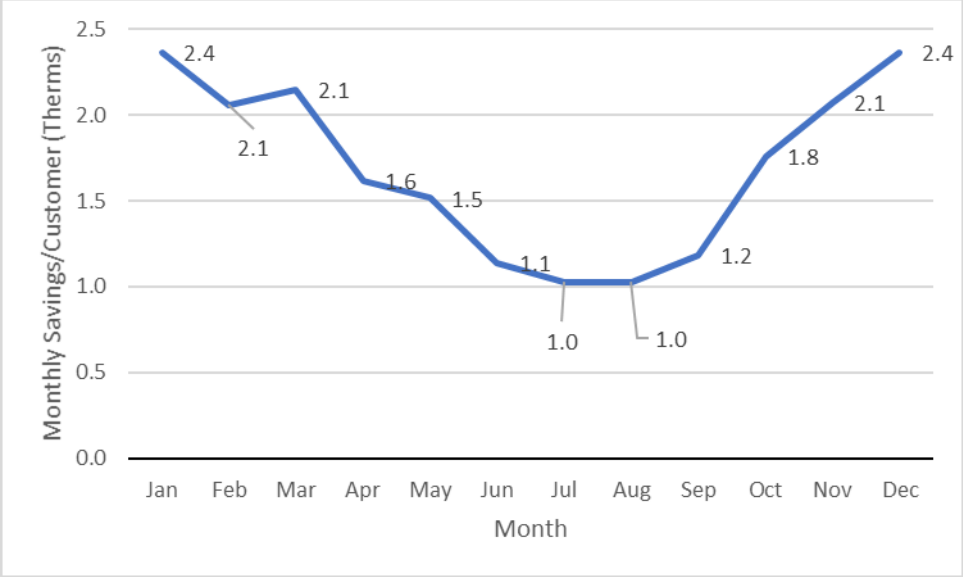


Figure 6-6: Window Replacement Monthly Savings, Shell Program



6.2 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 6-8. 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 6-8, 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 6-8: Cohort Restrictions, Low-Income Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
Whole home natural gas	Starting Count	164	1,852
	Install Date Range: January 1, 2022 to June 30, 2022	72	1,852
	Control Group Usage Outlier (>2X max treatment usage)	72	1,819
	Incomplete Post-Period Bills (<6 months)	69	1,718
	Incomplete Pre-Period Bills (<10 months)	69	1,718
	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 6-7 and Figure 6-8 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 6-7: Covariate Balance Before Matching, Low Income Gas Measures

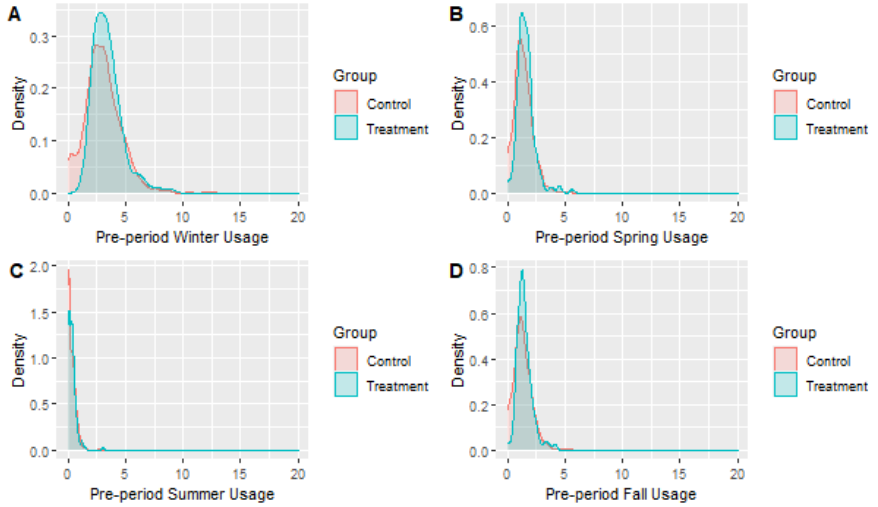
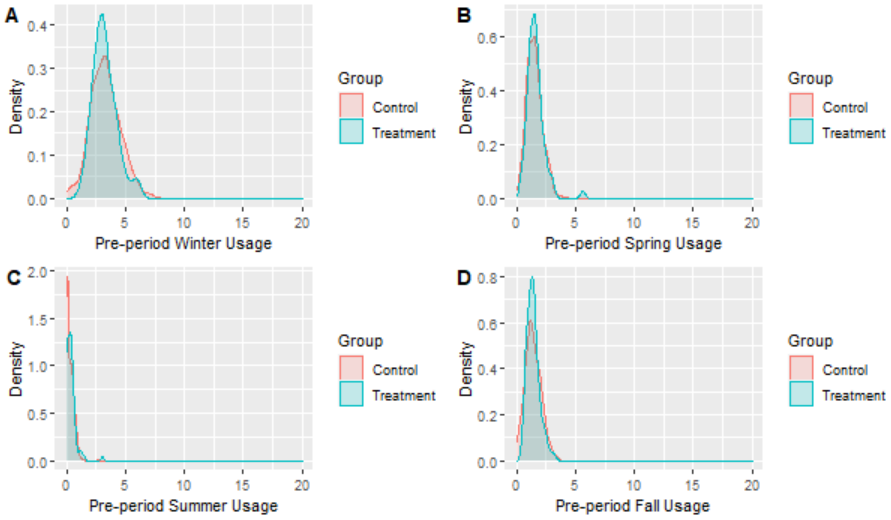


Figure 6-8: Covariate Balance After Matching, Low Income Gas Measures



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 6-9 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 6-9: 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 6-10 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 6-10: 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 6-11 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 6-11: 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[8]

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%

[8] 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_71556

Project Background

The participant is a dry cleaner that received incentives from Avista for replacing steam traps in a 100psig system. The Evaluators verified the participant had installed:

- (25) steam traps

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. Savings for the lighting measures were calculated using industry standard steam trap algorithms:

Savings Algorithm

$$therm_{savings} = \frac{Q \times Steam\ Discharge\ Rate \times OpHours \times h_{fg} \times boiler\ efficiency}{100{,}000}$$

Where:

Q = measure quantity (25)

$Steam\ Discharge\ Rate$ = steam loss in lb/hour (15.6388)

$OpHours$ = annual hours the steam system is pressurized,

h_{fg} = latent heat of evaporation in Btu/lb (888.6443)

$boiler\ efficiency$ = combustion efficiency of the boiler (80.0%)

Savings Calculations

Using deemed values from the table above, the Evaluators calculated lighting savings as follows:

Table 8-1: Steam Trap Savings Calculations

Quantity	Steam flow (lb/hr)	Heating hours	Latent heat of steam (BTU/lb)	Boiler Efficiency	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
25	15.64	2,600	888.64	80.0%	12,208	11,292	11,292	92.5%

Results

For project # SSLP_71556 the Therm realization rate is 92.5%.

Table 8-2: Verified Gross Savings, Realization Rates, & Adjustments

Measure	Expected Therm Savings	Adjusted Therm Savings	Verified Therm Savings	Realization Rate
Steam Trap Replacement	12,208	11,292	11,292	92.5%

Ex ante calculations used an approximation for latent heat of vaporization based on a gauge pressure of 5 psi. The verified gauge pressure is 100. Latent heat of vaporization was calculated using a saturated steam table.

Project Number SSLP_82019

Project Background

The participant is a religious gathering facility that received incentives from Avista for replacing two natural gas boilers.

- (2) natural gas 'indirect' water heaters

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 and operating as described 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 (50 degrees).

Savings Calculations

Using data described above, the Evaluators calculated lighting savings as follows:

Table 8-3: HDD and Model Fit

HDD base	'Pre' model R^2	'Post 'Model R^2
55	0.96	0.99

Table 8-4: Pre/Post Use and Therm Savings

Expected Therm Savings	Annual Pre Usage (Therms)	Annual Post Usage (Therms)	Verified Therm Savings	Realization Rate
2,007	18,279	12,594	5,685	283.3%

Results

For project #82019 the Therm realization rate is 283.3%.

Table 8-5: Verified Gross Savings, Realization Rates, & Adjustments

Measure	Verified Therm Savings	Therm Realization Rate	Therm Adjustments
Two (2) NG 'indirect' water heaters	5,685	283.3%	0
Totals:	**5,685**	**283.3%**	**0**

Measured savings are higher than ex ante predictions.

Project Number SSOP_80123

Project Background

The participant is automotive repair facility that received incentives from Avista for retrofitting high performance (better insulating) windows. The Evaluators verified the participant had installed:

- 109 Sq ft of new windows with a U value of .027

M&V Methodology

The Evaluators reviewed all project documentation including, plans, photos and invoices, as well as conducted on on-site visit to verify the installation of rebated equipment and total square footage installed. Expected savings calculations were examined and were found to be accurate with appropriate assumptions made. A regression analysis was conducted using metered billing data, however no statistically significant results could be obtained. The results that were obtained did corroborate claimed savings. The Evaluators compared claimed savings with a brief benchmark study of the same measure in similar buildings/climate zones, finding similar savings estimates.

Savings Calculations

Table 8-6: Window Retrofit Therms Savings Calculations

Measure	Total SqFt Replaced	Pre U-Value	Post U-Value	Pre SC	Post SC	Pre SHGC	Post SHGC	Expected Therm Savings	Verified Therm Savings	Realization Rate
High Efficiency Windows	109	1.00	0.27	0.87	0.35	0.87	0.30	132.45	132.45	100.0%

Results

For project # SSOP_80123, the Therms realization rate is 100.0%.

Table 8-7: Verified Gross Savings & Realization Rates

Measure	Verified Therm Savings	Adjusted Therm Savings	Realization Rate
High Efficiency Windows	132.45	132.45	100.0%

Project Number SSOP_81307

Project Background

The participant is a new primary school that received incentives from Avista for installing reduced power density lighting, (2) high efficiency boilers, and above code insulation. The Evaluators verified the participant had installed:

- (2) 2000 kBTU Arctic boilers
- Mass Wall Insulation: R13 batt and R10 continuous foam board
- Steel Framed Wall Insulation: R19 batt and R10 continuous foam board

M&V Methodology

The Evaluators reviewed all project documentation including plans, calculators, photos and invoices, to verify the installation of rebated equipment.

Boiler:

Savings for the boiler measure were calculated using eQuest modeling software. The evaluator examined the eQuest input files and determined that the high efficiency boiler measure was modeled correctly. Since there were no discrepancies in the model, the realization rate for the boiler measure is 100%.

The values used in calculating energy and demand savings are presented in the table below.

Table 8-8: eQuest Model Outputs - Boilers

Measure	Baseline kBtu	Verified kBtu	kBtu Savings	Therms Savings
High Efficiency Boilers	1,936,759	1,422,728	514,031	5,140

Insulation:

Savings for the insulation measure were also calculated using eQuest modeling software. The evaluator examined the eQuest input files and determined that most of the insulation measure looks accurate, however, the post-install R value looked understated for the mass walls.

There was an R value increase of 6 for the upper section of the building which aligns with the new insulation on the steel framed walls. For the mass walls, the R value increases by only 0.5 for the first-floor exterior walls. It was difficult to determine the exact scope of the insulation measure given the information that was available to the evaluator for this site. It is quite possible that this was modeled correctly and there were on-site restrictions to what insulation could be installed in the mass-walls. If there is any discrepancy in the model and what was installed, I believe the model would be conservative.

Table 8-9: eQuest Model Outputs - Insulation

Measure	Baseline kBtu	Verified kBtu	kBtu Savings	Therms Savings
High Efficiency Boilers	1,422,728	1,410,426	12,302	123

Results

For project SSOP_81307 the Therm realization rate is 100.0%.

Table 8-10: Verified Gross Savings, Realization Rates, & Adjustments

Measure	Verified Therm Savings	Adjusted Therm Savings	Therm Realization Rate
Boilers	5,140.00	5,140.00	100.0%
Insulation	123.00	123.00	100.0%
Totals:	**5,263.00**	**5,263.00**	**100.0%**

9. Appendix D: Cost Benefit Analysis Results

The Evaluators estimated the cost-effectiveness for the Avista Residential and Low-Income Programs using evaluated savings results, economic inputs provided by Avista, and incremental costs and non-energy impacts from the RTF. The table below presents the cost-effectiveness results for the PY2022 portfolio.

Table 9-1: Cost-Effectiveness Results

Sector	TRC	UCT	RIM	PCT
Residential	1.22	2.57	0.07	5.78
Residential Low Income	0.66	0.16	0.05	N/A*
Nonresidential	2.88	1.90	1.91	28.22
Total	**1.21**	**1.79**	**0.08**	**N/A***
***Low Income is offered at no cost to participants; PCT is not calculable.**				

9.1 Approach

The California Standard Practice Model was used as a guideline for the calculations. The cost-effectiveness analysis methods that were used in this analysis are among the set of standard methods used in this industry and include the Utility Cost Test (UCT)[9], Total Resource Cost Test (TRC), Ratepayer Impact Measure Test (RIM), and Participant Cost Test (PCT). All tests weigh monetized benefits against costs. These monetized amounts are presented as NPV evaluated over the lifespan of the measure. The benefits and costs differ for each test based on the perspective of the test. The definitions below are taken from the California Standard Practice Manual.

- The TRC measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs.
- The UCT measures the net costs of a demand-side management program as a resource option based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. Costs are defined more narrowly.
- The PCT is the measure of the quantifiable benefits and costs to the customer due to participation in a program. 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.
- The RIM test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills will go up if revenues collected after program implementation is less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels.

[9] The UCT is also referred to as the Program Administrator Cost Test (PACT).

A common misperception is that there is a single best perspective for evaluation of cost-effectiveness. Each test is useful and accurate, but the results of each test are intended to answer a different set of questions. The questions to be addressed by each cost test are shown in the table below.[10]

Table 9-2: Questions Addressed by the Various Cost Tests

Cost Test	Questions Addressed
Participant Cost Test (PCT)	▪ Is it worth it to the customer to install energy efficiency?
	▪ Is it likely that the customer wants to participate in a utility program that promotes energy efficiency?
Ratepayer Impact Measure (RIM)	▪ What is the impact of the energy efficiency project on the utility's operating margin?
	▪ Would the project require an increase in rates to reach the same operating margin?
Utility Cost Test (UCT)	▪ Do total utility costs increase or decrease?
	▪ What is the change in total customer bills required to keep the utility whole?
Total Resource Cost Test (TRC)	▪ What is the regional benefit of the energy efficiency project (including the net costs and benefits to the utility and its customers)?
	▪ Are all of the benefits greater than all of the costs (regardless of who pays the costs and who receives the benefits)?
	▪ Is more or less money required by the region to pay for energy needs?

Overall, the results of all four cost-effectiveness tests provide a more comprehensive picture than the use of any one test alone. The TRC cost test addresses whether energy efficiency is cost-effective overall. The PCT, UCT, and RIM address whether the selection of measures and design of the program are balanced from the perspective of the participants, utilities, and non-participants. The scope of the benefit and cost components included in each test are summarized in the table below.[11]

Table 9-3: Benefits and Costs Included in Each Cost-Effectiveness Test

Test	Benefits	Costs
PCT (Benefits and costs from the perspective of the customer installing the measure)	▪ Incentive payments ▪ Bill Savings ▪ Applicable tax credits or incentives	▪ Incremental equipment costs ▪ Incremental installation costs

[10] http://www.epa.gov/cleanenergy/documents/suca/cost-effectiveness.pdf
[11] Ibid.

Test	Benefits	Costs
UCT (Perspective of utility, government agency, or third party implementing the program	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Program overhead costs ▪ Utility/program administrator incentive costs
TRC (Benefits and costs from the perspective of all utility customers in the utility service territory)	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution ▪ Additional resource savings ▪ Monetized non-energy benefits	▪ Program overhead costs ▪ Program installation costs ▪ Incremental measure costs
RIM (Impact of efficiency measure on non-participating ratepayers overall)	▪ Energy-related costs avoided by the utility ▪ Capacity-related costs avoided by the utility, including generation, transmission, and distribution	▪ Program overhead costs ▪ Lost revenue due to reduced energy bills ▪ Utility/program administrator installation costs

9.2 Non-Energy Benefits

Non-energy Benefits (NEBs) were sourced from the 2022 Annual Conservation Plan developed by Avista. NEBs avoided illness from air pollution, avoided calls to the utility, avoided fires/insurance damage, and other impacts relative to energy efficiency upgrades offered to customers in each of Avista's programs.

- Residential measures with NEBs included air source heat pumps, ductless heat pumps, windows, and insulation measures.
- Low Income NEBs included the NEBs described for Residential as well as a dollar-for-dollar benefit adder for health and safety spending.

9.3 Economic Inputs for Cost Effectiveness Analysis

The Evaluators used the economic inputs provided by Avista for the cost benefit analysis. Avista provided the Evaluators with avoided costs on the following basis:

- Hourly avoided commodity costs
- Modifications for the Clean Premium
- Avoided capacity costs
- Avoided transmission

- 10% Conservation Adder
- Line losses
- Discount rate (after tax Weighted Average Cost of Capital)

The values were aggregated to provide a single benefit multiplier on a Therms basis for every hour of the year (8,760). Savings by measure were then parsed out to the following load shapes provided by Avista:

- Residential Space Heating
- Residential Air Conditioning
- Residential Lighting
- Residential Refrigeration
- Residential Water Heating
- Residential Dishwasher
- Residential Washer/Dryer
- Residential Furnace Fan
- Residential Miscellaneous

The Evaluators in addition created a Residential Heat Pump load shape by weighting the relative magnitude of cooling versus heating savings from a heat pump and assigning these to weight the Residential Space Heating and Residential Air Conditioning load shapes.

9.4 Results

The tables below outline the results for each test, for both the programs and the portfolio as a whole. Summations may differ by $1 due to rounding.

Table 9-4: Cost-Effectiveness Results by Sector

Sector	TRC	UCT	RIM	PCT
Residential	1.22	2.57	0.07	5.78
Residential Low Income	0.66	0.16	0.05	N/A*
Nonresidential	2.88	1.90	1.91	28.22
Total	**1.21**	**1.79**	**0.08**	**N/A***
***Low Income is offered at no cost to participants; PCT is not calculable.**				

Table 9-5: Cost-Effectiveness Benefits by Sector

Program	TRC Benefits	UCT Benefits	RIM Benefits	PCT Benefits
Residential	$11,945,017	$9,022,383	$9,023,183	$55,770,936
Residential Low Income	$1,128,387	$273,404	$273,888	$2,538,173
Nonresidential	$1,401,496	$814,494	$820,459	$5,626,701
Total	**$14,474,899**	**$10,110,282**	**$10,117,531**	**$63,935,810**

Table 9-6: Cost-Effectiveness Costs by Sector

Program	TRC Costs	UCT Costs	RIM Costs	PCT Costs

Residential	$9,807,343	$3,517,470	$125,767,140	$9,648,613
Residential Low Income	$1,717,014	$1,717,014	$5,125,936	$1,292,900
Nonresidential	$487,108	$428,260	$428,260	$199,380
Total	**$12,011,465**	**$5,662,744**	**$131,321,336**	**$11,140,892**

Table 9-7: Cost-Effectiveness Net Benefits by Sector

Program	TRC Net Benefits	UCT Net Benefits	RIM Net Benefits	PCT Net Benefits
Residential	$2,137,673	$5,504,914	($116,744,756)	$46,122,323
Residential Low Income	($588,627)	($1,443,610)	($4,852,532)	$1,245,272
Nonresidential	$914,388	$386,234	$386,234	$5,427,322
Total	**$2,463,434**	**$4,447,538**	**($121,211,055)**	**$52,794,918**

APPENDIX C – 2022 COST-EFFECTIVENESS TABLES

Electric

Electric Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 35,295,831	$ 22,489,310	1.57
Utility Cost Test (UCT)	$ 26,791,072	$ 10,084,412	2.66
Participant Cost Test (PCT)	$ 33,720,233	$ 20,435,922	1.65
Ratepayer Impact (RIM)	$ 26,791,072	$ 36,791,601	0.73

Electric Portfolio (without Low-Income)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 33,440,303	$ 20,905,591	1.60
Utility Cost Test (UCT)	$ 26,136,977	$ 8,500,693	3.07
Participant Cost Test (PCT)	$ 32,091,719	$ 19,288,638	1.66
Ratepayer Impact (RIM)	$ 26,136,977	$ 34,641,900	0.75

Residential (Prescriptive and MDFI)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 4,368,732	$ 3,139,052	1.39
Utility Cost Test (UCT)	$ 3,670,504	$ 2,443,994	1.50
Participant Cost Test (PCT)	$ 4,101,751	$ 3,110,106	1.32
Ratepayer Impact (RIM)	$ 3,670,504	$ 5,762,539	0.64

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 29,071,571	$ 17,766,539	1.64
Utility Cost Test (UCT)	$ 22,466,473	$ 6,056,699	3.71
Participant Cost Test (PCT)	$ 27,989,968	$ 16,178,532	1.73
Ratepayer Impact (RIM)	$ 22,466,473	$ 28,879,360	0.78

Multifamily Direct Install

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 678,627	$ 697,099	0.97
Utility Cost Test (UCT)	$ 616,934	$ 697,099	0.89
Participant Cost Test (PCT)	$ 959,927	$ 1,583,719	0.61
Ratepayer Impact (RIM)	$ 616,934	$ 1,295,086	0.48

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 3,690,105	$ 2,441,953	1.51
Utility Cost Test (UCT)	$ 3,053,570	$ 1,746,895	1.75
Participant Cost Test (PCT)	$ 3,141,824	$ 1,526,387	2.06
Ratepayer Impact (RIM)	$ 3,053,570	$ 4,467,453	0.68

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 1,855,528	$ 1,583,719	1.17
Utility Cost Test (UCT)	$ 654,095	$ 1,583,719	0.41
Participant Cost Test (PCT)	$ 1,628,514	$ 1,147,284	1.42
Ratepayer Impact (RIM)	$ 654,095	$ 2,149,701	0.30

Natural Gas

Natural Gas Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 14,502,734	$ 12,018,961	1.21
Utility Cost Test (UCT)	$ 10,135,585	$ 5,670,240	1.79
Participant Cost Test (PCT)	$ 64,115,695	$ 11,148,180	5.75
Ratepayer Impact (RIM)	$ 10,142,834	$ 131,648,733	0.08

Natural Gas Portfolio (without Low-Income)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 13,374,347	$ 10,301,947	1.30
Utility Cost Test (UCT)	$ 9,862,181	$ 3,953,226	2.49
Participant Cost Test (PCT)	$ 61,577,523	$ 9,855,280	6.25
Ratepayer Impact (RIM)	$ 9,868,946	$ 126,522,796	0.08

Residential (Prescriptive and MDFI)

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 11,972,851	$ 9,814,839	1.22
Utility Cost Test (UCT)	$ 9,047,687	$ 3,524,966	2.57
Participant Cost Test (PCT)	$ 55,950,822	$ 9,655,901	5.79
Ratepayer Impact (RIM)	$ 9,048,487	$ 126,094,536	0.07

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 1,401,496	$ 487,108	2.88
Utility Cost Test (UCT)	$ 814,494	$ 428,260	1.90
Participant Cost Test (PCT)	$ 5,626,701	$ 199,380	28.22
Ratepayer Impact (RIM)	$ 820,459	$ 428,260	1.92

Multifamily Direct Install

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 27,834	$ 7,496	3.71
Utility Cost Test (UCT)	$ 25,304	$ 7,496	3.38
Participant Cost Test (PCT)	$ 179,886	$ 7,288	24.68
Ratepayer Impact (RIM)	$ 25,304	$ 327,396	0.08

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 11,945,017	$ 9,807,343	1.22
Utility Cost Test (UCT)	$ 9,022,383	$ 3,517,470	2.57
Participant Cost Test (PCT)	$ 55,770,936	$ 9,648,613	5.78
Ratepayer Impact (RIM)	$ 9,023,183	$ 125,767,140	0.07

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 1,128,387	$ 1,717,014	0.66
Utility Cost Test (UCT)	$ 273,404	$ 1,717,014	0.16
Participant Cost Test (PCT)	$ 2,538,173	$ 1,292,900	1.96
Ratepayer Impact (RIM)	$ 273,888	$ 5,125,936	0.05

APPENDIX D – 2022 EXPENDITURES BY PROGRAM

Program	Electric	Natural Gas	Total
Energy Efficiency			
Low-Income/CEEP			
Low-Income	$ 953,767	$ 1,292,900	$ 2,246,667
CEEP	$ 193,517	$ -	$ 193,517
Residential			
ENERGY STAR Homes	$ 34,000	$ 2,980	$ 36,980
HVAC	$ 164,667	$ 2,526,511	$ 2,691,179
Multifamily Direct Install	$ 321,571	$ 7,288	$ 328,859
Shell	$ 157,184	$ 597,496	$ 754,680
Small Homes and Multifamily Weatherization	$ 48,504	$ 34,966	$ 83,470
Appliances	$ 43,900	$ 9,400	$ 53,300
Aerobarrier	$ 9,003	$ 16,002	$ 25,005
Water Heater	$ 52,500	$ 162,200	$ 214,700
Commercial/Industrial			
Site-Specific	$ 1,275,463	$ 26,556	$ 1,302,019
Sign Lighting	$ 53,010	$ -	$ 53,010
Grocer	$ 13,430	$ -	$ 13,430
Food Services	$ 5,250	$ 26,650	$ 31,900
Green Motors	$ 3,038	$ -	$ 3,038
HVAC	$ 3,060	$ 41,789	$ 44,849
Shell	$ 1,603	$ 45,537	$ 47,140
Exterior Lighting	$ 764,408	$ -	$ 764,408
Interior Lighting	$ 2,349,431	$ -	$ 2,349,431
Energy Efficiency Total	**$ 6,253,790**	**$ 4,790,276**	**$ 11,044,065**
Market Transformation			
Northwest Energy Efficiency Alliance	$ **1,507,782**	$ **607,597**	$ 1,795,247
Brio Eastside Market Transformation	$ 175,700	$ -	$ 175,700
Market Transformation Total	**$ 1,683,482**	**$ 607,597**	**$ 1,970,947**
Other Programs and Activities			
General Implementation	$ 162,597	$ 85,541	$ 248,138
Labor Costs	$ 2,027,454	$ 377,740	$ 2,405,194
Advertising and Outreach	$ 618,552	$ 85,671	$ 704,223
Third Party Implementation	$ 305,140	$ 388,078	$ 693,218
Pilot Programs	$ 443,009	$ 60,042	$ 503,051
EM&V/CPA	$ 262,984	$ 148,478	$ 411,462
CEEP Funds (Inclusive of PY reimb)	$ (91,818)	$ 119,040	$ 27,222
Other	$ 89,311	$ 9,761	$ 99,072
Other Programs and Activities Total	**$ 3,817,230**	**$ 1,274,350**	**$ 5,091,580**
Grand Total	**$ 11,754,502**	**$ 6,272,223**	**$ 18,106,592**

APPENDIX E – 2022 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	187	Homes	85,169	$ 937,886	357	Homes	7,015	$ 1,416,070
HVAC	59	Units	178,293	$ 208,171	2	Units	3,714	$ 3,490
Water Heat	0	Units	0	$ 0	114	Units	976	$ 183,039
Outreach/Giveaways	16	Events	116	$ 188,444	0	NA	0	$ 0
Health and Safety	47	HHS	0	$ 809	550	HHS	0	$ 114,415
Energy Star Refrigerator	1	Units	39	$ 10,660	0	Units	0	$ 0
CEEP	16	Units	94,819	$ 237,749	0	Units	0	$ 0
Low-Income Total			**358,436**	**$ 1,583,719**			**11,705**	**$ 1,717,014**
Residential								
ENERGY STAR Homes	38	Homes	66,555	$ 79,466	5	Homes	536	$ 3,142
HVAC	409	Furnace, Tstat	522,790	$ 402,328	5,441	Furnace, Tstat	370,728	$ 2,646,039
Water Heat	105	Units	136,058	$ 97,406	486	Units	33,696	$ 172,096
Multifamily Direct Install	8,650	Units (Measures)	558,895	$ 506,479	625	Units (Measures)	1,880	$ 7,658
Shell	270	Windows, Insulation	264,602	$ 438,676	1,101	Windows, Insulation	62,356	$ 624,563
Appliances	630	Washer/Dryer	82,327	$ 70,483	189	Washer/Dryer	972	$ 9,568
Multifamily Weatherization	108	Units (Measures)	129,232	$ 142,591	69	Units (Measures)	4,756	$ 36,443
AeroBarrier	4	Units (Measures)	1,077	$ 9,465	17	Units (Measures)	322	$ 17,961
Residential Total			**1,761,536**	**$ 1,746,895**			**475,245**	**$ 3,517,470**
Commercial/Industrial								
Site Specific	48	Projects	6,393,005	$ 1,824,441	5	Projects	22,372	$ 94,386
Compressed Air	0	Units	0	$ 0	0	NA	0	$ 0
Grocer	9	Projects	141,653	$ 24,506	0	Projects	0	$ 0
Food Services	6	Projects	31,611	$ 7,191	19	Projects	13,613	$ 86,428
Green Motors	8	Motor Rewinds	17,752	$ 3,042	0	NA	0	$ 0
HVAC	2	Units	15,637	$ 4,512	40	Units	13,863	$ 112,195
Shell	6	Projects	87,530	$ 12,006	8	Projects	8,971	$ 161,079
Exterior Lighting	599	Projects	3,583,727	$ 1,072,056	-	NA	0	$ 0
Interior Lighting	1102	Projects	10,629,769	$ 3,108,132	-	NA	0	$ 0
Commercial/Industrial Total			**20,900,684**	**$ 6,055,886**			**58,819**	**$ 454,089**
Energy Efficiency Total			**23,020,657**	**$ 9,386,500**			**545,769**	**$ 5,688,572**

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Spokane, Washington