2021 Idaho Annual Conservation Report

August 1, 2022

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.

Coeur d'Alene, Idaho

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Bonners Ferry, Idaho

INTRODUCTION

For more than four decades, Avista has served its communities by developing and implementing reliable and cost-effective energy-efficiency programs. The 2021 *Annual Conservation Report* provides a synopsis of those efforts for the company's electric and natural gas customers in the state of Idaho – efforts that are designed not only to provide a least-cost resource, but also to help these customers conserve energy, save money, and live more comfortably – and delivers the results of third-party assessments of Avista's efficiency program portfolio performance.

Recommendations from these assessments, 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.

Throughout 2021, COVID-19 continued to have significant impacts both on Avista's customers and on its electric and natural gas conservation achievements. The pandemic required customers to adapt their day-to-day activities, causing them to reprioritize how they invest their time, money, and energy. Avista programs continued to focus on affordability and flexibility so that opportunities remained available to customers who wished to pursue efficiency in their homes or businesses. While Avista made changes to manage its Energy-Efficiency Program, the overall conservation achieved in 2021 continued to be affected by lower participation rates. Nevertheless, the company made meaningful modifications to its outreach efforts and took steps to ensure customers stayed connected. These efforts are discussed in more detail in this report. In addition to offering a mix of programs implemented both by the company and by third-party contractors, Avista funds the regional market transformation effort through the Northwest Energy Efficiency Alliance (NEEA). Reported electric energy savings, cost-effectiveness, and other related data, however, are specific to local programs unless otherwise noted.

Note that the electric and natural gas savings conveyed in this report are provided as gross values based on all program participants.

FIGURE 1 – ELECTRIC AND NATURAL GAS SERVICE AREAS

TARIFF RIDER BALANCES

At the start of 2021, the Idaho electric and natural gas (aggregate) tariff rider balances were underfunded by nearly $1.6 million. During the year, approximately $12.1 million in tariff rider revenue was collected to fund energy efficiency, while over $9.2 million was expended to operate energy-efficiency programs. The $2.9 million excess of collections over expenditures contributed to the decrease in the underfunded balance of the tariff riders, resulting in an overfunded balance close to $1.3 million by year-end.

Table 1 illustrates the 2021 tariff rider activity by fuel type.

TABLE 1 – TARIFF RIDER ACTIVITY

	Electric	Natural Gas	Total
Beginning Balance (Underfunded)/Overfunded	**$ (574,186)**	**$ (1,021,500)**	**$ (1,595,686)**
Energy-Efficiency Funding	$ 10,700,382	$ 1,401,103	$ 12,101,485
Net Funding of Operations	$ 10,126,196	$ 379,603	$ 10,505,798
Energy-Efficiency Expenditures	$ 6,763,901	$ 2,446,649	$ 9,210,550
Ending Balances (Underfunded)/Overfunded	**$ 3,362,295**	**$ (2,067,047)**	**$ 1,295,248**

IDAHO ACHIEVEMENTS

- ***Electric Conservation:*** For 2021, Avista's electric Energy-Efficiency Program achieved 13,509,604 kWh of conservation from local programs.
- ***Natural Gas Conservation:*** For 2021, Avista's natural gas Energy-Efficiency Program achieved 300,000 therms of conservation from local programs.
- ***NEEA Conservation:*** An additional 3,416 MWh were conserved through the Northwest Energy Efficiency Alliance (NEEA) program, resulting in overall electric savings of 16,926 MWh; an additional 152,881 therms led to an overall natural gas savings of 452,881 therms.

Note: This *Annual Conservation Report* is intended to provide information on Avista's local programs and therefore will consistently refer to the local achievement of 13,509,604 kWh for electric and 300,000 therms for natural gas.

Program Impacts

COVID-19

COVID-19 continued to have multiple and far-reaching impacts on Avista's customers in 2021, though those impacts were significantly different from those of 2020. The job market made a strong recovery, 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 experienced supply chain problems, further contributing to delays. Avista continued to adapt its Energy-Efficiency Program to provide support for customers to help them through the pandemic.

COVID-19 Emergency Operating Plan Stages and Response

Early in 2020, Avista operated at the monitoring and precautions stages of its emergency operating plan (EOP), with additional precautions put in place to protect the safety of employees and customers. At the beginning of March 2020, the company had moved into the preventative stage, which increased restrictions and limited customer interactions. Within the same month, Avista had skipped the responsive stage and moved to critical, which places the highest restrictions on meetings, public interactions, travel, and customer-related work. In addition, all non-essential employees moved to a work-from-home model. Avista remained in the critical stage throughout 2021.

Table 2 illustrates the four stages of the COVID-19 EOP.

TABLE 2 – AVISTA COVID-19 EMERGENCY OPERATING PLAN STAGES

Stage	Monitoring and Precautions	Preventative	Responsive	Critical
Description	A regional health or safety threat exists with potential impact to Avista operations and/ or employees. Avista is monitoring and preparing to take necessary actions.	Regional organizations and/ or public health officials begin recommending preventative actions. Avista is mitigating risks to ensure it can continue to provide essential services to its customers.	Either the threat has affected employees or service territory directly or an impact is clearly imminent. Avista is actively responding to protect employees, customers, and essential services.	The threat to essential services is severe. Avista is taking critical measures to protect employees and essential services.
Public Interactions	Precautions	Additional precautions	Limited	Critical only
Meetings	Normal	Large postponed, virtual encouraged	Virtual only	Virtual only
Travel	Discretionary/limit high-risk	Limit non-essential	Essential only	Emergency only
DSM Staff Desk Work	Remote work voluntary	Remote work recommended	Remote work mandatory	Remote work mandatory
DSM Customer Site Work	Call ahead to check with customer.	Ask permission to work on customer site. Go to campus only for instruments.	Ask customer for essential work only. Plan trips to Avista campus for supplies to avoid others. Meet with two or fewer people at the customer site and maintain social distance.	Request through account executive that customer send information necessary for projects. No trips to Avista campus or customer without permission from manager.

The additional restrictions placed on demand-side management (DSM) customer site work and on programs with high customer interaction created challenges for programs within Avista's energy-efficiency portfolio. Customer-facing offerings such as the Multifamily Direct Install (MFDI) Program and the residential Home Energy Audit Program were placed on hold, since their inherent design includes entering customer homes. Avista maintains that customer safety continues to be a top priority and looks forward to resuming these programs in 2022.

Program Modifications during COVID-19

Installation Verification: Avista continued its modified approach to installation verification in 2021. For projects normally requiring on-site verification, the company allowed customers to submit photos in lieu of an in-person site visit. For some projects, Avista participated in live video chats with owners to verify equipment installation. This approach prioritized the safety of both workers and customers.

Multifamily Direct Install: This program uses the direct installation of LED lighting, faucet aerators, low-flow showerheads, and other measures to help multifamily customers save energy and reduce costs. Throughout 2021, the MFDI implementation team attempted multiple approaches to program delivery that did not require installers to enter multifamily homes, including a pilot approach that enabled customers to drop off their old equipment and pick up new energy-efficient items. This pilot is discussed in more detail later in the report.

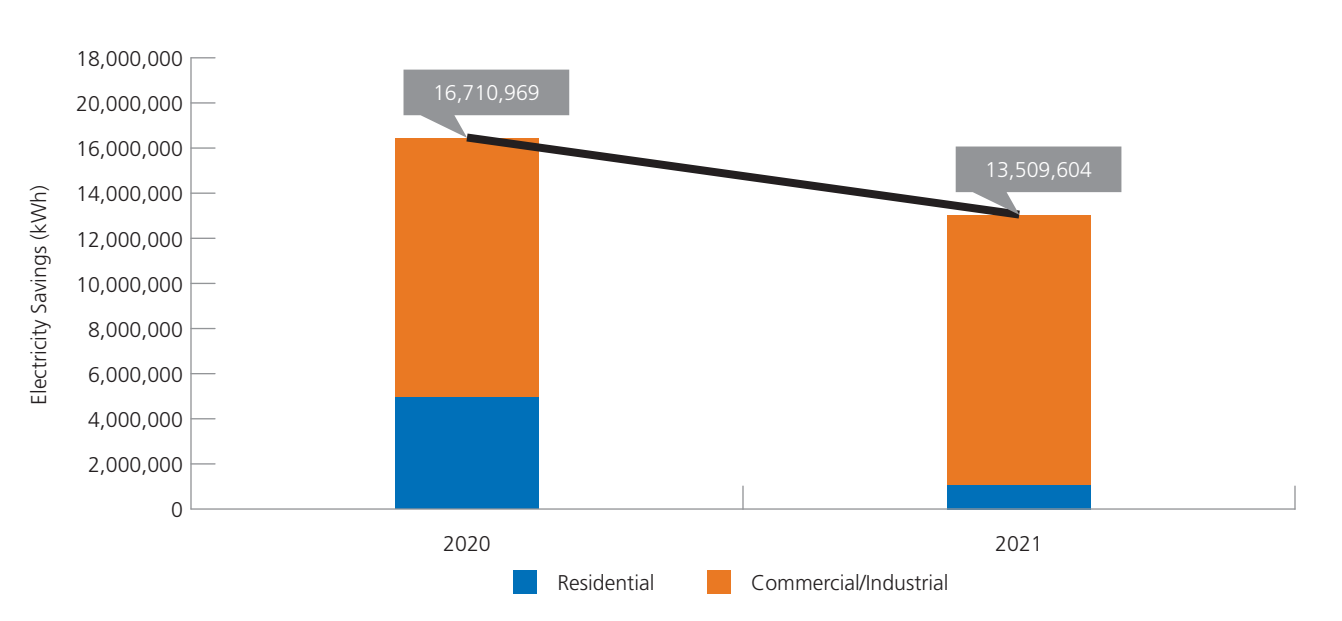
Account Executives: Avista's account executive (AE) team is responsible for interacting with commercial and industrial customers. COVID-19 continued to present challenges for the AE team in 2021. (Avista's EOP critical phase significantly limited face-to-face meetings; many business customers had similar restrictions.) Impacts ranged from customers closing operations for months to operating under reduced hours and workforce to, in some cases, increased demand for business and product. Customers have consequently had to re-evaluate energy-efficiency projects and how to fund them. Several have delayed or canceled capital expenditures, directly affecting energy-efficiency projects. In response, the AE team pursued every opportunity to continue to engage with customers while adhering to the restrictions.

Customer Outreach: Energy fairs and outreach events were canceled throughout the 2020-21 period, leaving a significant hole in Avista's ability to engage in-person within the communities it serves. The company developed outreach kits that contained low-cost, energy-saving items, and partnered with Meals on Wheels to help distribute them. The kits included window plastic, LED lamps, nightlights, energy-saving tips, and information on assistance programs.

Portfolio Trends

As shown in Figure 2, Avista's energy savings achieved in 2021 were lower than in 2020 (16,710,969 kWh vs 13,509,604 kWh). This decrease was greatly attributed to the reduction in residential program savings, e.g., the expiration of the Simple Steps, Smart Savings Program and lower activity in the Multifamily Direct Install Program. Savings acquired through the company's residential program decreased 73 percent between 2020 and 2021, while commercial/industrial programs increased 11 percent.

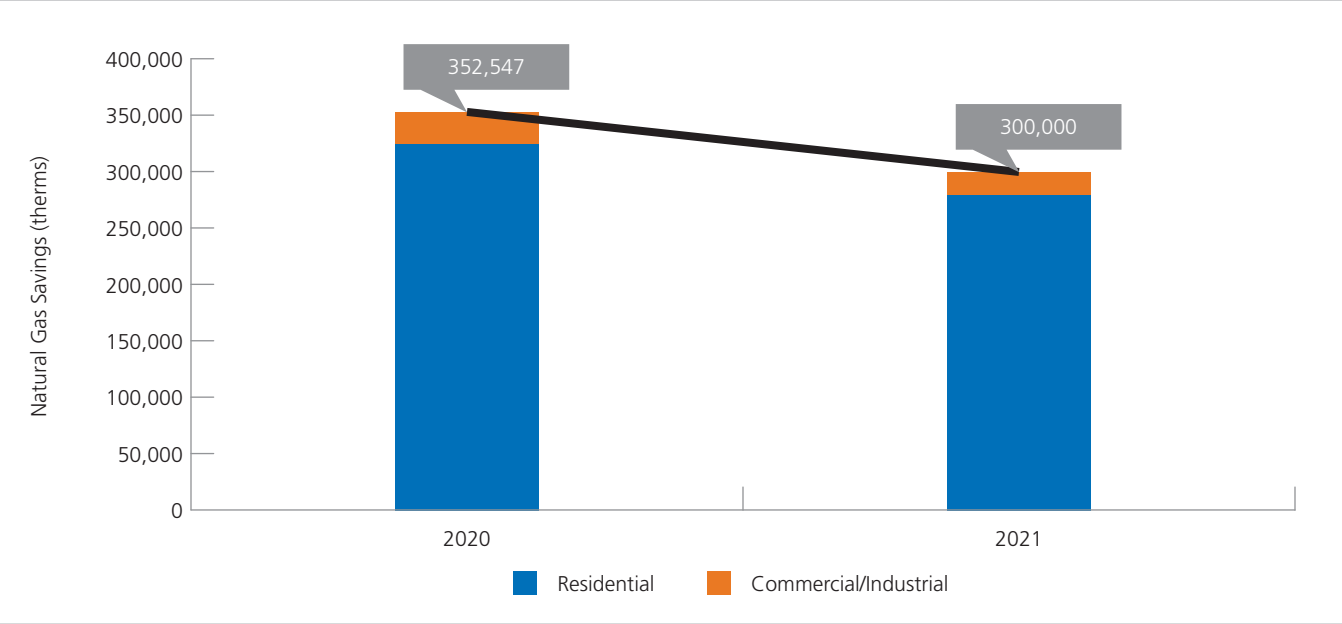
FIGURE 2 – ELECTRIC ENERGY SAVINGS (2020-21)



Customer Segment	2020	2021
Residential (Inclusive of Low-Income Programs)	5,497,847	1,566,738
Commercial/Industrial	11,213,122	11,942,866
Total	**16,710,969**	**13,509,604**

As shown in Figure 3, Avista's natural gas portfolio also decreased in savings in 2021 compared to the prior year. Both residential and commercial/industrial programs experienced a slight savings decrease. Overall natural gas portfolio savings decreased by 15 percent.

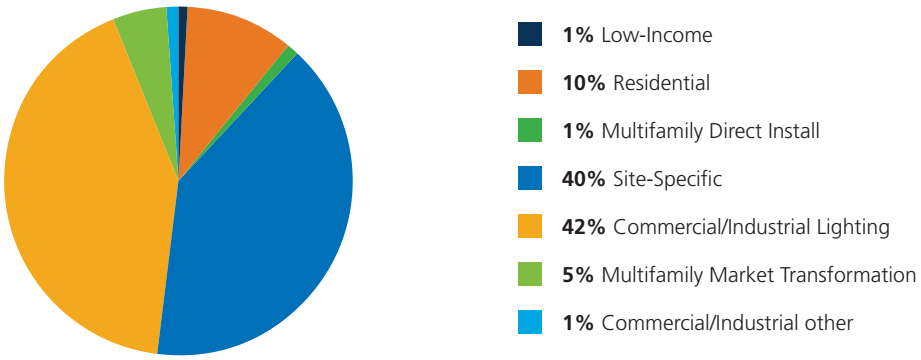
FIGURE 3 – NATURAL GAS ENERGY SAVINGS (2020-21)



Customer Segment	2020	2021
Residential	323,044	279,274
Commercial/Industrial	29,503	20,726
Total	**352,547**	**300,000**

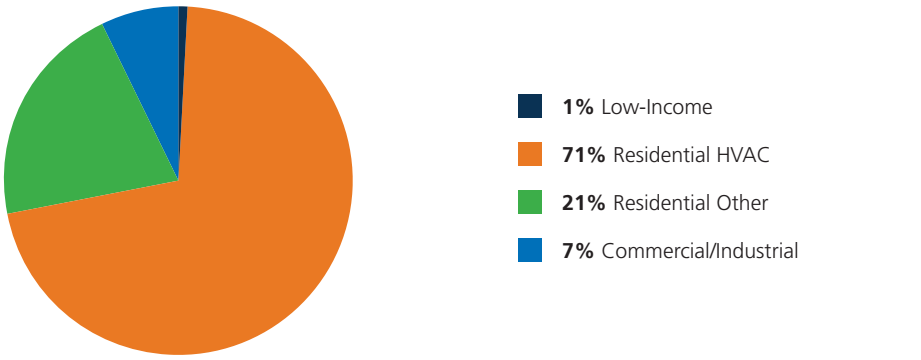
Of Avista's overall electric portfolio, the commercial/industrial prescriptive lighting and site-specific programs obtained 82 percent of the savings in 2021. All other programs combined achieved the remaining 18 percent (see Figure 4).

FIGURE 4 – ELECTRIC SAVINGS PORTFOLIO



Of Avista's overall natural gas savings portfolio, residential HVAC programs obtained 71 percent of the savings in 2021. Low-income, residential water heater, shell, and commercial/industrial programs combined achieved 29 percent of the overall savings for 2021 (see Figure 5).

FIGURE 5 – NATURAL GAS SAVINGS PORTFOLIO



Verified Savings

Avista's targets are set through the *Integrated Resource Plan* (*IRP*) process. Targets for 2021 were 14,504 MWh and 358,160 therms.

For the 2021 electric target, Avista chose to use the conservation potential assessment (CPA) obtained from its 2020 electric *IRP* as the basis for its *Annual Conservation Plan* (*ACP*) savings goals and targets. The company's 2021 conservation acquisition target identified in its *IRP* was 14,504 MWh of qualifying energy efficiency in Idaho.

The 2021 natural gas target of 358,160 therms was identified in the 2020 natural gas *IRP* and was used to establish the targets for each program in the natural gas portfolio.

In 2021, the electric energy-efficiency portfolio achieved first-year annual energy savings of 13,510 MWh (16,926 MWh inclusive of NEEA) and natural gas savings of 300,000 therms (452,881 therms inclusive of NEEA). Based on the target established in the electric and natural gas *IRPs*, Avista achieved 93 percent (107 inclusive of NEEA) of the electric savings target and 84 percent (126 inclusive of NEEA) of natural gas. Table 3 shows 2021 savings by fuel and sector.

The Idaho electric portfolio achieved an overall 100 percent realization rate.

TABLE 3 – ENERGY EFFICIENCY SAVINGS BY SECTOR – ELECTRIC

Sector	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Commercial/Industrial	11,879,012	11,942,866	101%
Residential	1,505,298	1,413,235	94%
Low-Income	161,323	153,503	95%
Total	**13,545,633**	**13,509,604**	**100%**

The Idaho natural gas portfolio achieved an overall realization rate of 100 percent as shown in Table 4.

TABLE 4 – ENERGY EFFICIENCY SAVINGS BY SECTOR – NATURAL GAS

Sector	Reported Savings (therms)	Gross Evaluated Savings (therms)	Realization Rate
Commercial/Industrial	20,726	20,726	100%
Residential	274,701	276,057	100%
Low-Income	3,778	3,217	85%
Total	**299,205**	**300,000**	**100%**

Expenditures

As part of Avista's annual business planning process, the company sets an expectation for operational planning, pursuing all cost-effective measures under Tariff Schedules 90 and 190. Since customer incentives are the largest component of expenditures, customer demand can easily affect the funding level of the tariff riders. Table 5 provides a detailed comparison of budgeted to actual energy-efficiency expenditures by fuel type.

TABLE 5 – ANNUAL CONSERVATION PLAN BUDGET TO ACTUAL EXPENDITURES COMPARISON

	Electric	Natural Gas
Projected 2021 Expenditures		
Incentives Budget	$ 5,301,623	$ 2,243,064
Non-Incentives and Labor	$ 1,734,268	$ 284,526
NEEA, CPA, EM&V	$ 1,394,232	$ 133,500
Total Budgeted Expenditures	**$ 8,430,123**	**$ 2,661,090**
Actual 2021 Expenditures		
Incentives	$ 4,104,944	$ 1,789,495
Non-Incentives and Labor	$ 1,566,938	$ 425,531
Market Transformation, CPA, EM&V, R&D, Pilot Programs	$ 1,092,019	$ 231,623
Total Actual Expenditures	**$ 6,763,901**	**$ 2,446,649**
Variance	**$ (1,666,222)**	**$ (214,441)**

Table 6 illustrates the top five programs with the highest impact on the expenditure variance.

TABLE 6 – PROGRAMS WITH HIGHEST IMPACT ON EXPENDITURE VARIANCE

Program	Planned	Actual	Variance	Variance Percentage
Multifamily Direct Install – Electric	$ 2,742,346	$ 155,623	$ 2,586,723	94%
Commercial/Industrial Exterior Lighting	$ 1,176,456	$ 1,514,671	$ (338,215)	(29)%
Residential Prescriptive – Electric	$ 302,822	$ 777,093	$ (474,271)	(157)%
Residential Fuel Conversions	$ 1,755,686	$ 359,619	$ 1,396,067	80%
Multifamily Market Transformation	$ 306,575	$ 989,860	$ (683,285)	(223)%

EVALUATION APPROACH

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

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

For 2021, Avista retained two separate firms to conduct impact and process evaluations of electric and natural gas programs in the utility's Idaho program portfolio. Cadmus conducted impact evaluations of the commercial/industrial program portfolio and process evaluations for most programs in the program portfolio; ADM performed impact evaluations of residential and low-income programs. Evaluations took a portfolio-wide evaluation approach to provide a benchmark to compare against future years. Impact and process evaluations for most programs were also completed at the program level, 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, the company may spend up to 10 percent of its conservation budget on programs whose savings impacts have not yet been measured if the overall conservation portfolio passes the applicable cost-effectiveness test. These programs may include educational, behavioral change, and other investigatory projects. Specific activities can include product and application document reviews, development of formal evaluation plans, field studies, data collection, statistical analysis, and solicitation of user feedback.

Both Avista and its customers benefit from activities and resources 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 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 a number of pilot projects and subcommittee evaluations; portions of the energy-efficiency savings acquired through the latter's regional programs are attributable to Avista's portfolio.

Evaluation Methodology and Activities

The 2021 Idaho electric portfolio impact evaluation employed a variety of methodology approaches, as shown in Table 7.

TABLE 7 – CADMUS PROGRAM EVALUATION ACTIVITIES – ELECTRIC

Sector	Program	Document/Database Review	Verification/Metering Site Visits
Commercial/Industrial	Prescriptive (Multiple)	✔	✔
	Site-Specific	✔	✔
Multifamily	Multifamily Direct Install	✔	
	Supplemental Lighting	✔	
Fuel Efficiency	Multifamily Market Transformation	✔	

Table 8 shows the methods used for the residential electric portfolio.

TABLE 8 – ADM IMPACT EVALUATION ACTIVITIES BY PROGRAM AND SECTOR – ELECTRIC

Sector	Program	Database Review	Survey Verification	Impact Methodology
Residential	Water Heat	✔	✔	RTF UES
	HVAC	✔	✔	RTF UES/Billing Analysis with Comparison Group
	Shell	✔		RTF UES
	Fuel Efficiency	✔	✔	Avista TRM/Billing Analysis with Comparison Group
	ENERGY STAR Homes	✔		RTF UES
	Simple Steps, Smart Savings	✔		RTF UES
Low-Income	Low-Income	✔		Avista TRM

More details about sample design for each sector are included later in this report and in Appendices A, B, C, and D.

Each evaluator also chose a tailored approach for program evaluation in the natural gas portfolio. Table 9 shows the evaluation activities by Cadmus.

TABLE 9 – CADMUS PROGRAM EVALUATION ACTIVITIES – NATURAL GAS

Sector	Program	Document / Database Review	Verification / Virtual Site Visit
Commercial/Industrial	Prescriptive (Multiple)	✔	✔
	Site-Specific	✔	✔
Fuel Efficiency	Site-Specific (Commercial/Industrial)	✔	

ADM evaluated programs in the residential natural gas portfolio.

TABLE 10 – ADM IMPACT EVALUATION ACTIVITIES BY PROGRAM AND SECTOR – NATURAL GAS

Sector	Program	Database Review	Survey Verification	Impact Methodology
Residential	Water Heat	✔	✔	Avista TRM
	HVAC	✔	✔	Avista TRM/IPMVP Option A
	Shell	✔		Avista TRM/Billing Analysis with Comparison Group
	Fuel Efficiency	✔	✔	Avista TRM/Billing Analysis with Comparison Group
	ENERGY STAR Homes	✔		Avista TRM
	Simple Steps, Smart Savings	✔		RTF UES
Low-Income	Low-Income	✔		Avista TRM

Cadmus was also contracted to conduct process evaluation activities, focusing on three fundamental objectives:

- Assess participant trade ally program journey, including motivation for participation, barriers to participation, and satisfaction.
- Assess Avista and implementer staff experiences, including organizational structure, communication, and program processes.
- Document areas of success, challenges, and changes to the program.

Table 11 outlines the process evaluation activities that were completed in Idaho in 2021.

TABLE 11 – PROCESS EVALUATIONS FOR PROGRAMS

Program
Commercial/Industrial Programs
Site-Specific
Prescriptive [a)]
Multifamily Programs
Multifamily Direct Install (MFDI)
Multifamily Market Transformation (MFMT)
Residential Programs
ENERGY STAR Homes
Simple Steps, Smart Savings

a) Includes Lighting, Food Service Equipment, Green Motors Rewind, Commercial HVAC, Insulation, HVAC Motor Controls, Grocer, Fleet Heat, and AirGuardian Compressed Air.

Residential HVAC, Water Heat, and Shell/Window Programs in Idaho will be evaluated following the program year.

Process evaluation findings are included in this report for each sector and, where relevant, at the program level under "Customer Satisfaction" headings.

Impact Evaluation Results, Portfolio

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

- ***Electric:*** 100 percent realization rate and 13,509,604 kWh in annual verified savings
- ***Natural Gas:*** 100 percent realization rate and 300,000 therms in annual gross savings

The evaluators collected Avista's reported savings through database extracts from its customer care and billing (residential) and Infor CRM and iEnergy (commercial/industrial) databases and from data provided by third-party implementers to determine evaluated savings.

COST-EFFECTIVENESS

Before implementing any new program, Avista conducts analyses to determine whether that program is cost-effective both from the company's and from customers' perspectives. Avista uses four metrics to evaluate cost-effectiveness: the utility cost test (UCT), the total resource cost (TRC), the participant cost test (PCT), and the ratepayer impact test (RIM). For Idaho programs, the UCT is the most important. Avista's cost-effectiveness goal for both the electric and natural gas program portfolios is to have a UCT above 1.00, which indicates that the benefits to the utility exceed the costs of implementing the program. In 2021, the UCT benefit/cost ratios were 1.24 for electric and 1.24 for natural gas.

TABLE 12 – ELECTRIC PORTFOLIO COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 8,349,163	$ 7,554,710	1.11
Utility Cost Test (UCT)	$ 6,778,064	$ 5,453,202	1.24
Participant Cost Test (PCT)	$ 15,934,301	$ 6,157,230	2.59
Ratepayer Impact (RIM)	$ 6,728,843	$ 17,331,781	0.39

TABLE 13 – NATURAL GAS PORTFOLIO COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,629,603	$ 4,346,572	0.60
Utility Cost Test (UCT)	$ 2,483,710	$ 2,007,089	1.24
Participant Cost Test (PCT)	$ 6,221,173	$ 4,059,208	1.53
Ratepayer Impact (RIM)	$ 2,413,940	$ 6,508,537	0.37

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COMMERCIAL/INDUSTRIAL SECTOR

Cedar Street Bridge, Sandpoint, Idaho

COMMERCIAL/INDUSTRIAL SECTOR

Overview

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

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

The site-specific program path is reserved for more unique or complex projects that require custom savings calculations and technical assistance from Avista's energy engineers (such as compressed air, process equipment and controls, and comprehensive lighting retrofits). In certain instances, a performance basis approach is used.

- ***846 commercial/industrial electric measures in 2021:*** Total savings of 11,943 MWh
- ***39 commercial/industrial natural gas measures in 2021:*** Total savings of 20,726 therms

TABLE 14 – COMMERCIAL/INDUSTRIAL VERIFIED SAVINGS BY PROGRAM

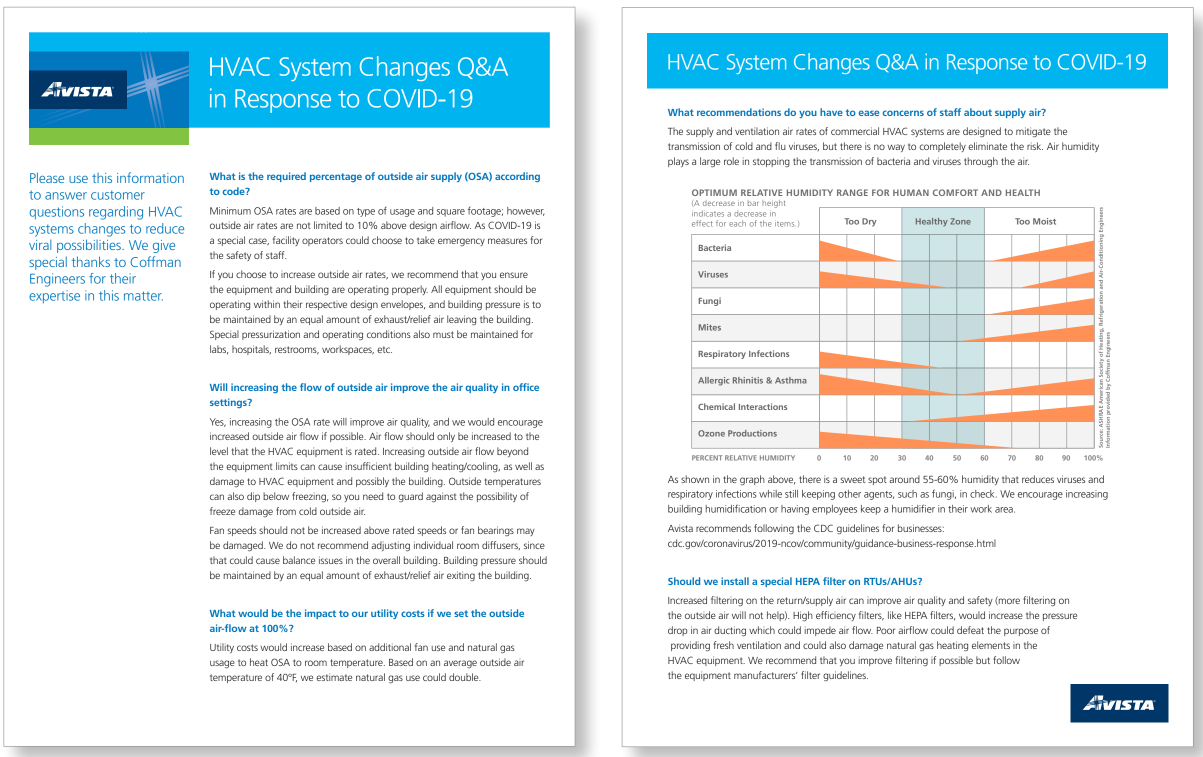
Commercial/Industrial	Program Type	Electric Savings (kWh)	Natural Gas Savings (Therms)
Interior Lighting	Prescriptive	3,362,227	-
Exterior Lighting	Prescriptive	2,307,395	-
HVAC	Prescriptive	-	5,885
Green Motors	Prescriptive	23,986	-
Motor Control HVAC (VFD)	Prescriptive	56,210	-
Shell	Prescriptive	2,547	360
Food Services	Prescriptive	977	14,480
Grocer	Prescriptive	7,443	-
Multifamily Market Transformation	Prescriptive	711,593	-
Site-Specific Lighting	Site-Specific	3,347,375	-
Site-Specific Other	Site-Specific	2,123,113	-
Total Commercial/Industrial		**11,942,866**	**20,726**

Marketing

To assist commercial customers during the coronavirus pandemic, Avista developed communications materials that included tip sheets – e.g., "HVAC System Changes Q&A" – plus checklists for saving energy when shutting buildings down and when re-entering. To support small businesses, a flyer was created identifying sources of local, state, and federal help available in Idaho. Electronic newsletters containing information on Avista's energy-efficiency programs and related content were also sent to commercial and small business customers. Vendors were mailed updates about program information. New email templates were created for Avista's account executives, providing a customizable tool that could be used to promote various rebate programs to their customers.

Ongoing updates to Avista's website regarding energy-efficiency programs, as well as COVID-19 information, continued throughout the year.

FIGURE 6 – COMMERCIAL/INDUSTRIAL HVAC SYSTEM CHANGES Q&A IN RESPONSE TO COVID-19 FLYER



AVISTA

HVAC System Changes Q&A in Response to COVID-19

Please use this information to answer customer questions regarding HVAC systems changes to reduce viral possibilities. We give special thanks to Coffman Engineers for their expertise in this matter.

What is the required percentage of outside air supply (OSA) according to code?

Minimum OSA rates are based on type of usage and square footage; however, outside air rates are not limited to 10% above design airflow. As COVID-19 is a special case, facility operators could choose to take emergency measures for the safety of staff.

If you choose to increase outside air rates, we recommend that you ensure the equipment and building are operating properly. All equipment should be operating within their respective design envelopes, and building pressure is to be maintained by an equal amount of exhaust/relief air leaving the building. Special pressurization and operating conditions also must be maintained for labs, hospitals, restrooms, workspaces, etc.

Will increasing the flow of outside air improve the air quality in office settings?

Yes, increasing the OSA rate will improve air quality, and we would encourage increased outside air flow if possible. Air flow should only be increased to the level that the HVAC equipment is rated. Increasing outside air flow beyond the equipment limits can cause insufficient building heating/cooling, as well as damage to HVAC equipment and possibly the building. Outside temperatures can also dip below freezing, so you need to guard against the possibility of freeze damage from cold outside air.

Fan speeds should not be increased above rated speeds or fan bearings may be damaged. We do not recommend adjusting individual room diffusers, since that could cause balance issues in the overall building. Building pressure should be maintained by an equal amount of exhaust/relief air exiting the building.

What would be the impact to our utility costs if we set the outside air-flow at 100%?

Utility costs would increase based on additional fan use and natural gas usage to heat OSA to room temperature. Based on an average outside air temperature of 40°F, we estimate natural gas use could double.

HVAC System Changes Q&A in Response to COVID-19

What recommendations do you have to ease concerns of staff about supply air?

The supply and ventilation air rates of commercial HVAC systems are designed to mitigate the transmission of cold and flu viruses, but there is no way to completely eliminate the risk. Air humidity plays a large role in stopping the transmission of bacteria and viruses through the air.

As shown in the graph above, there is a sweet spot around 55-60% humidity that reduces viruses and respiratory infections while still keeping other agents, such as fungi, in check. We encourage increasing building humidification or having employees keep a humidifier in their work area.

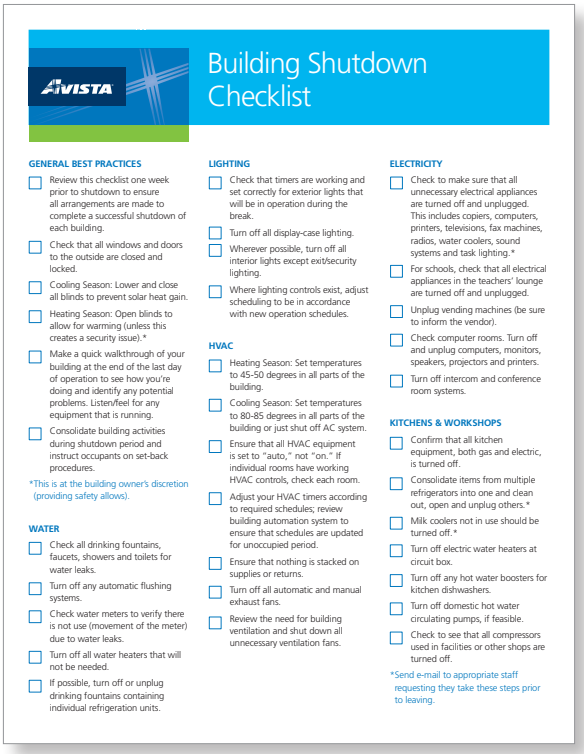
Avista recommends following the CDC guidelines for businesses:
cdc.gov/coronavirus/2019-ncov/community/guidance-business-response.html

Should we install a special HEPA filter on RTUs/AHUs?

Increased filtering on the return/supply air can improve air quality and safety (more filtering on the outside air will not help). High efficiency filters, like HEPA filters, would increase the pressure drop in air ducting which could impede air flow. Poor airflow could defeat the purpose of providing fresh ventilation and could also damage natural gas heating elements in the HVAC equipment. We recommend that you improve filtering if possible but follow the equipment manufacturers' filter guidelines.

AVISTA

FIGURE 7 – COMMERCIAL/INDUSTRIAL BUILDING SHUTDOWN CHECKLIST



Building Shutdown Checklist

GENERAL BEST PRACTICES

- ☐ Review this checklist one week prior to shutdown to ensure all arrangements are made to complete a successful shutdown of each building.
- ☐ Check that all windows and doors to the outside are closed and locked.
- ☐ Cooling Season: Lower and close all blinds to prevent solar heat gain.
- ☐ Heating Season: Open blinds to allow for warming (unless this creates a security issue).*
- ☐ Make a quick walkthrough of your building at the end of the last day of operation to see how you're doing and identify any potential problems. Listen/feel for any equipment that is running.
- ☐ Consolidate building activities during shutdown period and instruct occupants on set-back procedures.

*This is at the building owner's discretion (providing safety allows).

WATER

- ☐ Check all drinking fountains, faucets, showers and toilets for water leaks.
- ☐ Turn off any automatic flushing systems.
- ☐ Check water meters to verify there is not use (movement of the meter) due to water leaks.
- ☐ Turn off all water heaters that will not be needed.
- ☐ If possible, turn off or unplug drinking fountains containing individual refrigeration units.

LIGHTING

- ☐ Check that timers are working and set correctly for exterior lights that will be in operation during the break.
- ☐ Turn off all display-case lighting.
- ☐ Wherever possible, turn off all interior lights except exit/security lighting.
- ☐ Where lighting controls exist, adjust scheduling to be in accordance with new operation schedules.

HVAC

- ☐ Heating Season: Set temperatures to 45-50 degrees in all parts of the building.
- ☐ Cooling Season: Set temperatures to 80-85 degrees in all parts of the building or just shut off AC system.
- ☐ Ensure that all HVAC equipment is set to "auto," not "on." If individual rooms have working HVAC controls, check each room.
- ☐ Adjust your HVAC timers according to required schedules; review building automation system to ensure that schedules are updated for unoccupied period.
- ☐ Ensure that nothing is stacked on supplies or returns.
- ☐ Turn off all automatic and manual exhaust fans.
- ☐ Review the need for building ventilation and shut down all unnecessary ventilation fans.

ELECTRICITY

- ☐ Check to make sure that all unnecessary electrical appliances are turned off and unplugged. This includes copiers, computers, printers, televisions, fax machines, radios, water coolers, sound systems and task lighting.*
- ☐ For schools, check that all electrical appliances in the teachers' lounge are turned off and unplugged.
- ☐ Unplug vending machines (be sure to inform the vendor).
- ☐ Check computer rooms. Turn off and unplug computers, monitors, speakers, projectors and printers.
- ☐ Turn off intercom and conference room systems.

KITCHENS & WORKSHOPS

- ☐ Confirm that all kitchen equipment, both gas and electric, is turned off.
- ☐ Consolidate items from multiple refrigerators into one and clean out, open and unplug others.*
- ☐ Milk coolers not in use should be turned off.*
- ☐ Turn off electric water heaters at circuit box.
- ☐ Turn off any hot water boosters for kitchen dishwashers.
- ☐ Turn off domestic hot water circulating pumps, if feasible.
- ☐ Check to see that all compressors used in facilities or other shops are turned off.

*Send e-mail to appropriate staff requesting they take these steps prior to leaving.

FIGURE 8 – COMMERCIAL/INDUSTRIAL TIPS TO SAVE ENERGY WHEN SHUTTING DOWN COMMERCIAL BUILDINGS FLYER

Save energy when shutting down commercial buildings

Save energy when leaving a building unoccupied. Just follow these simple energy-saving tips from Avista. The larger your facility, the more you can save.

Leaving Lights On

If you are concerned about security, it's smart to leave at least one light on to deter burglars (or to put a few lights on an automatic timer). If you do leave any lights on, just make sure they are all LEDs, which use the least amount of energy. Businesses with a security fence should turn off all their lighting. Just make sure to close and lock your fence.

Unplug Energy-Nabbing Devices

Few people realize it, but electronics and appliances use energy even when they are off. These "parasitic load" devices include printers, scanners, personal entertainment systems, personal computers and other at-the-ready equipment that may be located throughout your offices. Unplugging these devices before you leave will save energy while you're temporarily away.

Curtains and Blinds

Save on heating and cooling by making sure all the windows of your building are closed and locked and that curtains and blinds are shut. This helps heat from coming in during the summer and prevents heat loss in the winter.

Refrigeration

A refrigerator can use up to $80 a year in electricity—even if it's not opened. To save energy, empty the contents of all refrigerators, unplug them, and open the doors (block them so they stay open). The same goes for any miniature refrigerators as well, and be sure to turn off lights in walk-in refrigerators. Also check to see if you have other types of refrigeration systems that can be shut off. You'll save money by pulling the plug on water coolers not being used, as well. If your business uses air compressors, shut them all off if there is not work occurring in the building. Although air compressors may not sound as if they're running, they will come on every time there is a slight drop in pressure. Last but not least, as you turn devices off, put sticky notes on them to remind people that they should be off (and as a reminder for you to turn them back on when you return).

HVAC Systems

If you must shorten the occupancy hours of your building, also shorten the operating time of your HVAC system and automated lighting systems by changing the programming in your EMS system, programmable thermostats, or manual thermostats. If your building will be unoccupied for several weeks, consider lowering your HVAC heating set point to 45°F. This will create a noticeable drop in HVAC usage and should not pose a problem to the building, as long as you monitor for extended periods of freezing temperatures.

Water Heater

Save electricity or natural gas by turning down your water heater when you leave. A water heater consumes 25% of its energy to keep the tank of water warm—even if hot water is not being used. When lowering the water temperature, set it above 115°F or below 75°F to prevent the growth of Legionella bacteria, which can cause illness.

If you think you'll be away for an extended period, shut off your water heater completely. Make sure your circulation pumps are off, as well.

FIGURE 9 – COMMERCIAL/INDUSTRIAL PREPARATIONS FOR WORKFORCE RE-ENTRY CHECKLIST

Preparations for Workforce Re-Entry

GENERAL BEST PRACTICES

- ☐ Begin completing these checklist tasks a week early for a successful reopening.
- ☐ Restart larger or hastily closed buildings earlier as they take more time to recommission.
- ☐ Send emails to educate building occupants about restarting procedures.
- ☐ Restart systems and equipment backward from shutdown order to avoid damage.
- ☐ Complete a complete facility inspection a day before reopening.

ELECTRICITY AND GAS

- ☐ Check all circuit breakers/fuses to ensure they are not tripped/blown.
- ☐ Ensure natural gas valves are open and that fittings do not leak.
- ☐ Plug in all office equipment, such as copiers, computers, printers, sound systems, task lighting, breakroom appliances, etc.
- ☐ Turn on intercom and conference room systems.
- ☐ Inspect and plug in refrigerated water fountains and water coolers.
- ☐ Plug in vending machines (be sure to inform the vendor).
- ☐ Ensure all gas appliances have relit pilot lights and are operational.
- ☐ Test the building security system.

LIGHTING

- ☐ Check all lighting controls and adjust settings to new operational schedules.
- ☐ Ensure exit and security lights are working.
- ☐ Turn on all display-case lighting.

WATER

- ☐ Flush water through all lines, especially drinking and potable sources, before use.
- ☐ Make sure all water fountain, faucet, toilet and shower valves are open and do not leak.
- ☐ Turn on all automatic flushing systems.
- ☐ Turn on water heaters and set temperatures at or above 120° F to meet safety requirements.
- ☐ Ensure hot-water recirculating pumps are turned on and operational.
- ☐ Turn on any hot water boosters for kitchen dishwashers.
- ☐ Ensure facility and shop compressors are turned on.

HEATING & AC/REFRIGERATION

- ☐ Inspect ductwork for holes/leaks as well as rodent or other animal nests.
- ☐ Replace dirty filters with higher-efficiency filters that are sealed properly.
- ☐ Ensure required vents are open.
- ☐ Turn on all necessary ventilation fans.
- ☐ Test economizers to ensure they are not stuck open or closed.
- ☐ Ensure all HVAC equipment and timers, including programmable thermostats, are operating properly. (Remember to check rooms with individual HVAC controls.)
- ☐ Gradually adjust temperature settings to suit occupancy levels (adjust a few degrees each day over a week).
- ☐ Maximize the introduction of outside air (per CDC guidelines) to dilute airborne contaminants/ viruses while maintaining indoor comfort.
- ☐ Aim for 40-60% relative humidity, which is considered ideal for containing the virus.
- ☐ Apply additional ASHRAE measures, including those for high-risk situations, found at **ashrae.org/technical-resources/commercial**
- ☐ Check equipment refrigerant levels to ensure there are no leaks. (Turn on milk coolers, if applicable.)

TRAFFIC EFFORT/SIGNAGE

- ☐ Place signs on all entrance doors reminding occupants not to enter if they have COVID-19 symptoms. Encourage personal health monitoring for employees as well.
- ☐ Suggest (or require) face masks for all occupants, visitors and maintenance personnel as part of entrance-sign messaging.
- ☐ Install signs listing CDC guidelines for COVID-19 in breakrooms and other highly used rooms. See "Print Resources" at **cdc.gov/coronavirus/2019-ncov/communication**
- ☐ Install signs that encourage safe physical distancing and respiratory etiquette (cover sneezes) in high-traffic and confined areas.
- ☐ Install signs that urge 20-second handwashing in common areas and restrooms.
- ☐ Consider 6-foot physical-distance markings on floors.

POINTS OF CONTACT/TOUCH

- ☐ Limit elevator capacity where possible.
- ☐ Provide open access to stairwells where security requirements allow.
- ☐ Prop open interior doors that do not pose a security or safety risk in order to provide hands-free traffic.
- ☐ Remove some tables and seating in breakrooms/conference areas for added physical distancing, and keep disinfectant wipes nearby to clean tables, handles and other equipment after each use.
- ☐ Consider staggering employee breaks so fewer people are in breakroom areas at the same time.
- ☐ Consider installing automated faucets, soap dispensers and towel dispensers in bathrooms.
- ☐ Consider installing ultraviolet disinfection lighting to create sterile environments.

JANITORIAL/MAINTENANCE

- ☐ Focus on cleaning and disinfecting high-touch surfaces using EPA-recommended products which eliminate SARS-CoV-2, the virus that causes COVID-19.
- ☐ Install stations with alcohol-based (70%) hand sanitizer in common areas with high-touch surfaces such as elevator buttons and door handles.
- ☐ Supply additional soap and paper towels in breakrooms.
- ☐ Frequently clean and disinfect breakroom refrigerator, microwave, coffee station, etc.
- ☐ Close blinds during cooling season to prevent solar heat gain. Open blinds during heating season to do the opposite.
- ☐ Perform building inspections/non-urgent repairs when rooms and offices are least crowded. Instruct nearby staff to wear masks when appropriate.

FIGURE 10 – COMMERCIAL/INDUSTRIAL SUPPORT FOR SMALL BUSINESSES DURING THE COVID-19 CRISIS FLYER

Support for small businesses during the COVID-19 crisis

COVID-19 Small Business Resources for Idaho

Small businesses are the backbone of our country. It's why Avista is dedicated to supporting you in these challenging times. We want to empower small business owners like you by providing advice and services to help, including:

- Making payment arrangements
- Applying security deposits to existing account balances (if applicable)
- Providing references to existing resources in Idaho and the federal programs available from the $2 Trillion Coronavirus Aid, Relief, and Economic Security Act, (CARES Act)

Let our dedicated support team help with your business.

Please call **509-495-4717** or **800-936-6629**
(Monday thru Friday, 7:00 a.m. to 5:00 p.m.)
or email **businessaccounts@avistacorp.com**

(See additional information on back)

Where to find business relief assistance due to COVID-19

Avista is committed to a strong future for small businesses. Below are some sources of local, state and federal help that may be available to your small business.

Idaho Resources

Avista's COVID-19 Response and Resources:
Energy-saving tips for closing buildings, suggested HVAC system changes, FAQs and more.
myavista.com/safety/covid-19-response

Innovia Foundation:
Two COVID-19 Response and Recovery Funds for community-based organizations working at the frontlines of the outbreak in Eastern Washington and North Idaho.
innovia.org/covid19

Joint Business Service Providers
cdaedc.org/covid19

Idaho Small Business Development Center:
COVID-19 resources for North Idaho.
idahosbdc.org/covid-19-resources

Idaho Community Foundation
Response and Recovery Fund for Idaho, which will provide grants to trusted organizations that support and serve low-income Idahoans.
idahocf.org/covid-19

United Way of North Idaho
Coeur d'Alene Coronavirus Relief Fund
unitedwayofnorthidaho.org/coronavirus-relief-fund

Federal Resources

U.S. Senate Committee on Small Business & Entrepreneurship:
A small business owner's guide to the CARES Act.
sbc.senate.gov/public/index.cfm/guide-to-the-cares-act

home.treasury.gov/policy-issues/cares/assistance-for-small-businesses

SBA COVID-19 Small Business Guidance & Loan Resources:
Long-term, low-interest SBA loans due to COVID-19 for eligible small business owners.
sba.gov/page/coronavirus-covid-19-small-business-guidance-loan-resources

SBA Economic Injury Disaster Loan Program:
Working-capital loans of up to $2 million to help small businesses overcome temporary revenue loss.
disasterloan.sba.gov/ela

Paycheck Protection Program (PPP) information Sheet – Borrowers:
Borrowers information fact sheet.
home.treasury.gov/system/files/136/PPP--Fact-Sheet.pdf

Coronavirus Emergency Loans Guide and Checklist for Small Businesses:
uschamberfoundation.org/reports/coronavirus-emergency-loans-guide-and-checklist-small-businesses-and-nonprofits

Business & Industry Loan Guarantees
Offers loan guarantees to rural businesses.
rd.usda.gov/programs-services/business-industry-loan-guarantees

FIGURE 11 – COMMERCIAL/INDUSTRIAL ACCOUNT EXECS EMAIL TEMPLATE

AVISTA

Meet your Avista Regional Account Executive:

Angela Koker
Office: (509) 495-8051
Cell: (509) 481-0038
Email: Angela.Koker@avistacorp.com

Areas of focus: South Spokane, Southeast Spokane (East of Division, South of the Spokane River), Spokane Valley, Spokane Industrial Park, Liberty Lake, Spangle, Rockford, Fairfield, Rosalia, Tekoa, and Colfax

Are you planning a new construction project?

Avista can often provide incentives for new construction projects if there are measures that are better than minimum Washington energy code requirements (we use the Washington code for both Washington and Idaho).

Common areas for new construction incentives, include wall and roof insulation, natural gas HVAC and lighting.

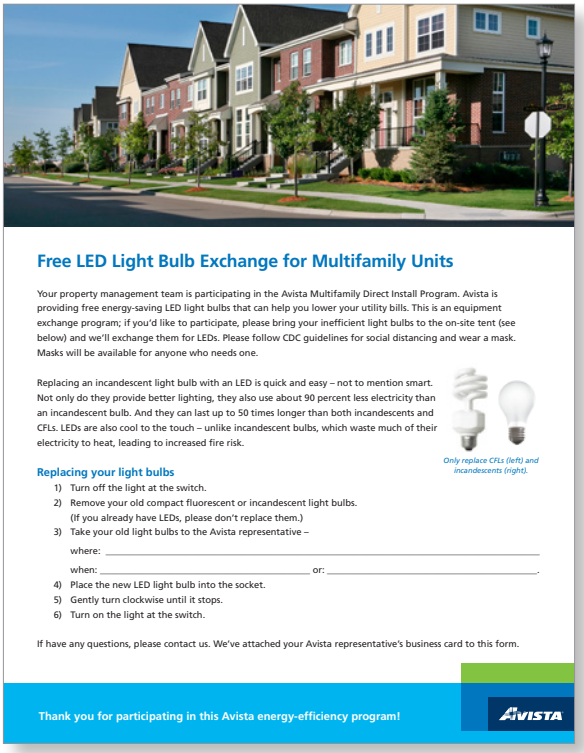
Increasing energy efficiency is one of the best ways to help reduce operating expenses.

For more information visit myavista.com/bizrebates

As your Regional Account Executive, I'm here to provide you and your business with personalized energy efficiency and account management assistance.

Let's start by seeing if you qualify for one of our energy savings programs and potential incentives. Please feel free to call or email me directly—I look forward to hearing from you.

FIGURE 12 – COMMERCIAL/INDUSTRIAL MULTIFAMILY DIRECT INSTALL FLYER, REFLECTING TEMPORARY PROGRAM MODIFICATIONS DUE TO COVID-19



Free LED Light Bulb Exchange for Multifamily Units

Your property management team is participating in the Avista Multifamily Direct Install Program. Avista is providing free energy-saving LED light bulbs that can help you lower your utility bills. This is an equipment exchange program; if you'd like to participate, please bring your inefficient light bulbs to the on-site tent (see below) and we'll exchange them for LEDs. Please follow CDC guidelines for social distancing and wear a mask. Masks will be available for anyone who needs one.

Replacing an incandescent light bulb with an LED is quick and easy – not to mention smart. Not only do they provide better lighting, they also use about 90 percent less electricity than an incandescent bulb. And they can last up to 50 times longer than both incandescents and CFLs. LEDs are also cool to the touch – unlike incandescent bulbs, which waste much of their electricity to heat, leading to increased fire risk.

Only replace CFLs (left) and incandescents (right).

Replacing your light bulbs

1) Turn off the light at the switch.
2) Remove your old compact fluorescent or incandescent light bulbs.
   (If you already have LEDs, please don't replace them.)
3) Take your old light bulbs to the Avista representative –
   where: _____
   when: _____ or: _____.
4) Place the new LED light bulb into the socket.
5) Gently turn clockwise until it stops.
6) Turn on the light at the switch.

If have any questions, please contact us. We've attached your Avista representative's business card to this form.

Thank you for participating in this Avista energy-efficiency program!

AVISTA

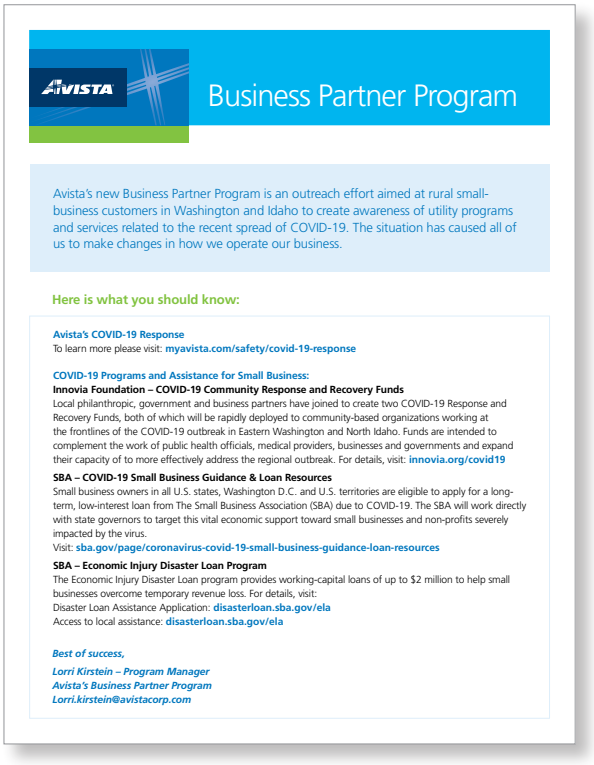
Business Partner Program

The Business Partner Program (BPP) began in fall 2019 as an outreach effort designed to target small business customers in Avista's rural service territories. Initiated with an introductory letter followed by a site visit, it was revised in March 2021 to mail-only due to the COVID-19 pandemic. 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, information related to COVID-19.

By the end of 2021, the BPP had reached 1,926 small businesses in 15 Idaho rural service territories. Outreach communication included mail, email, phone calls, and some initial site visits. Seven audits were performed, and 53 incandescent lamps were replaced with LEDs for a savings of 6,464 kWh.

In April of 2021, Avista introduced 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. This service also helps to educate and empower business owners and their employees to use less energy. 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 reach small business customers who may not have the time, budget, or access to contractors to make efficiency improvements. By the end of 2021, the program provided cost estimates to eight small business customers in Idaho.

FIGURE 13 – COMMERCIAL/INDUSTRIAL BUSINESS PARTNER PROGRAM NEWSLETTER



Business Partner Program

Avista's new Business Partner Program is an outreach effort aimed at rural small-business customers in Washington and Idaho to create awareness of utility programs and services related to the recent spread of COVID-19. The situation has caused all of us to make changes in how we operate our business.

Here is what you should know:

Avista's COVID-19 Response
To learn more please visit: **myavista.com/safety/covid-19-response**

COVID-19 Programs and Assistance for Small Business:
Innovia Foundation – COVID-19 Community Response and Recovery Funds
Local philanthropic, government and business partners have joined to create two COVID-19 Response and Recovery Funds, both of which will be rapidly deployed to community-based organizations working at the frontlines of the COVID-19 outbreak in Eastern Washington and North Idaho. Funds are intended to complement the work of public health officials, medical providers, businesses and governments and expand their capacity of to more effectively address the regional outbreak. For details, visit: **innovia.org/covid19**

SBA – COVID-19 Small Business Guidance & Loan Resources
Small business owners in all U.S. states, Washington D.C. and U.S. territories are eligible to apply for a long-term, low-interest loan from The Small Business Association (SBA) due to COVID-19. The SBA will work directly with state governors to target this vital economic support toward small businesses and non-profits severely impacted by the virus.
Visit: **sba.gov/page/coronavirus-covid-19-small-business-guidance-loan-resources**

SBA – Economic Injury Disaster Loan Program
The Economic Injury Disaster Loan program provides working-capital loans of up to $2 million to help small businesses overcome temporary revenue loss. For details, visit:
Disaster Loan Assistance Application: **disasterloan.sba.gov/ela**
Access to local assistance: **disasterloan.sba.gov/ela**

Best of success,

Lorri Kirstein – Program Manager
Avista's Business Partner Program
Lorri.kirstein@avistacorp.com

Customer Satisfaction

Evaluators conducted process evaluations of the site-specific and prescriptive programs for 2021. The methodology consisted of interviews with program staff at Avista as well as online surveys with trade allies and program participants.

Interviews with Avista program staff focused on the following program topics:

- Program roles and responsibilities
- Program goals and objectives
- Program design and implementation
- Data tracking
- Program participation
- Marketing and outreach
- Program successes
- Market barriers
- Program impact on the market
- Future program changes including redesign

The evaluator conducted 81 online surveys in 2021 with commercial/industrial program participants in Idaho and Washington. Site visits and telephone reminder calls were used to increase survey participation. The participant survey guides gathered critical insights into participants' program journey, covering the following topics:

- Program awareness
- General program participation
- Reasons for participation
- Program benefits
- Program delivery experience
- Overall program satisfaction
- Satisfaction with Avista
- Current energy-efficient behaviors and purchases
- Suggestions for program improvements

Key Findings

The impact of COVID-19 on project scope was minimal, but there may be slight reductions in the number or scope of energy-efficiency projects due to budget or staff constraints. Ten of 13 site-specific respondents and 88 percent of prescriptive participants (n=59) said COVID-19 did not create any obstacles to their 2021 project; most respondents who reported obstacles said those obstacles were minor. Four of 13 site-specific respondents and 24 percent of prescriptive respondents expected reductions to budget or staff availability to support energy-efficiency upgrades in 2021.

Although contractors drive a significant portion of participation, continued Avista outreach and messaging is important to support contractor sales. Eight of 15 site-specific participants and 70 percent of prescriptive participants (n=63) reported first hearing about the Avista program from a contractor, vendor, or retailer. Twelve of 15 site-specific participants and 55 percent of prescriptive participants (n=64) thought the best way to learn about rebates and incentives was through Avista emails or direct mail, or communication from an Avista account representative.

Despite some process issues in 2021, participants are satisfied with the application process and the program overall. Site-specific satisfaction was lowest for process-related aspects, including submitting the rebate application (75 percent satisfied, n=15) and the time to process the application (87 percent satisfied), but 100 percent of respondents were satisfied with the program overall. Though 14 percent of prescriptive participants mentioned that the application paperwork was burdensome – and 9 percent had some difficulty understanding requirements – 100 percent of participants were satisfied with the program overall, and several respondents mentioned the easy and fast process as an aspect of the program that worked well. Suggestions for process improvements were related to potential enhancements (such as a searchable database of eligible products, or a chat feature for application support) rather than suggestions to correct significant problems.

Recommendations

The evaluator offered the following recommendations to improve customer satisfaction for Avista's commercial/industrial programs:

- ***Develop tools to help participants sort through options and scope eligible projects more quickly.*** For example, although the Avista website currently directs customers to search for eligible lighting on the ENERGY STAR Product Finder database or Design Lights Consortium websites, both of which have advanced search functionality, the results can be overwhelming. A resource such as an "Energy-Efficiency Buying Guide" for specific products could help customers with less technical background navigate their options or evaluate and understand proposals they receive from contractors.
- ***If not already doing so, use emails, bill inserts, and other promotional tools that are direct from Avista to its customers, and use Avista branding to promote commercial/industrial programs and incentives.*** Participants were more likely to want communication directly from Avista than through their contractor or vendor. These marketing efforts will enhance any contractor and vendor marketing or advertising, and give sales representatives better credibility, enabling them to make more sales through the program.

- ***Consider developing and using customer testimonials in targeted outreach to those who have not historically participated in programs.*** The testimonials from satisfied participants could focus on the ease of participating in the programs and the benefits of participation, such as reduced energy use, bill savings, and receiving the rebate. The marketing could also provide information to prospective participants on potential energy savings for businesses with similar profiles.
- ***Continue to look for ways to provide contractor and installer training, educational resources about program requirements, and application completion tips to remove roadblocks or communication issues between Avista and participants.***

Program-specific customer satisfaction recommendations, as well as Avista's plans to improve the customer experience, are described in more detail in the program-by-program summaries (see pages 31-59).

Impact Evaluation: Commercial/Industrial Sector

Although some individual project results varied, particularly within the Prescriptive Exterior Lighting Program, the overall commercial/industrial sector performed strongly in 2021 relative to reported savings. Most projects that Cadmus sampled for the evaluation were well documented and matched findings from the remote project verifications. Savings realization rates were as follows:

- ***Electric:*** total verified savings of 11,943 MWh in 2021 with a combined realization rate of 101 percent
- ***Natural Gas:*** total verified savings of 20,726 therms with a combined realization rate of 100 percent

Performance and Savings Goals

The commercial/industrial sector did not meet the combined prescriptive and site-specific program paths' electric goal of 13,757 MWh, with the programs achieving 87 percent of the overall goal. For natural gas programs, the commercial/industrial sector also fell short of the annual therm savings goal for combined prescriptive and site-specific programs, achieving 20,725 therms (40 percent of the combined prescriptive and site-specific program paths' natural gas savings goal of 51,225 therms).

Impact Evaluation Methodology

As the first step in evaluating electric and natural gas savings for the commercial/industrial sector, Cadmus explored the following documents and data records to gain an understanding of the programs and measures slated for evaluation:

- Avista's annual business plans, detailing processes and energy savings justifications
- Project documents from external sources (such as customers, program consultants, or implementation contractors)
- Avista's iEnergy tracking system

Based on the initial review, Cadmus checked the distribution of program contributions with the overall program portfolio. The review provided insight into the sources for unit energy savings (UES) claimed for each measure offered in the programs, along with sources for energy-savings algorithms, internal quality assurance, and quality control processes for large commercial/industrial sector projects.

Following this review, Cadmus designed a sample strategy for impact evaluation activities and performed the following evaluation activities in two waves:

- Selected evaluation sample and requested project documentation from Avista
- Reviewed project documentation
- Prepared virtual site-visit M&V plans
- Performed virtual site visits using the Streem platform and collected on-site data (such as trends, photos, and operating schedules)
- Used virtual site-visit findings to calculate evaluated savings by measure
- Applied realization rates to the total reported savings population to determine overall evaluated savings

Sample Design

Cadmus created two sample waves for 2021. Sample 1 included program data from January through June; sample 2 included program data from July through December. As a guideline, Cadmus used the proposed overall 2019 commercial/industrial sample sizes by subprogram in the measurement and verification plan, seeking to complete approximately half of the sample in each wave.

Cadmus initially estimated the total annual population size by reviewing the wave 1 population data and comparing it to 2018-19. It developed initial sample size targets to achieve 90 percent confidence at ±10 percent precision (90/10) for the estimated annual population for 2021, with a target of 90/20 by program. After receiving the wave 2 population data, Cadmus revised the annual sample size targets for the full year and selected the wave 2 sample to complete the revised target within each program.

Avista advised Cadmus not to evaluate certain programs with low participation and historically consistent realization rates every year. Since the Green Motors Program has shown a 100 percent realization rate in every prior evaluation, Cadmus did not evaluate the program in 2021. Cadmus evaluated the Food Services and HVAC Programs in 2020 only, and the Energy Smart Grocer and Prescriptive Shell Programs only in 2021. Cadmus evaluated all other commercial/industrial programs that had participation in 2020 and 2021.

For each sample wave, Cadmus developed a stratified random sample of applications by program (such as Site-Specific Other, Site-Specific Lighting, Prescriptive Interior Lighting, or Prescriptive Motor Controls). In programs where individual projects represented a significant portion of the total savings in the program, the team selected the highest-savings applications with certainty. Within programs with a wide variance in savings, the team further stratified non-certainty applications by reported savings magnitude into small and medium strata, each with approximately 50 percent of the total non-certainty program savings. The team assigned random numbers within each stratum to select a random sample of non-certainty sites. In some cases, Cadmus selected additional applications at the same location as a previously selected application to evaluate as a convenience selection if the team could assess both applications in a single virtual visit.

Cadmus encountered some challenges contacting customers to evaluate the wave 1 sample, primarily due to changes in business operations as a result of the COVID-19 pandemic. The team pulled an additional backup sample for the wave 2 sample using random sampling and recruited participants from the backup sample when participants from the initial random sample were unreachable.

The team pooled results from the randomly selected sites to calculate a realization rate by stratum and applied that realization rate to projects in the population in that stratum. Cadmus applied the project-specific evaluated savings for every project that was in the sample, regardless of whether it was a random, certainty, or convenience selection.

Table 15 summarizes the Idaho commercial/industrial prescriptive program path evaluation sample. Cadmus sampled 41 prescriptive applications at 32 unique sites. Of the sampled applications, the team selected five for certainty review based on the scale of savings, selected the 29 randomly, and selected seven additional convenience projects based on location. There was no participation in the AirGuardian, Fleet Heat, and Motor Control Programs in 2021.

Table 15 shows the total number of unique application IDs sampled in each program, including three applications containing measures from more than one program.

TABLE 15 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE ELECTRIC EVALUATION SAMPLE

Program Type	Applications Sampled	Sampled Savings (kWh)	Percentage of Reported Savings
Interior Lighting	15	458,642	14%
Exterior Lighting	19	594,496	25%
Shell Measure	2	2,547	100%
Motor Control HVAC (VFD)	2	56,210	100%
Energy Smart Grocer	2	4,323	100%
Commercial/Industrial Prescriptive	**35**	**1,116,218**	**19%**

Table 16 summarizes the Site-Specific Program path's evaluation sample, where Cadmus sampled 12 site-specific applications at 12 unique sites overall. Of the sampled applications, the team selected three for certainty review based on the savings scale and selected the remaining nine applications randomly.

TABLE 16 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC ELECTRIC EVALUATION SAMPLE

Program Path	Applications Sampled	Sampled Savings (kWh)	Percentage of Reported Savings
Site-Specific	13	3,751,483	70%

Table 17 summarizes the Idaho commercial/industrial prescriptive program path natural gas evaluation sample. Overall, Cadmus sampled 14 prescriptive applications at 14 unique sites, selecting all applications randomly. The team did not select any applications for certainty review.

TABLE 17 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NATURAL GAS EVALUATION SAMPLE

Program Type	Applications Sampled	Sampled Savings (therms)	Percentage of Reported Savings
HVAC	7	3,553	26%
Shell	0	0	0%
Food Service Equipment	7	4,490	33%
Commercial/Industrial Prescriptive	**14**	**8,043**	**28%**

Note: Totals may not sum due to rounding.

Table 18 summarizes the Idaho commercial/industrial Site-Specific Program path's natural gas evaluation sample. Cadmus sampled one site-specific application at one unique site. The team selected the sampled application with certainty as it was the only natural gas participant in the Site-Specific Program.

TABLE 18 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC NATURAL GAS EVALUATION SAMPLE

Program	Applications Sampled	Sampled Savings (therms)	Percentage of Reported Savings
Site-Specific	1	94	100%

Document Review

Cadmus requested and reviewed project documentation for each sampled application and prepared M&V plans to guide the site visits. Typically, project documentation included data entered into the iEnergy system, incentive application forms, calculation workbooks, invoices, equipment specification sheets, and Avista installation verification (IV) reports.

Remote Verification

Cadmus performed virtual site visits and verification calls at 36 unique commercial/industrial locations to assess electric savings for 102 unique prescriptive and site-specific measures (not including fuel-efficiency measures) from 44 different applications. To assess natural gas savings, Cadmus performed verifications at 14 unique commercial/industrial locations in Idaho to assess natural gas energy savings for 17 unique prescriptive and site-specific measures (not including fuel-efficiency measures). Cadmus evaluated the remaining applications through desk reviews that did not require participant outreach, or through verification calls, which involved a brief discussion by phone or video to confirm key details and any information that was missing in the project documentation. Cadmus typically conducted video calls using the Streem platform, which records video and audio. The team conducted some verifications using Microsoft Teams meetings if customers were unable to access Streem or preferred using Teams due to prior familiarity. Cadmus used the project documentation review and on-site findings to adjust the reported savings calculations where necessary.

Impact Evaluation Recommendations

Cadmus offers the following conclusions and recommendations to improve the commercial/industrial sector's energy savings.

Cadmus found that Avista's new iEnergy system records detailed inputs on some prescriptive measures that were not previously tracked in Infor CRM and are not currently used in the savings calculations.

Recommendation: Review deemed savings values for prescriptive measures and consider opportunities to use the additional data now collected in iEnergy to calculate more accurate savings for each participant project. For example, food service measures can use the reported pounds of food cooked per day and cooking hours per day values collected in iEnergy to automatically calculate more precise savings.

The iEnergy system introduced variance of up to five percent between reported and evaluated savings by rounding intermediate wattage calculation values.

Recommendation: Review iEnergy calculations to ensure that rounding is only applied on final displayed values and not to any intermediate values.

Cadmus staff found that the level of detail in IV reports varied. Many IV reports only mention that "equipment and quantities were verified," and photos sometimes show the equipment only from a distance. Cadmus recommends including additional details in IV reports in 2019 and 2020, though it didn't observe additional detail in IV reports reviewed in 2021.

Recommendation: Provide more consistent documentation with Avista IV reports. Cadmus recommends that all IV reports include basic information explicitly stating the quantity and type of equipment found. For lighting projects, this would include confirmed fixture types, quantities, installation locations, controls, and estimated HOU. For most other equipment, this would include nameplates, model numbers, and quantities.

Cost-Effectiveness

Tables 19 and 20 show the commercial/industrial sector cost-effectiveness results by fuel type.

TABLE 19 – COMMERCIAL/INDUSTRIAL ELECTRIC COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 5,625,230	$ 5,161,398	1.09
Utility Cost Test (UCT)	$ 5,113,845	$ 3,808,611	1.34
Participant Cost Test (PCT)	$ 11,465,145	$ 4,454,119	2.57
Ratepayer Impact (RIM)	$ 5,113,845	$ 12,172,425	0.42

TABLE 20 – COMMERCIAL/INDUSTRIAL NATURAL GAS COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 109,588	$ 221,655	0.49
Utility Cost Test (UCT)	$ 109,588	$ 169,968	0.64
Participant Cost Test (PCT)	$ 246,625	$ 99,169	2.49
Ratepayer Impact (RIM)	$ 109,588	$ 369,111	0.30

As noted above, the UCT benefit-to-cost ratio for the commercial/industrial sector was 0.49 in 2021. While Avista always strives to ensure programs are cost-effective, the commercial/industrial natural gas program is very cost-sensitive due to its low participation rates. As compared to 2020, the 2021 program had a decrease in therm savings, yet continued to carry administrative costs that are allocated to Idaho natural gas. This decrease in savings was enough to move the program from a 1.01 UCT to a 0.64 UCT. As significant projects are completed, however, future years could see a material shift in CE with avoided cost benefits far exceeding the costs of providing those benefits.

Commercial/Industrial Site-Specific Program

TABLE 21 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM METRICS

Site-Specific – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		174
Overall kWh Savings		5,470,488
Incentive Spend	$	996,932
Non-Incentive Utility Costs	$	285,774
Idaho Energy Efficiency Rider Spend	$	1,282,706
Site-Specific – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		-
Overall Therm Savings		0
Incentive Spend	$	0
Non-Incentive Utility Costs	$	0
Idaho Energy Efficiency Rider Spend	$	0

Description

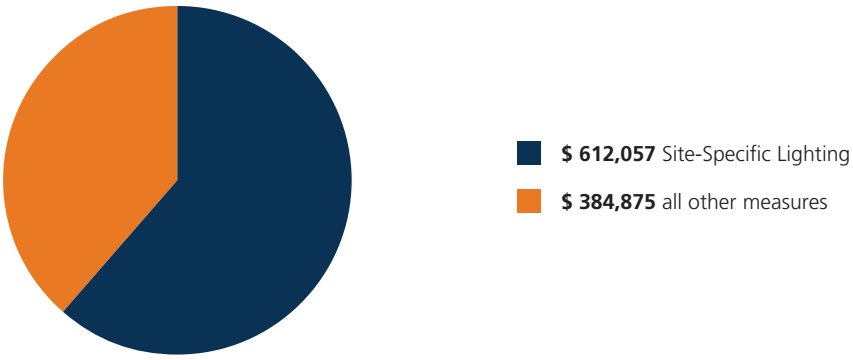
The commercial/industrial energy-efficiency market is delivered through a combination of prescriptive and site-specific offerings. Any measure not offered through a prescriptive program is automatically eligible for treatment through the Site-Specific Program, subject to the criteria for participation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

Program Activities

- ***Electric:*** Savings of 5,470,488 kWh, or 40 percent of the overall electric savings. The largest percentage of incentives went to lighting projects (61 percent).
- ***Natural Gas:*** No savings were recognized in 2021.

Measure type and savings are shown in Figure 14.

FIGURE 14 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM INCENTIVE DOLLARS BY MEASURE



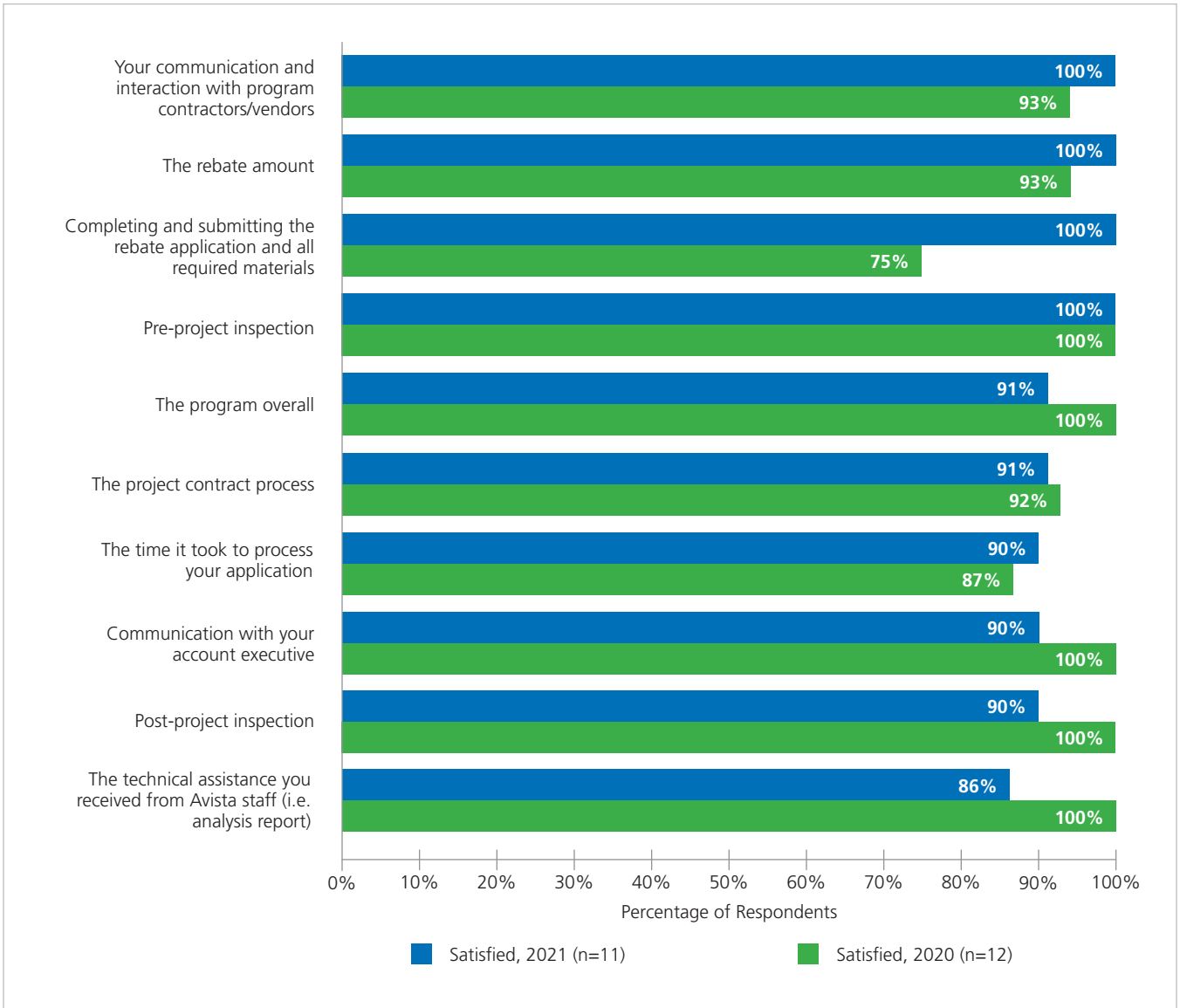
Program Changes

In 2021, Avista did not make any changes to site-specific programs. Incentives for any qualifying electric or natural gas energy-saving improvements with a 15-year simple payback or less continue to be offered.

Customer Satisfaction

Cadmus evaluated the Site-Specific Program in its 2021 process evaluation. Ten of 11 respondents were very or somewhat satisfied with the overall program. Figure 15 compares the percentage of 2021 respondents rating themselves very satisfied or somewhat satisfied with different aspects of the site-specific program with responses from 2020. Respondents were more likely to be satisfied with several components in 2021 than in 2020: communication with vendors (100 percent in 2021 vs. 93 percent in 2020), the rebate amount (100 percent in 2021 vs. 93 percent in 2020), and completing the rebate application/materials (100 percent in 2021 vs. 75 percent in 2020). Respondents were less satisfied in 2021 than in 2020 with the technical assistance they received, their post-project inspection, and their communication with their Avista account representative.

FIGURE 15 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM RESPONDENTS SATISFIED WITH COMPONENTS



Source: 2021 and 2020 site-specific survey question E1: "In terms of the site-specific program, how satisfied were you with the following aspects? Please think about each item individually as you select your answer." Showing only respondents that indicated they were very satisfied or somewhat satisfied.

As shown in Table 22, eight of 11 respondents provided feedback about their program participation challenges. The most common challenge reported was lack of knowledge about the program (four respondents). Two respondents reported that coordinating internal resources and external contractors were challenges for them.

TABLE 22 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM PARTICIPATION CHALLENGES

Challenge	2021
Knowledge of the programs, costs and/or the rebates	4
Coordinating internal resources and external contractors	2
COVID-19 restrictions	1
Coordinating with Avista	1

Source: Site-specific survey question E4: "What do you so see as the biggest challenges to participating in Avista's site-specific program for your company or other companies like yours (n=8)?"

On the other hand, 2021 respondents commented on many aspects of the program that worked well:

- "The Avista energy-efficiency program engineering and utility account executive teams were very helpful."
- "Communication from Avista account executive."
- "It was relatively easy and fast to participate in, so that was appreciated."
- "[The] rebates are a great incentive."
- "Keep doing what you're doing. It worked out well."

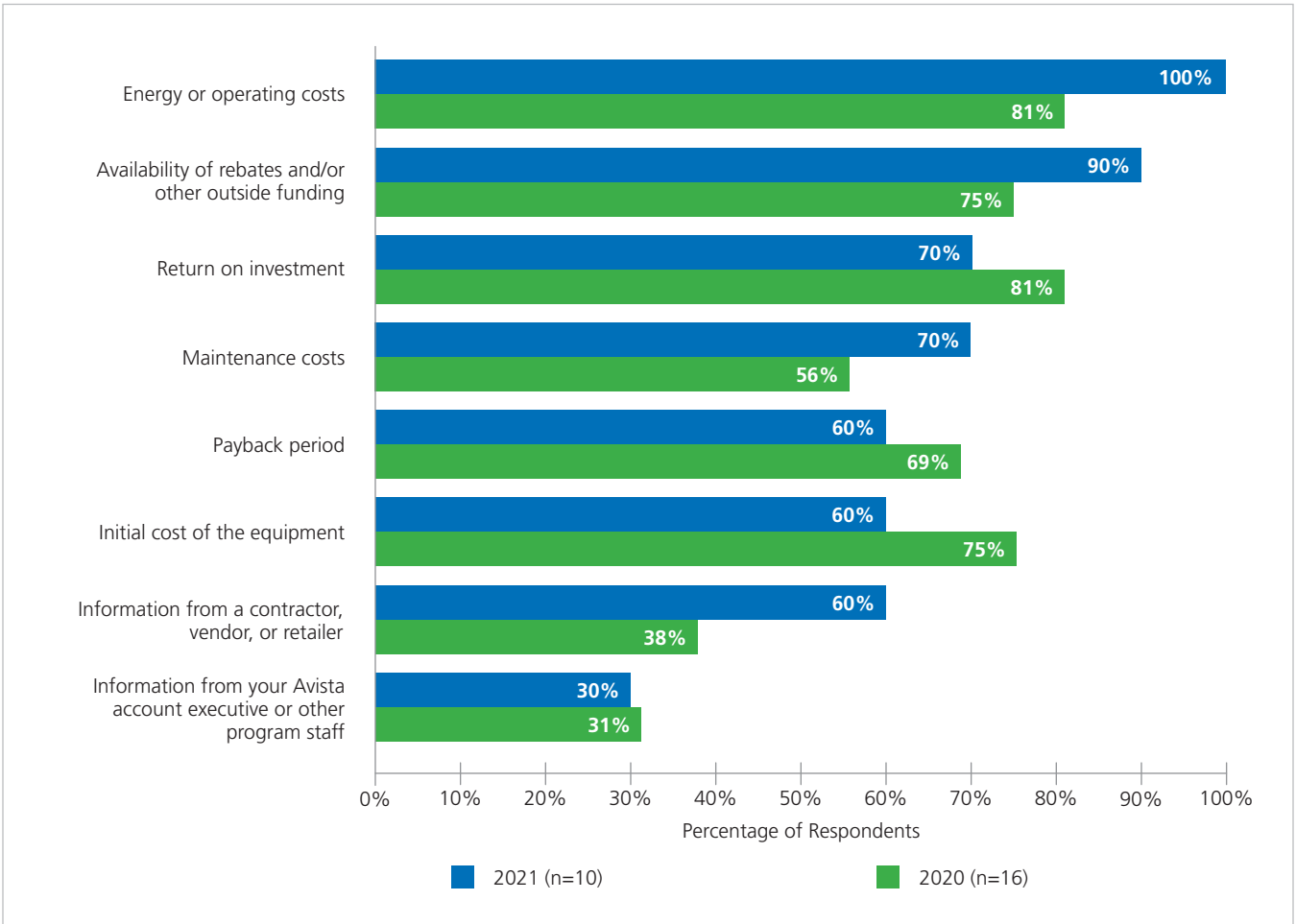
Four of the 11 survey respondents provided suggestions about improving the program, which primarily fell into categories listed below:

- Increase communication about programs (three respondents)
- Increase rebate amounts (one respondent)

Eight of 11 2021 respondents said the rebate provided by Avista was very important in their decision to complete their project. Another three said it was somewhat important. When making capital upgrades, eight respondents said energy efficiency was very important, two said it was somewhat important and only one said it was not too important.

As shown in Figure 16, respondents most frequently selected energy or operating costs as the most important criteria for making energy-efficiency improvements (100 percent). This was followed closely by the rebate or the availability of outside funding (90 percent).

FIGURE 16 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM IMPORTANT CRITERIA FOR ENERGY-EFFICIENCY IMPROVEMENTS



Source: Site-specific survey question F5: "Which of the following criteria are important in deciding whether your company makes energy efficiency improvements?" Multiple responses allowed.

Since participating in the Site-Specific Program, three 2021 respondents purchased energy-efficient equipment, and one adopted new energy-efficient protocols and purchased new equipment. Three respondents who mentioned purchasing new equipment had invested in lighting upgrades. One had purchased compressor upgrades and one upgraded to digital programmable thermostats.

COVID-19 Impacts

In 2021, respondents faced potential obstacles related to the COVID-19 pandemic. Six respondents said there were no impacts to their project from the pandemic, however. Most respondents (three of 10) who faced challenges related to COVID-19 experienced issues with both general delays and delays in receiving equipment. One respondent said their project scope was affected because it was difficult to get supplies; another said both their project scope and timeline were affected.

Two respondents thought the COVID-19 impacts would not affect their organization's interest in or ability to complete other energy-efficiency projects. Two respondents thought there would be less budget available; two thought there would be more interest in cost-cutting projects like efficiency. One noted that their organization's interest would not be affected unless there were new guidelines and policies mandated.

Impact Evaluation

Table 23 shows reported and evaluated electric energy savings for Avista's commercial/industrial Site-Specific Program path for the year. The overall Site-Specific Program path had a 102 percent electric realization rate. The table does not include reported and evaluated electric savings for measures in the Multifamily Market Transformation Program which, for the purposes of the Cadmus Impact Evaluation Report, were included as a site-specific program.

TABLE 23 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM ELECTRIC IMPACT FINDINGS

Program Path	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Site-Specific	5,355,291	5,470,488	102%

Of 13 evaluated applications, Cadmus identified discrepancies in 12, based on in-person and virtual site visits and project documentation review. Table 24 summarizes the reasons for discrepancies between reported and evaluated savings.

TABLE 24 – COMMERCIAL/INDUSTRIAL SITE-SPECIFIC PROGRAM EVALUATION SUMMARY OF DISCREPANCIES

Project Type	Number of Occurrences	Savings Impact	Reason(s) for Discrepancy
Site-Specific Lighting	3	↑	Cadmus evaluated one project and found additional fixtures installed than reported and increased the HOU for several areas of the facility.
			Cadmus evaluated one project that reported replacing wall-mounted three-lamp fluorescent fixtures with LED wall packs. The team confirmed with the site contact that the baseline fixtures were actually standard high-intensity discharge fixtures with higher baseline wattage than reported, increasing estimated savings.
			Cadmus evaluated two applications at one facility that used different HVAC interactive factors. Cadmus adjusted the HVAC interactive factor for one application to be consistent with the other application at this facility.
	4	↓	Cadmus verified fewer fixtures installed in several areas of the facility for one project.
			Cadmus evaluated one project with several discrepancies across its measures. One measure replaced a 75 W incandescent fixture with an LED, but the Energy Independence and Security Act baseline wattage for these types of lamps is 53 W. Avista used the correct baseline wattage to estimate lighting savings, but the original 75 W value was referenced to calculate the cooling savings due to interactive HVAC effects. Cadmus also adjusted the baseline lamp type for another measure based on an interview with the site contact and finding that the reported baseline lamp type would not mount into the fixture that was retrofit.
			Cadmus reduced the HOU for some fixtures on two projects based on interviews with site staff.
Compressed Air	1	↑	Cadmus evaluated one compressed air project and used updated trend data after the new air compressor was installed. We found an increase in the average flow and average current from what was reported, increasing energy savings.
Motor Controls Industrial	2	↑	Cadmus updated the average motor load for one irrigation pump VFD project to match the operational schedule reported. Cadmus also updated the motor efficiencies based on the verified value on each motor's nameplate, increasing energy savings.
			Cadmus increased the HOU of one project based on the run hours verified on the equipment's interface.
Appliance	1	↓	Cadmus adjusted the analysis inputs for one project based on the values verified on the equipment's nameplate. Cadmus verified that the systems were single phase rather than three-phase as reported, reducing the calculated energy consumption in the baseline and post periods.
Other	1	↑	Cadmus increased the uptime HOU of one project which installed a VFD on a forced draft fan of a boiler based on interviews with site staff.

Recommendations

Evaluated hours of use (HOU) reported by site contacts during verification interviews often varied substantially from the HOU reported on interior and exterior documentation for HOU lighting among site-specific projects.

- ***Recommendation:*** Standardize the site-specific lighting report template to include a description of the lighting schedule and HOU source. Ensure that meter data are clearly referred to in the report if a light state logger or power meter is used to determine HOU.
- ***Recommendation:*** Consider deploying light loggers on a random sample of lighting projects each year to validate reported HOU values and develop an understanding of whether self-reported hours are typically over- or under-reported compared to actual usage.

Cadmus evaluated a site-specific appliance project that used logger data provided by the implementer to estimate savings. Avista also installed temporary electric current loggers and then estimated savings based on these data, but ultimately did not report the savings from these calculations. Both calculations assumed the equipment had three-phase service, but Cadmus verified that the installed equipment was single-phase.

- ***Recommendation:*** When estimating power from logged current data, carefully review the equipment nameplates and operating parameters to ensure the correct conversion. When multiple datasets are collected for a project, clearly identify in the project files which dataset was used for the final estimation and document why one dataset was chosen over the other.

Cadmus found that reported fixture quantities for site-specific lighting projects often did not match invoice quantities, and applications often lacked detailed notes explaining these differences. It is often impractical for Avista staff conducting IV inspections or evaluators conducting verification visits to count every fixture for large lighting projects to resolve such discrepancies.

- ***Recommendation:*** Include more detailed documentation for site-specific lighting projects. Applications should include lighting drawings whenever possible, and should clearly explain any difference between invoice quantities and rebated quantities. Lighting workbooks should note the locations where fixtures are installed to facilitate verification by Avista and by evaluators. Avista IV inspection reports should explicitly state the verified quantities of each fixture type and should include any notes, spreadsheets, or other documentation used to verify the eligible quantities.

Plans for 2022

Avista plans to continue to offer the site-specific program in Idaho for both electric and natural gas customers in 2022. Avista will assess the current measurement and verification process and develop a standardized installation verification report, which could include lighting schedules and hours of use as well as an indication if lighting loggers or power meters were used for lighting projects, as well as nameplates, model numbers, and quantities of other equipment installed.

Commercial/Industrial Multifamily Natural Gas Market Transformation

TABLE 25 – COMMERCIAL/INDUSTRIAL MULTIFAMILY NATURAL GAS MARKET TRANSFORMATION PROGRAM METRICS

Multifamily Natural Gas Market Transformation Program Summary		2021
Participation, Savings, and Costs		
Conservation Projects		5
Overall kWh Savings		711,593
Incentive Spend	$	890,123
Non-Incentive Utility Costs	$	99,738
Idaho Energy Efficiency Rider Spend	$	989,860

Description

The site-specific program path also includes a market transformation initiative intended to encourage natural gas space and water heating in multifamily residential developments. The focus is on new-construction multifamily residential rental buildings with five or more units. The goal of the program is to address the split incentive issue where developers are focused on low development costs, which can drive low-efficiency heating choices and place a higher cost burden on building tenants. The program intends to create developer confidence in natural gas as a heating option for multifamily construction, while also helping developers and building owners understand the added long-term value of natural gas space and water heating systems. Avista offers program incentives of $3,000 per unit for converting to natural gas by installing standard-efficiency space heat and water heaters.

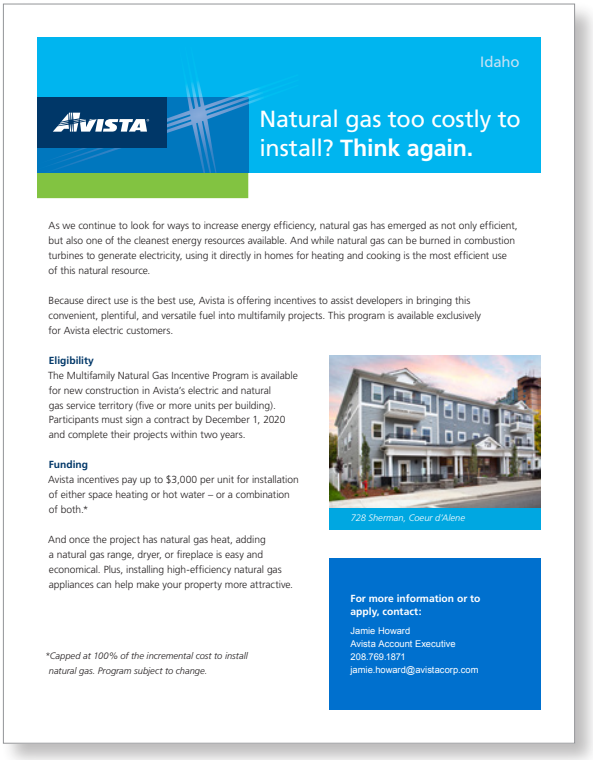
Program Activities

In 2021, Idaho program performance was consistent with prior years. Five projects with a total of 121 units were constructed. Savings totaled 711,593 kWh and $989,860 in total tariff rider spend. The multifamily market transformation program accounted for approximately six percent of non-residential savings in 2021.

Marketing

Avista's account executive team focused on creating relationships with regional builders, including one-on-one conversations with contractors and developers. The team also engaged in regular informal check-ins to provide education about offered programs, benefits, savings, and payoffs in installing natural gas – from environmental, comfort, and cost-saving standpoints.

FIGURE 17 – COMMERCIAL/INDUSTRIAL MULTIFAMILY NATURAL GAS INCENTIVE PROGRAM FLYER



Idaho

AVISTA

Natural gas too costly to install? **Think again.**

As we continue to look for ways to increase energy efficiency, natural gas has emerged as not only efficient, but also one of the cleanest energy resources available. And while natural gas can be burned in combustion turbines to generate electricity, using it directly in homes for heating and cooking is the most efficient use of this natural resource.

Because direct use is the best use, Avista is offering incentives to assist developers in bringing this convenient, plentiful, and versatile fuel into multifamily projects. This program is available exclusively for Avista electric customers.

Eligibility
The Multifamily Natural Gas Incentive Program is available for new construction in Avista's electric and natural gas service territory (five or more units per building). Participants must sign a contract by December 1, 2020 and complete their projects within two years.

Funding
Avista incentives pay up to $3,000 per unit for installation of either space heating or hot water – or a combination of both.*

And once the project has natural gas heat, adding a natural gas range, dryer, or fireplace is easy and economical. Plus, installing high-efficiency natural gas appliances can help make your property more attractive.

Capped at 100% of the incremental cost to install natural gas. Program subject to change.

728 Sherman, Coeur d'Alene

For more information or to apply, contact:
Jamie Howard
Avista Account Executive
208.769.1871
jamie.howard@avistacorp.com

Impact Evaluation

Cadmus followed the same impact evaluation methodology for fuel-efficiency measures as outlined in the Impact Evaluation Methodology section on page 26, sampling two of five multifamily market transformation projects in 2021.

TABLE 26 – COMMERCIAL/INDUSTRIAL FUEL-EFFICIENCY IMPACT FINDINGS

Fuel-Efficiency Measure	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Multifamily Market Transformation	711,593	711,593	100%
Total	**711,593**	**711,593**	**100%**

Fuel Efficiency Conclusions and Recommendations

Multifamily Market Transformation (MFMT) fuel-efficiency measures achieved evaluated savings of 711,593 kWh, yielding a 100 percent realization rate. Combined, the measures achieved 150 percent of the electric energy savings goal of 475,794 kWh. The evaluator found that the MFMT Program achieved its objectives in 2021 and does not have any recommendations for this program.

Plans for 2022

The program will continue in the Idaho service area. Avista has increased documentation standards for this program and has not made any adjustments to the incentive levels.

Commercial/Industrial Prescriptive Lighting Programs

TABLE 27 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM METRICS

Prescriptive Lighting Program Summary		2021
Participation, Savings, and Costs		
Conservation Projects		499
Overall kWh Savings		5,669,622
Incentive Spend	$	1,199,848
Non-Incentive Utility Costs	$	314,824
Idaho Energy Efficiency Rider Spend	$	1,514,671

Description

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 the customer.

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

This streamlined approach makes program participation easier, especially for smaller customers and vendors. The measures included in the prescriptive lighting program include fluorescent lamps and fixtures, HID, MR16, and incandescent can fixture retrofits to more energy-efficient LED light sources and controls.

Program Activities

Savings for prescriptive lighting were 5,669,622 kWh, or 42 percent of commercial/industrial electric savings, a 13 percent decrease in savings compared to 2020.

As the continued shift toward more prescriptive exterior lighting measures occurred in 2020 and 2021, the 4 foot T12/T8 lamp replacement measure fell second to the sign lighting measure as the most popular, which also achieved the highest kWh savings in 2021.

As seen in Figure 18, lighting throughput was not affected by COVID-19 in 2021. There was a noticeable shift toward exterior lighting projects throughout the year which may have been a result of social distancing measures. However, apart from June and September, monthly goals were met and annual savings targets were not affected.

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

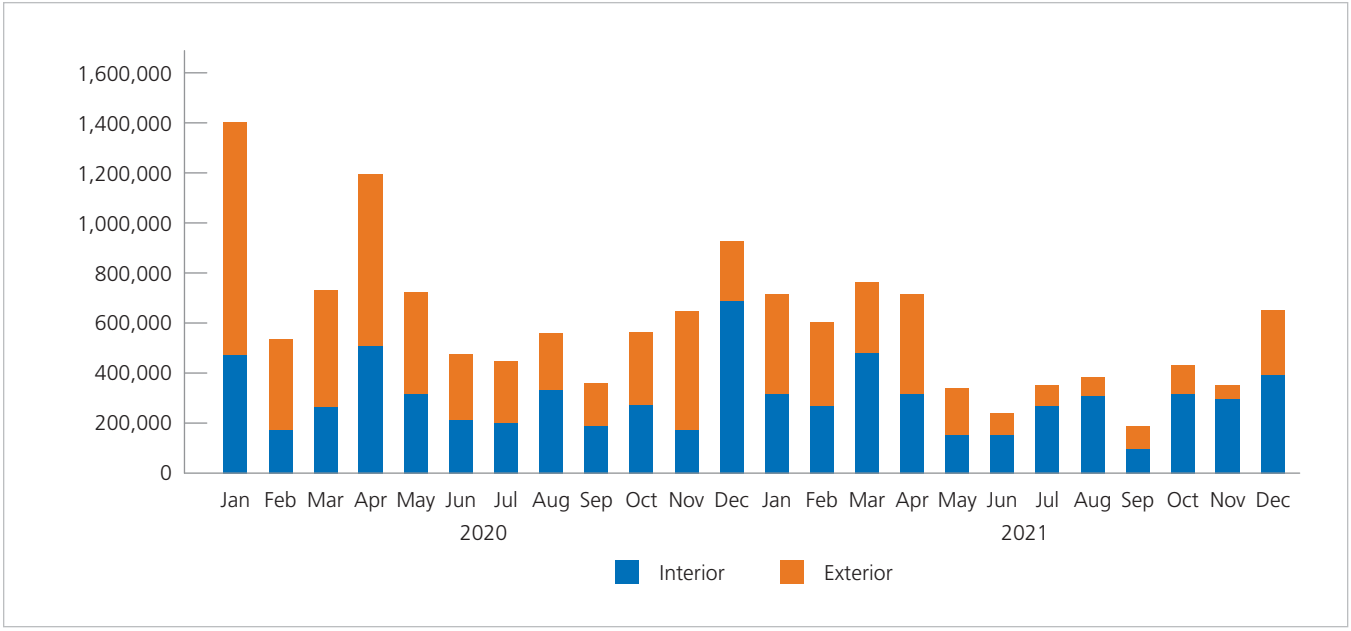


FIGURE 19 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE INTERIOR LIGHTING PROGRAM KWH SAVINGS BY MEASURE

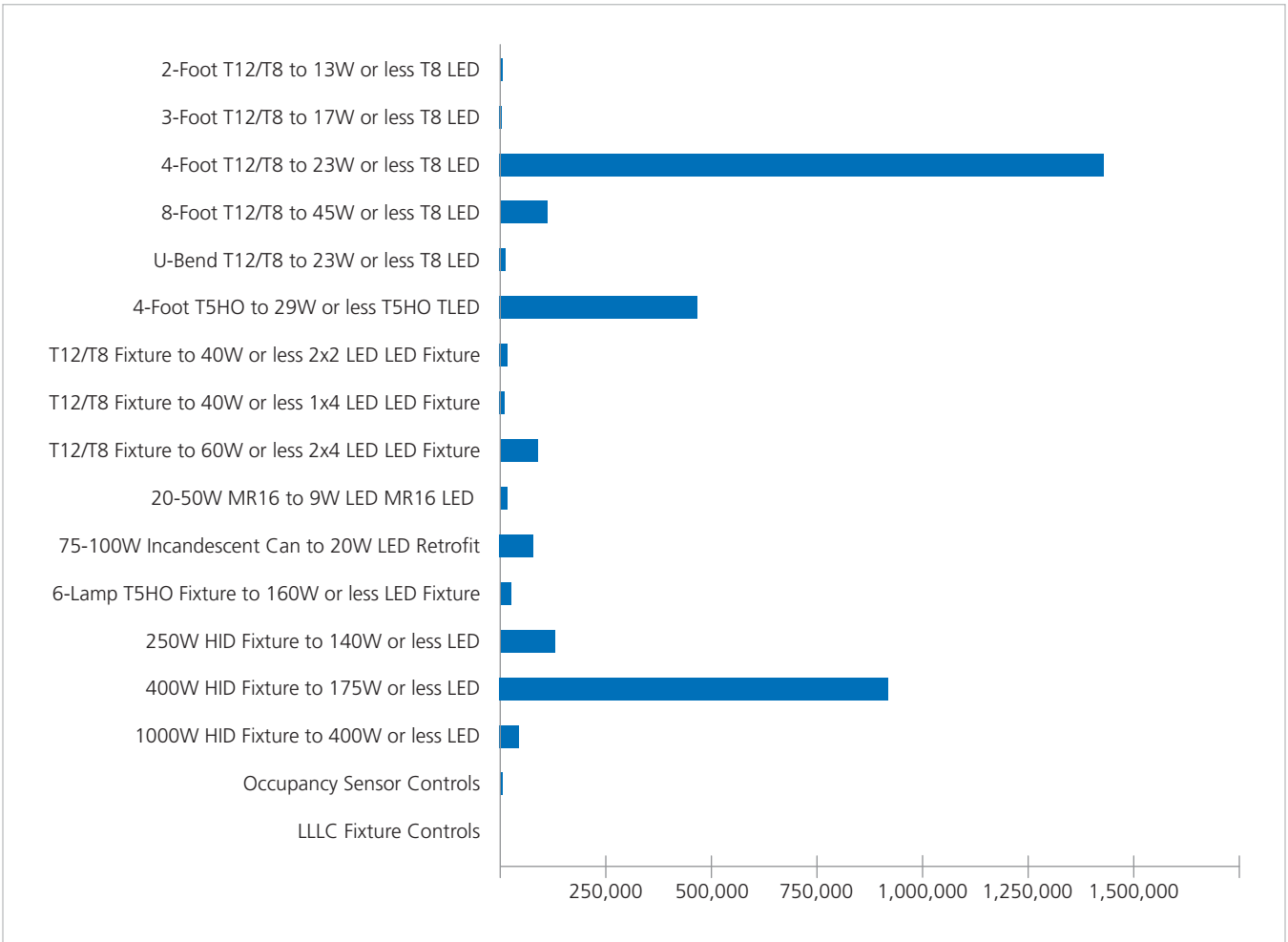
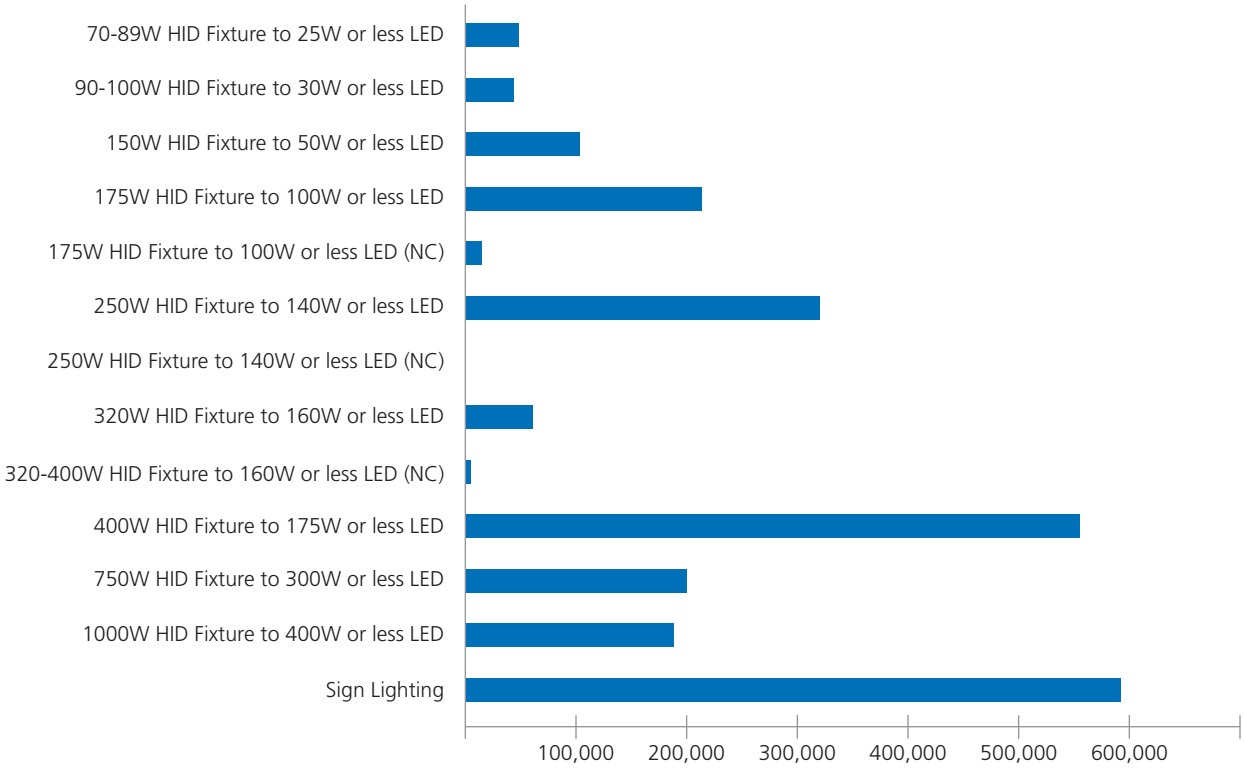


FIGURE 20 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE EXTERIOR LIGHTING PROGRAM KWH SAVINGS BY MEASURE



Program Changes

Avista made the following changes to the program in 2021.

TABLE 28 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM CHANGES

2021 Changes to Commercial Lighting Rebates	2020	2021	2021 Mid-Year
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, retrofit kit, or lamp	$ 65	$ 65	$ 70
90-100W HID fixture to ≤ 30W LED fixture, retrofit kit, or lamp	$ 85	$ 85	$ 100
150W HID fixture to ≤ 50W LED fixture, retrofit kit, or lamp	$ 130	$ 130	$ 150
175W HID fixture to ≤ 100W LED fixture, retrofit kit, or lamp	$ 130	$ 130	$ 155
250W HID fixture to ≤ 140W LED fixture, retrofit kit, or lamp	$ 160	$ 180	$ 200
320W HID fixture to ≤ 160W LED fixture, retrofit kit, or lamp	$ 195	$ 215	$ 270
400W HID fixture to ≤ 175W LED fixture, retrofit kit, or lamp	$ 280	$ 285	$ 325
750W HID fixture to ≤ 300W LED fixture, retrofit kit, or lamp	$ 490	$ 505	$ 575
1000W HID fixture to ≤ 400W LED fixture, retrofit kit, or lamp	$ 610	$ 640	$ 820
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	$ 130	$ 140	$ 150
250W code HID fixture to ≤ 140W LED fixture	$ 160	$ 160	$ 175
320W code HID fixture to ≤ 160W LED fixture	$ 195	$ 195	$ 220
Sign Lighting Retrofit – Requires at Least 4,288 Hours of Use per Year			
T12 to LED sign lighting	$ 22/SQFT	$ 22/SQFT	$ 11/SQFT

2021 Changes to Commercial Lighting Rebates	2020	2021	2021 Mid-Year
Interior Lighting			
Fluorescent Tubular Lamps – Must Be DLC-Rated			
T5HO four-foot TLED	$ 12.50	$ 15.00	$ 22.00
T8 two-foot TLED	$ 0.00	$ 8.00	$ 15.00
T8 three-foot TLED	$ 0.00	$ 8.00	$ 15.00
T8 four-foot TLED	$ 6.50	$ 8.00	$ 13.50
T8 four-foot TLED to TLED (>5W reduction)	$ 0.00	$ 0.00	$ 4.00
T8 U-bend TLED	$ 10.00	$ 10.00	$ 16.00
T8 eight-foot TLED	$ 11.50	$ 11.50	$ 12.00
Fluorescent Fixtures – Must Be DLC-Rated			
2, 3, or 4-Lamp T12/T8 fixture to LED-qualified 2x4 fixture	$ 28.00	$ 30.00	$ 46.00
2-Lamp T12/T8 fixture to LED-qualified 2x2 fixture	$ 20.00	$ 20.00	$ 30.00
2-Lamp T12/T8 fixture to LED-qualified 1x4 fixture	$ 0.00	$ 20.00	$ 30.00
6-Lamp T5HO Fixture to ≤ 160W LED fixture	$ 0.00	$ 0.00	$ 215.00
HID Lighting – Must Be DLC-Rated			
250W HID fixture to ≤ 140W LED fixture or lamp	$ 125.00	$ 125.00	$ 195.00
400W HID fixture to ≤ 175W LED fixture or lamp	$ 185.00	$ 195.00	$ 250.00
1000W HID fixture to ≤ 400W LED fixture or lamp	$ 270.00	$ 355.00	$ 565.00
MR16 (GU10 base) – Must be ENERGY STAR-Rated			
2-9W MR16 lamp	$ 5.50	$ 8.50	$ 8.50
Can Light Kit – Must be ENERGY STAR-Rated			
≤ 20W LED fixture retrofit	$ 20.00	$ 30.00	$ 40.00
Controls			
Occupancy Sensor Controls with Built-In Relays	$ 25.00	$ 30.00	$ 40.00
LLLC Fixture Controls	$ 35.00	$ 50.00	$ 150.00

Marketing

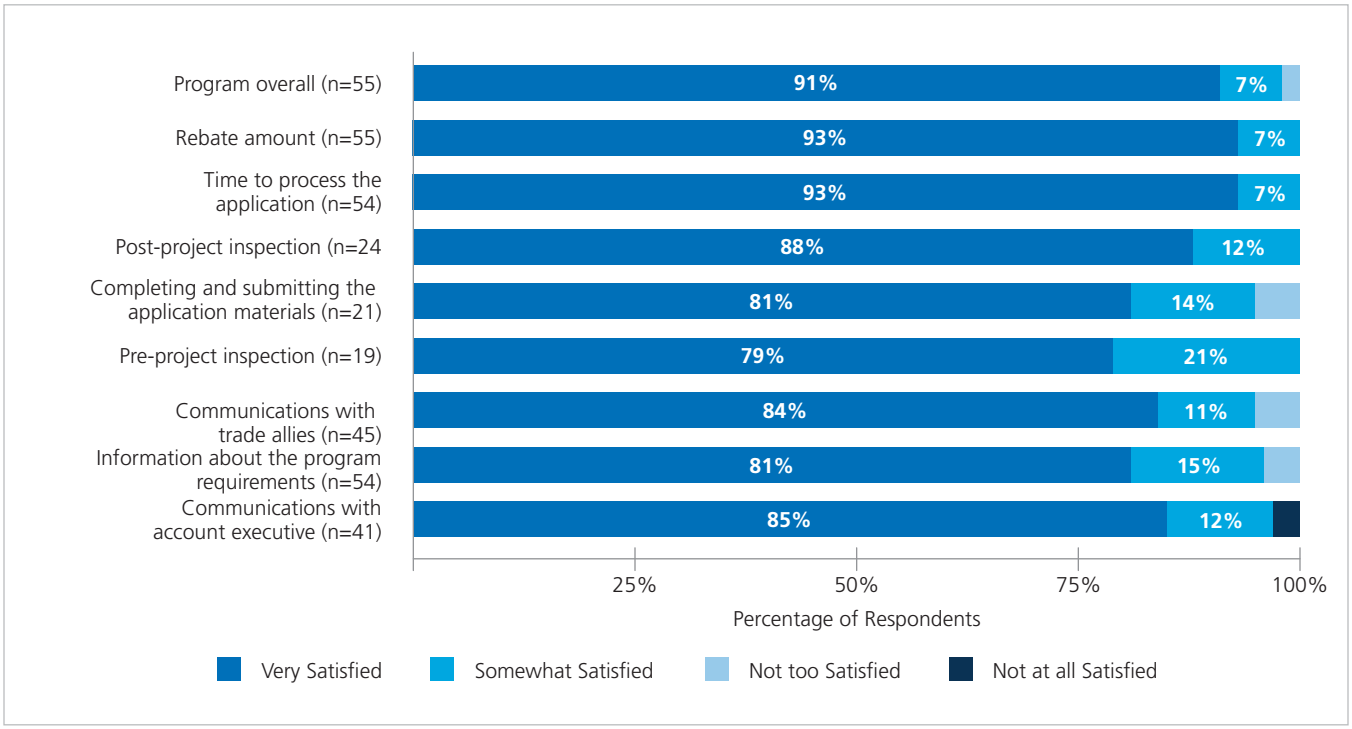
Key to the success of the prescriptive lighting program is clear communication to lighting supply houses, distributors, electricians, and customers regarding incentive requirements and forms. The Avista website communicates program requirements and highlights opportunities for customers. In addition, the company's regionally based account executives play an integral role in delivering the prescriptive lighting program to commercial/industrial customers. Any changes to the program typically include 90 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.

Customer Satisfaction

Fifty-six online surveys were completed with prescriptive participants in 2021. Because 50 of the 56 respondents installed lighting projects, the results primarily represent lighting participants rather than non-lighting participants.

Respondents were nearly all somewhat or very satisfied with all aspects of the Avista program, as shown in Figure 21. One respondent was not too satisfied with the overall program, citing challenges in filling out the forms due to lack of instructions from the contractor. None of the other respondents who were not too or not at all satisfied provided specific reasons for being less satisfied.

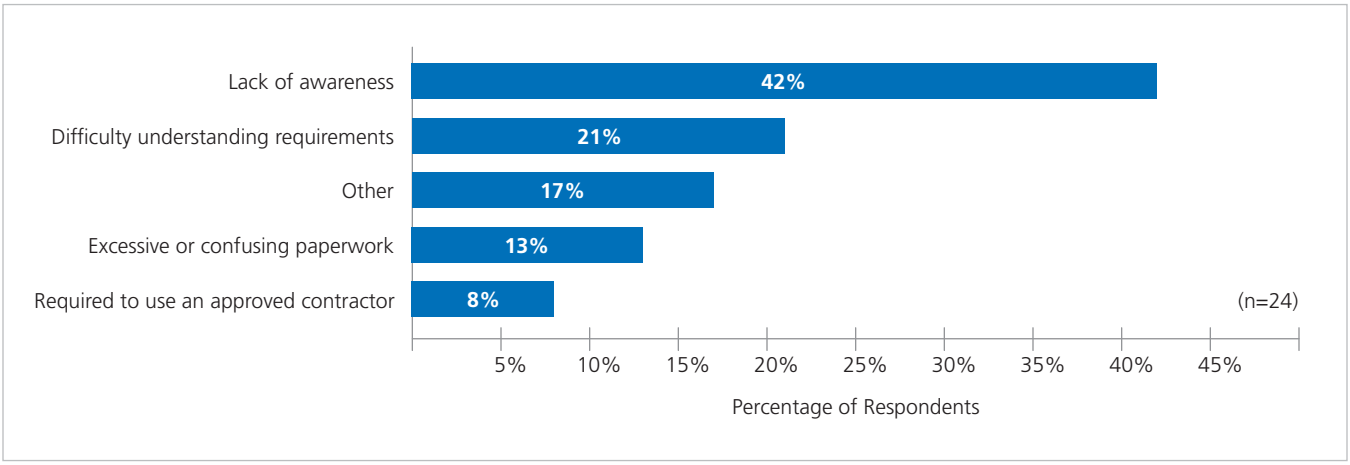
FIGURE 21 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE PROGRAM COMPONENTS SATISFACTION



Source: Prescriptive survey questions H1: "In terms of the program, how satisfied were you with the following aspects? Please think about each item individually as you select your answer."

When asked what challenges the program presented, 39 percent of respondents (n=56) provided no response and 18 percent reported there were no problems or complimented the program. As shown in Figure 22, respondents most frequently cited lack of awareness as their biggest challenge to participation (42 percent, n=24) followed by difficulty understanding the lighting requirements and rebate form. Two respondents had issues using an approved contractor; for example, one respondent mentioned they did not want to use an approved contractor, but would have liked to complete the work themselves. Responses in the "other" category include difficulty disposing of old lighting, internal company challenges such as budget and labor, differing lighting preferences, and finding the decision-maker.

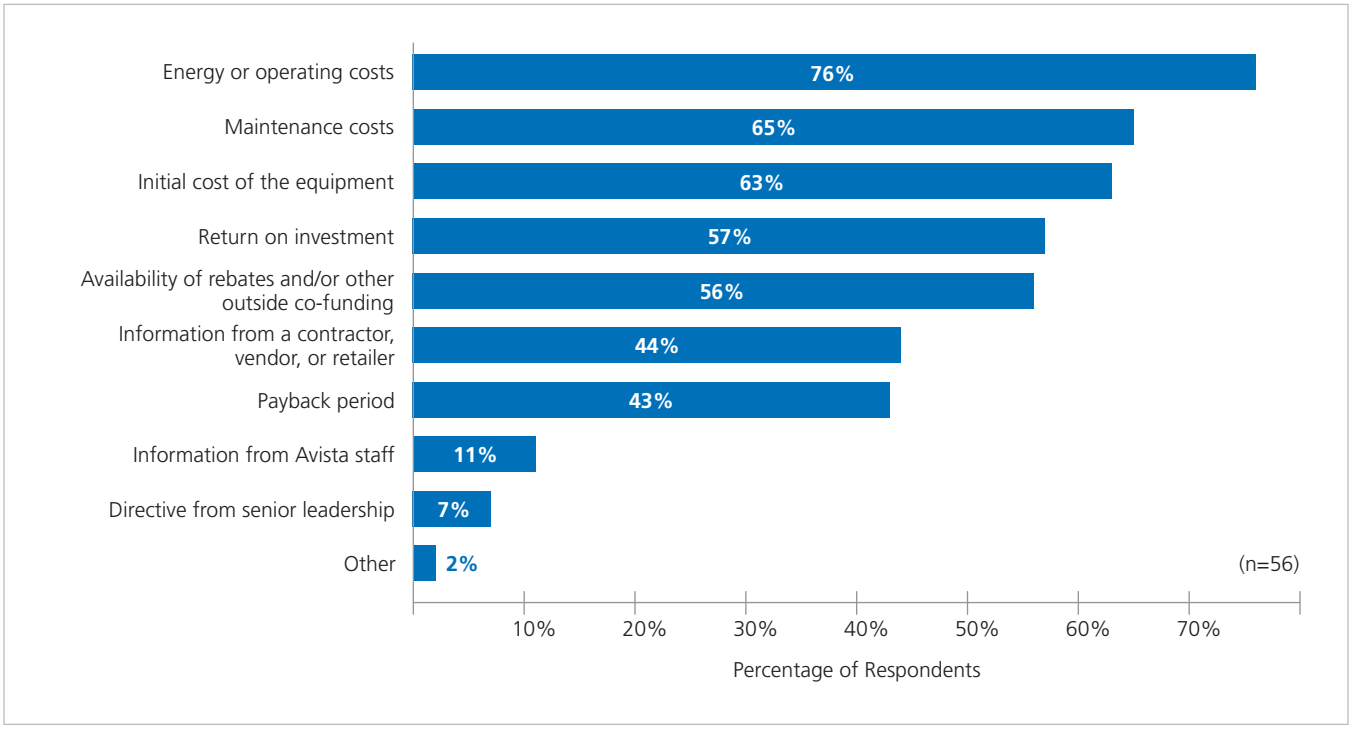
FIGURE 22 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE PROGRAM PARTICIPATION CHALLENGES



Source: Prescriptive survey question H10: "What do so see as the biggest challenges to participating in Avista's program for your company or other companies like yours?" Percentage may not sum to 100 percent due to rounding.

A majority of the 2021 respondents (98 percent, n=55) considered energy efficiency either somewhat or very important to their organization when making capital upgrades or improvements. As shown in Figure 23, respondents cited energy or operating costs (76 percent, n=56) as the most important criteria in their decision to undertake energy-efficiency improvements, followed by maintenance costs (65 percent) and initial cost of equipment (63 percent).

FIGURE 23 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE PROGRAM IMPORTANT CRITERIA FOR ENERGY-EFFICIENCY IMPROVEMENTS



Source: Prescriptive survey question I4: "Which of the following criteria are important in deciding whether your company makes energy-efficiency improvements?" Multiple responses allowed.

Respondents provided feedback about what worked well in Avista's prescriptive programs. As shown in Table 29, they most commonly mentioned the fast or easy application process (seven respondents), followed by the opportunity to save energy and money on utility bills (six respondents).

TABLE 29 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM ASPECTS THAT WORKED WELL

Program Aspects	Number of Respondents
Easy/fast process	7
Saving energy and money on utility bills	6
Overall program works well	5
Good customer service	5
Rebate amount	4
Contractor support	3
Program duration	2
Access to better lighting	1

Source: Prescriptive survey question H12: "What would you say is working particularly well with Avista's program?" (n=33)

As shown in Table 30, 18 respondents made suggestions for improvements to the prescriptive programs. They most frequently suggested providing more information about the program requirements (nine respondents).

TABLE 30 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM SUGGESTIONS FOR IMPROVEMENT

Suggestion	Number of Respondents
More information about program requirements	9
More marketing to customers	3
Expansion of prescriptive list to include motion sensors and other lighting options	2
Vendor motivation	1
More time to submit rebate application	1
Bigger rebates	1
List of available contractors	1

Source: Prescriptive survey question H11: "What recommendations, if any, would you make to improve the program?" (n=18)

The survey asked respondents how the COVID-19 pandemic affected their project. The majority (78 percent, n=51) reported there was no impact, while 16 percent said the pandemic affected the project timeline, and six percent said it affected both the timeline and the scope. One respondent mentioned that COVID-19 affected the project positively as they could complete the project faster. Those who reported negative impacts described the following factors:

- Supply chain problems (six responses)
- Labor shortages (two responses)
- Delay in project (one responses)

Overall, respondent satisfaction with the prescriptive programs was high.

- Ninety-eight percent of prescriptive program respondents said they were very or somewhat satisfied with the program. While satisfaction with all aspects of the prescriptive programs remained high, some respondents expressed dissatisfaction with completing and submitting the rebate application, communication with trade allies and their account executive, and information about program requirements.

Most prescriptive respondents said their lack of awareness about the program was the biggest challenge to participation (42 percent, n=24). Some respondents (nine of 18) said that more information about the program requirements would improve the prescriptive program.

Impact Evaluation

TABLE 31 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM ELECTRIC IMPACT FINDINGS

Program Type	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Interior Lighting	3,382,567	3,362,227	99%
Exterior Lighting	2,341,518	2,307,395	99%

Of 35 evaluated applications across all prescriptive programs, Cadmus identified discrepancies for 18 based on in-person and virtual site visits, verification calls, and project documentation review. 17 of 18 were lighting discrepancies. Table 32 summarizes the reasons for discrepancies between reported and evaluated savings.

TABLE 32 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE LIGHTING PROGRAM EVALUATION SUMMARY OF DISCREPANCIES

Project Type	Number of Occurrences	Savings Impact	Reason(s) for Discrepancy
Interior Lighting	6	↓	Cadmus found that for one project, only half of the installed quantity of one fixture type was installed because the occupants felt they provided sufficient illumination to the space. Cadmus also found that another installed fixture type on the same project had a higher wattage than reported.
			Cadmus reduced the HOU for five projects after interviewing on-site staff about their facilities' lighting operation.
	4	↑	Cadmus increased the HOU of two projects after interviewing on-site staff about their facilities' lighting operation. Cadmus also determined that the Avista database incorrectly categorized one of these projects as exterior lighting measures and transferred these savings to interior lighting.
			Cadmus revised two projects to use the actual installed lamp wattage instead of the default proposed lamp wattage to calculate savings.
Exterior Lighting	4	↓	Cadmus evaluated one sign lighting project that reported multiple different lamp types installed in a single 100-square-foot sign. Cadmus determined that only one of the lamp types matched the dimensions of the sign and recalculated savings.
			Cadmus found that two projects had fewer lamps installed than reported. Some missing lamps were found in storage for possible installation at a later date and others were ordered in higher quantities than required to retrofit all corresponding fixtures in the space.
			Cadmus found that one project had discrepancies up to five percent due to rounding differences. iEnergy rounds the kilowatt savings to two decimal places in the middle of the calculation, causing a loss of accuracy in the final savings.
	3	↑	Cadmus increased the HOU for one sign lighting project due to verifying that it is controlled by a manually adjusted mechanical timeclock. Cadmus also found that the sign had more fixtures installed than reported.
			Cadmus evaluated one project that had one more fixture retrofitted than reported.
			Cadmus verified a higher baseline lamp wattage for one project.

During the 2020 evaluation, Cadmus identified a systemic issue with sign lighting measures in the prescriptive exterior lighting program, which resulted in particularly low realization rates for applicable projects. Avista had applied a deemed savings estimate per square footage of signage replaced based on a 2014 internal engineering review that assumed 8-foot T12 high-output fluorescent lamps as the baseline for all sign lighting. Cadmus evaluated sign lighting projects by verifying the actual quantity, wattages, and HOU for the baseline and installed lamps in each. The average realization rate for 2020 sign lighting measures was approximately 26 percent. Cadmus advised Avista of this discrepancy upon noticing it and reported these findings in detail in the 2020 report. Avista implemented changes to the exterior lighting program in the first quarter of 2021 in response to the exterior lighting program in the first quarter of 2021 in response to the recommendations. Since then, no similar issues were encountered, and the exterior lighting program achieved a 99 percent realization rate in 2021.

Recommendations

The evaluator found that lighting HOU reported by site contacts during verification interviews often varied substantially from the HOU reported on interior and exterior lighting applications. The HOU portion of the prescriptive lighting application does not collect any explanation or context, and documentation for HOU lighting among site-specific projects varied. The following recommendations were offered:

- Add a line to the prescriptive lighting application for customers to briefly describe their interior lighting schedule. Review this description when entering the application to determine whether the annual HOU values are consistent with the schedule described. For exterior lighting, include a line in the application to document existing controls, with checkboxes for common control types and timer settings.
- Benchmark the estimated annual HOU against the RTF's values for the building type and request additional details from the customer if there is a significant difference.
- Consider deploying light loggers on a random sample of lighting projects each year to validate reported HOU values and develop an understanding of whether self-reported hours are typically over- or under-reported compared to actual usage.

The evaluator also found that some prescriptive lighting projects referred to the default proposed wattage in the iEnergy system to calculate energy savings when the actual proposed wattage was also provided. To remedy this, the following recommendation was offered:

- Review iEnergy calculations to ensure that the actual proposed wattage is used in the savings calculation when provided.
- General recommendations to increase customer awareness of all commercial/industrial programs are described on pages 24 and 25.

Plans for 2022

With the more sophisticated measure-level detail in iEnergy, Avista has been able to update interior and exterior lighting measures annually to reflect market conditions. The refined iEnergy data now also includes the site-specific program path, allowing Avista to refine and add new measures into the prescriptive offerings in 2022. Minor refinement to the program is anticipated in 2022 as the company plans to keep the increased incentive rates adopted in mid-2021. Avista will continue to be flexible in making mid-year changes as needed to further encourage program participation. The company will continue evaluating networked lighting controls incentives and will use existing project data to determine whether the prescriptive offering is the right fit for the uniqueness of Luminaire Level Lighting installations. Avista will also consider bringing RTF annual hours-of-use assumptions into IEnergy, flagging outliers for further analysis.

iEnergy is currently configured to use actual proposed wattage rather than default. Avista investigated all instances in which iEnergy referred to default wattage and determined that these calculations happened in error, likely due to a glitch in the iEnergy software or a temporary lapse in connectivity. Avista will consider implanting an additional report for verification and quality control purposes, which could be done on a monthly or quarterly basis.

Commercial/Industrial Prescriptive Non-Lighting Programs

TABLE 33 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM METRICS

Prescriptive Non-Lighting Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		52
Overall kWh Savings		91,163
Incentive Spend	$	14,429
Non-Incentive Utility Costs	$	6,944
Idaho Energy Efficiency Rider Spend	$	21,373
Prescriptive Non-Lighting Program Summary – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		39
Overall Therm Savings		20,725
Incentive Spend	$	47,482
Non-Incentive Utility Costs	$	122,486
Idaho Energy Efficiency Rider Spend	$	169,968

Description

Commercial Food Service Equipment Program – The Commercial Food Service Equipment Program helps encourage customers to use energy-efficient equipment and is available for replacing existing or purchasing new equipment. If Avista provides the fuel type of the equipment installed, customers are eligible when that equipment meets the efficiency requirement. 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.

Commercial Insulation – The Commercial Insulation Program is a retrofit program to encourage customers to increase the insulation in an existing building. It addresses three building areas – wall, attic, and roof – and is available to Avista commercial customers who have an annual heating footprint of at least 340 therms or 8,000 kWh. Insulation must be installed by a licensed contractor and meet the eligibility guidelines for existing and new R-values. Customers who meet the requirements must submit rebate paperwork with an accompanying insulation certificate and invoice within 90 days of project completion. Incentives are disbursed after receipt of documentation and verification of 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.

Commercial Natural Gas HVAC – The Commercial Natural Gas HVAC Program encourages Avista commercial natural gas customers to save energy by choosing to install energy-efficient natural gas furnaces and boilers. It offers 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 eligibility.

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

Fleet Heat – The Fleet Heat Program is provided to Avista commercial electric customers who use uncontrolled block heaters to keep fleet engines warm when their vehicles are not running during the colder climate months, typically from the end of October to the end of March. This program offers a product that provides an engine-mounted remote thermostat with an ambient temperature thermostat in a Twinstat cord to maximize energy efficiency. Upon receiving the rebate form, Avista will order the cords for customers from Hotstart according to the information provided on the form. Avista 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 offers Avista commercial electric customers a range of retrofit energy savings measures associated with commercial refrigeration. The incentives within this program offer specific measures that can be installed and applied for after project completion. Customers may install any of the eligible measures from display case lighting, motors, controls, strip curtains, or gaskets, and apply for an incentive by submitting a rebate form with associated invoicing and providing proof of purchase and installation. Incentives are disbursed after receipt of documentation and verification of eligibility.

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

Program Activities

- ***Electric:*** Savings of 91,163 kWh, a decrease of 19 percent compared to 113,087 kWh in 2020.
- ***Natural Gas:*** Savings of 20,725 therms, a decrease of 30 percent in comparison to 29,409 therms in 2020.

FIGURE 24 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM INCENTIVE DOLLARS BY MEASURE – ELECTRIC

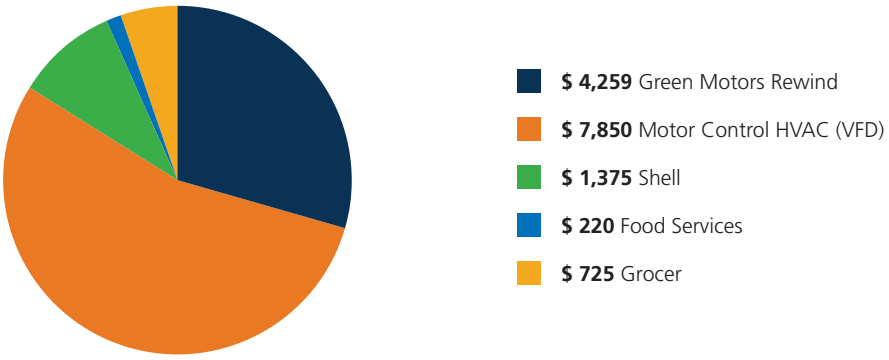
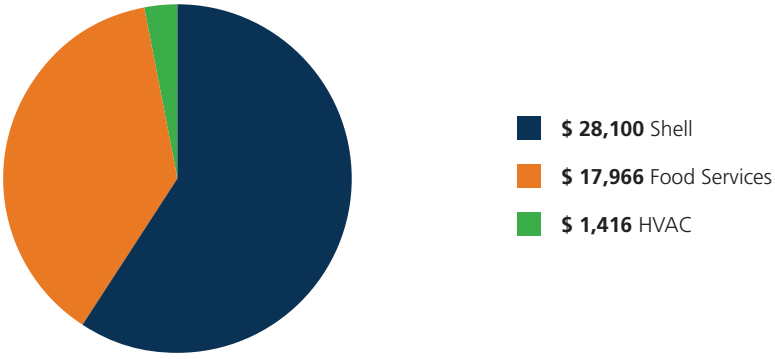


FIGURE 25 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM INCENTIVE DOLLARS BY MEASURE – NATURAL GAS



Program Changes

Table 34 lists changes to commercial/industrial non-lighting prescriptive programs in 2021.

TABLE 34 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM REBATE CHANGES

2021 Changes to Prescriptive Program Incentives	2020	2021	Notes
Commercial Natural Gas HVAC Program			
92% AFUE Natural Gas Unit Heater <300 kBtu/hr	$ 0	$ 6/kBtu Input	New Measure
Commercial Variable Frequency Drive Retrofit			
VFD Fans	$ 130	$ 200	Incentive Increase
VFD Cooling Pump Only	$ 130	$ 200	Incentive Increase
VFD Heating Pump Only or Combined Heating and Cooling Pump	$ 130	$ 200	Incentive Increase
Commercial Insulation Retrofit Program			
Wall Less Than R4 to R11-R18	$ .35/SQ FT	$ .60/SQ FT	Incentive Increase
Wall Less Than R4 to R19 or Greater	$ .45/SQ FT	$ .65/SQ FT	Incentive Increase
Attic Less Than R11 to R30-R44	$ .50/SQ FT	$ .75/SQ FT	Incentive Increase
Attic Less Than R11 to R45 or Greater	$ .60/SQ FT	$ .85/SQ FT	Incentive Increase
Roof Less Than R11 to R30 or Greater	$ .40/SQ FT	$ .60/SQ FT	Incentive Increase
Commercial Compressed Air Line Isolation Retrofit Program			
New program. See myavista.com/bizrebates or the Commercial Compressed Air Line Isolation Retrofit agreement form for details.			

Marketing

Avista account executives market this program; it's also featured on the Avista efficiency website and used by trade allies as a marketing tool.

Customer Satisfaction

This program was included in a prescriptive programs process evaluation for 2021. Survey respondents from lighting and non-lighting prescriptive programs were combined into one set of commercial/industrial prescriptive findings, which are summarized in the preceding prescriptive lighting section. The full process evaluation is included as Appendix E to this report.

Impact Evaluation

Electric: Table 35 shows reported and evaluated electric energy savings for Avista's commercial/industrial prescriptive program path (non-lighting) as well as the realization rates between the evaluated and reported savings for 2021. The overall commercial/industrial prescriptive program path achieved a 76 percent electric realization rate.

TABLE 35 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM ELECTRIC IMPACT FINDINGS

Program Type	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Shell Measure	2,547	2,547	100%
Green Motors	23,986	23,986	100%
Motor Control HVAC (VFD)	56,210	56,210	100%
Food Service Equipment	977	977	100%
Energy Smart Grocer	4,323	7,443	172%
Commercial/Industrial Prescriptive	**88,043**	**91,163**	**104%**

Of 35 evaluated applications, the evaluator identified discrepancies for 18; however, just one discrepancy was in the non-lighting prescriptive program (the other 17 were in lighting and were covered in the preceding prescriptive lighting section). Table 36 summarizes the reasons for discrepancies between reported and evaluated savings for the Energy Smart Grocer Program.

TABLE 36 – COMMERCIAL/INDUSTRIAL PRESCRIPTIVE NON-LIGHTING PROGRAM EVALUATION SUMMARY OF DISCREPANCIES

Project Type	Number of Occurrences	Savings Impact	Reason(s) for Discrepancy
Grocer	1	↑	Cadmus found that one refrigerated lighting application used lamp counts rather than the total lamp length as the unit of measurement to estimate deemed energy savings. Cadmus updated the calculation to account for the 4' lamps that were installed in the refrigerated cases.

Recommendations

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

- Review deemed savings values for prescriptive measures and consider opportunities to use the additional data now collected in iEnergy to calculate more accurate savings for each participant project. For example, HVAC furnace measures can use the exact AHRI efficiency rating collected in iEnergy instead of a typical average to automatically calculate more precise savings.
- Review iEnergy calculations to ensure that rounding is only applied on final displayed values and not to any intermediate values.
- When estimating power from logged current data, carefully review the equipment nameplates and operating parameters to ensure the correct conversion. When multiple datasets are collected for a project, clearly identify in the project files which dataset was used for the final estimation and document why one dataset was chosen over the other.

Plans for 2022

Avista is considering modifications to the Grocer and Food Service Equipment Programs to better align with the RTF.

The company will continue to improve and refine calculations in iEnergy for prescriptive rebates in line with Cadmus' recommendations. Avista currently collects more detailed customer information, such as pounds of food cooked per day, hours per day, and days per year – as well as AHRI certification – but does not use this information for savings calculations. Avista will consider doing so, balanced with considerations related to the upcoming transition to a midstream program for many prescriptive HVAC, Grocer, and Food Service Equipment Program measures.

Avista will also consider increasing outreach to customers for commercial/industrial programs, as well as ways to help participants sort through equipment options more efficiently.

Coeur d'Alene River, Idaho

RESIDENTIAL SECTOR

Overview

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

Nearly $2 million in rebates and direct customer benefits were provided to Idaho residential customers to offset the cost of implementing these energy-efficiency measures in 2021. All programs within the residential sector portfolio combined contributed 1,413 MWh and 276,057 therms to the annual energy savings.

TABLE 37 – RESIDENTIAL SAVINGS BY PROGRAM

Residential	Electric Savings (kWh)	Natural Gas Savings (Therms)
Water Heat	30,726	41,972
HVAC	323,274	212,647
Shell	219,690	18,214
Fuel Efficiency	586,226	
ENERGY STAR Homes	72,093	670
Small Home & Multifamily Weatherization	49,193	2,301
Appliances	13,420	253
Multifamily Direct Install	118,613	
Total Residential	**1,413,235**	**276,057**

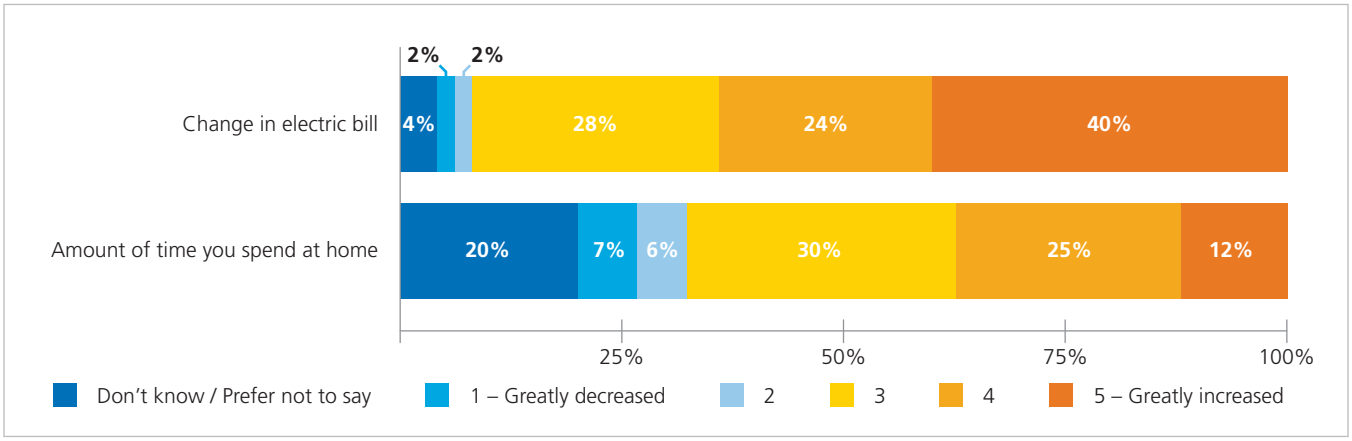
Impacts of COVID-19 Pandemic

Idaho residential programs fared well in 2021 with active programs, but did see decreases in activity due to the expiration of the Simple Steps Program and less activity in the Multifamily Direct Install Program.

The impact evaluator conducted a survey of program participants and asked respondents about changes in electric bills as well as changes in amount of time spent at home.

Sixty-four percent of respondents said that the amount of time they spend at home had increased since the COVID-19 pandemic began. Thirty-seven percent of respondents indicated that their utility bill had increased. Figure 26 displays the change in amount of time spent at home and the change in electricity bills since the COVID-19 pandemic began.

FIGURE 26 – CHANGE IN AMOUNT OF TIME SPENT AT HOME AND CHANGE IN ELECTRIC BILL SINCE COVID-19 PANDEMIC BEGAN



The process evaluator also noted that COVID-19 was the main challenge for customers and trade allies in 2021. Not all program goals were met because of the impact of pandemic-specific issues, such as quarantine periods, contractor staffing issues, and customers being less likely to allow contractors in their homes. Some of these issues affected project completion, but Avista was lenient with schedules to account for timeline challenges. In addition, the cost of equipment continued to increase due to supply chain issues caused by the pandemic – another challenge for customers, though Avista was able to increase some incentives in response.

Marketing

The "Way to Save" advertising campaign included TV, digital, search engine marketing, streaming, and social media. With a call-to-action to visit myavista.com for more information, the advertising successfully drove visits to the company's website as evidenced by analytics. The campaign ran three times: in the spring between March 15 and May 9, in the summer between July 23 and August 15, and in the fall between September 7 and November 1. The campaign was effective in driving website traffic: Average page views on Avista's Idaho rebates page had been 75 per day; when the ads were running, that number jumped to 1,025 (spring), 1,039 (summer), and 882 (fall) – an increase of as much as 493 percent.

FIGURE 27 – RESIDENTIAL "WAY TO SAVE" TELEVISION COMMERCIALS

Avista continued its annual "Way to Save" digital advertising campaign in 2021 to help increase awareness of the company's rebates. The advertising included streaming and YouTube for time-shifted viewing, social media, online advertising banners, and search engine marketing. The digital campaign coincided with the same spring, summer, and fall timeframes as the overall advertising campaign described on page 34. The digital efforts drove 27,908,068 display and 1,494,811 YouTube impressions, as well as 561,686 searches and 16,910 clicks. Customer interest in particular measures varied by season; furnaces and electric heat pumps garnered the most interest in spring; insulation, washers, and ductless heat pumps took the lead in summer and fall.

FIGURE 28 – RESIDENTIAL "WAY TO SAVE" REBATES SOCIAL MEDIA AND DIGITAL ADVERTISING

As cold weather moved in, the "Winter Tips" campaign was implemented to remind customers of energy-saving tips for the season.

FIGURE 29 – RESIDENTIAL ENERGY-SAVINGS WINTER TIPS PRINT AD

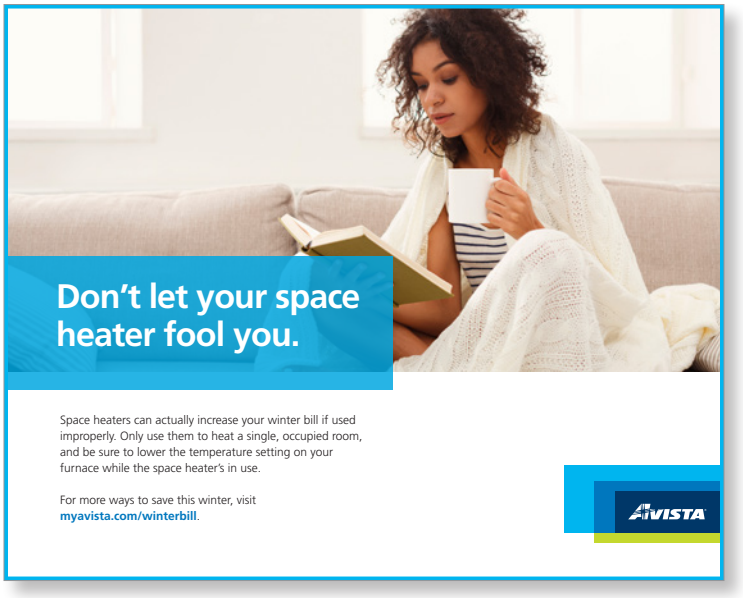


FIGURE 30 – RESIDENTIAL ENERGY-SAVINGS WINTER TIPS BILL INSERT

FIGURE 31 – RESIDENTIAL ENERGY-SAVINGS TIPS SOCIAL MEDIA

In addition to appearing on Avista's website, energy-efficiency tips and/or rebates content was included in the company's monthly *Connections* newsletter, which is sent to customers as a bill insert. Search engine marketing (SEM) was also used to reach customers who were actively seeking information about energy-efficiency rebates.

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 2021, "At Home with Lisa" blogs on myavista.com/connect were viewed 8,449 times. On social media, her posts reached 102,441 viewers. Of 49 articles written, 38 focused solely on energy-efficiency topics. Hoping to influence similar customers to act, Lisa continues to share about the steps she's taking to help control her energy use.

FIGURE 32 – RESIDENTIAL AT HOME WITH LISA CONNECTIONS ARTICLE AND BLOG POSTS

Customer Satisfaction

Evaluators conducted process evaluations of the residential programs for the 2021 program year. The methodology consisted of interviews with trade allies as well as online surveys with program participants.

Residential Contractor Interviews

The evaluator conducted 10 interviews with contractors who serve residential customers (five serving Idaho, five Washington). The telephone interviews focused on the following program topics:

- Program awareness and motivation
- Program benefits
- Program delivery experience, including marketing and fulfilling rebates
- Effects of program on success of business
- Interaction with Avista staff
- Perception of customer experience, including awareness and satisfaction
- Successes and challenges
- Feedback and recommendations

Participant Surveys

Residential participants in Idaho and Washington completed 150 online surveys. The complete process evaluation is included as Appendix E.

Impact Evaluation: Residential Sector

While some individual program results varied, the residential sector performed strongly overall in 2021. Savings realization rates were as follows:

- ***Electric:*** Total verified savings of 1,413,235 kWh with a realization rate of 94 percent
- ***Natural Gas:*** Evaluated natural gas savings show a realization rate of 100 percent on savings of 276,057 therms

Complete impact evaluations for electric and natural gas are included as Appendices C and D.

Performance and Savings Goals

The electric program portfolio achieved 31 percent of the 2021 savings goal. The Multifamily Direct Install Program continued to be impacted by COVID-19 restrictions, operating on a limited basis and offering only supplemental lighting measures in 2021. The Small Home & Multifamily Weatherization and the fuel-efficiency programs also had lower than expected savings, driven by lower than expected participation.

Although the Fuel-Efficiency Program did not meet its target, it still accounted for 41 percent of total residential sector savings. HVAC measures accounted for 23 percent of savings. The ENERGY STAR Homes Program far surpassed its kWh saving goal, contributing 5 percent of residential savings.

Table 38 shows savings goals assigned to Avista's residential sector programs for 2021, as well as reported savings and the goal portion achieved in 2021.

TABLE 38 – RESIDENTIAL PROGRAMS REPORTED ELECTRIC SAVINGS

Program	Savings Goals (kWh)	Verified Savings (kWh)	Percentage of Goal
Water Heat	16,324	30,726	188%
HVAC	349,613	323,274	92%
Shell	252,351	219,690	87%
Fuel Efficiency	2,391,800	586,226	25%
ENERGY STAR Homes	6,630	72,093	1087%
Small Home & Multifamily Weatherization	94,287	49,193	52%
Appliances	4,220	13,420	318%
Multifamily Direct Install	1,500,000	118,613	8%
Residential Total	**4,615,225**	**1,413,235**	**31%**

The natural gas segment of the portfolio achieved 63 percent of the goal for 2021.

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

- The HVAC Program accounted for 77 percent of residential natural gas savings
- The Water Heating Program accounted for 15% of residential natural gas savings
- The Shell Program accounted for 6.5% of residential natural gas savings

Table 39 shows savings goals assigned to Avista's residential sector programs for 2021, as well as reported savings and percentage of goal achieved in 2021.

TABLE 39 – RESIDENTIAL PROGRAMS REPORTED NATURAL GAS SAVINGS

Program	Savings Goals (Therms)	Verified Savings (Therms)	Percentage of Goal
Water Heat	27,593	41,972	152%
HVAC	342,173	212,647	62%
Shell	59,286	18,214	31%
ENERGY STAR Homes	1,340	670	50%
Small Home & Multifamily Weatherization	5,602	2,301	41%
Appliances	-	253	NA
Residential Total	**435,994**	**276,057**	**63%**

Impact Evaluation Methodology

In their effort to complete impact evaluation activities, the evaluators defined two primary methods of determining net savings for Avista's programs:

- A deemed savings approach involves using stipulated savings for energy conservation measures with well-known and documented savings values. These prescriptive savings may also include an adjustment for certain measures, such as lighting, 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 non-participant customers. Billing analysis does not require on-site data collection for model calibration. This approach aligns with the International Performance Measurement and Verification Protocol (IPMVP) Option C.

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

- Verify savings with 10 percent precision at the 90 percent confidence level
- Where appropriate, apply the RTF to verify measure impacts
- Where available data exists, conduct billing analysis with a suitable comparison group to estimate measure savings

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

The evaluators assigned a methodological rigor level for each measure and program based on its contribution to the portfolio savings and availability of data. They analyzed billing data for all electric measure participants in the HVAC and Low-Income Programs. The evaluators applied billing analysis results to determine evaluated savings only for measures where savings could be isolated (that is, where a sufficient number of participants could be identified who installed only that measure). Program-level realization rates for the HVAC, Water Heat, and Fuel-Efficiency Programs incorporate billing analysis results for some measures.

A longer overview of the impact evaluation methodology for residential and low-income programs is described in Appendix C (Electric Residential Impact Evaluation) as well as in Appendix D (Natural Gas Residential Impact Evaluation).

The evaluators implemented a web-based survey to verify program participation. They contacted all customers in the Water Heat, Fuel-Efficiency, and Small Home & Multifamily Weatherization Programs with the goal of reaching 90/10 precision. All efforts were exhausted to reach these customers; however, these programs do not display 90/10 precision at the program-level for in-service rate calculations. For programs in which this goal was not met, the evaluators assumed in-service rates of 100 percent.

The findings from these activities served to estimate in-service rates for each measure surveyed. These in-service rates were applied to verification sample desk review rebates toward verified savings, which were then applied to the population of rebates.

Impact Evaluation Recommendations

The evaluators offered the following recommendations for Avista's residential programs:

- Avista could improve methods for collecting mail-in rebate application information to reconcile the CC&B database. The values found in the project documentation should accurately reflect the values represented in the CC&B database.
- A number of rebates were not accompanied by AHRI certification. In order to acquire accurate equipment efficiencies and tank sizes, AHRI certifications are recommended to be required and submitted with the rebate application, with an invoice that matches the model number found in the AHRI certification.
- A number of rebate applications did not contain values associated with whether the home was existing or new construction. 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 also recommend collecting information on single-family/multifamily/manufactured homes on the web rebate form. This enables them to accurately assign RTF values. The mail-in rebates collect this information; however, it is not currently required to complete the rebate. As a result, many rebates are missing this information.
- 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. They recommend updating data collection standards in order for all sources of information to reflect the same values as the project documentation.

Cost-Effectiveness

Tables 40 and 41 show the residential sector cost-effectiveness results by fuel type. Note that these values are inclusive of both the prescriptive programs and the Multifamily Direct Install Programs.

TABLE 40 – RESIDENTIAL ELECTRIC COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,334,452	$ 1,805,380	1.29
Utility Cost Test (UCT)	$ 1,467,936	$ 967,775	1.52
Participant Cost Test (PCT)	$ 3,737,848	$ 1,368,023	2.73
Ratepayer Impact (RIM)	$ 1,467,936	$ 4,175,204	0.35

TABLE 41 – RESIDENTIAL NATURAL GAS COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,270,583	$ 3,844,791	0.59
Utility Cost Test (UCT)	$ 2,270,583	$ 1,543,307	1.47
Participant Cost Test (PCT)	$ 5,682,281	$ 3,750,981	1.51
Ratepayer Impact (RIM)	$ 2,270,583	$ 5,776,091	0.39

Program-by-Program Summaries

Residential HVAC Program

TABLE 42 – RESIDENTIAL HVAC PROGRAM METRICS

HVAC Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		239
Overall kWh Savings		323,274
Incentive Spend	$	103,839
Non-Incentive Utility Costs	$	72,866
Idaho Energy Efficiency Rider Spend	$	176,705
HVAC Program Summary – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		3,717
Overall Therm Savings		212,647
Incentive Spend	$	1,162,362
Non-Incentive Utility Costs	$	67,905
Idaho Energy Efficiency Rider Spend	$	1,230,267

Description

Avista's residential rebate program provides a variety of options to assist customers with multiple energy-efficiency improvements for the home. Various rebates are available to provide comprehensive solutions for space and water heating systems, the building shell, and appliances.

Idaho residential electric customers (Schedule 1) who heat their homes with Avista electricity may be eligible for a rebate to convert their electric straight-resistance space heating to an air-source heat pump or ductless heat pump system. Annual energy use in the home pre-upgrade must show 8,000 kWh or more (and less than 340 therms if natural gas is also available) of heating use. Air source heat pumps with HSPF of nine or higher and ductless heat pumps with HSPF of 10 or higher qualify for the program.

Idaho natural gas customers (Schedule 101) who heat their homes with Avista natural gas may be eligible for a rebate for installing a high-efficiency natural gas furnace or boiler. High-efficiency natural gas furnaces and boilers with an AFUE of 90 percent or higher are eligible. 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.

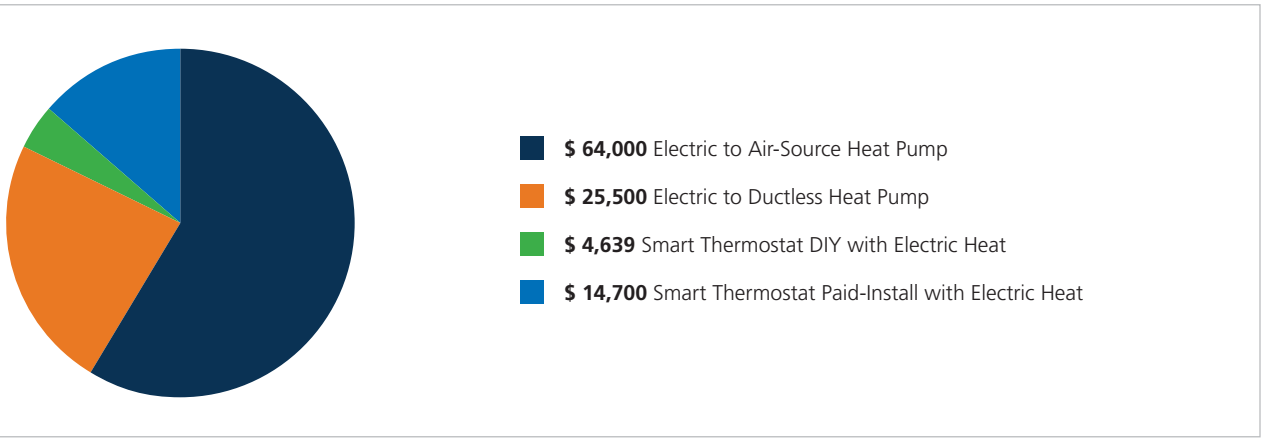
The rebate is paid to the customer after the measure has been installed and associated documentation has been received. Energy-efficiency marketing efforts build awareness of opportunities in the home and drive customers to the website for rebate information. Vendors generate participation using the Avista rebate as a sales tool for their services.

Additional communication methods that encourage program participation include website promotion and bill inserts. Vendor training, retail location visits, and presentations at various customer events are also part of the marketing efforts, though they've been postponed due to pandemic restrictions.

Program Activities

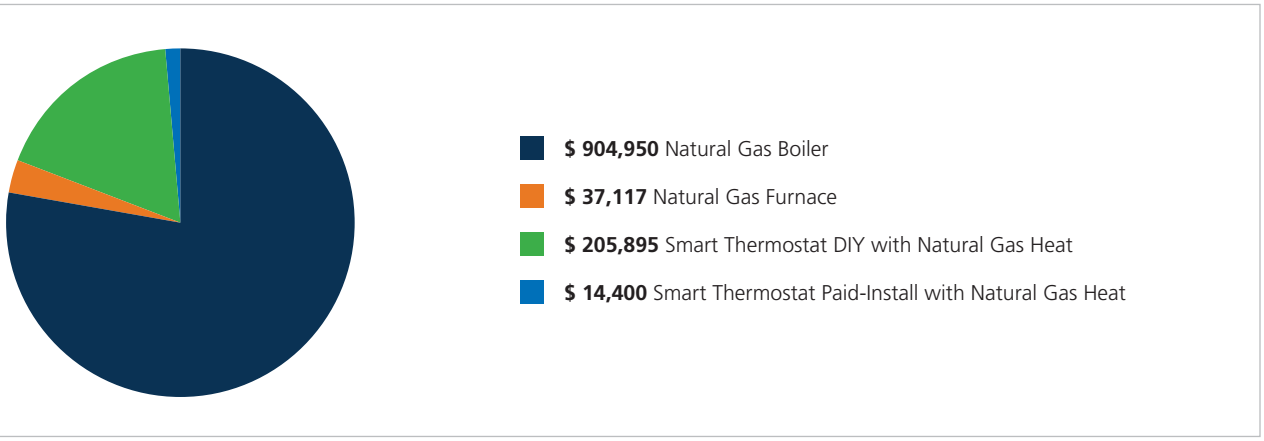
- ***Electric:*** Savings of 323,274 kWh in 2021, 23 percent of the overall savings achieved in Avista's residential portfolio. The program achieved 92 percent of its savings goal of 349,613 kWh.
- ***Natural Gas:*** Savings of 212,647 therms in 2021 – 71 percent of the overall residential savings. The program achieved less than its savings goal of 342,173 therms (62 percent of goal).

FIGURE 33 – RESIDENTIAL HVAC PROGRAM INCENTIVE DOLLARS BY MEASURE – ELECTRIC



For the electric HVAC program, electric furnace to air-source heat pump conversions comprised approximately 62 percent of residential HVAC electric incentives. Ductless heat pumps experienced a decrease with approximately 50 percent of the number of incentives provided in 2021 as compared to 2020.

FIGURE 34 – RESIDENTIAL HVAC PROGRAM INCENTIVE DOLLARS BY MEASURE – NATURAL GAS



High-efficiency natural gas furnaces continued to provide the largest portion of natural gas savings in the residential sector portfolio, comprising approximately 78 percent of Avista's 2021 residential HVAC incentives. Smart thermostats continued to be popular, with 1,810 installed in the Idaho service territory (1,676 for natural gas HVAC systems, 134 for electric HVAC systems).

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

In 2021, 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.

The program also took advantage of the "Way to Save" advertising campaigns to increase awareness and drive program participation, as well as ongoing SEM activities. See pages 63-67.

Impact Evaluation

The ADM impact evaluation team found a 97 percent realization rate for the electric HVAC program and a 100 percent realization rate for the natural gas HVAC program in 2021.

The evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program adjusted savings. In addition, they reviewed and applied the current RTF UES values for the electric measures along with verified tracking data to estimate net program verified savings for this measure.

The smart thermostat DIY with electric heat measure realization rate is low because the Avista TRM uses an average of retail and direct-installation 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 installation and retail rebates for this measure. In addition, the evaluators found that a number of thermostats did not qualify for RTF savings; savings were therefore removed in these instances. Finally, the measure-level ISRs were applied to the measures, further decreasing the realization rate for the electric to air source heat pump and smart thermostat measures.

Recommendations

ADM offered the following recommendations for Avista's residential HVAC programs, in addition to the overall recommendations for the residential sector listed on page 72:

- 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 thermostats meet program requirements. In addition, the evaluators recommend that Avista verify each program rebate to ensure qualifications after rebates are submitted.

Plans for 2022

Avista will continue to offer this program in 2022. The company will consider a qualified product list for thermostats; however, this potential improvement must be considered against potential increases in the program's administrative burden.

Residential Shell Program

TABLE 43 – RESIDENTIAL SHELL PROGRAM METRICS

Shell Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		130
Overall kWh Savings		219,690
Incentive Spend	$	71,766
Non-Incentive Utility Costs	$	107,345
Idaho Energy Efficiency Rider Spend	$	179,111
Shell Program Summary – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		370
Overall Therm Savings		18,214
Incentive Spend	$	55,712
Non-Incentive Utility Costs	$	10,708
Idaho Energy Efficiency Rider Spend	$	66,420

Description

Avista encourages residential customers to improve their home's building envelope by adding insulation, upgrading windows, and installing storm windows. Following the same energy usage requirements as the HVAC program, this approach issues payment to the customer after the measure has been installed.

Idaho residential electric customers who heat their homes with Avista electric and use at least 8,000 kWh a year are eligible to apply, as are Idaho residential natural gas customers with an annual home heating usage of 340 therms or more.

Rebates related to attics, floors, and walls follow the same eligibility requirements for usage and must be installed by a licensed contractor. Existing levels of insulation in the home must meet the following parameters: attic insulation must have an initial insulation level of R-11 or less, and floor and wall insulation may not have any insulation to start. Contractor supporting documentation should verify these details and include an invoice along with information about the square footage of the space insulated along with both pre- and post-installation R-values.

Window projects must replace existing windows in a home, be installed by a licensed contractor, and have a U-factor rating of .29 or lower. Supporting documentation should include a copy of the invoice, along with window dimensions and U-factor ratings.

New storm windows can also be considered for a rebate. They must be the same size and not in direct contact with the existing window. The storm window exterior low-E coating must be facing the interior of the home. Glazing material emissivity must be less than 0.22 with a solar transmittance greater than 0.55.

Marketing efforts build awareness of opportunities in the home and drive customers to the website for rebate information. Vendors generate participation using the rebate as a sales tool for their services. Additional communication methods that encourage program participation include promotion on Avista's website and bill inserts. Vendor training, retail location visits, and presentations at various customer events have been postponed due to pandemic restrictions.

Program Activities

- ***Electric:*** Savings of 219,690 kWh in 2021 (16 percent of the overall residential savings), a 39 percent decrease over the 358,972 kWh achieved in 2020.
- ***Natural Gas:*** Savings of 18,214 therms in 2021, or seven percent of the overall residential savings. The program had a 51 percent increase in savings relative to the 12,000 therms achieved in 2020.

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

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

Marketing

The program also took advantage of the "Way to Save" advertising campaigns to increase awareness and drive program participation, as well as ongoing SEM activities. See pages 63-67.

Impact Evaluation

ADM arrived at a 116 percent realization rate of savings for prescriptive shell rebate measures in electric homes and a realization rate of 100 percent for rebate measures in homes with natural gas. This includes all three insulation cavities (attic, floor, and wall) along with regular and storm window installation.

The realization rate for the electric savings in the Shell Program deviates from 100 percent 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 for heat pumps, electric FAF, and zonal heating types.

The realization rate for natural gas savings in the Shell Program had significant deviation from 100 percent because of low realization rates for two measures: window replacement and attic insulation. Both measures had a statistically significant difference between the billing analysis done by ADM and the RTF values the program used to calculate savings.

The evaluators found no duplicate rebates in the project data and therefore did not remove any rebates from verified savings. However, ADM's document review did illuminate some discrepancies for residential shell projects:

- In one instance, square footage quantity in the rebate application did not match the values presented in the project data for attic insulation.
- Two rebates showed R-values that did not align with TRM or RTF values related to the measure.
- For one floor insulation rebate, the new R-value did not match TRM or RTF values.
- In several instances, web-based rebate data indicated electric space heating, but other sources (project data and document verification) indicated natural gas space heating, and vice versa.
- In one instance, R-values for a window were assigned incorrectly. Evaluators reassigned window insulation on this project from an insulation of R0 to R49 to an insulation of R11 to R49.

Recommendations

In addition to the recommendations offered in the overall residential impact evaluation recommendations (noted on page 72), ADM offered the following recommendations for the Residential Shell Program:

- The evaluators recommend adjusting the Avista TRM values to more closely align with observed participation within each heating type category. In addition, small changes to verified square footage led to variation in realization rate for each project.

Plans for 2022

For window measures in the Shell Program, Avista plans to adjust the U-factor requirement to 0.29 or lower, following the RTF required efficiency revision. ENERGY STAR-rated doors will also be added to the shell measure category.

As restrictions related to COVID-19 are reduced, Avista is planning a return to in-person vendor interaction and customer events and education around energy-efficiency program availability. The company is also considering ways to improve customer-facing processes and accuracy of data, as program data is migrated to iEnergy in 2022.

Residential Water Heating Program

TABLE 44 – RESIDENTIAL WATER HEATING PROGRAM METRICS

Water Heating Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		26
Overall kWh Savings		30,726
Incentive Spend	$	5,590
Non-Incentive Utility Costs	$	4,052
Idaho Energy Efficiency Rider Spend	$	9,642
Water Heating Program Summary – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		562
Overall Therm Savings		41,972
Incentive Spend	$	216,100
Non-Incentive Utility Costs	$	13,501
Idaho Energy Efficiency Rider Spend	$	229,601

Description

Idaho 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 with an efficiency rating of 1.8 or higher, a natural gas tankless water heater with an efficiency of .82 or higher, or a natural gas high-efficiency storage tank water heater with an efficiency of .65 or higher. Efficiency ratings for all equipment are verified according to the contractor invoice or the AHRI certification and should be included with the customer's rebate application.

Program Activities

- ***Electric:*** Program savings were 30,726 kWh in 2021, a 137 percent increase over the 12,986 kWh of savings achieved in 2020.
- ***Natural Gas:*** Overall therm savings were 41,972 therms, an increase of 11 percent over savings of 37,976 therms in 2020. Savings accounted for 15 percent of the residential portfolio and the program achieved 96 percent of its savings goal of 39,436 therms.

Program Changes

There were no program changes for 2021.

Marketing

The program also took advantage of the "Way to Save" advertising campaigns to increase awareness and drive program participation, as well as ongoing SEM activities. See pages 63-67.

Impact Evaluation

ADM arrived at a realization rate of 101 percent for the electric program and 100 percent for the natural gas program.

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.

They noted 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 did note the following discrepancy for electric measures:

- 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. Not all rebates were accompanied with AHRI certification.

Recommendations

- For electric measures, 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 offered no recommendations for natural gas measures.

Plans for 2022

Avista plans to continue offering water heater rebates in the 2022 program year with increases to the efficiency values. Heat-pump water heaters must have an efficiency rating of 2.9; natural gas tankless water heaters will increase to .93 UEF. There will be no efficiency change to the storage tank natural gas water heater.

As restrictions related to COVID-19 are reduced, Avista is planning a return to in-person vendor interaction and customer events and education around energy-efficiency program availability. Avista is also considering ways to improve customer-facing processes and accuracy of data, as program data is migrated to iEnergy in 2022.

Residential ENERGY STAR Homes Program

TABLE 45 – RESIDENTIAL ENERGY STAR HOMES PROGRAM METRICS

ENERGY STAR Homes Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		22
Overall kWh Savings		72,093
Incentive Spend	$	20,000
Non-Incentive Utility Costs	$	23,960
Idaho Energy Efficiency Rider Spend	$	43,960
ENERGY STAR Homes Program Summary – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		6
Overall Therm Savings		670
Incentive Spend	$	3,800
Non-Incentive Utility Costs	$	276
Idaho Energy Efficiency Rider Spend	$	4,076

Description

The ENERGY STAR Manufactured Homes Program takes advantage of the regional and national effort surrounding the U.S. Department of Energy and U.S. Environmental Protection Agency's ENERGY STAR label. The ENERGY STAR Manufactured Homes Program promotes a sustainable, low operating cost, environmentally friendly structure as an alternative to traditional manufactured home construction.

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.

Any Idaho residential electric customer (Schedule 1) with a Northwest Energy-Efficient Manufactured (NEEM)-certified home with Avista electric and/or Avista residential natural gas (Schedule 101) 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 can be electric forced air, an electric heat pump, or a natural gas furnace. This rebate may not be combined with other Avista individual measure rebate offers (such as high-efficiency water heaters).

Program Activities

- ***Electric:*** ENERGY STAR Homes electric savings were 72,093 kWh in 2021. The program accounted for five percent of the residential electric savings portfolio.
- ***Natural Gas:*** Program savings were 670 therms in 2021, with six projects overall (three natural gas, three natural gas and electric combined), less than 1 percent of the residential natural gas savings portfolio.

The 2021 incentive for ENERGY STAR Manufactured Homes was $1,000 for homes using either Avista electric service or homes with both electric and natural gas. Customers whose homes are heated with Avista natural gas and who receive electricity from another provider received a $600 rebate.

Impact Evaluation

Evaluators arrived at a realization rate of 99 percent for the electric ENERGY STAR Homes Program and 100 percent for the natural gas program.

The evaluators found that realization rates for electric measures differed from 100 percent due to application of heating zone and cooling zone via the RTF, which the Avista TRM lacks. In addition, the realization for the measure is low because the expected savings employed an additive methodology between a natural 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 natural gas-heated home with electricity would save. Therefore, they assigned electric savings from the RTF associated with a fully natural gas-heated home at 43 kWh saved per year. Finally, two projects were verified to have natural gas furnace space heating for the home and therefore verified savings did not include full electric savings. This led to one project displaying 130 percent realization for electric savings, leading to a large downward adjustment in the population realization rates.

Recommendations

- For electric measures, 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.
- The evaluators recommend that Avista's TRM be updated to reflect electric savings of 43 kWh for a fully natural gas-heated home.

Plans for 2022

There are no substantial measure changes planned for this program in 2022. However, Avista will include a TRM savings value of 43kWh for natural gas-heated ENERGY STAR homes. Avista will also consider ways to claim more specific building heating and square footage data, as program data is migrated to iEnergy.

Residential Appliances Program

TABLE 46 – RESIDENTIAL APPLIANCES PROGRAM METRICS

Appliances Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		152
Overall kWh Savings		13,420
Incentive Spend	$	5,590
Non-Incentive Utility Costs	$	2,466
Idaho Energy Efficiency Rider Spend	$	8,056
Appliances Program Summary – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		68
Overall Therm Savings		253
Incentive Spend	$	2,530
Non-Incentive Utility Costs	$	67
Idaho Energy Efficiency Rider Spend	$	2,597

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 other prescriptive paths. For 2021, the company backed an appliance rebate specifically for ENERGY STAR-certified products that included front-load washers and electric dryers.

The program served more than 500 customers in 2021. More participation is anticipated in future years, as market awareness grows. This tends to be an easy home improvement that most customers appreciate having available, though there is a lack of customer understanding about what is considered ENERGY STAR. The yellow energy guide on the side of the appliance is usually provided as proof of eligibility, though it serves only as a descriptor of the amount of energy the product will use, not whether it is ENERGY STAR-certified.

This type of program allows renters to control some of the energy costs in their homes. While usually not able to make decisions regarding the space heat, water heat, or shell improvements for their rental property, they sometimes own their own appliances and can be an active participant in saving energy.

Program Activities

- ***Electric:*** Savings of 13,420 kWh in 2021.
- ***Natural Gas:*** Savings of 253 therms in 2021.

Impact Evaluation

TABLE 47 – RESIDENTIAL APPLIANCES PROGRAM VERIFIED ELECTRIC SAVINGS

Measure	Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
ENERGY STAR-Rated Clothes Dryer	68	4,846	4,624	4,846	100.00%
ENERGY STAR-Rated Front Load Washer	84	11,989	12,012	8,574	71.51%
Total	**152**	**16,835**	**16,636**	**13,420**	**79.71%**

The electric Appliances Program displayed verified savings of 13,420 kWh with a realization rate of 79.71 percent against the expected savings for the program.

TABLE 48 – RESIDENTIAL APPLIANCES PROGRAM VERIFIED NATURAL GAS SAVINGS

Measure	Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
ENERGY STAR-Rated Clothes Dryer	29	78.88	67.30	67.30	85.32%
ENERGY STAR-Rated Front Load Washer	39	235.17	190.34	185.33	78.81%
Total	**68**	**314.05**	**257.65**	**252.64**	**80.44%**

The natural gas Appliance Program displayed verified savings of 252.64 therms with a realization rate of 80.44 percent against the expected savings for the program.

Evaluators found that three of the sampled clothes washer projects did not qualify due to minimum volume requirements specified by the RTF. They also found that the Avista TRM applied RTF savings from the "front load" measure description for clothes washers. However, the evaluators found that three of the clothes washers were top-loading, which the RTF assigns significantly lower annual savings. This change, in addition to the disqualification of three rebates, led to a downward adjustment in realization rate.

The natural gas measures rebated through the Appliances Program are not contained in the Avista TRM. Therefore, the evaluators applied savings for these projects by converting Avista TRM electric savings to natural gas savings by dividing approved Avista TRM savings for the equipment by 29.3. This led to an 85 percent realization for clothes dryers and 79 percent for clothes washers. The evaluators recommend Avista include savings estimates for these measures in the Avista TRM for future evaluations.

Recommendations

The evaluators recommend adding top-loading clothes washers to the Avista TRM and applying savings for those measures appropriately. They recommend Avista include savings estimates for natural gas measures in the Avista TRM for future evaluations.

Plans for 2022

Due to the interest in the program in 2021, the measure list for these appliances has been expanded for 2022 to include the following:

- front-load washer
- top-load washer
- clothes dryer – electric and natural gas
- refrigerator
- freezer

As restrictions related to COVID-19 are reduced, Avista is planning a return to in-person vendor interaction and customer events and education around energy-efficiency program availability. The company has also added top-loading clothes washers to the TRM.

Residential Fuel-Efficiency Program

TABLE 49 – RESIDENTIAL FUEL-EFFICIENCY PROGRAM METRICS

Fuel-Efficiency Program Summary		2021
Participation, Savings, and Costs		
Conservation Projects		50
Overall kWh Savings		586,226
Incentive Spend	$	201,900
Non-Incentive Utility Costs	$	157,719
Idaho Energy Efficiency Rider Spend	$	359,619

Description

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

In 2021, the rebate to convert from electric heat to a forced-air natural gas furnace or boiler was $2,100. The rebate to convert from electric heat to natural gas forced-air space and water heat was $2,850.

Program Activities

The Fuel-Efficiency Program obtained 586,226 kWh of savings in 2021, which is a decrease of eight percent from the 635,962 kWh achieved in 2020. Savings from this program accounted for 41 percent of the residential electric savings portfolio.

Program Changes

No changes to this program were implemented in 2021.

Marketing

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

The program also took advantage of the "Way to Save" advertising campaigns to increase awareness and drive program participation, as well as ongoing SEM activities. See pages 63-67.

Impact Evaluation

ADM arrived at a realization rate of 83.5 percent for the residential Fuel-Efficiency Program in the Idaho service territory.

The realization rate for the electric savings in the Fuel-Efficiency Program deviate from 100 percent due to the differences between the applied Avista TRM prescriptive savings value and the billing analysis and true Avista TRM value.

The Fuel-Efficiency Program, which contributes 45 percent of the expected savings, resulted in a realization rate of 84 percent whereas each of the other programs resulted in a combined 103 percent realization rate. The Fuel-Efficiency Program contributed to a 10 percent decrease in the overall residential sector, which displayed a realization rate of 93 percent.

Evaluation methods for this program included a database review and document verification, verification surveys, and a billing analysis. The realization rate for the electric savings deviate from 100 percent due to the differences between the applied Avista TRM prescriptive savings value and the billing analysis and true Avista TRM value. The evaluators found one rebate was duplicated in the project data for the electric to natural gas furnace measure. ADM removed this instance from the verified savings for the program. In addition, the 93.33 percent survey in-service rate applied to the combination conversion measure further decreased the realization rate for the measure and program overall.

Plans for 2022

There were no changes made for the program in 2021. In 2022, Avista will consider ADM's general recommendations to expand information collected on the rebate form to include efficiency values and manufacturer information.

Residential Multifamily Direct Install and Supplemental Lighting Programs

TABLE 50 – RESIDENTIAL MULTIFAMILY DIRECT INSTALL AND SUPPLEMENTAL LIGHTING PROGRAM METRICS

Multifamily Direct Install Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		121
Overall kWh Savings		118,613
Incentive Spend	$	110,710
Non-Incentive Utility Costs	$	44,913
Idaho Energy Efficiency Rider Spend	$	155,623

The MFDI has been tracked by total measures installed, which include LED lamps, faucet aerators, showerheads, smart strips, pipe wrap, and other measures.

Description

The Multifamily Direct Install (MFDI) Program 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, in tenant units, 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 and Avista to ensure the project is cost-effective, after which the project is completed.

Program Activities

- ***Electric:*** MFDI electric program savings were 118,613 kWh in 2021. The response to the COVID-19 pandemic disrupted the MFDI Program's direct-installation design, forcing the third-party implementer to temporarily halt program processes and apply changes that adapt to pandemic restrictions. These changes included the Exchange and Trunk N Treat pandemic pilots, which reduced the face-to-face interaction that occurs in a traditional MFDI program design. As a result, there was no participation in the MFDI Program and limited participation in the MFDI Supplemental Lighting Program, where participation is defined as the number of installed lighting fixtures. Avista completed and provided incentives through the MFDI Supplemental Lighting Program for 121 installed lighting fixtures in Idaho and reported total electric energy savings of 118,613 kWh.

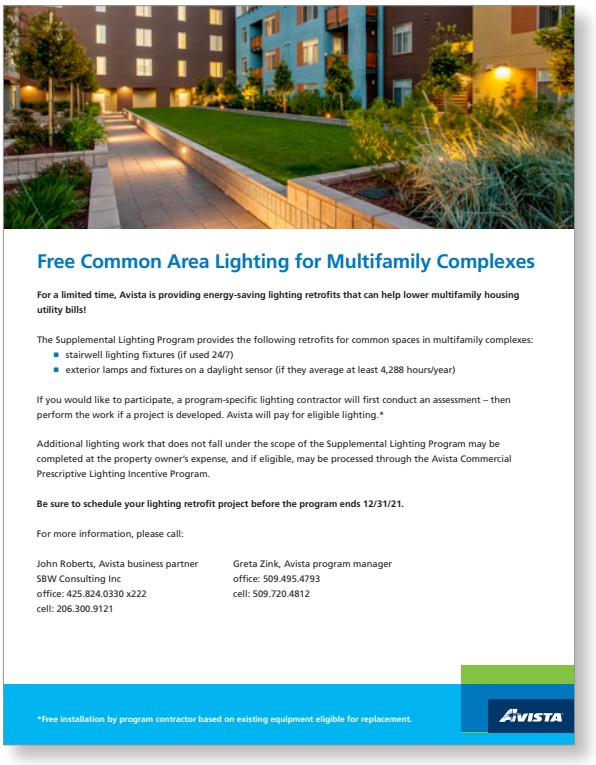
Program Changes

The program did not have any measure changes in 2021.

Marketing

The program is marketed by Avista and SBW, and by property managers through word of mouth. Avista tries to proactively manage the program pipeline to provide a timely scheduling process.

FIGURE 35 – RESIDENTIAL MULTIFAMILY DIRECT INSTALL PROGRAM FLYER



Free Common Area Lighting for Multifamily Complexes

For a limited time, Avista is providing energy-saving lighting retrofits that can help lower multifamily housing utility bills!

The Supplemental Lighting Program provides the following retrofits for common spaces in multifamily complexes:

- stairwell lighting fixtures (if used 24/7)
- exterior lamps and fixtures on a daylight sensor (if they average at least 4,288 hours/year)

If you would like to participate, a program-specific lighting contractor will first conduct an assessment – then perform the work if a project is developed. Avista will pay for eligible lighting.*

Additional lighting work that does not fall under the scope of the Supplemental Lighting Program may be completed at the property owner's expense, and if eligible, may be processed through the Avista Commercial Prescriptive Lighting Incentive Program.

Be sure to schedule your lighting retrofit project before the program ends 12/31/21.

For more information, please call:

John Roberts, Avista business partner
SBW Consulting Inc
office: 425.824.0330 x222
cell: 206.300.9121

Greta Zink, Avista program manager
office: 509.495.4793
cell: 509.720.4812

*Free installation by program contractor based on existing equipment eligible for replacement.

AVISTA

Impact Evaluation

The evaluator conducted a database review to evaluate savings for each measure, then rolled up measure-level evaluated savings to calculate savings and a realization rate for each element of the program. Table 51 shows the resulting rates.

TABLE 51 – RESIDENTIAL MULTIFAMILY DIRECT INSTALL PROGRAM ELECTRIC IMPACT FINDINGS

Program	Reported Electric Savings (kWh)	Adjusted Electric Savings (kWh)	Realization Rates
MFDI	0	0	N/A
MFDI Supplemental Lighting	116,121	118,613	102%
MFDI Programs Total	**116,121**	**118,613**	**102%**

During 2021, the evaluator identified discrepancies between evaluated and reported savings. This included contractors using undefined annual HOU for exterior spaces in the reported savings calculations instead of hours that were consistent with the savings calculations methodology or the site data provided. All evaluated projects with undefined HOU exceeded 100 percent realization because these hours were lower than those documented in the calculation methodology.

Due to the adaptations made for pandemic restrictions the MFDI Program's participation in Idaho was limited to only the supplemental lighting component; savings were therefore well below target. Cadmus found that the program continues to be an efficient mechanism for installing high-efficiency lighting in additional multifamily common areas. However, the lack of participation in the non-supplemental lighting multifamily component and the limited participation in the Supplemental Lighting Program that resulted from the pandemic adaptations were insufficient to meet 2021 savings targets.

All reported program savings calculations appeared to use custom HOU values that were different from deemed HOU values for exterior spaces. Avista could not confirm some custom HOU values because some spaces did not have an assigned site identification.

Recommendations

Cadmus offered the following recommendations for the MFDI Program:

- As pandemic restrictions are lifted in future years, return to a traditional MFDI program design by providing direct installation of energy-efficient lighting and non-lighting measures. Continue to replace high-use, low-efficiency lamps where practical to maximize program cost-effectiveness and yield higher savings.
- The MFDI Program implementer should ensure clear and consistent project documentation and accurate inputs for all site data relating to site locations and hours of use (HOU)

Plans for 2022

This program is currently scheduled to run as originally planned as COVID-19 restrictions are lifted. Avista will continue to set expectations for clear and consistent project documentation for all site data.

Residential Small Home & Multifamily Weatherization Program

TABLE 52 – RESIDENTIAL SMALL HOME & MULTIFAMILY WEATHERIZATION PROGRAM METRICS

Small Home & Multifamily Weatherization Program Summary – Electric	2021
Participation, Savings, and Costs	
Conservation Projects	25
Overall kWh Savings	49,193
Incentive Spend	$ 11,023
Non-Incentive Utility Costs	$ 24,037
Idaho Energy Efficiency Rider Spend	$ 35,059
Small Home & Multifamily Weatherization Program Summary – Natural Gas	**2021**
Participation, Savings, and Costs	
Conservation Projects	16
Overall Therm Savings	2,301
Incentive Spend	$ 8,993
Non-Incentive Utility Costs	$ 1,353
Idaho Energy Efficiency Rider Spend	$ 10,345

Description

Created in response to a gap in program availability, the Small Home & Multifamily Weatherization 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 typically been excluded from program eligibility because condos are usually constructed as a multifamily building (i.e., five or more units per building).

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

Results from the 2021 evaluation and implementation review demonstrated that 49,139 kWh savings and 2,301 therms were achieved with this program, prompting consideration toward adding additional measures for these homes.

Program Activities

The Residential Small Home & Multifamily Weatherization Program accounted for three percent of program savings for electric and one percent of savings for natural gas programs.

- ***Electric:*** Savings of 49,139 kWh in 2021.
- ***Natural Gas:*** Savings of 2,301 therms in 2021.

Impact Evaluation

TABLE 53 – RESIDENTIAL SMALL HOME & MULTIFAMILY WEATHERIZATION PROGRAM VERIFIED SAVINGS

Electric Measure	2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
Multifamily Attic Insulation with Electric Heat	3	2,685	2,780	2,685	100.00%
Multifamily Thermostat with Baseboard Electric Heat	2	152	152	220	144.74%
Multifamily Wall Insulation with Electric Heat	1	1,904	1,906	1,400	73.53%
Multifamily WIFI Thermostat with Baseboard Electric Heat	6	549	549	6,858	1249.18%
Multifamily Window Replc with Electric Heat	13	44,621	44,616	38,030	85.23%
Total	**25**	**49,911**	**50,003**	**49,193**	**98.56%**
Natural Gas Measure	**2021 Units**	**Expected Savings (Therms)**	**Adjusted Savings (Therms)**	**Verified Savings (Therms)**	**Verified Realization Rate**
Multifamily Attic Insulation with Natural Gas Heat	2	28.11	76.18	70.56	251.01%
Multifamily Floor Insulation with Natural Gas Heat	1	0.04	42.60	42.60	-
Multifamily Window Replacement with Natural Gas Heat	16	437.61	1,203.24	2,117.20	483.81%
Natural Gas Wall Heater	1	81.66	70.54	70.54	86.39%
Total	**20**	**547.42**	**1,392.56**	**2,300.90**	**420.32%**

The Small Home & Multifamily Weatherization Program displayed verified savings of 2,300.90 therms with a realization rate of 420.32 percent against the expected savings for the program.

Evaluators found that many projects exceeded the "small home" square footage limit defined in Avista's program guidelines. In addition, the evaluators note that the current program rebate applications do not provide an option to indicate "multifamily" home type. Rather, the current rebate application includes an option for "single family," "manufactured," "new construction," and "other."

The realization rate for the natural gas savings in the Small Home & Multifamily Weatherization Program is unexpectedly high at 420.32 percent due to differences between the unit-level savings values Avista had applied to the project quantity for seven sampled projects and the unit-level savings presented in the Avista TRM.

Recommendations

Evaluators recommend claiming projects on single family homes that are larger than 1,000 square feet into the Shell Program.

They recommend verifying space heating type and home type during application approval, in order to apply correct savings values to each project. The evaluators also recommend including an option for "multifamily" on the project application

The expected savings calculated for these projects did not align with the values indicated in the Avista TRM. The evaluators recommend updating the CC&B database to correct for these issues.

Plans for 2022

Due to the interest in the program in 2021, the measure list for these homes has been extended to offer all incentives currently accessible through the residential rebate program.

As restrictions related to COVID-19 are reduced, Avista is planning a return to in-person vendor interaction and customer events and education around energy-efficiency program availability. The company has updated the program application for 2022 with a "multifamily" option for building type. Avista is also considering ways to capture additional building information that doesn't contribute to the administrative burden of the program for staff, trade allies, and customers.

Wallace, Idaho

LOW-INCOME SECTOR

Program Summary

Low-Income Program

TABLE 54 – LOW-INCOME PROGRAM METRICS

Low-Income Program Summary – Electric		2021
Participation, Savings, and Costs		
Conservation Projects		158
Overall kWh Savings		153,503
Incentive Spend	$	473,195
Non-Incentive Utility Costs	$	252,844
Idaho Energy Efficiency Rider Spend	$	726,038
Low-Income Program Summary – Natural Gas		**2021**
Participation, Savings, and Costs		
Conservation Projects		133
Overall Therm Savings		3,217
Incentive Spend	$	473,195
Non-Incentive Utility Costs	$	252,844
Idaho Energy Efficiency Rider Spend	$	726,038

Description

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

The agency may spend the contract amount at its discretion on either electric or natural gas efficiency measures. Improvements to the residential shell (e.g., insulation, windows) require that the home demonstrates a minimum level of annual energy use of either Avista electricity or natural gas for space heating purposes. For conversions from electric resistive heat to a heat pump or to a natural gas furnace, an annual kilowatt hour use of 8,000 is required. Within the annual funding allocation is a 15 percent reimbursement for administrative costs. The agency may also choose to use up to 15 percent of its annual allocation for home repair, as well as other health and safety improvements.

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

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

Program Activities

For 2021, the program achieved 153,503 kWh of verified electric savings and 3,217 of verified natural gas savings in Idaho. Table 55 shows Avista savings goals for the low-income sector for 2021, as well as reported savings and goal portions achieved.

TABLE 55 – LOW-INCOME PROGRAM EVALUATED SAVINGS

Program	Savings Goals	Verified Savings	Percentage of Goal
Electric (kWh)	109,952	153,503	140%
Natural Gas (Therms)	16,078	3,217	20%

Avista continued to reimburse the agencies for 100 percent of the cost for installing most energy-efficiency measures defined on the approved measure list (see Table 56). Avista deemed these measures as cost-effective during the development of the 2021 *Annual Conservation Plan*, which took place in late 2020.

TABLE 56 – LOW-INCOME PROGRAM APPROVED MEASURE LIST

Electric Measures	Natural Gas Measures
Air Infiltration	Boiler
Attic Insulation	Doors – ENERGY STAR-Rated
Doors – ENERGY STAR-Rated	Furnace
Duct Insulation	Water Heater (storage)
Duct Sealing	Water Heater (tankless)
Floor Insulation	Windows – ENERGY STAR-Rated
LED Lamps	**Fuel Conversion Measures**
Refrigerator – ENERGY STAR-Rated	Electric to Natural Gas Furnace
Wall Insulation	Electric to Natural Gas Water Heater
Windows – ENERGY STAR-Rated	Electric to Air-Source Heat Pump
	Electric to Ductless Heat Pump

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

TABLE 57 – LOW-INCOME PROGRAM QUALIFIED REBATE MEASURE LIST

Electric Measures	Natural Gas Measures
Air Source Heat Pump Replacement (9 HSPF) Attic Insulation Electric to Ductless Heat Pump (9.0 HSPF) Heat Pump Water Heater (Tier 2-3 any size) Window – ENERGY STAR Rated – .30 U-factor	Air Infiltration Attic Insulation Duct Insulation Duct Sealing Floor Insulation Wall Insulation

Program Changes

The agency has a funding allocation of $875,000 for energy-efficiency measures. Other program changes include the yearly update of measures eligible for the approved and qualified rebate lists. This is based on the company's annual business plan process that is completed in Q4 2020. The eligible measures for 2021 are summarized in Tables 57 and 58. While COVID-19 was still part of everyday conversation and daily precautions continued, the agency was able to spend its contract allocation.

Customer Outreach

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

In a typical year, other customer contacts and referrals are made to the agency as a 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 disability, and veterans. Avista reaches this target population through workshops, energy fairs, and mobile and general outreach. Each medium 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 agencies. One low-income and senior outreach goal is to increase awareness of energy assistance programs such as the Low-Income Home Energy Assistance Program (LIHEAP) and Project Share.

Avista recognizes several educational strategies as being efficient and effective activities for delivering energy efficiency and conservation outreach:

- Energy conservation workshops for groups of Avista customers where the primary target audience is senior and low-income participants.
- Energy fairs where attendees can receive information about low- and no-cost methods to weatherize their homes through demonstrations and limited samples. In addition, fair attendees can learn about bill assistance and watch demonstrations of the 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.
- Mobile outreach is conducted through the Avista Energy Resource Van, where visitors can learn about effective tips to manage their energy use, bill payment options, and community assistance resources. Through general outreach, Avista provides energy management information and resources at events (such as resource fairs) and partnerships that reach the target populations. General outreach also includes outlining bill payment options and assistance resources in senior and low-income publications.

In 2021, to safeguard public and staff health and well-being, Avista suspended outreach activities for several months and used the time to come up with new strategies to safely connect with customers to provide energy-saving information and resources. The outreach team distributed items to local food banks to include in food boxes. Customers could also pick up items during drive-through events at food banks. In the spring, kits were provided to the St. Maries CAP agency and to the Community Resource EnVision Center in Sandpoint. The outreach team conducted and participated in 34 events that included mobile outreach and general outreach (via partnerships and events) that reached 1,550 individuals in Idaho. Table 58 shows an overview of the different activities in Idaho.

TABLE 58 – LOW-INCOME PROGRAM OUTREACH EVENT AND LED BULB DISTRIBUTION SUMMARY

Description	Number of Events/ Activities	Contacts	LEDs
Energy Fairs	0	0	0
General Outreach	29	953	2,450
Mobile Outreach	3	547	1,093
Workshops	2	50	300
Total	**34**	**1,550**	**3,843**

In addition to the company's outreach and education activities, Avista partners with CAP agencies for the employment of a full-time conservation education specialist. CAP agencies also use the funds to enable energy assistance intake specialists in their 10 offices to conduct conservation education activities with clients and in their communities. The conservation specialist conducts activities similar to and in parallel with Avista, and also provides one-on-one education to individuals seeking energy assistance and while weatherization projects are underway. Furthermore, the conservation specialist supports each CAP office's energy staff in their local conservation efforts.

In some situations, the conservation specialist partners with Avista's outreach personnel.

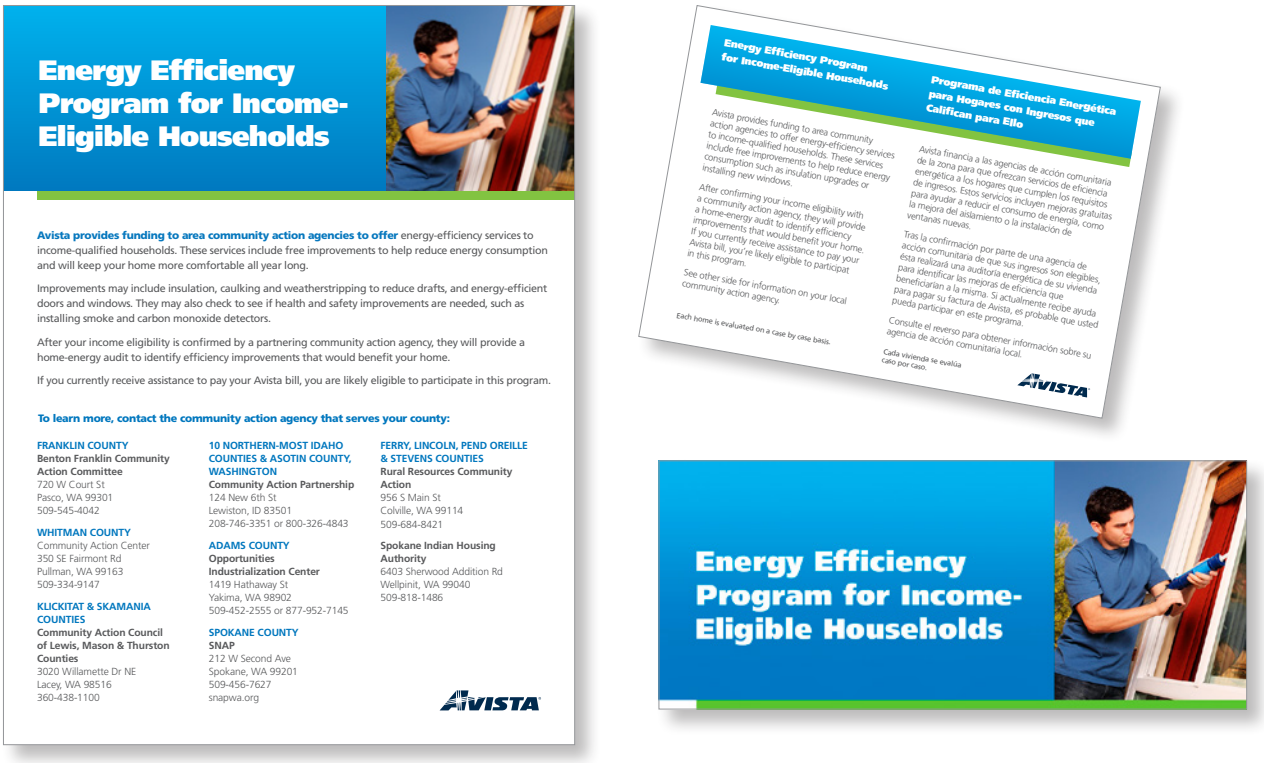
These collaborations provide an opportunity for the specialist to learn Avista outreach practices and messaging. During the events where both the company and agency staff are present, the specialist focuses on promoting CAP services and programs. Due to COVID and similar to Avista's Outreach Program, CAP agencies suspended participation at community events in 2021 and sought to connect with clients through mailed kits. Nine hundred and seventy-two home energy kits were mailed to households who had received energy assistance in the past year, including deluxe window kits, gasket covers, V-Seal weather-stripping, LED bulbs, nightlights, energy saving tips, a bill/payment options and assistance programs information sheet, and an option for customers to request a home energy guide and/or a kid's energy-saving activity book.

FIGURE 36 – LOW-INCOME PROGRAM HOME ENERGY SAVINGS KIT BROCHURE

Marketing

Multiple communication channels were utilized to increase awareness of Avista's energy fairs. Tactics included news releases, direct mail, email, fliers, community calendars, social media, signage, and print advertising.

FIGURE 37 – LOW-INCOME PROGRAM WEATHERIZATION FLYER, POSTCARD, AND EMAIL HEADING



CAP categorizes their activities in three different approaches: low-, medium-, and high-impact. Low-impact activities are designed to heighten awareness but have the least probability of resulting in behavior change: brochures or flyers on the wall in the office waiting room. Medium-impact activities help to heighten awareness, are educational in nature, and have a moderate probability of resulting in behavior changes. They include workshops and/or informational booths at community events. Finally, high-impact activities are conducted one-on-one with individuals and have the highest probability of inspiring behavior change. High-impact activities are conducted during energy assistance intake appointments and/or while weatherization projects are underway.

With a realization rate of 95 percent for electricity and 85 percent for natural gas savings, the low-income program achieved savings of 153,503 kWh in 2021. The program achieved 3,217 therms in natural gas savings.

The realization rates for each program deviate from 100 percent 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 verified Avista TRM values for the Low-Income Program, then applied a realization rate from a sample of rebates after verifying documentation for quantity and efficiency of measures.

In the Low-Income Program, the evaluators found the LED bulbs' unit-level savings were inaccurately referred to. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11 percent realization for LED bulb projects under the program.

Customer and Agency Satisfaction

The evaluator's process evaluation of the Low-Income Program consisted of stakeholder interviews with Avista staff and with six CAP agencies participating in 2021, including the lone agency serving the state of Idaho.

Generally, CAP agencies and participating customers were highly satisfied with the Low-Income Program. All six CAP agencies and Avista staff emphasized positive, well-established relationships that are communicative and collaborative. Despite facing challenges with participation, some CAP agencies noted that Avista was working with them to market the program and increase outreach in an effort to bring in potential customers.

All CAP agencies who served customers in 2021 reported that customers generally provided positive feedback. These agencies said that customers were typically happy with the equipment they received through the program and appreciative of the work provided.

Both Avista and CAP agencies reported that COVID-19 affected the program in 2021. After Avista temporarily suspended the program in 2020 to establish health and safety protocols, participation was slow to rebound in some areas. While some CAP agencies had returned to steady work, others (especially newer agencies) have struggled to reach customers. Other customer bases, such as elderly clients and those with health vulnerabilities, were still difficult to serve at the time of the interviews.

Program marketing also suffered as a result of the pandemic. Certain in-person events were canceled, which made particular groups of clients more difficult to reach.

Idaho's CAP agency reported issues with untreatable homes due to the condition of the home, such as a damaged roof or sewer line.

The evaluators provided the following recommendations for Avista's Low-Income Program:

- Increase and adjust program marketing efforts to target hard-to-reach members of the income-eligible community. As more in-person events are offered, market the program to increase potential customer participation. Along with in-person events, offer virtual marketing opportunities to reach more vulnerable customers, such as the elderly or those with health vulnerabilities, who may not be able to attend in-person events. Work with community groups in rural areas to help identify customer bases and plan marketing efforts to inform them of the program.
- Continue to work with newer CAP agencies to help increase customer participation. Providing support in more rural areas where these new CAP agencies are working will be essential to helping them gain customers. Understanding the needs of people within their territories can also help inform targeted marketing offerings or ways to promote the program.
- Many deviations from a 100 percent realization rate are due to differences between the limited measure category option's Avista TRM values, and the more detailed categories referring to heating zone, cooling zone, heating type, and bulb types present in the RTF. The evaluators recommend that Avista refer to the more detailed RTF measures when calculating expected savings for the programs.

- The evaluators reviewed the project documentation provided by Avista and identified conflicting square footage or number of units between the aggregated project data from the expected savings calculated for each project. The evaluators found very few instances in which the tracking data quantity differed from the quantity displayed in sampled documentation and invoices. They recommend providing corrections to the application of Avista TRM values to tracking data quantity.

The evaluators note that many deviations from 100 percent realization rate in the Low-Income Program are due to verifying that 20 percent annual household energy caps were properly applied.

- The evaluators found the LED bulbs' unit-level savings were inaccurately referred to for the Low-Income Program. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11 percent realization for LED bulb projects under the program. The evaluators recommend updating database calculations to use Avista TRM values during expected savings calculations.

Cost-Effectiveness

Tables 59 and 60 show the low-income sector cost-effectiveness results by fuel type.

TABLE 59 – LOW-INCOME PROGRAM ELECTRIC COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 389,481	$ 587,932	0.66
Utility Cost Test (UCT)	$ 196,283	$ 676,816	0.29
Participant Cost Test (PCT)	$ 731,308	$ 335,089	2.18
Ratepayer Impact (RIM)	$ 147,061	$ 984,151	0.15

TABLE 60 – LOW-INCOME PROGRAM NATURAL GAS COST-EFFECTIVENESS RESULTS

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 249,432	$ 280,125	0.89
Utility Cost Test (UCT)	$ 103,539	$ 293,813	0.35
Participant Cost Test (PCT)	$ 292,267	$ 209,058	1.40
Ratepayer Impact (RIM)	$ 33,769	$ 363,334	0.09

Plans for 2022

The measures available for full reimbursement will be the same as 2021. Homes that heat with electricity continue to receive partial funding that has been slightly adjusted for replacement of existing air-source heat pumps with high-efficiency models, conversion of electric water heaters to natural gas, and the installation of heat pump water heaters. Homes that heat with natural gas continue to receive partial funding for all insulation measures.

As a dual-fuel utility, Avista does not impose requirements to annually serve a set number of electric- or natural gas-heated homes. The CAP is provided with the flexibility to serve the home of a qualified customer identified during a program year. As mentioned previously, the measures that appear on the approved and qualified list may fluctuate annually based on utility cost-effectiveness tests. The flexibility given to the health, safety, and repair allocation does allow for measures on the qualified list to be fully funded.

The agency has demonstrated the ability to fully spend its utility allocation each year. In 2022 it will receive a two-year agreement to allow for continuous service of Avista customers. Often the agency will have spent out utility funds prior to the end of the calendar year; the two-year agreement will enable them to reach into the future year for additional funds that may be needed in year one of the contract.

In a separate but related issue, the agency was awarded $250,000 from the company's Energy Efficiency Assistance Fund (EEAF) that was developed as part of Idaho Settlement Agreement AVU-E-19-4. In conjunction with the EEAF advisory group, these funds are distributed for projects that are not typically eligible for traditional energy-efficiency funding. The agency will use this amount toward health, safety, and repair work on homes that have not been able to receive holistic energy-efficiency services due to extenuating circumstances. The agency will make the necessary improvements that could vary from electrical issues to asbestos removal. Once the issue has been resolved, the agency will be able to provide a comprehensive energy-efficiency offering using funds from Avista's low-income energy efficiency contract. In 2021 the agency served 12 homes with over $103,000 worth of work that enabled the home to receive weatherization services. Most of the improvements were for electrical panel replacements – an item that is needed if a heat pump is installed and is often not supported by other funding sources.

Avista plans to fix a discrepancy in the TRM related to direct-installation LED bulbs savings assumptions by adding a separate TRM value for LED direct installation. Avista currently notes on each invoice whether a cap related to annual consumption has been applied to the project. Avista also maintains a tracking spreadsheet for projects that have savings caps. The company will work with the evaluator in subsequent years to ensure this process is understood and is visible to evaluators. Finally, Avista will conduct a comparison between current measures in the TRM and current RTF measures to evaluate whether it makes sense to move to more detailed RTF categories for savings associated with low-income projects.

Canyon Creek, Wallace, Idaho

Program-by-Program Summaries

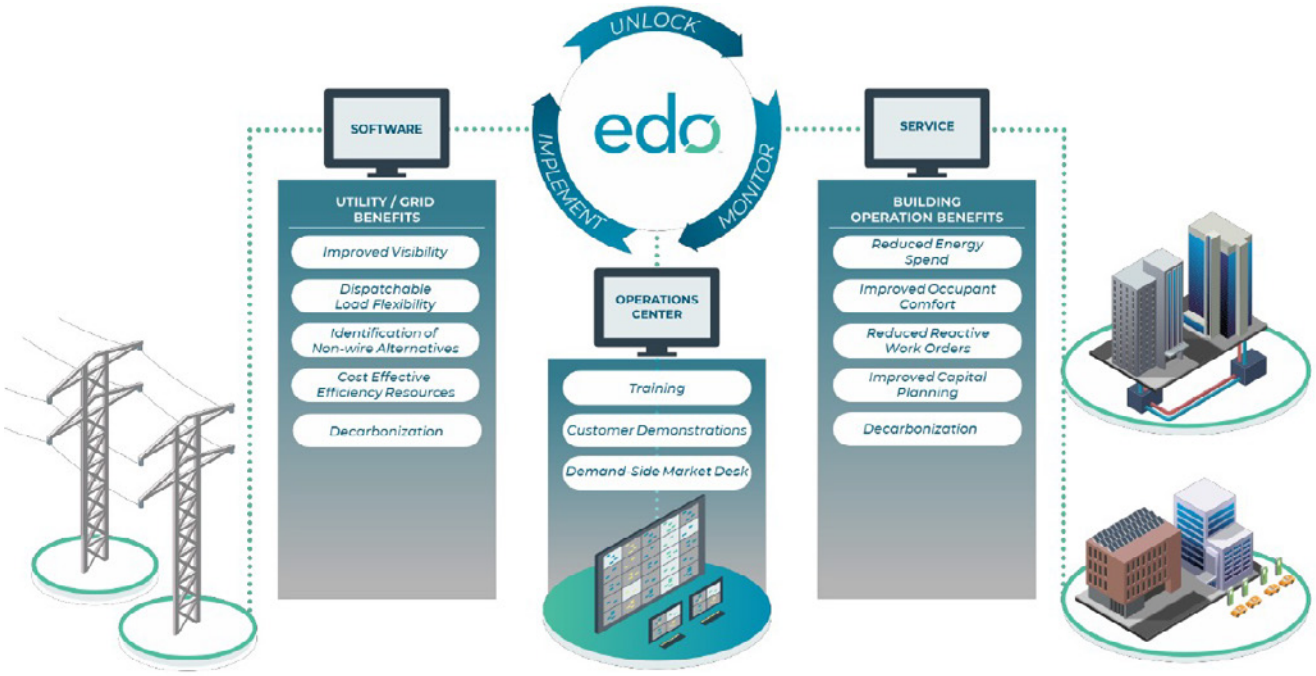
Active Energy Management

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.

Avista is partnering with Edo for this pilot. Edo, a joint investment between Avista Development and McKinstry, is a building efficiency and grid optimization business. 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 through interactive sponsored Strategic Energy Management (SEM) services. This arrangement creates an integrated customer experience and expanded outcomes and skills for Avista. Figure 38 illustrates the expected benefits for both customers and Avista.

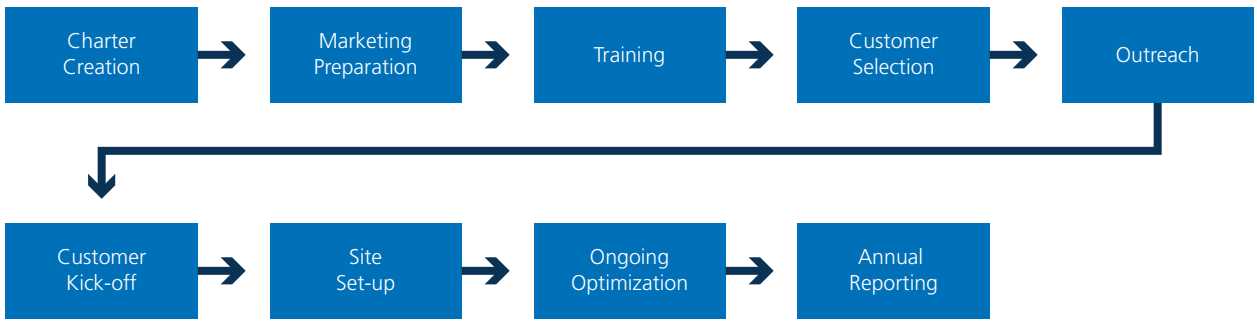
FIGURE 38 – EXPECTED BENEFITS OF THE ACTIVE ENERGY MANAGEMENT PROGRAM FOR AVISTA AND FOR CUSTOMERS



Program Activities

The design process, finalized in 2021, identified nine work stages.

FIGURE 39 – ACTIVE ENERGY MANAGEMENT DESIGN PROCESS



The first three work stages were completed in 2021; the others were delayed due to COVID restrictions and customer availability to coordinate equipment installations. In 2022, the customer selection through ongoing optimization stages are happening in tandem. Site setups are expected to be completed by the end of 2022.

When setup is complete, up to 10 sites will be participating in the pilot, which will encompass more than one million square feet.

Program goals include the following:

1. 4.8 million kWh of energy savings over three years.
2. Up to eight Avista account management and energy-efficiency team members trained in technology-based SEM solutions and best practices.
3. Acquire rich facility operating information that can inform future rate or program design, particularly focused on future load flexibility programs.
4. Increased customer satisfaction for participating building owners and operators.
5. Insights into customer willingness to participate in future demand flexibility programs.
6. Demonstrate non-energy benefits from program participation including occupant comfort, reduced greenhouse gas emissions, and improved equipment life expectancy.

Residential Home Energy Audit Pilot Program

Description

Taking advantage of previous experience and aligning with industry best practices, Avista launched a pilot Home Energy Audit Program in 2019. Eligible participants included residential customers who use Avista energy as their primary heating source and reside in Kootenai County, Idaho or in Spokane County, Washington. The program was implemented by Avista using a contract auditor.

The contract auditor conducted in-person energy audits in customer homes. Audit findings and energy-efficiency recommendations were discussed with the customer and documented in an audit report, which was later sent by both email and postal mail to customers. Customers were also given low-cost efficiency items if needed. Where applicable/feasible, items were installed by the auditor at the time of the audit. Energy savings were captured for LED lamps, power strips, low-flow showerheads, and low-flow faucet aerators. Other low-cost efficiency items were left behind for the customer to self-install if warranted. These included rope caulk, plastic window film kits, foam outlet and switch-plate gaskets, door sweeps, and weather stripping. Customers were then interviewed for feedback on the program.

Program Activities

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. 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 or 2021.

Plans for 2022

The program will resume as planned by June 2022. The Home Energy Audit Program will be scaled up and offered across the utility's entire Idaho and Washington service territory. Based on participation, Avista estimates that 200 audits will be conducted between the two states per year. Customer education about energy efficiency and cross-program awareness will be key focus areas. Avista will also continue to work closely with community agency partners to serve vulnerable populations with this program offering.

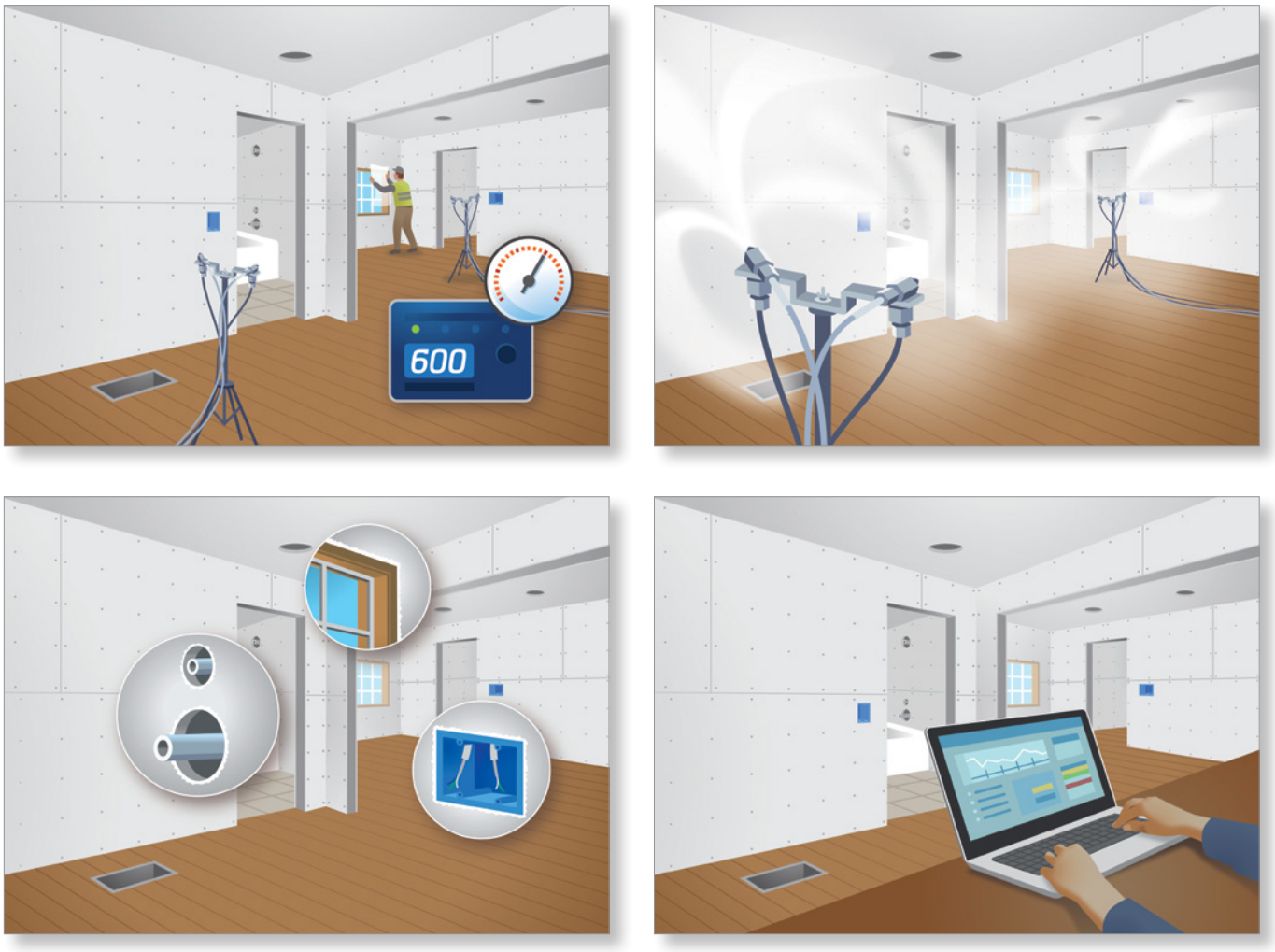
Qualifying participants are residential customers using an Avista fuel for space heating. Single-family homes, multifamily homes up to a four-plex, and condominium homes are eligible to participate. Multifamily homes with five or more units will be considered on a case-by-case basis.

AeroBarrier Pilot Program

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

The pilot program offers 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.

FIGURE 40 – AEROBARRIER APPLICATION PROCESS

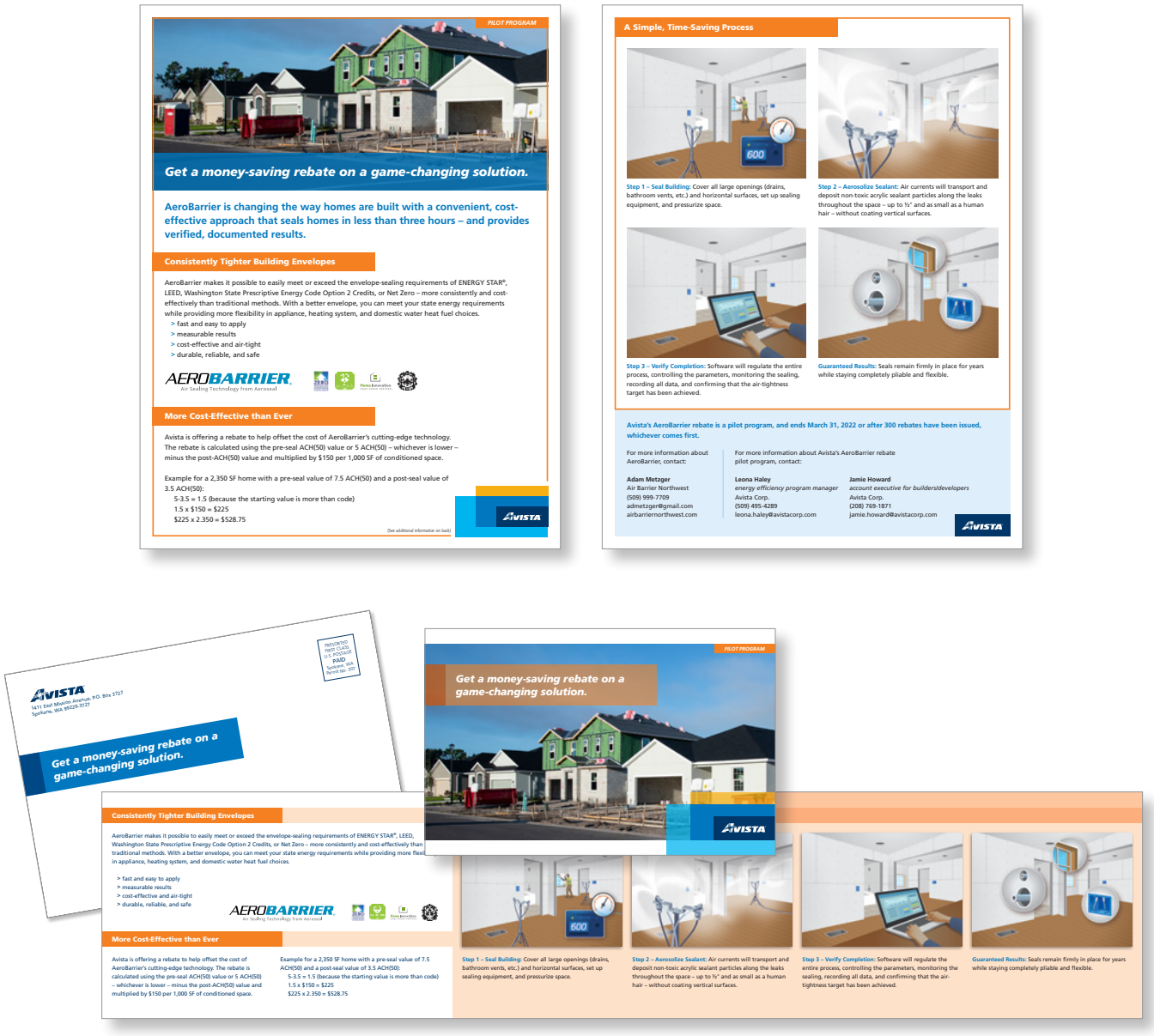


Program Implementation

The pilot was launched in April 2021 to provide home builders with an incentive to seal new homes with AeroBarrier's product. Through this pilot, Avista intends to evaluate the cost-effectiveness of this method on up to 300 homes; to accomplish this, the pilot is expected to run for a one-year term.

A comprehensive list of new home builders was created from publicly available historical building permit applications and internal trade ally lists. Marketing materials to bring awareness of this new pilot program were then mailed and/or emailed to this list of builders. In addition, Avista promoted the pilot to the Spokane Area Home Builder's Association at monthly meetings and provided leave-behind reference materials for this group to have on hand. Website content was also created and added to myavista.com for awareness and reference.

FIGURE 41 – AEROBARRIER MARKETING COLLATERAL



Program Eligibility

Eligibility for the pilot rebate is limited to builders of residential single-family new-construction homes in Idaho and Washington using an Avista fuel for space heating. Customers who meet the eligibility requirements will receive a $100 per air change per hour at 50 pascals (ACH(50)) reduction from the pre-seal value or state building code level (whichever is less) per 1,000 square feet sealed, subject to the provision of required documents by the customer to Avista (either mailed or submitted electronically). However, online rebate processing is not currently within the scope of the pilot, as further review by Avista's technology team is still required. For the pilot, Avista will include a 50 percent incentive bonus to aid in removing the market barrier. Incentives will be capped at the total project cost.

Plans for 2022

This pilot will conclude in June of 2022. Avista will evaluate the pilot and determine whether to offer a full program. Findings and a recommendation will be presented to the EEAG at the fall 2022 meeting, and input from stakeholders will be incorporated into next steps.

Pilot Programs On Hold

The following pilot programs remained on hold in 2020 due to COVID-19:

Small Business Lighting Direct Install Pilot – The Small Business Lighting Direct Install pilot is designed for hard-to-reach small business customers within Avista's service territory. The criteria for participation are still in development; it will, however, have similar criteria to the company's MFDI program for area lighting. Initially, the pilot will select 25 customers to participate, and its cost-effectiveness will be evaluated.

Luminaire Level Lighting Control (LLLC)/Networked Lighting Pilot – Avista will pilot LLLC for 20 customers to determine whether additional efficiencies can be gained by fine-tuning lighting within a commercial/industrial building. Avista will work with the customer to add LLLC or networked lighting in a space in the customer's building prior to a lighting upgrade of 50 percent or greater. The goal of the pilot is to show the additional energy savings derived from the additional network controls.

Energy Use Index (EUI) Retrofit Pilot – The EUI pilot will encourage customers to move toward a more efficient use of their energy. The pilot will use a pay-for-performance approach with the goal of achieving 50 percent of the customer's previous energy use. Facilities must do at least 25 percent of their buildings' square footage, and there must be a way to accurately measure at a sub-panel for performance. The pilot will be limited to five customers.

Tool-Lending Pilot – The Tool-Lending pilot will be a two-year program allowing tool lending to Avista customers from a public space in the eco-district. The library of tools will include the current stock of energy efficiency-related equipment but will also include some newer technologies that provide more insight into energy use. In addition to training, the program will include shipping the tools and training materials to customers who are not in the immediate area.

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REGIONAL MARKET TRANSFORMATION

Clark Fork, Idaho

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 Northwest have cooperatively 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 61 shows the 2021 NEEA actual savings and the associated costs for Idaho. The 2021 electric costs of $560,054 are inclusive of $557,659 paid directly to NEEA and $2,395 for Avista's participation in committees. For natural gas, $157,375 was paid directly to NEEA and an additional $2,023 originated from Avista's participation in committees.

TABLE 61 – ACTUAL SAVINGS AND ASSOCIATED COSTS FOR IDAHO

Fuel Type	2021 NEEA Final Reported Energy Savings	2021 Costs (Avista Financials)	Avista Idaho Current Funding Share (2021-2024)
Electric	3,416 MWh (0.39 aMW)	$ 560,054	1.69%
Natural Gas	152,881	$ 159,398	3.55%

Electric Energy Savings Share

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

Natural Gas Energy Savings Share

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

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

Eastside Collaborative Market Transformation

During 2021, Avista began investigating new market transformation efforts with a specific focus on energy-efficiency measures and solutions that work well in northern Idaho and eastern Washington. This engagement is complementary to NEEA's efforts for the broader region. The goal of this effort is aimed at assessing market transformation opportunities that drive greater local impact and create deeper customer engagement. To do this, Avista 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 2022 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 2021 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

Coeur d'Alene, Idaho

GLOSSARY OF TERMS

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

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

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

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.

Annual Conservation Plan: A plan produced annually by Avista laying out expected savings and efficiency program expenditures as well as new programs and changes to existing programs.

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

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

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

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

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

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

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

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

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

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.

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

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

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

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

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

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

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.

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

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

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

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

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

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

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

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).

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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.

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.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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APPENDICES AND SUPPLEMENTS

Kootenay River, Bonners Ferry, Idaho

APPENDIX A

CADMUS

PY 2021 Idaho Electric Impact Evaluation Report

April 15, 2022

Prepared for:

Avista Corporation
1411 East Mission Avenue
Spokane, WA 99202

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Tables

Portfolio Executive Summary

For several decades, Avista Corporation (Avista) has administered demand-side management (DSM) programs to reduce the electricity and natural gas energy use by its customer portfolio. While Avista has implemented most of these programs in house, external vendors have fulfilled some of them.

Avista contracted with Cadmus to complete process and impact evaluations of its program year (PY) 2021 electric DSM nonresidential and multifamily residential programs in Idaho. This report presents the electric impact evaluation findings for PY 2021. Cadmus did not apply net-to-gross (NTG) adjustments to savings values, except where deemed energy savings values already incorporated NTG as a function of the market baseline.

Evaluation Methodology and Activities

Table 1 shows the methods and activities Cadmus conducted as a part of the Idaho portfolio evaluation.

Table 1. Electric Program Evaluation Activities

Sector	Program	Document/Database Review	Verification/Metering Site Visits
Nonresidential	Prescriptive (multiple)	✓	✓
	Site Specific	✓	✓
Multifamily	Multifamily Direct Install (MFDI)	✓	--
	Supplemental Lighting	✓	--
Fuel Efficiency	Multifamily Market Transformation	✓	--

Summary of Impact Evaluation Results

The nonresidential and multifamily Idaho electric energy efficiency programs achieved an 101% realization rate and acquired 12,061,479 kWh in evaluated savings, as shown in Table 2. Cadmus collected Avista's reported savings through database extracts, drawn from Avista's iEnergy database (nonresidential) and from data provided by the third-party implementor (MFDI program).

Despite impacts from the COVID-19 pandemic and reduced participation in the nonresidential and multifamily sectors, most programs Cadmus evaluated performed strongly relative to reported savings in PY 2021.

Table 2. Reported and Evaluated Energy Efficiency Electric Savings

Sector	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Nonresidential	11,167,420	11,231,273	101%
Multifamily Direct Install	116,121	118,613	102%
Fuel Efficiency	711,593	711,593	100%
Total	**11,995,134**	**12,061,479**	**101%**

Note: totals may not sum due to rounding.

Conclusions and Recommendations

During the PY 2021 evaluation, Cadmus identified several areas for improvement, outlined below by sector.

Nonresidential Conclusions and Recommendations

The nonresidential programs achieved total evaluated electric energy savings of 11,231 MWh in PY 2021, with a combined realization rate of 101%. The nonresidential sector did not meet the combined Prescriptive and Site Specific programs' electric savings goal of 13,281 MWh, achieving 85% of this goal.

Realization rates varied across projects, but overall, the PY 2021 nonresidential programs performed strongly relative to reported savings. Most projects Cadmus sampled for the evaluation were well documented and verified savings matched reported savings.

Cadmus offers the following conclusions and recommendations to improve the nonresidential sector's energy savings:

- **Conclusion:** Cadmus found that lighting hours of use (HOU) reported by site contacts during verification interviews often varied substantially from the HOU reported on interior and exterior lighting applications. The HOU portion of the Prescriptive lighting application does not collect any explanation or context, and documentation for HOU lighting among Site Specific projects varied.
  - **Recommendation:** Add a line to the Prescriptive lighting application for customers to briefly describe their interior lighting schedule. Review this description when entering the application to determine whether the annual HOU values are consistent with the schedule described. For exterior lighting, include a line in the application to document existing controls, with checkboxes for common control types and timer settings.
  - **Recommendation:** Standardize the Site Specific lighting report template to include a description of the lighting schedule and HOU source. Ensure that meter data are clearly referenced in the report if a light state logger or power meter is used to determine HOU.
  - **Recommendation:** Benchmark the estimated annual HOU against the Region Technical Forum's (RTF's) values for the building type and request additional details from the customer if there is a significant difference.

  - **Recommendation:** Consider deploying light loggers on a random sample of lighting projects each year to validate reported HOU values and develop an understanding of whether self-reported hours are typically over- or under-reported compared to actual usage.

- **Conclusion:** Cadmus evaluated a Site Specific Appliance project that used logger data provided by the implementer to estimate savings. Avista also installed temporary electric current loggers and then estimated savings based on these data, but ultimately did not report the savings from these calculations. Both calculations assumed the equipment had three-phase service, but Cadmus verified that the installed equipment was single-phase.
  - **Recommendation:** When estimating power from logged current data, carefully review the equipment nameplates and operating parameters to ensure the correct conversion. When multiple datasets are collected for a project, clearly identify in the project files which dataset was used for the final estimation and document why one dataset was chosen over the other.
- **Conclusion:** Cadmus found that some Prescriptive lighting projects referenced the Default Proposed Wattage in the iEnergy system to calculate energy savings when the actual Proposed Wattage was also provided.
  - **Recommendation:** Review iEnergy calculations to ensure that the actual Proposed Wattage is used in the savings calculation when provided.
- **Conclusion:** Cadmus found that Avista's new iEnergy system records detailed inputs on some Prescriptive measures that were not previously tracked in InforCRM and are not currently used in the savings calculations.
  - **Recommendation:** Review deemed savings values for Prescriptive measures and consider opportunities to leverage the additional data now collected in iEnergy to calculate more accurate savings for each participant project. For example, food service measures can use the reported pounds of food cooked per day and cooking hours per day values collected in iEnergy to automatically calculate more precise savings.
- **Conclusion:** The iEnergy system introduced variance of up to 5% between reported and evaluated savings by rounding intermediate wattage calculation values.
  - **Recommendation:** Review iEnergy calculations to ensure that rounding is only applied on final displayed values and not to any intermediate values.
- **Conclusion:** Cadmus staff found that the level of detail in IV reports varied. Many IV reports only mention that "equipment and quantities were verified," and photos sometimes show the equipment only from a distance. We recommended including additional details in IV reports in PY 2019 and PY 2020, but we did not observe additional detail in IV reports reviewed in PY 2021.
  - **Recommendation:** Provide more consistent documentation with Avista IV reports. We recommend that all IV reports include basic information explicitly stating the quantity and type of equipment found. For lighting projects, this would include confirmed fixture types, quantities, installation locations, controls, and estimated HOU. For most other equipment, this would include nameplates, model numbers, and quantities.

- **Conclusion:** Cadmus found that reported fixture quantities for Site Specific lighting projects often did not match invoice quantities, and applications often lacked detailed notes explaining these differences. It is often impractical for Avista staff conducting IV inspections or evaluators conducting verification visits to count every fixture for large lighting projects to resolve such discrepancies.
  - **Recommendation:** Include more detailed documentation for Site Specific lighting projects. Applications should include lighting drawings whenever possible, and should clearly explain any difference between invoice quantities and rebated quantities. Lighting workbooks should note the locations where fixtures are installed to facilitate verification by Avista and by evaluators. Avista IV inspection reports should explicitly state the verified quantities of each fixture type and should include any notes, spreadsheets, or other documentation used to verify the eligible quantities.

Multifamily Direct Install Conclusions and Recommendations

The MFDI programs achieved 118,613 kWh of evaluated electricity savings, for a realization rate of 102%. The programs met 8% of their combined savings goal for the year.

Cadmus offers the following conclusions and recommendations:

- **Conclusion:** Due to the adaptations made for pandemic restrictions the, MFDI program's participation in Idaho was limited to only the Supplemental Lighting path and savings were well below target. Cadmus found that the Supplemental Lighting program continued to be an efficient mechanism for installing high-efficiency lighting in additional multifamily common areas. However, the lack of participation in the non-supplemental lighting multifamily component and the limited participation in the Supplemental Lighting program were insufficient to meet PY 2021 savings targets.
  - **Recommendation:** As pandemic restrictions are lifted in future years, return to a traditional MFDI program design by providing direct installation of energy-efficient lighting and non-lighting measures. Continue to replace high-use low-efficiency lamps where practical to maximize program cost-effectiveness and yield higher savings.
- **Conclusion:** All reported Supplemental Lighting program savings calculations appeared to use custom HOU values that were different from deemed HOU values for exterior spaces. We could not confirm some custom HOU values because some spaces did not have an assigned site identification.
  - **Recommendation:** The MFDI program implementor should ensure clear and consistent project documentation and accurate inputs for all site data.

Fuel Efficiency Conclusions and Recommendations

The Multifamily Market Transformation (MFMT) fuel efficiency measures achieved evaluated savings of 711,593 kWh, yielding a 100% realization rate. Combined, the measures achieved 150% of the electric energy savings goal of 475,794 kWh. Cadmus found that the MFMT program achieved its objectives in PY 2021 and does not have any recommendations for this program.

Nonresidential Impact Evaluation

Through its nonresidential portfolio of programs, Avista promotes the purchase of high-efficiency equipment to commercial and industrial utility customers. Avista provides rebates to partially offset the difference in cost between high-efficiency equipment and standard equipment. Cadmus conducted nonresidential impact evaluation activities to determine evaluated savings for most programs; the team conducted measurement and verification (M&V) across a sample of Prescriptive and Site Specific projects.

Program Summary

Avista completed and provided incentives for 987 nonresidential electric measures in Idaho during PY 2021 and reported total electric energy savings of 11,167,420 kWh. Through the nonresidential sector, Avista offers incentives for high-efficiency equipment and controls through three program paths: Prescriptive, Site Specific, and Multifamily Market Transformation.

The Prescriptive programs apply to smaller, straightforward equipment installations that generally have similar operating characteristics (such as lighting, simple HVAC systems, food service equipment, and variable frequency drive [VFD]). The Site Specific programs apply to more unique projects that require custom savings calculations and technical assistance from Avista's account executives (such as compressed air, process equipment and controls, and comprehensive lighting retrofits).

Multifamily Market Transformation, a Site Specific program, prompts building owners and developers to consider natural gas as the fuel of choice when constructing new multifamily housing. These measures, which generate electric savings offset by natural gas penalties, typically involve replacing electric space-heating or water-heating systems with natural gas equipment. See the *Fuel Efficiency Impact Evaluation* section for a discussion of the evaluation methodology and results for the nonresidential fuel efficiency measures.

Program Participation Summary

This section summarizes nonresidential sector participation and progress toward PY 2021 goals through the Prescriptive and Site Specific programs.

Nonresidential Prescriptive Program Path

Table 3 shows electric energy savings goals assigned to Avista's nonresidential Prescriptive programs for PY 2021, as well as reported savings and a comparison between reported savings and goals. Avista's Nonresidential Prescriptive programs reported savings totaling 70% of their collective savings goal in PY 2021.

Table 3. PY 2021 Nonresidential Prescriptive Electric Savings

Program Name	Savings Goals (kWh)	Savings Reported (kWh)	Percentage of Goal
Interior Lighting	3,425,845	3,382,567	99%
Exterior Lighting	4,695,385	2,341,518	50%
Shell Measure	18,202	2,547	14%
Green Motors	13,038	23,986	184%
Motor Control (VFD)	19,345	56,210	291%
Fleet Heat	8,000	0	0%
Food Service Equipment	56,152	977	2%
AirGuardian	6,000	0	0%
Energy Smart Grocer	39,413	4,323	11%
Total	**8,281,380**	**5,812,128**	**70%**

Table 4 summarizes program participation by unique application numbers.

Table 4. PY 2021 Nonresidential Prescriptive Participation by Project

Program Type	Number of Applications	Number of Measures
Interior Lighting	301	442
Exterior Lighting	198	344
Shell Measure	2	3
Green Motors	8	8
Motor Control (VFD)	2	12
Fleet Heat	0	0
Food Service Equipment	1	1
AirGuardian	0	0
Energy Smart Grocer	2	3
Total[a]	**514**	**813**

[a] Total participants. A single application may contain measures from multiple programs.

Nonresidential Site Specific Program Path

Table 5 shows electric savings goals, reported savings, and the percentage of goal achieved for the Site Specific program in Avista's nonresidential sector for PY 2021. The table does not include reported electric savings for the fuel efficiency sector, such as those associated with the MFMT program. Reported savings for the Site Specific program met 107% of the program's PY 2021 savings goal.

Table 5. PY 2021 Nonresidential Site Specific Electric Savings

Program Path	Savings Goals (kWh)	Savings Reported (kWh)	Percentage of Goal
Site Specific	5,000,000	5,355,291	107%

Table 6 summarizes program participation for the Site Specific program.

Table 6. PY 2021 Nonresidential Site Specific Participation by Project

Program	Number of Applications	Number of Measures
Site Specific Lighting	24	166
Site Specific Other	7	8
Total	**31**	**174**

Nonresidential Impact Evaluation Methodology

Cadmus examined the following documents and data records to identify any changes to the nonresidential programs and measures slated for evaluation:

- Avista's annual business plans, processes, and energy savings justifications
- Project documents from external sources (such as customers, program consultants, or implementation contractors)
- Avista's iEnergy tracking system for nonresidential programs

Based on the initial review, Cadmus checked the distribution of program contributions with the overall program portfolio energy savings. The review provided insight into the sources for unit energy savings (UES) claimed for each program measure, along with sources for energy-savings algorithms, internal quality assurance, and quality control processes for large nonresidential sector projects.

Following this review, Cadmus designed a sample strategy to conduct the following evaluation activities in two waves:

- Selected evaluation sample and requested project documentation from Avista
- Reviewed project documentation
- Prepared M&V plans for virtual and in-person site visits
- Performed virtual site visits using the Streem platform or in-person site visits and collected on-site data (such as trend data, photos, and operating schedules)[1]
- Calculated evaluated savings by measure using site visit findings
- Determined overall evaluated savings by applying realization rates to the total reported savings population

Sample Design

Cadmus created two sample waves for PY 2021:

- Sample 1 included program data from January 2021 through June 2021.
- Sample 2 included program data from July 2021 through December 2021.

[1] For more information on Streem: https://www.streem.com/platform-streem#platform-remote-video

Cadmus initially estimated the total annual population size by reviewing the wave 1 population data and comparing it to PY 2020 population data. We developed initial sample size targets to achieve 90% confidence and ±10% precision (90/10) for the estimated PY 2021 population, with a target of 90/20 by program. After receiving the wave 2 population data, we revised the sample size targets and selected the wave 2 sample to bring the 2021 sample to the annual target within each program.

Avista advised Cadmus not to evaluate certain programs with low participation and historically consistent realization rates every year. Since the Green Motors program has shown a 100% realization rate in every prior evaluation, Cadmus did not evaluate the program in PY 2020 or PY 2021. We evaluated the Food Services and HVAC programs in PY 2020 only and evaluated the Energy Smart Grocer and Prescriptive Shell programs in PY 2021 only. Cadmus evaluated all other nonresidential programs that had participation in both PY 2020 and PY 2021.

For each sample wave, Cadmus developed a stratified random sample of applications by program (such as Site Specific Other, Site Specific Lighting, Prescriptive Interior Lighting, or Prescriptive Motor Controls). In programs where individual projects represented a significant portion of the total savings in the program, we evaluated a census of the highest-savings applications as a certainty stratum. Within programs with a wide variance in savings, we stratified applications by reported savings magnitude into small and large strata, each with approximately 50% of the total noncertainty program savings. We assigned random numbers within each stratum to select a random sample of noncertainty sites. In some cases, we evaluated one or more additional applications at the same location as another sampled application, as a convenience selection, if we could assess both applications in a single site visit.

Our team encountered some challenges contacting customers to evaluate in each sample, primarily due to changes in participant business operations as a result of the COVID-19 pandemic. We pulled an additional backup sample for the wave 2 sample using random sampling and recruited participants to meet the year's sample target.

Cadmus summed the evaluated savings from each of the sampled projects to calculate a realization rate by stratum and applied that realization rate to projects in the population in that stratum. We applied the project-specific evaluated savings for every project that was in the sample, regardless of whether it was a random, certainty, or convenience selection. To determine the evaluated savings and realization rates for each program, we summed the annual evaluation results.

Table 7 summarizes the evaluation samples for the Idaho nonresidential Prescriptive programs. Cadmus sampled 35 Prescriptive applications at 34 unique sites. Of the sampled applications, we selected three for certainty review based on the scale of savings, 31 randomly, and six additional convenience projects at six sites based on location. There was no participation in the AirGuardian and Fleet Heat programs in PY 2021, as shown in Table 4. Table 7 shows the total number of unique applications sampled in each program, including five applications containing measures from more than one program.

Table 7. PY 2021 Idaho Nonresidential Prescriptive Electric Evaluation Sample

Program Type	Applications Sampled[a]	Sampled Savings (kWh)	Percentage of Reported Savings
Interior Lighting	15	458,642	14%
Exterior Lighting	19	594,496	25%
Shell Measure	2	2,547	100%
Motor Control HVAC (VFD)	2	56,210	100%
Energy Smart Grocer	2	4,323	100%
Nonresidential Prescriptive	**35**	**1,116,218**	**19%**

[a] Five applications included measures in the Interior Lighting and Exterior Lighting programs, but each measure is only counted once in the total.

Table 8 summarizes the Idaho nonresidential Site Specific program path's evaluation sample, where Cadmus sampled 13 Site Specific applications at 12 unique sites overall. Of the sampled applications, we selected two for certainty review based on the savings scale and the remaining 11 applications randomly.

Table 8. PY 2021 Idaho Nonresidential Site Specific Electric Evaluation Sample

Program Path	Applications Sampled	Sampled Savings (kWh)	Percentage of Reported Savings
Site Specific	13	3,751,483	70%

Document Review

Cadmus requested and reviewed project documentation for each sampled application and prepared M&V plans to guide its site visits. Typically, project documentation included data entered into the iEnergy system, incentive application forms, calculation workbooks, invoices, equipment specification sheets, and Avista installation verification reports.

On-Site Verification

Cadmus performed site visits at 15 unique nonresidential locations to assess electric savings for 99 unique Prescriptive and Site Specific measures from 18 different applications. During the site visits, we verified installed equipment types, make and model numbers, operating schedules, and set points, as applicable. Our team used the project documentation review and on-site findings to adjust reported savings calculations, where necessary.

Remote Verification

Cadmus performed virtual site visits and verification calls at 26 unique nonresidential locations to assess electric savings for 60 unique Prescriptive and Site Specific measures from 27 different applications. We evaluated the remaining three applications through desk reviews that did not require participant outreach. Typically, we conducted virtual site visits using the Streem platform, which records video and audio. During the visits, the site contact conducted a detailed walkthrough to help us verify installed equipment types, make and model numbers, operating schedules, and set points, as applicable. We conducted some virtual visits using Microsoft Teams with customers who were unable to access Streem or preferred using Teams. Verification calls involved a brief phone or video call to confirm key details

and any information missing from the project documentation. We used the project documentation review and on-site findings to adjust reported savings calculations, where necessary.

Nonresidential Impact Evaluation Results

This section summarizes electric impact evaluation findings for the nonresidential Prescriptive and Site Specific programs in PY 2021.

Nonresidential Prescriptive Programs

Table 9 shows reported and evaluated electric energy savings for Avista's nonresidential Prescriptive programs, as well as the realization rates between the evaluated and reported savings for PY 2021. Overall, the nonresidential Prescriptive programs achieved a 99% electric realization rate.

Table 9. PY 2021 Nonresidential Prescriptive Electric Impact Findings

Program Type	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Interior Lighting	3,382,567	3,362,227	99%
Exterior Lighting	2,341,518	2,307,395	99%
Shell Measure	2,547	2,547	100%
Green Motors	23,986	23,986	100%
Motor Control (VFD)	56,210	56,210	100%
Food Service Equipment	977	977	100%
Energy Smart Grocer	4,323	7,443	172%
Nonresidential Prescriptive	**5,812,128**	**5,760,785**	**99%**

Of 35 evaluated applications, Cadmus identified discrepancies for 18 based on in-person and virtual site visits, verification calls, and project documentation review. Table 10 summarizes the reasons for discrepancies between reported and evaluated savings.

Table 10. PY 2021 Nonresidential Prescriptive Evaluation Summary of Discrepancies

Project Type	Number of Occurrences	Savings Impact	Reason(s) for Discrepancy
Interior Lighting	6	↓	• Cadmus found that for one project, only half of the installed quantity of one fixture type was installed because the occupants felt they provided sufficient illumination to the space. Cadmus also found that another installed fixture type on the same project had a higher wattage than reported. • Cadmus reduced the HOU for five projects after interviewing on-site staff about their facilities' lighting operation.
	4	↑	• Cadmus increased the HOU of two projects after interviewing on-site staff about their facilities' lighting operation. Cadmus also determined that the Avista database incorrectly categorized one of these projects as exterior lighting measures and transferred these savings to interior lighting. • Cadmus revised two projects to use the actual installed lamp wattage instead of the default proposed lamp wattage to calculate savings.

Project Type	Number of Occurrences	Savings Impact	Reason(s) for Discrepancy
Exterior Lighting	4	↓	• Cadmus evaluated one sign lighting project that reported multiple different lamp types installed in a single 100 square foot sign. Cadmus determined that only one of the lamp types matched the dimensions of the sign and recalculated savings. • Cadmus found that two projects had fewer lamps installed than reported. Some missing lamps were found in storage for possible installation at a later date and others were ordered in higher quantities than required to retrofit all corresponding fixtures in the space. • Cadmus found that one project had discrepancies up to 5% due to rounding differences. iEnergy rounds the kilowatt savings to two decimal places in the middle of the calculation, causing a loss of accuracy in the final savings.
	3	↑	• Cadmus increased the HOU for one sign lighting project due to verifying that it is controlled by a manually adjusted mechanical timeclock. Cadmus also found that the sign had more fixtures installed than reported. • Cadmus evaluated one project that had one more fixture retrofitted than reported. • Cadmus verified a higher baseline lamp wattage for one project.
Grocer	1	↑	• Cadmus found that one refrigerated lighting application used lamp counts rather than the total lamp length as the unit of measurement to estimate deemed energy savings. Cadmus updated the calculation to account for the 4' lamps that were installed in the refrigerated cases.

During the PY 2020 evaluation, Cadmus identified a systematic issue with sign lighting measures in the Prescriptive Exterior Lighting program, which resulted in particularly low realization rates for applicable projects. Avista had applied a deemed savings estimate per square footage of signage replaced based on a 2014 internal engineering review that assumed 8-foot T12 high-output fluorescent lamps as the baseline for all sign lighting. Cadmus evaluated sign lighting projects by verifying the actual quantity, wattages, and HOU for the baseline and installed lamps in each. The average realization rate for PY 2020 sign lighting measures was approximately 26%. We advised Avista of this discrepancy upon noticing it and reported these findings in detail in the PY 2020 report. Avista implemented changes to the Exterior Lighting program in the first quarter of 2021 in response to the recommendations from Cadmus. Since then, no similar issues were encountered, and the Exterior Lighting program achieved a 99% realization rate in PY 2021.

Nonresidential Site Specific Program

Table 11 shows reported and evaluated electric energy savings for Avista's nonresidential sector Site Specific program for the program year. Overall, the Site Specific program achieved a 102% electric realization rate. The table does not include reported and evaluated electric savings for measures in the fuel efficiency path.

Table 11. PY 2021 Nonresidential Site Specific Electric Impact Findings

Program Path	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Site Specific	5,355,291	5,470,488	102%

Of 13 evaluated applications, Cadmus identified discrepancies in 12, based on in-person and virtual site visits and project documentation review. Table 12 summarizes the reasons for discrepancies between reported and evaluated savings.

Table 12. PY 2021 Nonresidential Site Specific Evaluation Summary of Discrepancies

Project Type	Number of Occurrences	Savings Impact	Reason(s) for Discrepancy
Site Specific Lighting	3	↑	• Cadmus evaluated one project and found additional fixtures installed than reported and increased the HOU for several areas of the facility. • Cadmus evaluated one project that reported replacing wall-mounted three-lamp fluorescent fixtures with LED wall packs. The team confirmed with the site contact that the baseline fixtures were actually standard high intensity discharge fixtures with higher baseline wattage than reported, increasing estimated savings. • Cadmus evaluated two applications at one facility that used different HVAC interactive factors. Cadmus adjusted the HVAC interactive factor for one application to be consistent with the other application at this facility.
	4	↓	• Cadmus verified fewer fixtures installed in several areas of the facility for one project. • Cadmus evaluated one project with several discrepancies across its measures. One measure replaced a 75 W incandescent fixture with an LED, but the Energy Independence and Security Act baseline wattage for these types of lamps is 53 W. Avista used the correct baseline wattage to estimate lighting savings, but the original 75 W value was referenced to calculate the cooling savings due to interactive HVAC effects. Cadmus also adjusted the baseline lamp type for another measure based on an interview with the site contact and finding that the reported baseline lamp type would not mount into the fixture that was retrofit. • Cadmus reduced the HOU for some fixtures on two projects based on interviews with site staff.
Compressed Air	1	↑	• Cadmus evaluated one compressed air project and used updated trend data after the new air compressor was installed. We found an increase in the average flow and average current from what was reported, increasing energy savings.
Motor Controls Industrial	2	↑	• Cadmus updated the average motor load for one irrigation pump VFD project to match the operational schedule reported. Cadmus also updated the motor efficiencies based on the verified value on each motor's nameplate, increasing energy savings. • Cadmus increased the HOU of one project based on the run hours verified on the equipment's interface.
Appliance	1	↓	• Cadmus adjusted the analysis inputs for one project based on the values verified on the equipment's nameplate. Cadmus verified that the systems were single phase rather than three-phase as reported, reducing the calculated energy consumption in the baseline and post periods.
Other	1	↑	• Cadmus increased the uptime HOU of one project which installed a VFD on a forced draft fan of a boiler based on interviews with site staff.

Cadmus found that some M&V plans, pre-installation verifications, and installation verification reports relied on customer-provided photos and data because Avista staff could not safely visit the site due to the COVID-19 pandemic. It is likely that some of the discrepancies identified above may have been

avoided had Avista been able to conduct thorough in-person inspections before and after the project to verify the baseline and installed equipment.

Nonresidential Conclusions and Recommendations

The nonresidential programs achieved total evaluated electric energy savings of 11,231 MWh in PY 2021, with a combined realization rate of 101%. The nonresidential sector did not meet the combined Prescriptive and Site Specific programs' electric savings goal of 13,281 MWh, achieving 85% of this goal.

Realization rates varied across projects, but overall the PY 2021 nonresidential programs performed strongly relative to reported savings. With most projects Cadmus sampled for the evaluation, projects were well documented and verified savings matched reported savings.

Cadmus offers the following conclusions and recommendations to improve the nonresidential sector's energy savings:

- **Conclusion:** Cadmus found that lighting HOU reported by site contacts during verification interviews often varied substantially from the HOU reported on interior and exterior lighting applications. The HOU portion of the Prescriptive lighting application does not collect any explanation or context, and documentation for HOU lighting among Site Specific projects varied.
  - **Recommendation:** Add a line to the Prescriptive lighting application for customers to briefly describe their interior lighting schedule. Review this description when entering the application to determine whether the annual HOU are consistent with the schedule described. For exterior lighting, include a line in the application to document existing controls, with checkboxes for common control types and timer settings.
  - **Recommendation:** Standardize the Site Specific lighting report template to include a description of the lighting schedule and HOU source. Ensure that meter data are clearly referenced in the report if a light state logger or power meter is used to determine HOU.
  - **Recommendation:** Benchmark the estimated annual HOU against RTF values for the building type and request additional details from the customer if there is a significant difference.
  - **Recommendation:** Consider deploying light loggers on a random sample of lighting projects each year to validate reported HOU and develop an understanding of whether self-reported hours are typically over- or under-reported compared to actual usage.
- **Conclusion:** Cadmus evaluated a Site Specific appliance project that used logger data provided by the implementer to estimate savings. Avista also installed temporary electric current loggers and then estimated savings based on these data, but ultimately did not report the savings from these calculations. Both calculations assumed the equipment had three-phase service, but Cadmus verified that the installed equipment was single-phase.
  - **Recommendation:** When estimating power from logged current data, carefully review the equipment nameplates and operating parameters to ensure the correct conversion. When multiple datasets are collected for a project, clearly identify in the project files which

dataset was used for the final estimation and document why one dataset was chosen over the other.

- **Conclusion:** Cadmus found that some Prescriptive lighting projects referenced the Default Proposed Wattage in the iEnergy system to calculate energy savings when the actual Proposed Wattage was also provided.
  - **Recommendation:** Review iEnergy calculations to ensure that the actual Proposed Wattage is used in the savings calculation when provided.
- **Conclusion:** Cadmus found that Avista's new iEnergy system records detailed inputs on some Prescriptive measures that were not previously tracked in InforCRM and are not currently used in the savings calculations.
  - **Recommendation:** Review deemed savings values for Prescriptive measures and consider opportunities to leverage the additional data now collected in iEnergy to calculate more accurate savings for each participant project. For example, food service measures can use the reported pounds of food cooked per day and cooking hours per day values collected in iEnergy to automatically calculate more precise savings.
- **Conclusion:** The iEnergy system introduced variance of up to 5% between reported and evaluated savings by rounding intermediate wattage calculation values.
  - **Recommendation:** Review iEnergy calculations to ensure that rounding is only applied on final displayed values and not to any intermediate values.
- **Conclusion:** Cadmus staff found that the level of detail in IV reports varied. Many IV reports only mention that "equipment and quantities were verified," and photos sometimes show the equipment only from a distance. We recommended including additional details in IV reports in PY 2019 and PY 2020, but we did not observe additional detail in IV reports reviewed in PY 2021.
  - **Recommendation:** Provide more consistent documentation with Avista IV reports. We recommend that all IV reports include basic information explicitly stating the quantity and type of equipment found. For lighting projects, this would include confirmed fixture types, quantities, installation locations, controls, and estimated HOU. For most other equipment, this would include nameplates, model numbers, and quantities.
- **Conclusion:** Cadmus found that reported fixture quantities for Site Specific lighting projects often did not match invoice quantities, and applications often lacked detailed notes explaining these differences. It is often impractical for Avista staff conducting IV inspections or evaluators conducting verification visits to count every fixture for large lighting projects to resolve such discrepancies.
  - **Recommendation:** Include more detailed documentation for Site Specific lighting projects. Applications should include lighting drawings whenever possible, and should clearly explain any difference between invoice quantities and rebated quantities. Lighting workbooks should note the locations where fixtures are installed to facilitate verification by Avista and by evaluators. Avista IV inspection reports should explicitly state the verified quantities of

each fixture type and should include any notes, spreadsheets, or other documentation used to verify the eligible quantities.

Multifamily Direct Install Impact Evaluation

Cadmus designed the MFDI program's impact evaluation to verify reported program participation and energy savings. Considering that billing analysis for the PY 2018 – PY 2019 evaluation did not provide meaningful evaluation results and that a document review was out of scope for this evaluation, we determined that a database review was the most appropriate evaluation approach. We used data collected and reported in the tracking database, the Avista Technical Reference Manual, and RTF values to evaluate savings. This approach provided a reasonable estimate of the achieved savings practical for each program, given its delivery method, magnitude of savings, and number of participants.

Program Summary

During PY 2021, the response to the COVID-19 pandemic disrupted the MFDI program's direct-install design, forcing the third-party implementer to temporarily halt program processes and implement changes that adapt to pandemic restrictions. These changes included the Exchange and Trunk N Treat pandemic pilots, which reduced the face-to-face interaction that occurs in a traditional MFDI program design. As a result, there was no participation in the MFDI program and limited participation in the MFDI Supplemental Lighting program, where participation is defined as the number of installed lighting fixtures. Avista completed and provided incentives through the MFDI Supplemental Lighting program for 121 installed lighting fixtures in Idaho and reported total electric energy savings of 116,121 kWh.

Program Participation Summary

Table 13 shows PY 2021savings goals and reported savings for the MFDI programs. Due to pandemic restrictions, the MFDI and MFDI Supplemental Lighting programs did not meet savings goals, with reported savings only meeting 8% of their combined goal.

Table 13. MFDI Programs Reported Electric Savings

Program	Savings Goals (kWh)	Savings Reported (kWh)	Percentage of Goal
MFDI	1,000,000	0	0%
MFDI Supplemental Lighting	500,000	116,121	23%
MFDI Programs Total	**1,500,000**	**116,121**	**8%**

Table 14 summarizes reported participation in the MFDI programs for PY 2021.

Table 14. MFDI Programs Participation

Program	Participation Reported
MFDI[a]	0
MFDI Supplemental Lighting[b]	121
MFDI Programs Total	**121**

[a] Participation is defined as the number of living units and common areas served.

[b] Participation is defined as the number of installed units.

Supplemental Lighting measures accounted for 100% of the total MFDI programs' electricity savings in PY 2021.

MFDI Impact Evaluation Methodology

To determine the MFDI program's evaluated savings for PY 2021, Cadmus employed a database review. For the impact evaluation database review, Cadmus applied UES values and savings methodologies outlined by the RTF to calculate savings for measures reported in the measure tracking database. Such impact activity has helped identify incorrect UES values and methods used to calculate reported savings. For this evaluation, Cadmus applied the most recent RTF UES values and standard protocols to PY 2021 measures.

MFDI Impact Evaluation Results

Cadmus used the results of the database review to evaluate savings for each measure. We then rolled up measure-level evaluated savings to calculate evaluated savings and a realization rate for each program. Table 15 shows the resulting evaluated savings and realization rates.

Table 15. MFDI Programs Electric Impact Findings

Program	Reported Electric Savings (kWh)	Adjusted Electric Savings (kWh)	Realization Rates
MFDI	0	0	N/A
MFDI Supplemental Lighting	116,121	118,613	102%
MFDI Programs Total	**116,121**	**118,613**	**102%**

During PY 2021, Cadmus identified discrepancies between evaluated and reported savings for the MFDI Supplemental Lighting program. This included contractors using undefined annual HOU for exterior spaces in the reported savings calculations instead of hours that were consistent with the savings calculations methodology or the site data provided. In PY 2021, all evaluated projects with undefined HOU exceeded 100% realization because these hours were lower than those documented in the calculation methodology.

MFDI Conclusions and Recommendations

The MFDI programs achieved 118,613 kWh of evaluated electricity savings, for a realization rate of 102%. The programs met 8% of their combined savings goal for the year.

Cadmus offers the following conclusions and recommendations to improve Avista's MFDI electric programs:

- **Conclusion:** Due to the adaptations made for pandemic restrictions the, MFDI program's participation in Idaho was limited to only the Supplemental Lighting component and savings were well below target. Cadmus found that the Supplemental Lighting program continues to be an efficient mechanism for installing high-efficiency lighting in additional multifamily common areas. However, the lack of participation in the non-supplemental lighting multifamily

component and the limited participation in the Supplemental Lighting program that resulted from the pandemic adaptations were insufficient to meet PY 2021 savings targets.

  - **Recommendation:** As pandemic restrictions are lifted in future years, return to a traditional MFDI program design by providing direct installation of energy-efficient lighting and non-lighting measures. Continue to replace high-use, low-efficiency lamps where practical to maximize program cost-effectiveness and yield higher savings.

- **Conclusion:** All reported Supplemental Lighting program savings calculations appeared to use custom HOU values that were different from deemed HOU values for exterior spaces. We could not confirm some custom HOU values because some spaces did not have an assigned site identification.

  - **Recommendation:** The MFDI program implementor should ensure clear and consistent project documentation and accurate inputs for all site data.

Fuel Efficiency Impact Evaluation

Cadmus designed the fuel efficiency sector impact evaluation to verify reported program participation and energy savings. Evaluation methods included a database review and document review.

Program Summary

Fuel efficiency measures replace electric space-heating or water-heating systems with equipment using natural gas. These measures are offered within the nonresidential Site Specific programs, which includes MFMT measures. From this program, Avista reported electric energy savings of 711,593 kWh for five fuel efficiency measures.

Fuel efficiency measures provide positive electricity savings and negative natural gas savings, reflecting negative avoided costs. Cadmus incorporated these negative avoided costs in the electric cost-effectiveness calculations and reported the negative natural gas consumption impacts in the PY 2021 Idaho Natural Gas Impact Evaluation report.

Program Participation Summary

This section summarizes fuel efficiency sector participation and progress toward PY 2021 goals for the MFMT program.

Table 16 shows savings goals, reported savings, and percentage of goal for the MFMT program. Avista did not set savings goals for the Site Specific fuel efficiency measures outside of the MFMT program.

Table 16. Avista Portfolio Fuel Efficiency Reported Electric Savings

Program	Savings Goals (kWh)	Reported Savings (kWh)	Percentage of Goal
Multifamily Market Transformation	475,794	711,593	150%

Table 17 shows Avista's PY 2021 reported participation for the MFMT measures. Avista did not set participation goals for Site Specific fuel efficiency measures. There were five MFMT participants in PY 2021.

Table 17. Avista Portfolio Fuel Efficiency Reported Participation

Fuel Efficiency Measure	Participation Reported
Multifamily Market Transformation	5

Fuel Efficiency Impact Evaluation Methodology

The impact methodology for fuel efficiency measures is outlined below for the MFMT program.

Nonresidential Site Specific Fuel Efficiency Impact Methodology

Cadmus followed the same impact evaluation methodology for fuel efficiency measures as outlined in the *Nonresidential Impact Evaluation Methodology* section. Cadmus sampled two MFMT applications. Of the sampled applications, we selected one for certainty review based on the savings scale and one randomly.

Fuel Efficiency Impact Evaluation Results

The following section summarizes findings for the MFMT program. All fuel efficiency measures provide positive electricity savings and negative natural gas consumption impacts because these measures replace electric space-heating or water-heating systems with equipment that uses natural gas. Negative natural gas consumption impacts reflect negative avoided costs and are incorporated in the electric cost-effectiveness calculations. We also reported these negative natural gas consumption impacts in the PY 2021 Idaho Natural Gas Impact Evaluation report.

Nonresidential Fuel Efficiency Impact Findings

Table 18 shows reported and evaluated electric energy savings for Avista's nonresidential fuel efficiency measures, along with realization rates, for PY 2021.

Table 18. Nonresidential Fuel Efficiency Electric Impact Findings

Fuel Efficiency Measure	Reported Savings (kWh)	Evaluated Savings (kWh)	Realization Rate
Multifamily Market Transformation	711,593	711,593	100%
Total	**711,593**	**711,593**	**100%**

Fuel Efficiency Conclusions and Recommendations

MFMT fuel efficiency measures achieved evaluated savings of 711,593 kWh, yielding a 100% realization rate. Combined, the measures achieved 150% of the electric energy savings goal of 475,794 kWh. Cadmus found that the MFMT program achieved its objectives in PY 2021 and does not have recommendations for this program.

APPENDIX B

CADMUS

PY 2021 Idaho Natural Gas Impact Evaluation Report

April 15, 2022

Prepared for:

Avista Corporation
1411 East Mission Avenue
Spokane, WA 99202

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Tables

Portfolio Executive Summary

For several decades, Avista Corporation (Avista) has administered demand-side management (DSM) programs to reduce electricity and natural gas energy use by its customer portfolio. While most of these programs have been implemented in house, a few have had external implementers.

Avista contracted with Cadmus to complete process and impact evaluations of its program year (PY) 2021 natural gas DSM nonresidential and multifamily residential programs in Idaho. This report presents the natural gas impact evaluation findings. Cadmus did not apply net-to-gross (NTG) adjustments to savings values, except where deemed energy savings values already incorporated NTG as a function of the market baseline.

Evaluation Methodology and Activities

Cadmus used a variety of methods and activities to conduct the Idaho natural gas portfolio evaluation, shown in Table 1.

Table 1. Annual Natural Gas Program Evaluation Activities

Sector	Program	Document/ Database Review	Verification/ Virtual Site Visit
Nonresidential	Prescriptive (multiple)	✓	✓
	Site Specific	✓	✓
Fuel Efficiency	Site Specific (nonresidential)	✓	--

Summary of Impact Evaluation Results

Overall, the Idaho portfolio achieved a 100% realization rate on savings from natural gas measures, acquiring 20,726 therms in annual gross savings, as shown in Table 2. Cadmus collected Avista's reported savings through database extracts, drawn from Avista's iEnergy database.

Table 2. PY 2020 Reported and Gross Evaluated Natural Gas Savings

Sector	Reported Savings (therms)	Gross Evaluated Savings (therms)	Realization Rate
Nonresidential	20,726	20,726	100%
Total	**20,726**	**20,726**	**100%**

Conclusions and Recommendations

During the course of the annual evaluation, Cadmus identified the areas addressed below for improvements by sector.

Nonresidential Conclusions and Recommendations

The nonresidential sector achieved total evaluated natural gas energy savings of 20,726 therms in PY 2021, with a combined realization rate of 100%. The Prescriptive and Site Specific programs achieved 25% of their combined natural gas savings goal of 82,680 therms.

Cadmus offers the following conclusion and recommendation to improve the nonresidential sector's natural gas savings:

- **Conclusion:** Cadmus found that Avista's new iEnergy system records detailed inputs on some Prescriptive measures that were not previously tracked in InforCRM and are not currently used in the savings calculations.
    - **Recommendation:** Review deemed savings values for Prescriptive measures and consider opportunities to leverage the additional data now collected in iEnergy to calculate more accurate savings for each participant project. For example, HVAC furnace measures can use the exact AHRI efficiency rating collected in iEnergy instead of a typical average to automatically calculate more precise savings.

Fuel Efficiency Conclusions and Recommendations

Nonresidential Site Specific and Multifamily Market Transformation MFMT fuel efficiency measures resulted in evaluated natural gas penalties of 36,409 therms, yielding a 100% realization rate.

Nonresidential Impact Evaluation

Through its nonresidential program portfolio, Avista promotes purchases of high-efficiency equipment for commercial and industrial utility customers. Avista provides rebates to partially offset the difference in costs between high-efficiency and standard equipment. Cadmus conducted nonresidential impact evaluation activities to determine evaluated savings for most programs, as well as measurement and verification (M&V) across a sample of Prescriptive and Site Specific projects.

Program Summary

In PY 2021, Avista completed and provided incentives for 38 nonresidential natural gas projects in Idaho, reporting total natural gas energy savings of 20,726 therms. Through the nonresidential sector, Avista offers incentives for high-efficiency equipment and controls through three program paths: Prescriptive, Site Specific, and Fuel Efficiency.

The Prescriptive programs serve smaller, straightforward equipment installations that generally include similar operating characteristics (such as simple HVAC systems, food service equipment, and envelope upgrades). The Site Specific program serves more unique projects requiring custom savings calculations and technical assistance from Avista's account executives (such as process equipment, controls, and comprehensive HVAC retrofits).

MFMT measures involve a combination of electric savings and natural gas penalties. Typically, these measures include replacing electric space-heating or water-heating systems with natural gas equipment. The *Fuel Efficiency Impact Evaluation* section details the evaluation methodology and results for MFMT measures.

Program Participation Summary

This section summarizes nonresidential sector participation and progress toward PY 2021 goals through the Prescriptive and Site Specific programs.

Nonresidential Prescriptive Programs

Table 3 shows natural gas energy savings goals assigned to Avista's nonresidential Prescriptive programs for PY 2021, as well as reported savings and a comparison between reported savings and goals. The programs achieved 44% of their collective savings goal in PY 2021. The lower participation is likely due to effects from the COVID-19 pandemic, which forced many businesses to reduce their operations or close entirely. For those businesses that remained open, facility and maintenance staff had to prioritize planning for health and safety impacts above energy efficiency concerns.

Table 3. Nonresidential Prescriptive Natural Gas Savings

Program Type	Savings Goals (therms)	Savings Reported (therms)	Percentage of Goal
HVAC	19,070	5,885	31%
Shell	10,080	360	4%
Food Service Equipment	18,075	14,480	80%
Total	**47,225**	**20,726**	**44%**

Table 4 summarizes program participation by unique application numbers.

Table 4. Nonresidential Prescriptive Participation by Project

Program Type	Number of Applications	Number of Measures
HVAC	15	16
Shell	1	2
Food Service Equipment	20	20
Total[a]	**36**	**38**

[a] Total participants. A single application may contain measures from multiple programs.

Nonresidential Site Specific Program

Table 5 shows natural gas savings goals, reported savings, and the percentage of goal achieved by the Site Specific program for Avista's nonresidential sector for PY 2021. The Site Specific program did not achieve any savings goal as there was no participation. The table does not include reported natural gas penalties for the fuel efficiency sector, such as those associated with the MFMT program.

Table 5. Nonresidential Site Specific Natural Gas Savings

Program	Savings Goals (therms)	Savings Reported (therms)	Percentage of Goal
Site Specific	4,000	0	0%

Table 6 summarizes program participation of the Site Specific program.

Table 6. Nonresidential Site Specific Participation by Project

Program Type	Number of Applications	Number of Measures
Site Specific Other	0	0
Total	**0**	**0**

Nonresidential Impact Evaluation Methodology

To review the programs and measures slated for evaluation in Avista's nonresidential sector, Cadmus examined the following documents and data records:

- Avista's annual business plans, processes, and energy savings justifications
- Project documents from external sources (such as customers, program consultants, or implementation contractors)
- Avista's iEnergy tracking system for nonresidential programs

Based on the initial review, Cadmus checked the distribution of program contributions with the overall program portfolio energy savings. The review provided insight into the sources for unit energy savings (UES) claimed for each program measure, along with sources for energy-savings algorithms, internal quality assurance, and quality control processes for large nonresidential sector projects.

Following this review, Cadmus designed a sample strategy for impact evaluation activities and performed the following evaluation activities in two waves:

- Selected evaluation sample and requested project documentation from Avista
- Reviewed project documentation
- Prepared M&V plans for virtual and in-person site visits
- Performed virtual site visits using the Streem platform or in-person site visits and collected on-site data (such as trend data, photos, and operating schedules)[1]
- Calculated evaluated savings by measure using site visit findings
- Determined overall evaluated savings by applying realization rates to the total reported savings population

Sample Design

Avista advised Cadmus not to evaluate certain programs with low participation and historically consistent realization rates every year. Cadmus evaluated the Food Services and HVAC programs in PY 2020 only. Cadmus evaluated the Prescriptive Shell program in PY 2021 only. There were no other programs with participation in PY 2021.

Table 7 summarizes natural gas evaluation sample for the Idaho nonresidential Prescriptive program. Cadmus evaluated the only participating Prescriptive Shell application.

Table 7. Idaho Nonresidential Prescriptive Natural Gas Evaluation Sample

Program Type	Applications Sampled	Sampled Savings (therms)	Percentage of Reported Savings
HVAC	0	0	0%
Shell	1	360	100%
Food Service Equipment	0	0	0%
Nonresidential Prescriptive	**1**	**360**	**2%**

Note: totals may not sum due to rounding.

Table 8 summarizes the natural gas evaluation sample for the Idaho nonresidential Site Specific program. None of the Site Specific applications reported natural gas savings in PY 2021.

Table 8. Idaho Nonresidential Site Specific Natural Gas Evaluation Sample

Program	Applications Sampled	Sampled Savings (therms)	Percentage of Reported Savings
Site Specific	0	0	N/A

[1] For more information on Streem: https://www.streem.com/platform-streem#platform-remote-video

Document Review

Cadmus requested and reviewed project documentation for the evaluated application and prepared an M&V plan to guide the virtual site visit. Project documentation included data entered into the iEnergy system and the incentive application forms.

Remote Verification

Cadmus performed a verification at one nonresidential location in Idaho to assess natural gas energy savings for two unique Prescriptive measures from one application. We conducted the video call using the Streem platform that records video and audio. Our team used the project documentation review and on-site findings to adjust the reported savings calculations where necessary.

Nonresidential Impact Evaluation Findings

This section summarizes the nonresidential Prescriptive and Site Specific program's natural gas impact evaluation results for PY 2021.

Nonresidential Prescriptive Programs

Table 9 shows the reported and evaluated natural gas energy savings for Avista's nonresidential Prescriptive programs and the associated realization rates for PY 2021. Overall, the nonresidential Prescriptive programs achieved a 100% natural gas realization rate.

Table 9. Nonresidential Prescriptive Natural Gas Impact Findings

Program Type	Reported Savings (therms)	Evaluated Savings (therms)	Realization Rate
HVAC	5,885	5,885	100%
Shell	360	360	100%
Food Service Equipment	14,480	14,480	100%
Nonresidential Prescriptive	**20,726**	**20,726**	**100%**

Cadmus did not identify any discrepancies in the sampled application based on the verification and project documentation review.

Nonresidential Site Specific Program

Avista's nonresidential Site Specific program did not report any natural gas savings for the program year (Table 10). The table does not include reported and evaluated natural gas penalties for measures in the fuel efficiency sector.

Table 10. Nonresidential Site Specific Natural Gas Impact Findings

Program	Reported Savings (therms)	Evaluated Savings (therms)	Realization Rate
Site Specific	0	0	N/A

Nonresidential Conclusions and Recommendations

The nonresidential sector programs achieved total evaluated natural gas energy savings of 20,726 therms in PY 2021, with a combined realization rate of 100%. The Prescriptive and Site Specific programs achieved 25% of their combined natural gas savings goal of 82,680 therms.

Cadmus offers the following conclusion and recommendation to improve the nonresidential sector's natural gas savings:

- **Conclusion:** Cadmus found that Avista's new iEnergy system records detailed inputs on some Prescriptive measures that were not previously tracked in InforCRM and are not currently used in the savings calculations.
    - **Recommendation:** Review deemed savings values for Prescriptive measures and consider opportunities to leverage the additional data now collected in iEnergy to calculate more accurate savings for each participant project. For example, HVAC furnace measures can use the exact AHRI efficiency rating collected in iEnergy instead of a typical average to automatically calculate more precise savings.

Fuel Efficiency Impact Evaluation

Cadmus designed the fuel efficiency sector impact evaluation to verify reported program participation and natural gas consumption impacts. Evaluation methods included a database review and document review.

Program Summary

Fuel efficiency measures replace electric space-heating or water-heating systems with equipment using natural gas. These measures are offered through the nonresidential Site Specific program, which includes MFMT measures. From this program, Avista reported a natural gas energy penalty of 36,409 therms for five fuel efficiency measures.

Fuel efficiency measures provide positive electricity savings and negative natural gas consumption impacts, reflecting negative avoided costs. Cadmus reported the electric energy savings in the PY 2021 Idaho Electric Impact Evaluation report.

Program Participation Summary

This section summarizes participation and progress toward PY 2021 goals for the MFMT program.

Table 11 shows reported participation for MFMT measures in PY 2021. Avista did not set participation goals for Site Specific fuel efficiency measures. There were five MFMT participants in PY 2021.

Table 11. Avista Portfolio Fuel Efficiency Participation

Program	Participation Reported
Multifamily Market Transformation	5

Fuel Efficiency Impact Evaluation Methodology

The impact methodology for fuel efficiency measures is outlined below for the MFMT program.

Nonresidential Site Specific Fuel Efficiency Impact Methodology

Cadmus followed the same impact evaluation methodology for fuel efficiency measures as outlined in the *Nonresidential Impact Evaluation Methodology* section. Cadmus sampled two MFMT applications. Of the sampled applications, we selected one for certainty review based on the savings scale and one randomly.

Fuel Efficiency Impact Evaluation Results

The following section summarizes findings for the MFMT program. All fuel efficiency measures provide positive electricity savings and negative natural gas consumption impacts because these measures replace electric space-heating or water-heating systems with equipment that uses natural gas. Negative natural gas consumption impacts reflect negative avoided costs and are incorporated in the electric cost-effectiveness calculations. We also reported these positive electric savings in the PY 2021 Idaho Electric Impact Evaluation report.

Nonresidential Site Specific Fuel Efficiency Impact Findings

Table 12 shows reported and evaluated natural gas penalties for Avista's nonresidential fuel efficiency measures, along with realization rates, through PY 2021.

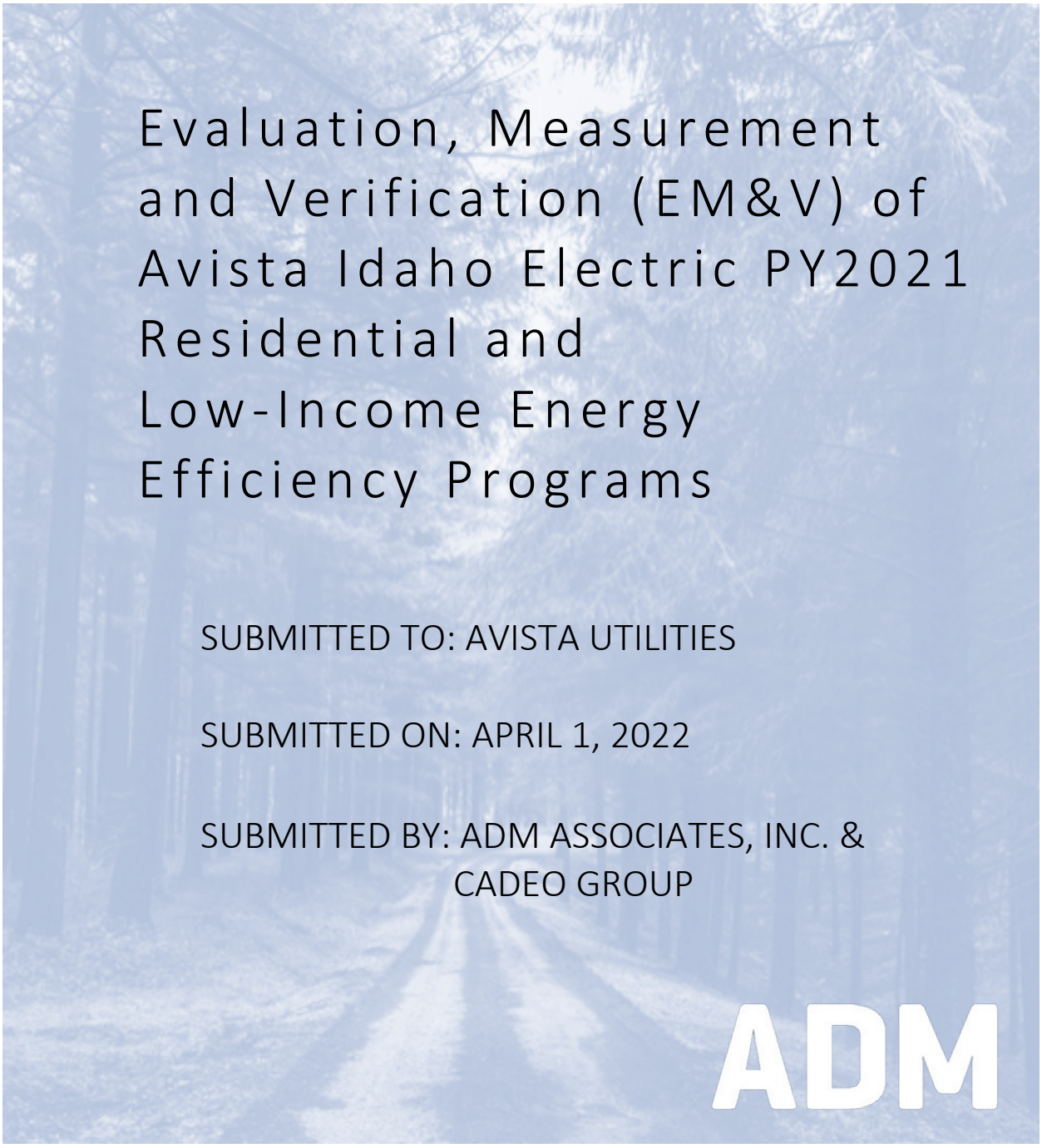
Table 12. Nonresidential Fuel Efficiency Natural Gas Findings

Fuel Efficiency Measure	Reported Impacts (therms)	Evaluated Impacts (therms)	Realization Rate
Multifamily Market Transformation	(36,409)	(36,409)	100%
Total	**(36,409)**	**(36,409)**	**100%**

Fuel Efficiency Conclusions and Recommendations

Nonresidential Site Specific and MFMT fuel efficiency measures resulted in evaluated natural gas penalties of 36,409 therms, yielding a 100% realization rate.

APPENDIX C



Evaluation, Measurement and Verification (EM&V) of Avista Idaho Electric PY2021 Residential and Low-Income Energy Efficiency Programs

SUBMITTED TO: AVISTA UTILITIES

SUBMITTED ON: APRIL 1, 2022

SUBMITTED BY: ADM ASSOCIATES, INC. & CADEO GROUP

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List of Tables

1. Executive Summary

This report is a summary of the Residential and Low-Income Electric Evaluation, Measurement, and Verification (EM&V) effort of the 2021 program year (PY2021) portfolio of programs for Avista Corporation (Avista) in the Idaho service territory. The evaluation was administered by ADM Associates, Inc. and Cadeo Group, LLC (herein referred to as the "Evaluators").

1.1 Savings Results

The Evaluators conducted an impact evaluation for Avista's Residential and Low-Income programs for PY2021. The Residential portfolio savings amounted to 1,294,535 kWh with a 93.19% realization rate. The Low-Income portfolio savings amounted to 153,503 kWh with a 95.15% realization rate. The Evaluators summarize the Residential portfolio verified savings in Table 1-1 and the Low-Income portfolio verified savings in Table 1-2 below.

Table 1-1: Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Water Heat	30,316	30,726	101.35%
HVAC	333,762	323,274	96.86%
Shell	190,085	219,690	115.57%
Fuel Efficiency	702,026	586,226	83.50%
ENERGY STAR Homes	66,243	72,007	108.70%
Small Home & MF Weatherization	49,911	49,193	98.56%
Appliances	16,835	13,420	79.71%
AeroBarrier	0	0	-
Total Res	**1,389,177**	**1,294,535**	**93.19%**

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

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Low-Income	161,323	153,503	95.15%
Total Low-Income	**161,323**	**153,503**	**95.15%**

Table 1-3 summarizes the electric programs offered to residential and low-income customers in the Idaho Avista service territory in PY2021 as well as the Evaluators' evaluation tasks and impact methodology for each program.

Table 1-3: Impact Evaluation Activities by Program and Sector

Sector	Program	Database Review	Survey Verification	Impact Methodology
Residential	Water Heat	✓	✓	RTF UES
Residential	HVAC	✓	✓	RTF UES
Residential	Shell	✓		RTF UES
Residential	Fuel Efficiency	✓	✓	Avista TRM/Billing analysis with comparison group
Residential	ENERGY STAR® Homes	✓		RTF UES
Residential	Small Home & MF Weatherization	✓	✓	RTF UES
Residential	Appliances	✓	✓	RTF UES
Residential	AeroBarrier	✓		No evaluation completed for PY2021
Low-Income	Low-Income	✓		Avista TRM

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 and Low-Income Portfolio.

1.2.1.1 Residential Programs

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

- The Evaluators found the Residential portfolio to demonstrate a total of 1,294,535 kWh with a realization rate of 93.19%.
- The Fuel Efficiency Program, which contributes 45% of the expected savings, resulted in a realization rate of 84% whereas each of the other programs resulted in a combined 103% realization rate. The Fuel Efficiency Program contributed to a 10% decrease in the overall residential sector, which displayed a realization rate of 93%.
- The Residential Portfolio impact evaluation resulted in a realization rate of 93% due to slight differences between the Avista TRM categories and the appropriately assigned RTF UES categories for each measure as well as due to differences between applied values from billing analysis and the expected savings for those measures. 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, 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 higher 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 92-100%. These values were applied to impact analysis results to estimate verified savings through the programs.
- The Evaluators found the CC&B tracking database consistently reflected values indicated on randomly sampled documents.
- 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 UES across heating types, while the Evaluators assigned the appropriate RTF UES value for each heating zone. 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 HVAC Program, the Evaluators verified smart thermostat model specifications through the ENERGY STAR qualified products list to verify if the thermostat met all conditions required from the RTF measure specifications. The Evaluators verified that 6 of the 68 thermostats did not meet RTF measure specifications (6% of sampled thermostat rebates). The 6% of thermostats verified to not meet the conditions had lacked occupancy detection and/or geofencing capabilities, a specification required by the RTF.
- In 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.
- 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 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. Finally, two projects were verified to have natural gas furnace space heating for the home and therefore verified savings did not include full electric savings. This led to one project displaying 1.30% realization for electric savings, leading to a large downward adjustment in the population realization rates.
- 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”.

- In the Appliance Program, the Evaluators found that 3 of the sampled clothes washer projects did not qualify due to minimum volume requirements specified by the RTF. The Evaluators also found that the Avista TRM applied RTF savings from the “Front Load” measure description for clothes washers. However, the Evaluators found that 3 of the clothes washer equipment were “Top loading”, which the RTF assigns significantly lower annual savings. This change in addition to the disqualification of 3 rebates led to a downward adjustment in realization rate for this program.
- The Evaluators did not complete an impact analysis for the AeroBarrier Program. A full impact analysis will be completed for the program in PY2022.

1.2.1.2 Low-Income Programs

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

- The Evaluators found the Low-Income portfolio to demonstrate a total of 153,503 kWh with a realization rate of 95.15%.
- 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 verified Avista TRM values for the Low-Income Program. 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 in the Low-Income in order to estimate savings for the average household participating in the program, across all measures. The Evaluators found a realization rate of 65% for all electric measures in the program, which is significantly lower than the realization rate of 95% from the desk review. However, due to requirements for measure-level verified savings for cost-effectiveness testing, the Evaluators designated the desk review savings as verified.
- In the Low-Income Program, The Evaluators found the LED bulbs unit-level savings were inaccurately referenced. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11% realization for LED bulb projects under the program.

1.2.2 Recommendations

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

1.2.2.1 Residential Programs

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

- The Evaluators imputed home type and space heating type for a large number of sampled rebates, as the tracking database does not contain values for these characteristics or remain outdated. The mail-in rebates collect this information; however, it does not seem to be required to complete the rebate and therefore many rebates are missing this information. The Evaluators recommend verifying home type and space heating type during rebate application approval in order to apply correct savings values to each project.
- In addition, the Evaluators note that the current program rebate applications for the Small Home & MF Weatherization Program do not provide an option to indicate "Multifamily" home type. For the Small Home & MF Weatherization Program, project savings largely depends on the home type (single family vs. multifamily vs. manufactured). The current rebate application includes an option for "Single family", "Manufactured", "New construction", and "Other". The Evaluators recommend including an option for "Multifamily" in order to consistently apply RTF savings for each of the measures. The Evaluators recommend Avista verify home type prior to applying Avista TRM values in order to ensure proper categorization of measure savings.
- The Evaluators 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 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.
- 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 Avista TRM applied RTF savings from the "Front Load" measure description for clothes washers. However, the Evaluators found that 3 of the clothes washer equipment were "Top loading", which the RTF assigns significantly lower annual savings. This change in addition to the disqualification of 3 rebates led to a downward adjustment in realization rate for this program. The Evaluators recommend adding "top loading" clothes washers to the Avista TRM and applying savings for those measures appropriately.
- 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 (larger systems have a more stringent code baseline). 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 Evaluators recommend updating the Avista TRM value for this measure based on actual tank size, in addition to collecting information on the tank size of the measure in the rebate applications.
- The 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 this measure to reflect the RTF values associated with a fully natural gas-heated home at 43 kWh saved per year.

1.2.2.2 Low-Income Programs

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

- The Evaluators note that most deviations from 100% realization rate is due to differences between the limited measure category options Avista TRM values and the more detailed categories referencing heating zone, cooling zone, heating type, and bulb types present in the RTF. The Evaluators recommend that Avista reference the more detailed RTF measures when calculating expected savings for the programs.
- The Evaluators reviewed the project documentation provided by Avista and identified conflicting square footage or number of units between the aggregated project data from the expected savings calculated for each project. The Evaluators found very few instances in which the tracking data quantity differed from the quantity displayed in sampled documentation and invoices. The Evaluators recommend providing corrections to the application of Avista TRM values to tracking data quantity.
- The Evaluators found the LED bulbs unit-level savings were inaccurately referenced for the Low-Income Program. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11% realization for LED bulb projects under the program. The Evaluators

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

2. General Methodology

The Evaluators performed an impact evaluation on each of the programs summarized in Table 1-3. The Evaluators used the following approaches to calculate energy impact defined by the International Performance Measurement and Verification Protocols (IPMVP)[1] and the Uniform Methods Project (UMP)[2]:

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

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

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

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

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

2.1 Glossary of Terminology

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

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

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

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

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

2.2 Summary of Approach

This section presents our general cross-cutting approach to accomplishing the impact evaluation of Avista's Residential and Low-Income programs listed in Table 1-3. The Evaluators start by presenting our general evaluation approach. This chapter is organized by general task due to several overlap across programs. Section 3.3 describes the Evaluators' program-specific residential impact evaluation methods and results in further detail and Section 4.1 describes the Evaluator's program-specific low-income impact evaluation methods and results.

The Evaluators outline the approach to verifying, measuring, and reporting the residential portfolio impacts as well as 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.

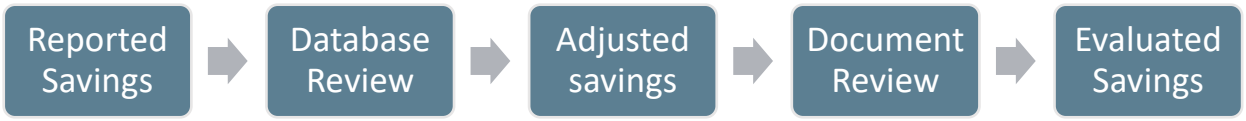
The Evaluators employed the following approach to complete impact evaluation activities for the programs. The Evaluators define two major approaches to determining net savings for Avista's programs:

- 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.

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

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

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



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

The Evaluators analyzed billing data for all electric measure participants in the HVAC and Low-Income programs. The Evaluators applied billing analysis results to determine evaluated savings only for measures where savings could be isolated (that is, where a sufficient number of participants could be identified who installed only that measure). Program-level realization rates for the HVAC, Water Heat, and Fuel Efficiency programs incorporate billing analysis results for some measures.

2.2.1 Database Review

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

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

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

2.2.2 Verification Methodology

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.

[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

2.2.2.1 Document-Based Verification

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

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

This sample of documents was used to cross-verify tracking data inputs. In the case the Evaluators found any deviations between the tracking data and application values, the Evaluators reported and summarized those differences in the Database Review sections presented for each program in Section 3.3 and Section 4.1.

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

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

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

Sector	Program	Electric Population	Sample (With Finite Population Adjustment) *	Precision at 90% CI
Residential	Water Heat	109	42	±10.0%
Residential	HVAC	648	64	±9.8%
Residential	Shell	386	66	±9.2%
Residential	Fuel Efficiency	84	39	±9.7%
Residential	ENERGY STAR® Homes	51	31	±9.3%
Residential	Small Home & MF Weatherization	93	43	±9.3%
Residential	Appliances	479	61	±9.9%
Residential	AeroBarrier	N/A	N/A	N/A
Low-Income	Low-Income	408	87	±7.8%

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

The Evaluators summarize the final sample sizes shown in Table 2-2 for the Idaho Electric Avista projects. The Evaluators developed a sampling plan that achieved a sampling precision of ±5.5% 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	109	8	±28.1%*
Residential	HVAC	648	77	±8.8%
Residential	Fuel Efficiency	84	19	±16.7%*
Residential	Small Home & MF Weatherization	93	6	±32.7%*
Residential	Appliances	479	86	±8.0%
Total		**1,413**	**196**	**±5.5%**

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

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

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

2.2.3 Impact Evaluation Methodology

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

- Deemed Savings
- Billing Analysis (IPMVP Option C)

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

2.2.3.1 Deemed Savings

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

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

2.2.3.2 Billing Analysis

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

For the purposes of this analysis, a household is considered a treatment household if it has received a program incentive. Additionally, a household is considered a control household if the household has not received a program incentive. To isolate measure impacts, treatment households are eligible to be included in the billing analysis if they installed only one measure during the2021 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. This is particularly relevant in 2021 due to COVID-19 related lockdowns and restrictions.

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, 2021)
5. Typical Meteorological Year (TMY3) data

Billing and weather data were obtained for program year 2021 and for one year prior to measure install dates (2020).

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.

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, 2021 through June 30, 2021) 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

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

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 PY2021 and perhaps also PY2021 are affected by the stay-at-home orders that had taken effect starting March 2021 in Idaho. The stay-at-home orders most likely affect the post-period household usage. Because there is insufficient post-period data before the shelter-in-place orders, the Evaluators were unable to separate the effects on consumption due to the orders and the effects on consumption due to the measure installation. Therefore, the results from this additional gross savings analysis are unable to reflect actual typical year savings. However, for planning purposes, these estimates may be useful.

2.2.4 Net-To-Gross

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

2.2.5 Non-Energy Benefits

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

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

3. Residential Impact Evaluation Results

The Evaluators completed an impact evaluation on Avista's Residential portfolio to verify program-level and measure-level energy savings for PY2021. The following sections summarize findings for each electric impact evaluation in the Residential Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, RTF, and billing analysis of participants and nonparticipants to evaluate savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data. Table 3-1 summarizes the Residential verified impact savings by program.

Table 3-1: Residential Verified Impact Savings by Program

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Water Heat	30,316	30,726	101.35%
HVAC	333,762	323,274	96.86%
Shell	190,085	219,690	115.57%
Fuel Efficiency	702,026	586,226	83.50%
ENERGY STAR Homes	66,243	72,007	108.70%
Small Home & MF Weatherization	49,911	49,193	98.56%
Appliances	16,835	13,420	79.71%
AeroBarrier	0	-	-
Total Res	**1,389,177**	**1,294,535**	**93.19%**

In PY2021, Avista completed and provided incentives for residential electric measures in Idaho and reported total electric energy savings of 1,294,535 kWh. All programs except the Fuel Efficiency Program and Appliances Program met or exceeded savings goals based on reported savings, leading to an overall achievement of 93.19% of the expected savings for the residential programs. Further details of the impact evaluation results by program are provided in the sections following.

3.1 Simple Verification Results

The Evaluators surveyed 302 unique customers that participated in Avista's residential energy efficiency program in September and October 2021 and in February 2022 using an email survey approach.

Customers with a valid email were sent the survey via an email invitation. Fifty-three did not have email addresses in program records. The Evaluators also conducted targeted follow-up outreach to customers for certain measures.

The Evaluators surveyed customers that received rebates for HVAC, Water Heater, and Small Home & MF Weatherization, and Appliances Programs.

Table 3-2: Summary of Survey Response Rate

Population	Respondents
Initial email contact list	1,376
Invalid or bounced	53
Invalid or bounced email (%)	*4%*
Invitations sent (unique valid)	1,323
Completions	302
Response rate (%)	23%

3.1.1 In-Service Rates

The Evaluators calculated in-service rates of installed measures from simple verification surveys deployed to program participants for the Water Heat, HVAC, Fuel Efficiency, Small Home & MF Weatherization, and Appliances Programs. The Evaluators asked participants if the rebated equipment is currently installed and working, in addition to questions about the new equipment fuel type. The Evaluators achieved 5.5% precision across the programs surveyed for the electric measures in Avista's service territory, summarized in Table 3-3.

Table 3-3: Simple Verification Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	109	8	±28.1%
Residential	HVAC	648	77	±8.8%
Residential	Fuel Efficiency	84	19	±16.7%
Residential	Small Home & MF Weatherization	93	6	±32.7%
Residential	Appliances	479	86	±8.0%
Total		**1,413**	**196**	**±5.5%**

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

Table 3-4: Water Heat Program ISRs by Measure

Measure	Respondents	ISR
E Heat Pump Water Heater	8	100%*

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

Table 3-5: HVAC Program ISRs by Measure

Measure	Respondents	ISR
E Electric To Air Source Heat Pump	19	95%
E Electric to Ductless Heat Pump	10	100%
E Smart Thermostat DIY with Electric Heat	23	96%
E Smart Thermostat Paid Install with Electric Heat	25	92%

Table 3-6: Fuel Efficiency Program ISRs by Measure

Measure	Respondents	ISR
E Electric To Natural Gas Furnace	9	89%*
E Electric To Natural Gas Furnace & Water Heat	10	100%

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

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

Measure	Respondents	ISR
E Multifamily Thermostat with Baseboard Electric Heat	3	100%
E Multifamily WIFI Thermostat with Baseboard Electric Heat	3	100%

Table 3-8: Appliance Program ISRs by Measure

Measure	Respondents	ISR
E Electric To Natural Gas Furnace	35	100%
E Electric To Natural Gas Furnace & Water Heat	51	98%

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

These ISR values were utilized in the desk reviews for the Water Heat, HVAC, Fuel Efficiency, 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 Impacts of COVID-19 Pandemic

On average, about three people lived at the residence that had the rebated equipment installed and about 65% of respondents said that two or fewer lived at the residence that had the rebated equipment installed.

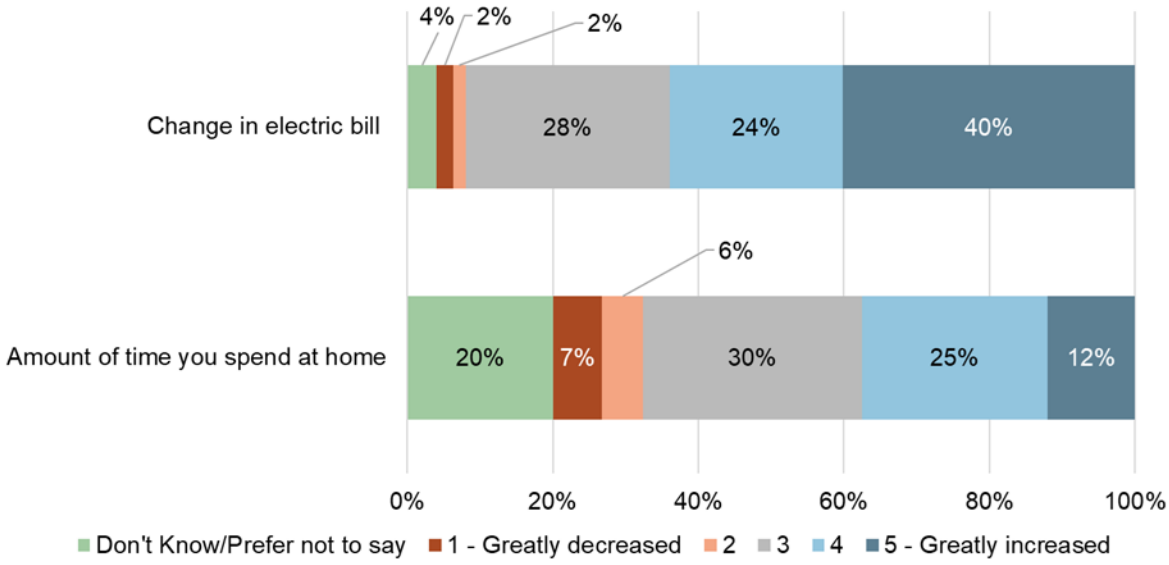
About two-thirds of respondents observed that the pandemic had not changed the number of people in their household that worked or went to school remotely.[8] Eighteen percent of respondents said that more members of their household were attending school remotely or working from home since the

[8] n=257

COVID-19 pandemic began. Sixteen percent of respondents indicated that more members of their household had gone to work or school remotely before the COVID-19 pandemic.

Sixty-four percent of respondents said that the amount of time they spend at home has increased since the COVID-19 pandemic began. Thirty-seven percent of respondents indicated that their utility bill had increased. Figure 3-1 displays the change in amount of time spent at home and the change in electricity bills since the COVID-19 pandemic began.

Figure 3-1: Change in amount of time spent at home and change in electricity bill since COVID-19 pandemic began



3.3 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.

3.3.1 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	PY2021 Participation	Expected Savings	Adjusted Savings	Verified Savings	Realization Rate
E Heat Pump Water Heater	26	30,316	30,316	30,726	101.35%
Total	**26**	**30,316**	**30,316**	**30,726**	**101.35%**

The Water Heat Program displayed verified savings of 30,726 kWh with a realization rate of 101.35% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-11 Water Heat Program Incentive Costs by Measure

Measure	Incentive Costs
E Heat Pump Water Heater	$5,590.00
Total	**$5,590.00**

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

3.3.1.1 Database Review & Verification

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

3.3.1.2 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 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.

However, 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 all sampled rebate equipment met or exceeded the measure efficiency requirements for the Water Heat Program.

3.3.1.3 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?

In addition, the Evaluators asked participants how the COVID19 pandemic stay-at-home orders have affected their household's energy consumption. The responses to this verification survey were used to calculate ISRs for the measures offered in the Water Heat Program.

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

Table 3-12: Water Heat Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Program-Level Precision at 90% Confidence	In-Service Rate
E Heat Pump Water Heater	83	8	±28.1%*	100%

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

3.3.1.4 Impact Analysis

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

3.3.1.5 Billing Analysis

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

3.3.1.6 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 30,316 kWh with a realization rate of 101.35%, 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.

3.3.2 HVAC Program

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

Table 3-13: HVAC Program Measures

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

*No E Variable Speed Motor projects were completed in PY2021

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

Table 3-14: HVAC Program Verified Electric Savings

Measure	PY2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
E Electric To Air Source Heat Pump	64	194,670	197,776	196,597	100.99%
E Electric to Ductless Heat Pump	41	37,228	37,228	38,795	104.21%
E Smart Thermostat DIY with Electric Heat	37	28,462	27,695	28,713	100.88%
E Smart Thermostat Paid Install with Electric Heat	97	73,402	72,605	59,169	80.61%
Total	**239**	**333,762**	**335,303**	**323,274**	**96.86%**

The HVAC Program displayed verified savings of 323,274 kWh with a realization rate of 96.86% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-15: HVAC Program Incentive Costs by Measure

Measure	Incentive Costs
E Electric To Air Source Heat Pump	$64,000.00
E Electric to Ductless Heat Pump	$20,500.00
E Smart Thermostat DIY with Electric Heat	$4,639.29
E Smart Thermostat Paid Install with Electric Heat	$14,700.00
Total	**$103,839.29**

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

3.3.2.1 Database Review & Verification

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

3.3.2.2 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. 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 was unable to verify 2 of the 68 sampled thermostats due to missing information (4% of sampled thermostat rebates). The Evaluators verified that 6 of the 68 thermostats did not meet RTF measure specifications (6% of sampled thermostat rebates). The 6% of thermostats verified to not meet the conditions had lacked occupancy detection and/or geofencing capabilities, a specification required by the RTF. The remaining smart thermostats were verified to qualify for RTF measure savings (92% of sampled thermostat rebates). The thermostats that were verified to not meet RTF measure specifications were removed from verified savings (6 thermostats). These 6 smart thermostat rebates encompassed 2 different smart thermostat models (Honeywell RTH9585WF1004 and AccuLink Platinum 850 Control). This change led to an 80% realization rate for the paid install smart thermostat.

Additionally, the RTF defines different UES values for the same measure in homes with different space heating type, cooling type, and homes in different heating and cooling zones. The Avista TRM provides UES values averaged between these values. Therefore, the realization rates resulting from the verified savings defined by the RTF differ for each project. This led to slight variations in realization rate across the HVAC measures.

In addition, the Evaluators identified one rebate to be a duplicated rebate. The tracking data indicated two separate line items for the same project, however, one of the entries defined expected savings for the project while the other did not. For the entry in which no savings was defined, the Evaluators did not verify savings. Therefore, the realization rate was not affected by this identification. However, the Evaluators recommend that Avista note instances in which corrections are made to rebates in order to avoid duplicate verified savings in the future.

3.3.2.3 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 B.

Table 3-16 displays the ISRs for each of the HVAC measures for Idaho and Washington electric territory combined. The ISRs resulted in 8.8% 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 Electric To Air Source Heat Pump	104	19	±8.8%	95%
E Electric to Ductless Heat Pump	72	10		100%
E Smart Thermostat DIY with Electric Heat	102	23		96%
E Smart Thermostat Paid Install with Electric Heat	131	25		92%

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

3.3.2.4 Impact Analysis

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

3.3.2.5 Billing Analysis

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

3.3.2.6 Verified Savings

The HVAC Program in total displays a realization rate of 96.86% with 323,274 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-14. The realization rate for the electric savings in the HVAC Program deviate from 100% due to the differences between the applied Avista TRM prescriptive savings value and the true Avista TRM or appropriate RTF UES value.

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program adjusted savings. In addition, the Evaluators reviewed and applied the current RTF UES values for the electric measures along with verified tracking data to estimate net program verified savings for this measure.

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. In addition, the Evaluators found a number of thermostats did not qualify for RTF savings and therefore savings were removed for these instances. Finally, the measure-level ISRs were applied to the measures, further decreasing the realization rate for the E Electric to Air Source Heat Pump and smart thermostat measures.

3.3.3 Shell Program

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

Table 3-17: Shell Program Measures

Measure	Description	Impact Analysis Methodology
E Attic Insulation with Electric Heat	Attic insulation for homes heated with electricity	RTF UES
E Floor Insulation with Electric Heat	Floor insulation for homes heated with electricity	RTF UES
E IGU Window Replc from Single Pane W Electric Heat	IGU window replacement 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	PY2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
E Attic Insulation With Electric Heat	20	39,113	39,113	13,492	34.49%
E Floor Insulation With Electric Heat	3	2,094	2,094	2,094	100.00%
E IGU Window Replc from Single Pane W Electric Heat	1	2,200	2,200	1,773	80.59%
E Wall Insulation With Electric Heat	8	22,290	21,480	9,606	43.10%
E Window Replc from Single Pane W Electric Heat	98	124,388	124,388	192,725	154.94%
Total	**130**	**190,085**	**189,275**	**219,690**	**115.57%**

The Shell Program displayed verified savings of 219,690 kWh with a realization rate of 115.57% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-19: Shell Program Incentive Costs by Measure

Measure	Incentive Costs
E Attic Insulation With Electric Heat	$17,476.50
E Floor Insulation With Electric Heat	$1,570.50
E IGU Window Replc from Single Pane W Electric Heat	$800.00
E Wall Insulation With Electric Heat	$6,687.00
E Window Replc from Single Pane W Electric Heat	$45,232.00
Total	**$71,766.00**

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

3.3.3.1 Database Review & Verification

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

3.3.3.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Shell Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

The Evaluators reviewed each measure number of units, square footage, and insulation where available. The Evaluators found six instances of the 23 sampled projects in which square footage quantity in the rebate application did not match the values presented in the project data attic insulation. However, 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 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 in order to apply correct savings values to each project.

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

3.3.3.3 Verification Surveys

The Evaluators did not conduct verification surveys for the Shell Program. Weatherization measures historically have high verification rates.

3.3.3.4 Impact Analysis

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

3.3.3.5 Billing Analysis

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

3.3.3.6 Verified Savings

The Shell Program in total displays a realization rate of 115.57% with 219,690 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-18. The realization rate for the electric savings in the Shell Program deviate from 100% 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 heat pump vs electric FAF vs zonal heating type. The Evaluators recommend adjusting the Avista TRM values to more closely align with observed participation within each heating type category. In addition, small changes to verified square footage led to variation in realization rate for each project.

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

3.3.4 Fuel Efficiency Program

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

Table 3-20: Fuel Efficiency Program Measures

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

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

Table 3-21: Fuel Efficiency Program Verified Electric Savings

Measure	PY2021 Participation	Expected Savings	Adjusted Savings	Verified Savings	Verified Realization Rate
E Electric to Air Source Heat Pump*	0	N/A	N/A	N/A	N/A
E Electric To Natural Gas Furnace	50	369,200	369,200	253,400	68.63%
E Electric To Natural Gas Furnace & Water Heat	34	332,826	332,826	332,826	100.00%
Total	**84**	**702,026**	**702,026**	**586,226**	**83.50%**

*The E Electric to Air Source Heat Pump measure had 0 rebates completed in PY2021

The Fuel Efficiency Program displayed verified savings of 586,226 kWh with a realization rate of 83.50% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

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

Measure	Incentive Costs
E Electric to Air Source Heat Pump*	N/A
E Electric To Natural Gas Furnace	$105,000.00
E Electric To Natural Gas Furnace & Water Heat	$96,900.00
Total	**$201,900.00**

*The E Electric to Air Source Heat Pump measure had 0 rebates completed in PY2021

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

3.3.4.1 Database Review & Verification

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

3.3.4.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Fuel Efficiency Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.1.

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

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

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

3.3.4.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure, as described in Section 2.2.2.2. The Evaluators included questions such as:

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

The responses to this verification survey were used to calculate in-service rates (ISRs) for the measures offered in the Fuel Efficiency Program. 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 B.

Table 3-12 displays the ISRs for each of the Fuel Efficiency measures for Idaho territory. The ISRs did not meet 10% precision at the 90% confidence interval for the program.

Table 3-23: Fuel Efficiency Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Electric To Natural Gas Furnace	50	9	±16.7%	88.89%
E Electric To Natural Gas Furnace & Water Heat	34	10		100.00%

Although the Evaluators contacted all participants for this program, response rates did not meet the 90/10 precision goal for the program. Therefore, the Evaluators assumed 100% in-service rate for this

measure. However, of the participants who did respond, all survey respondents for each furnace water heater combination measure described equipment to be currently functioning, supporting the 100% in-service rate assumption for this measure. In addition, due to the furnace impact billing analysis used to verify savings for the measure, in-service rates are already included in the verified unit energy savings developed. Therefore, no in-service rate adjustments were made to the verified impact savings for this program.

3.3.4.4 Impact Analysis

This section summarizes the verified savings results for the Fuel Efficiency Program. The Evaluators attempted to conduct a billing analysis for the Fuel Efficiency Program measures, but participation was insufficient to complete verified savings using this methodology. Therefore, the Evaluators calculated verified savings for the measures using the PY2020 billing analysis results for the E Electric to Natural Gas Furnace measure and used the RTF workbook in place at the time the savings goal for the program was finalized for the E Electric to Natural Gas Furnace & Water Heat measure. The Evaluators calculated verified savings for the gas measures using the active Avista TRM values. These UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

The following sections summarize the results of the billing analysis and the desk review, with a summary of the verified savings for the Fuel Efficiency Program.

3.3.4.5 Billing Analysis

The results of the billing analysis for the Fuel Efficiency Program are provided in the PY2020 Residential Impact Evaluation Report. The details of the PY2020 billing analysis are presented in this section as well as further details in Appendix A.

Table 3-24 displays customer counts for customers considered for billing analysis (i.e. customer with single-measure installations) and identifies measures that met the requirements for a billing analysis.

Table 3-24: Measures Considered for Billing Analysis, Fuel Efficiency Program

Measure	Measure Considered for Billing Analysis	Number of Customers w/ Isolated-Measure Installations	Sufficient Participation for Billing Analysis
E Electric To Natural Gas Furnace	✓	186	✓
E Electric To Natural Gas Furnace & Water Heat	✓	33	

The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. The final number of customers in each the treatment and control group are listed in Table 3-25.

The Evaluators performed three tests to determine the success of PSM:

1. *t*-test on pre-period usage by month

2. Joint chi-square test to determine if any covariates are imbalanced
3. Standardized difference test for each covariate employed in matching

All tests confirmed that PSM performed well for each measure and the Evaluators conducted a linear regression using the matched participant and nonparticipant monthly billing data. Further details regarding the billing analysis methodology can be found in Appendix A.

Table 3-25 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Fuel Conversion 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.

Table 3-25: Measure Savings, Fuel Efficiency Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (kWh)	90% Lower CI	90% Upper CI	Relative Precision (90% CI)	Adjusted R-Squared	Model
E Electric to Natural Gas Furnace	85	421	5,068	4,384	5,7512	0.13	0.73	Model 2: PPR

The Evaluators determined the savings estimate for E Electric to Natural Gas Furnace in PY2020 to be 5,068 kWh, which represents a value 68.63% of that demonstrated in the Avista TRM. The Evaluators applied this value to all rebates in the PY2021 project data.

3.3.4.6 Verified Savings

The Fuel Efficiency Program in total displays a realization rate of 83.50% with 586,226 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-14. The realization rate for the electric savings in the Fuel Efficiency Program deviate from 100% due to the differences between the applied Avista TRM prescriptive savings value and the billing analysis and true Avista TRM value.

The Evaluators applied the results of the PY2020 billing analysis to each E Electric to Natural Gas Furnace measure. The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program adjusted savings for measures not evaluated through billing analysis. In addition, the Evaluators reviewed and applied the current Avista TRM values for the electric measures along with verified tracking data to estimate net program verified savings for this measure.

3.3.5 ENERGY STAR® Homes Program

The ENERGY STAR® Homes Program provides rebates for homes within Avista's service territory that attain an ENERGY STAR® certification. This program incentivizes for ENERGY STAR® Eco-rated homes. Table 3-9 summarizes the measures offered under this program.

Table 3-26: ENERGY STAR® Homes Program Measures

Measure	Description	Impact Analysis Methodology
E ENERGY STAR Home - Manufactured, Furnace	ENERGY STAR-rated manufactured home with electric furnace	RTF UES
G ENERGY STAR Home - Manufactured, Natural Gas	ENERGY STAR-rated manufactured home with natural gas heating	RTF UES
G ENERGY STAR Home - Manufactured, Gas & Electric	ENERGY STAR-rated manufactured home with gas and electric	RTF UES

The following table summarizes the verified electric energy savings for the ENERGY STAR® Homes Program impact evaluation.

Table 3-27: ENERGY STAR® Homes Program Verified Electric Savings

Measure	PY2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
E Energy Star Home - Manufactured, Furnace	17	56,355	56,355	65,730	117%
E Energy Star Home - Manufactured, Gas & Electric	3	9,888	9,945	6,278	63%
G Energy Star Home - Manufactured, Gas & Electric	2	6,592	6,630	86	1%
Total	**22**	**72,835**	**72,930**	**72,093**	**98.98%**

The ENERGY STAR® Homes Program displayed verified savings of 72,930 kWh with a realization rate of 98.98% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-28: ENERGY STAR® Homes Program Incentive Costs by Measure

Measure	Incentive Costs
E Energy Star Home - Manufactured, Furnace	$17,000.00
E Energy Star Home - Manufactured, Gas & Electric	$3,000.00
G Energy Star Home - Manufactured, Gas & Electric	N/A
Total	**$20,000.00**

*The costs associated with this measure are claimed in the Idaho 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.

3.3.5.1 Database Review & Verification

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

3.3.5.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the ENERGY STAR® Homes Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

The Evaluators found no significant or notable discrepancies in the project data and rebate documentation for the rebates in the Idaho electric service territory.

3.3.5.3 Verification Surveys

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

3.3.5.4 Impact Analysis

This section summarizes the verified savings results for the ENERGY STAR® Homes Program. The Evaluators calculated verified savings for the electric measures using the RTF workbook in place at the time the savings goal for the program was finalized. These RTF UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.3.5.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate adjusted program savings for each of the ENERGY STAR® Homes measures. In addition, the Evaluators reviewed and applied the current RTF UES values for each measure along with verified tracking data to estimate net program savings.

The ENERGY STAR® Homes Program in total displays a realization rate of 98.98% with 72,093 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 3-27. The realization rate for the electric savings in the ENERGY STAR® Homes Program deviate from 100% due to the categorical differences between the applied Avista TRM prescriptive savings value and the more detailed RTF UES categories.

The Avista TRM applies RTF savings values from heating zone 2 to all rebates. In addition, the Avista TRM does not take into account cooling zone, which also affects savings assigned in the RTF. The Evaluators applied the appropriate RTF savings values for the heating zone and cooling zone for each rebated household. This change led to low realization rates for some rebates and high realization rates for others within the same Avista E ENERGY STAR® Home – Manufactured Furnace measure category. The overall effect this change had on the measure is an upward adjustment on savings.

The realization for the E ENERGY STAR® Home – Manufactured, Gas & Electric measure is low because the expected savings employed an additive methodology between a gas-heated home and an electric-heated home for the electric savings. However, the Evaluators reviewed the RTF and determined manufactured home 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.

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

3.3.6 Small Home & MF Weatherization Program

The Small Home & MF Weatherization Program is a residential prescriptive program that waives the energy usage requirement that is typically employed for residential prescriptive programs. This benefits

small homes (less than 1,000 square feet in size) and multifamily dwellings (specifically customers in condominiums larger than five units in size). While this program is designed for all customers, it could also benefit members of Named Communities who reside in smaller homes.

This section summarizes the impact results of the evaluation results for the Small Home & MF Weatherization Program. Table 3-29 summarizes the measures offered under this program.

Table 3-29: Small Home & MF Weatherization Program Measures

Measure	Description	Impact Analysis Methodology
E Multifamily Attic Insulation With Electric Heat	Attic insulation for multifamily homes with electric heat	RTF UES
E Multifamily Floor Insulation With Electric Heat	Floor insulation for multifamily homes with electric heat	RTF UES
E Multifamily IGU Window Replc With Electric Heat	Window replacement for multifamily homes with electric heat	RTF UES
E Multifamily Storm Window Replc With Electric Heat	Storm window replacement for multifamily homes with electric heat	RTF UES
E Multifamily Thermostat with Baseboard Electric Heat	Thermostats for multifamily homes with electric heat	RTF UES
E Multifamily Wall Insulation With Electric Heat	Wall insulation for multifamily homes with electric heat	RTF UES
E Multifamily WIFI Thermostat with Baseboard Electric Heat	Connected thermostat for multifamily homes with electric heat	RTF UES
E Multifamily Window Replc With Electric Heat	Window replacement for multifamily homes with electric heat	RTF UES

The following table summarizes the verified electric energy savings for the Small Home & MF Weatherization impact evaluation.

Table 3-30: Small Home & MF Weatherization Program Verified Electric Savings

Measure	PY2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Multifamily Attic Insulation With Electric Heat	3	2,685	2,780	2,685	100.00%
E Multifamily Thermostat with Baseboard Electric Heat	2	152	152	220	144.74%
E Multifamily Wall Insulation With Electric Heat	1	1,904	1,906	1,400	73.53%
E Multifamily WIFI Thermostat with Baseboard Electric Heat	6	549	549	6,858	1249.18%
E Multifamily Window Replc With Electric Heat	13	44,621	44,616	38,030	85.23%
Total	**25**	**49,911**	**50,003**	**49,193**	**98.56%**

The Small Home & MF Weatherization Program displayed verified savings of 49,193 kWh with a realization rate of 98.56% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-31: Small Home & MF Weatherization Incentive Costs by Measure

Measure	Incentive Costs
E Multifamily Attic Insulation With Electric Heat	$2,013.75
E Multifamily Thermostat with Baseboard Electric Heat	$80.00
E Multifamily Wall Insulation With Electric Heat	$525.00
E Multifamily WIFI Thermostat with Baseboard Electric Heat	$160.00
E Multifamily Window Replc With Electric Heat	$8,244.00
Total	**$11,022.75**

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.

3.3.6.1 Database Review & Verification

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

3.3.6.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Small Home & MF Weatherization Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.1.

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 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 three instances of the 14 sampled rebates in which square footage quantity in the rebate application does not match the values presented in the project data attic insulation. However, 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 3 E Multifamily WIFI Thermostat with Baseboard Electric Heat projects are high due to verification that the equipment qualified for RTF connected thermostat savings at 939 kWh annual savings rather than the Avista TRM value of 91.5 kWh saved. The Evaluators recommend verifying proper measure assignment for the equipment provided in the rebate application.

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

3.3.6.3 Verification Surveys

The Evaluators randomly selected a subset of participant customers to survey for simple verification of installed measure described in Section 2.2.2.2. 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 Small Home & MF Weatherization 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 B.

Table 3-16 displays the ISRs for each of the Small Home & MF Weatherization measures for Idaho and Washington electric territory combined. The ISRs resulted in 8.8% precision at the 90% confidence interval for the program.

Table 3-32: Small Home & MF Weatherization Program Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Multifamily Thermostat with Baseboard Electric Heat	4	3	±32.7%	100%
E Multifamily WIFI Thermostat with Baseboard Electric Heat	9	3		100%

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

3.3.6.4 Impact Analysis

This section summarizes the verified savings results for the Small Home & MF Weatherization Program. The Evaluators calculated verified savings for the electric measures using the RTF workbook in place at the time the savings goal for the program was finalized.

3.3.6.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. Final verified savings were estimated using the RTF UES values associated with each measure. The Small Home & MF Weatherization Program displayed 98.56% realization with 49,193 kWh saved, as displayed in Table 3-30.

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. In addition, three smart thermostats qualified for connected thermostat savings, significantly higher than the savings the expected savings identified for those projects. These adjustments led to high realization rates for the overall program. The Evaluators recommend Avista verify home type prior to applying Avista TRM values in order to ensure proper categorization of measure savings.

3.3.7 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 3-29 summarizes the measures offered under this program.

Table 3-33: Appliances Program Measures

Measure	Description	Impact Analysis Methodology
E Energy Star Rated Clothes Dryer	ENERGY STAR-certified clothes dryer for residential homes	RTF UES
E Energy Star Rated Front Load Washer	ENERGY STAR-certified clothes washer for residential homes	RTF UES

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

Table 3-34: Appliances Program Verified Electric Savings

Measure	PY2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Energy Star Rated Clothes Dryer	68	4,846	4,624	4,846	100.00%
E Energy Star Rated Front Load Washer	84	11,989	12,012	8,574	71.51%
Total	**152**	**16,835**	**16,636**	**13,420**	**79.71%**

The Appliances Program displayed verified savings of 13,420 kWh with a realization rate of 79.71% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-35: Appliances Program Incentive Costs by Measure

Measure	Incentive Costs
E Energy Star Rated Clothes Dryer	$1,390.00
E Energy Star Rated Front Load Washer	$4,200.00
Total	**$5,590.00**

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

3.3.7.1 Database Review & Verification

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

3.3.7.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Appliances Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in in Section 2.2.2.1.

The rebate application form sufficiently collects all required RTF measure specification details. All rebate applications and tracking data contain AHRI documentation or model numbers to verify model specifications. The Evaluators were able to verify the models for RTF specifications for the majority of projects.

The Evaluators verified each model specification with values provided by ENERGY STAR qualified product lists. The Evaluators found that 1 of the 13 sampled clothes washer projects did not qualify due to minimum volume requirements specified by the RTF. All other sampled projects qualified for RTF savings.

The Evaluators found that the Avista TRM applied RTF savings from the "Front Load" measure description for clothes washers. However, the Evaluators found that 3 of the clothes washer equipment were "Top loading", which the RTF assigns significantly lower annual savings. This change in addition to the disqualification of 3 rebates led to a downward adjustment in realization rate for this program. The Evaluators recommend adding "top loading" clothes washers to the Avista TRM and applying savings for those measures appropriately.

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

3.3.7.3 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 equipment replace?
- Is your home heating's water heated with electricity or natural gas?
- Was the previous equipment functional?
  Is the newly installed equipment still properly functioning?

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

Table 3-16 displays the ISRs for each of the Appliances measures for Idaho and Washington electric territory combined. The ISRs resulted in 8.0% precision at the 90% confidence interval for the program.

Table 3-36: Appliances Program Verification Survey ISR Results

Measure	Number of Rebates	Number of Survey Completes	Precision at 90% Confidence	In-Service Rate
E Energy Star Rated Clothes Dryer	219	35	±8.0%	100%
E Energy Star Rated Front Load Washer	260	51		98%

The majority of survey respondents described equipment to be currently functioning, leading to a 100% ISR for the clothes dryer measure and a 98% ISR for the clothes washer measure. The Evaluators applied the ISRs listed in Table 3-16 to each rebate to quantify verified savings for each measure.

3.3.7.4 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 goal for the program was finalized.

3.3.7.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. Final verified savings were estimated using the RTF UES values associated with each measure. The Appliances Program displayed 79.71% realization with 13,420 kWh saved, as displayed in Table 3-30.

The program verified savings resulted in a realization rate of less than 100% due to three projects in which clothes washers were "top loading" instead of "front loading" and three instances in which the equipment was disqualified due to lack of RTC measure specification requirements in minimum volume. The Evaluators recommend adding "top loading" clothes washers to the Avista TRM and applying savings for those measures appropriately.

3.3.8 AeroBarrier Program

The AeroBarrier program provides incentives for customers 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 Program. The Evaluators did not conduct an impact evaluation for the measures in this program for PY2021. A full impact analysis will be completed for PY2022 projects. Table 3-37 summarizes the measures offered under this program.

Table 3-37: AeroBarrier Program Measures

Measure	Description	Impact Analysis Methodology
E AeroBarrier Rebate	Whole home insulation with AeroBarrier	No impact evaluation completed for PY2021

In PY2021, there were no AeroBarrier projects completed for homes in Idaho with electric heating.

3.4 Conclusions and Recommendations

The Evaluators provide the following conclusions and recommendations for Avista's Residential Portfolio program implementation.

3.4.1 Conclusions

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

- The Evaluators found the Residential portfolio to demonstrate a total of 1,294,535 kWh with a realization rate of 93.19%.
- The Fuel Efficiency Program, which contributes 45% of the expected savings, resulted in a realization rate of 84% whereas each of the other programs resulted in a combined 103% realization rate. The Fuel Efficiency Program contributed to a 10% decrease in the overall residential sector, which displayed a realization rate of 93%.
- The Residential Portfolio impact evaluation resulted in a realization rate of 93% due to slight differences between the Avista TRM categories and the appropriately assigned RTF UES categories for each measure as well as due to differences between applied values from billing analysis and the expected savings for those measures. 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, 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 higher 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 92-100%. These values were applied to impact analysis results to estimate verified savings through the programs.
- 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 UES across heating types, while the Evaluators assigned the appropriate RTF UES value for each heating zone. 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 HVAC Program, the Evaluators verified smart thermostat model specifications through the ENERGY STAR qualified products list to verify if the thermostat met all conditions required from the RTF measure specifications. The Evaluators verified that 6 of the 68 thermostats did not meet RTF measure specifications (6% of sampled thermostat rebates). The 6% of thermostats verified to not meet the conditions had lacked occupancy detection and/or geofencing capabilities, a specification required by the RTF.
- In 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.
- 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 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. Finally, two projects were verified to have natural gas furnace space heating for the home and therefore verified savings did not include full electric savings. This led to one project displaying 1.30% realization for electric savings, leading to a large downward adjustment in the population realization rates.

- 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”.
- In the Appliance Program, the Evaluators found that 3 of the sampled clothes washer projects did not qualify due to minimum volume requirements specified by the RTF. The Evaluators also found that the Avista TRM applied RTF savings from the “Front Load” measure description for clothes washers. However, the Evaluators found that 3 of the clothes washer equipment were “Top loading”, which the RTF assigns significantly lower annual savings. This change in addition to the disqualification of 3 rebates led to a downward adjustment in realization rate for this program.
- The Evaluators did not complete an impact analysis for the AeroBarrier Program. A full impact analysis will be completed for the program in PY2022.

3.4.2 Recommendations

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 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.
- 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 Avista TRM applied RTF savings from the "Front Load" measure description for clothes washers. However, the Evaluators found that 3 of the clothes washer equipment were "Top loading", which the RTF assigns significantly lower annual savings. This change in addition to the disqualification of 3 rebates led to a downward adjustment in realization rate for this program. The Evaluators recommend adding "top loading" clothes washers to the Avista TRM and applying savings for those measures appropriately.
- 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 (larger systems have a more stringent code baseline). 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 Evaluators recommend updating the Avista TRM value for this measure based on actual tank size, in addition to collecting information on the tank size of the measure in the rebate applications.

- The 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 this measure to reflect the RTF values associated with a fully natural gas-heated home at 43 kWh saved per year.

4. Low-Income Impact Evaluation Results

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies ("Agencies") and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

The Evaluators completed an impact evaluation on Avista's Low-Income portfolio to verify program-level and measure-level energy savings for PY2021. The following sections summarize findings for each electric impact evaluation in the Low-Income Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, and RTF values to evaluate verified savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data.

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

Program	Expected Savings (kWh)	Verified Savings (kWh)	Verified Realization Rate
Low-Income	161,323	153,503	95.15%
Total Low-Income	**161,323**	**153,503**	**95.15%**

In PY2021, Avista completed and provided incentives for low-income electric measures in Idaho and achieved total electric energy savings of 153,503 kWh. The Low-Income Program exceeded savings expectations based on reported savings. The Low-Income sector had achieved 95.15% of the savings expectations. Further details of the impact evaluation results by program are provided in the sections following.

4.1 Program-Level Impact Evaluation Results

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

4.1.1 Low-Income Program

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies ("Agencies") and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

Avista provides CAP agencies with the following approved measure list, which are reimbursed in full by Avista. Avista also provides a rebate list of additional energy saving measures the CAP agencies are able

to utilize which are partially reimbursed. The following table summarizes the measures offered under this program.

Table 4-2 summarizes the measures offered under this program.

Table 4-2: Low-Income Program Measures

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

Table 4-3 summarizes the verified electric energy savings for the Low-Income Program impact evaluation.

Table 4-3: Low-Income Program Verified Electric Savings

Measure	PY2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
E Air Infiltration	22	11,006	10,874	10,874	98.80%
E Duct Sealing	1	610	218	218	35.76%
E Ductless Heat Pump	5	15,080	15,081	15,081	100.01%
E Energy Star Doors	13	2,853	2,781	2,781	97.48%
E Energy Star Refrigerator	1	16	16	16	101.13%
E Energy Star Windows	20	8,955	8,494	8,494	94.85%
E INS - Attic	4	2,154	1,878	1,878	87.22%
E INS - Duct	1	346	124	124	35.70%
E INS - Floor	6	5,707	4,465	4,465	78.25%
E To G Furnace Conversion	3	12,981	12,982	12,982	100.00%
E To Heat Pump Conversion	29	100,056	96,399	96,399	96.35%

Measure	PY2021 Participation	Expected Savings (kWh)	Adjusted Savings (kWh)	Verified Savings (kWh)	Realization Rate
Health And Safety	21	0	0	0	N/A
LED Bulbs	32	1,559	191	191	12.25%
Total	**158**	**161,323**	**153,503**	**153,503**	**95.15%**

The Low-Income Program displayed verified savings of 153,503 kWh with a realization rate of 95.15% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

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

Measure	Incentive Costs
E Air Infiltration	$25,464.13
E Duct Sealing	$245.82
E Ductless Heat Pump	$43,589.98
E Energy Star Doors	$14,142.24
E Energy Star Refrigerator	$780.85
E Energy Star Windows	$59,333.23
E INS - Attic	$8,144.71
E INS - Duct	$491.64
E INS - Floor	$11,876.88
E To G Furnace Conversion	$16,768.37
E To Heat Pump Conversion	$305,993.52
Health And Safety	$56,604.90
LED Bulbs	$737.16
Total	**$544,173.43**

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

4.1.1.1 Database Review & Verification

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

4.1.1.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Low-Income Program. The Evaluators selected a subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

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.

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. In addition, the Evaluators found some instances in which electric savings were applied to gas measures.

The Evaluators found the LED bulbs unit-level savings were inaccurately referenced. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11% realization for LED bulb projects under the program. The Evaluators recommend updating database calculations to use Avista TRM values during expected savings calculations.

These few instances of downward adjustment led to a realization rate of 95% for the Low-Income Program.

4.1.1.3 Verification Surveys

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

4.1.1.4 Impact Analysis

This section summarizes the verified savings results for the Low-Income Program. The Evaluators calculated verified savings for Low-Income Program measures using the Avista TRM. However, a whole building billing analysis was completed to supplement the findings from the desk review.

4.1.1.5 Billing Analysis

The results of the billing analysis for the Low-Income Program are provided below.

The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolate each unique measure. In doing so, the Evaluators also isolate the measure effects using the customer's consumption billing data. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators were unable to estimate measure-level savings through billing analysis.

The Evaluators instead conducted a whole-home billing analysis for all the electric measures combined in order to estimate savings for the average household participating in the program, across all measures. The Evaluators successfully created a matched cohort for the electric measure households. Customers were matched on zip code (exact match) and their average pre-period seasonal usage, including summer, fall, winter, and spring for each control and treatment household. The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers.

Table 4-5 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Low-Income Program as it provided the highest adjusted R-squared among the regression models. Savings are statistically significant at the 90% level for all measures and the adjusted R-squared shows the model provided an sufficient fit for the data.

Table 4-5: Measure Savings, Low-Income Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (kWh)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
All Electric Measures	31	308	827	351.07	1302.81	0.7	Model 2: PPR

The Evaluators applied these regression savings estimates to the program, by the number of unique households in the program and found a realization rate of 64.84% for all electric measures in the program. Further details of the billing analysis can be found in Appendix A.

4.1.1.6 Verified Savings

Due to insufficient participation to conduct measure-level billing analyses, the Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program savings for those measures. Adjusted savings were estimated using the Avista TRM. The Low-Income Program in total displays a realization rate of 95.15% with 153,503 kWh verified electric energy savings in the Idaho service territory, as displayed in Table 4-3. The billing analysis supports this estimate, with the billing analysis estimating a 64.84% realization. Due to requirements for measure-level verified savings for cost-effectiveness testing, the Evaluators designated the adjusted savings as final.

The Evaluators note that the majority of deviations from 100% realization rate is due to the change in square footage or number of units verified in the project documentation or due to changes in the 20% savings cap.

4.2 Conclusions and Recommendations

The Evaluators provide the following conclusions and recommendations for Avista's Low-Income Portfolio program implementation.

4.2.1 Conclusions

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 153,503 kWh with a realization rate of 95.15%.
- 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 verified Avista TRM values for the Low-Income Program. 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 in the Low-Income in order to estimate savings for the average household participating in the program, across all measures. The Evaluators found a realization rate of 65% for all electric measures in the program, which is significantly lower than the realization rate of 95% from the desk review. However, due to requirements for measure-level verified savings for cost-effectiveness testing, the Evaluators designated the desk review savings as verified.

- 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.

4.2.2 Recommendations

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

- The Evaluators note that most deviations from 100% realization rate is due to differences between the limited measure category options Avista TRM values and the more detailed categories referencing heating zone, cooling zone, heating type, and bulb types present in the RTF. The Evaluators recommend that Avista reference the more detailed RTF measures when calculating expected savings for the programs.
- The Evaluators reviewed the project documentation provided by Avista and identified conflicting square footage or number of units between the aggregated project data from the expected savings calculated for each project. The Evaluators found very few instances in which the tracking data quantity differed from the quantity displayed in sampled documentation and invoices. The Evaluators recommend providing corrections to the application of Avista TRM values to tracking data quantity.
- The Evaluators found the LED bulbs unit-level savings were inaccurately referenced for the Low-Income Program. Avista TRM specifies 1 kWh per bulb, while expected savings uses 9 kWh savings per bulb, leading to 11% realization for LED bulb projects under the program. The Evaluators recommend updating database calculations to use Avista TRM values during expected savings calculations.

5. Appendix A: Billing Analysis Results

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

5.1 Fuel Efficiency Program

The results of the billing analysis for the Fuel Conversion program are provided in this section. These results are provided from the PY2020 impact evaluation for this program.

The methodology for the billing analysis is provided in Section 2.2.3.2. Table 5-1 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 Evaluators attempted to estimate measure-level Fuel Efficiency 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.

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 billing analysis included participants in both PY2019 and PY2020 in order to acquire the maximum number of customers possible. However, results from billing analyses are only extrapolated to PY2020 participants.

Table 5-1: Measures Considered for Billing Analysis, Fuel Efficiency Program

Measure	Measure Considered for Billing Analysis	Number of Customers w/ Isolated-Measure Installations	Sufficient Participation for Billing Analysis
E Electric To Natural Gas Furnace	✓	186	✓
E Electric To Natural Gas Furnace & Water Heat	✓	33	

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 5-2. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 5-2, 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 5-2: Cohort Restrictions, Fuel Efficiency Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
E Electric To Natural Gas Furnace	Starting Count	186	132,725
E Electric To Natural Gas Furnace	Install Date Range: January 1, 2019 to June 30, 2020	162	132,725
E Electric To Natural Gas Furnace	Control Group Usage Comparable to Treatment Group	158	132,654
E Electric To Natural Gas Furnace	Incomplete Post-Period Bills (<4 months)	132	89,361
E Electric To Natural Gas Furnace	Incomplete Pre-Period Bills (<10 months)	85	69,413
E Electric To Natural Gas Furnace	Restrict to Controls w/ Probable Electric Resistance[9]	85	10,412
E Electric To Natural Gas Furnace	Ending Count (Matched by PSM)	85	421

Figure 5-1 and Figure 5-2 display the density of each variable employed in propensity score matching for the E Electric to Natural Gas Furnace measure, before and after conducting matching.

The distributions prior to matching appear to be less similar, with control customers averaging lower usage. However, after matching, the pre-period usage distribution is more similar between the groups. The pre-period usage in the winter before and after matching averages a more spread distribution for the treatment group, however, the average usage between groups appears the same after matching (verified with *t*-test on pre-usage).

[9] The Evaluators restricted to controls with pre-period winter usage higher than the 85th percentile (i.e. top 15%) as these customers are more likely to have electric resistance heating.

Figure 5-1: Covariate Balance Before Matching, E Electric to Natural Gas Furnace

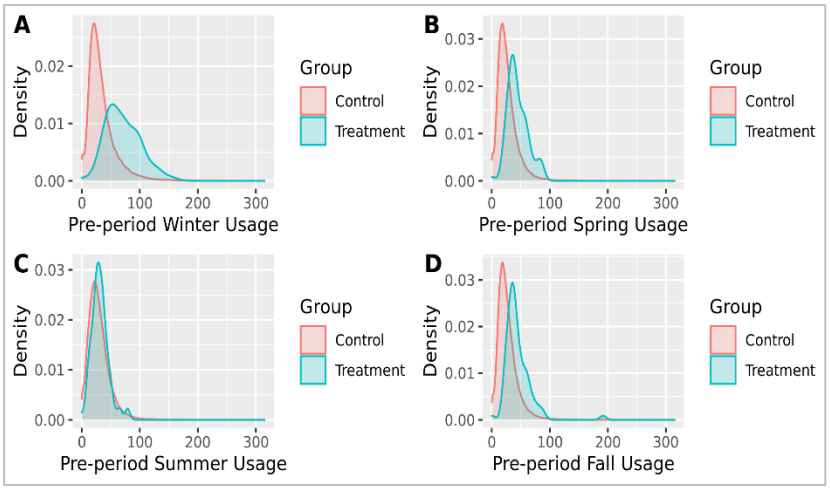
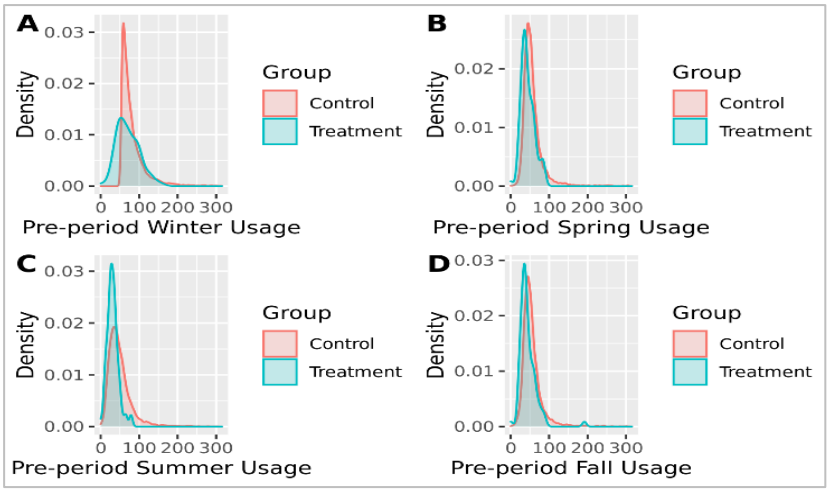


Figure 5-2: Covariate Balance After Matching, E Electric to Natural Gas Furnace



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 the 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 5-3 provides the results for the *t*-test on pre-period usage between the treatment and control groups after matching for the Fuel Efficiency 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 5-3: Pre-period Usage T-test for Electric to Gas Furnace, Fuel Conversion Program

Month	Average Daily Usage (kWh), Control	Average Daily Usage (kWh), Treatment	T Stat	Std Error	P-Value	Reject Null?
Jan	72.502	69.978	0.699	3.613	0.486	No
Feb	69.808	67.655	0.611	3.522	0.542	No
Mar	59.063	60.098	-0.344	3.006	0.731	No
Apr	43.331	43.494	-0.077	2.133	0.939	No
May	30.497	29.155	0.915	1.466	0.362	No
Jun	29.164	27.861	0.802	1.624	0.423	No
Jul	34.092	33.291	0.364	2.198	0.716	No
Aug	33.202	32.844	0.175	2.050	0.862	No
Sep	30.944	30.174	0.435	1.766	0.664	No
Oct	41.417	41.816	-0.156	2.567	0.877	No
Nov	59.142	60.794	-0.389	4.246	0.698	No
Dec	69.305	69.601	-0.072	4.086	0.942	No

Table 5-4 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 5-4: TMY Weather, Fuel Efficiency Program

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
E Electric to Natural Gas Furnace	720322	3	727834	6,915	376	6,333	517
E Electric to Natural Gas Furnace	726817	3	727834	6,915	376	6,333	517
E Electric to Natural Gas Furnace	727827	4	727827	5,428	731	6,333	517
E Electric to Natural Gas Furnace	727830	7	727830	5,511	907	6,333	517
E Electric to Natural Gas Furnace	727834	13	727834	6,915	376	6,333	517
E Electric to Natural Gas Furnace	727855	2	727855	7,360	439	6,333	517
E Electric to Natural Gas Furnace	727856	47	727856	6,246	519	6,333	517
E Electric to Natural Gas Furnace	727857	4	727857	6,467	299	6,333	517
E Electric to Natural Gas Furnace	727870	2	727856	6,246	519	6,333	517

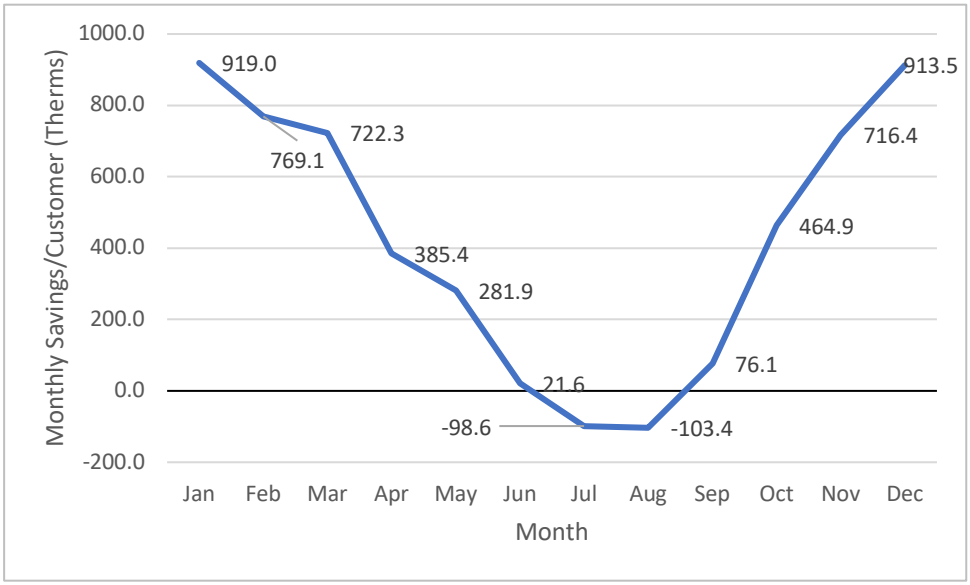
Table 5-5 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Fuel Efficiency Program as it provided the highest adjusted R-squared among the regression models. Savings are statistically significant at the 90% level for all measures and the adjusted R-squared shows the model provided an excellent fit for the data.

Table 5-5: Measure Savings, Fuel Efficiency Program

Measure	# of Treatment Customers	# of Control Customers	Annual Savings/Customer (kWh)	90% Lower CI	90% Upper CI	90% Relative Precision	Adjusted R-Squared	Model
E Electric to Natural Gas Furnace	85	421	5,068	4,384	5,7512	0.13	0.73	Model 2: PPR

Figure 5-3 provides monthly TMY savings per customer for the Fuel Conversion Program. As expected, the greatest savings occur during the winter months.

Figure 5-3: E Electric to Gas Furnace Monthly Savings, Fuel Conversion Program



The Evaluators found the E Electric To Natural Gas Furnace measure to display 5,068 kWh savings per year. This estimate was statistically significant at the 90% confidence interval with precision of 13%. The Evaluators estimate the Therms penalty for this measure with the following equation:

Equation 5-1: Furnace Conversion Heating Load

$$Heating\ Load = \frac{Annual\ kWh\ Savings * COP_{Electric} * \frac{3{,}412\ kWh}{BTU}}{\frac{100{,}000\ Therms}{BTU}}$$

Equation 5-2 Furnace Conversion Therms Penalty

$$Therms\ Penalty = \frac{Heating\ Load}{0.80\ Base\ AFUE}$$

Where,

- $Heating\ Load$ = The number of full load hours required for heating the home per year
- $Annual\ kWh\ Savings$ = measure saving result from linear regression (5,068 kWh/year)
- $COP_{Electric}$ = Coefficient of performance (equal to 1, assuming electric resistance baseline)

The Therms penalty for the E Electric to Natural Gas Furnace measure is 216.15 Therms. This penalty is applied in the Idaho Gas Impact Evaluation Report.

Due to the insufficient isolated measure participation for the E Electric To Natural Gas Furnace & Water Heater measure, the Evaluators assigned savings for this measure using the Avista TRM value of 9,789 kWh and -565 Therms savings per year.

Evaluators also conducted a treatment-only regression model for each of the measures described above. This analysis was completed at the request of Avista in order to help with program planning. Table 5-6 provides annual savings/customer for the Fuel Conversion 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). The treatment-only model represents estimated gross savings for this measure at 5,430 Therms saved per year.

Table 5-6: Measure Savings for All Regression Models, Fuel Efficiency Program

Measure	Model	# of Treatment Customers	# of Control Customers	Annual Savings/Customer (kWh)	90% Lower CI	90% Upper CI	90% Relative Precision	Adjusted R-Squared
Electric to Natural Gas Furnace	Diff-in-diff	85	421	5,267.69	3,572.27	6,963.10	0.32	0.26
Electric to Natural Gas Furnace	PPR	85	421	5,068.03	4,384.25	5,751.80	0.13	0.73
Electric to Natural Gas Furnace	Treatment Only (Gross)	85	N/A	5,430.42	4,625.74	6,235.10	0.15	0.70

5.2 Low-Income Program

The Evaluators conducted a whole-home billing analysis for all the electric measures combined in order to estimate savings for the average household participating in the program, across all measures. The Evaluators successfully created a matched cohort for the electric measure households. Customers were matched on 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 5-7. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 5-7, 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 5-7: Cohort Restrictions, Low-Income Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
Whole home electric	Starting Count	412	8,045
	Install Date Range: January 1, 2020 to June 30, 2021	47	8,045
	Control Group Usage Outlier (>2X max treatment usage)	47	8,045
	Incomplete Post-Period Bills (<4 months)	46	7,162
	Incomplete Pre-Period Bills (<10 months)	31	4749
	Ending Count (Matched by PSM)	31	315/308

Figure 5-4 and Figure 5-5 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 5-4: Covariate Balance Before Matching, Low-Income Electric Measures

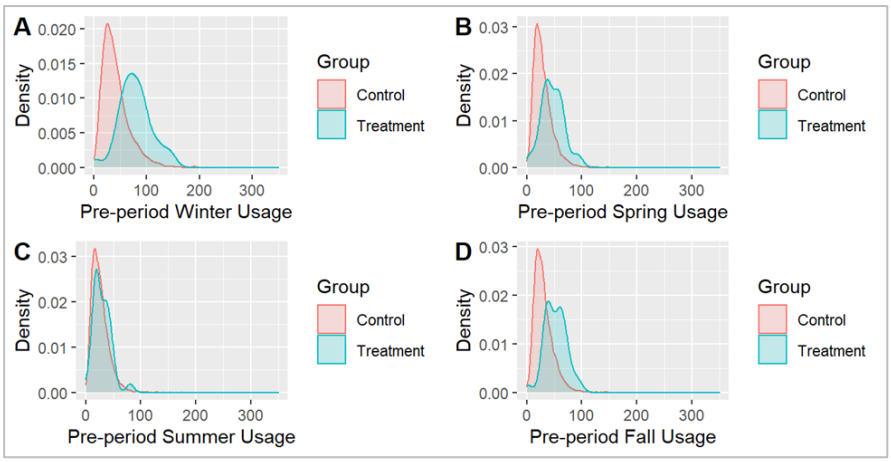
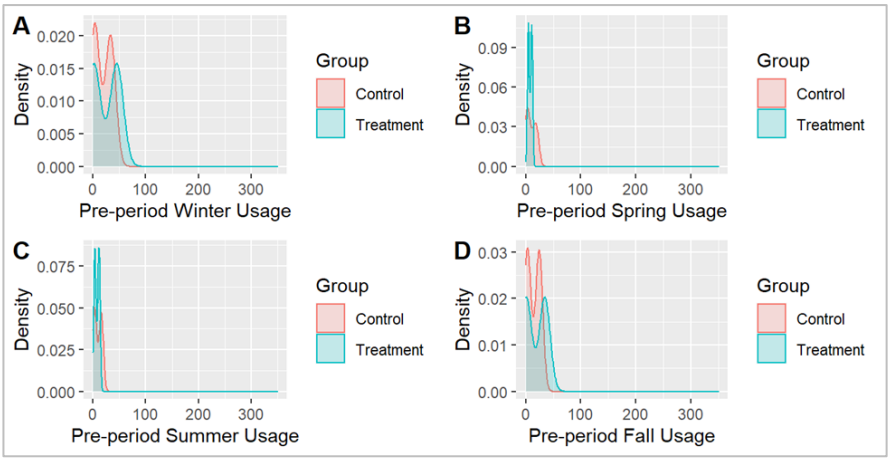


Figure 5-5: Covariate Balance After Matching, Low-Income Electric Measures



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 5-8 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 5-8: 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	28.926	29.498	-0.241	2.371	0.809	No
Feb	27.695	27.928	-0.105	2.203	0.916	No
Mar	24.674	25.378	-0.374	1.886	0.709	No
Apr	21.803	21.716	0.053	1.628	0.958	No
May	19.853	19.733	0.08	1.503	0.936	No
Jun	21.393	21.452	-0.033	1.782	0.973	No
Jul	25.695	26.272	-0.254	2.27	0.8	No
Aug	26.904	27.217	-0.135	2.319	0.893	No

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Sep	22.217	21.801	0.241	1.725	0.81	No
Oct	22.956	23.387	-0.253	1.701	0.8	No
Nov	27.493	28.509	-0.453	2.243	0.651	No
Dec	29.415	30.491	-0.431	2.496	0.667	No

Table 5-9 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 5-9: 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	8	727827	5,428	731	6,292	510
All Electric Measures	727830	22	727830	5,510	906	6,292	510
All Electric Measures	727834	23	727834	6,915	376	6,292	510
All Electric Measures	727850	9	727850	6,246	519	6,292	510
All Electric Measures	727855	5	727855	7,360	439	6,292	510
All Electric Measures	727856	104	727856	6,246	519	6,292	510
All Electric Measures	727857	32	727857	6,467	299	6,292	510

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 5-10 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 1,303 kWh per year.

Table 5-10: 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	31	308	387.59	0	1,223.79	0.13
All Electric Measures	PPR	31	308	826.98	351.07	1,302.81	0.70
All Electric Measures	Treatment Only (Gross)	31	308	520.36	0	1,459.29	0.14

6. 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 6-1.

Table 6-1: Type and Number of Measures Received by Respondents

Measure Category	Total	Percent
One Measure	171	56%
Two Measures	91	30%
Three Measures	34	11%
Four Measures	7	2%
Five Measures	2	1%
HVAC	108	35%
Water Heater	87	29%
Smart Thermostat	127	42%
Clothes Washer	99	32%
Clothes Dryer	66	22%

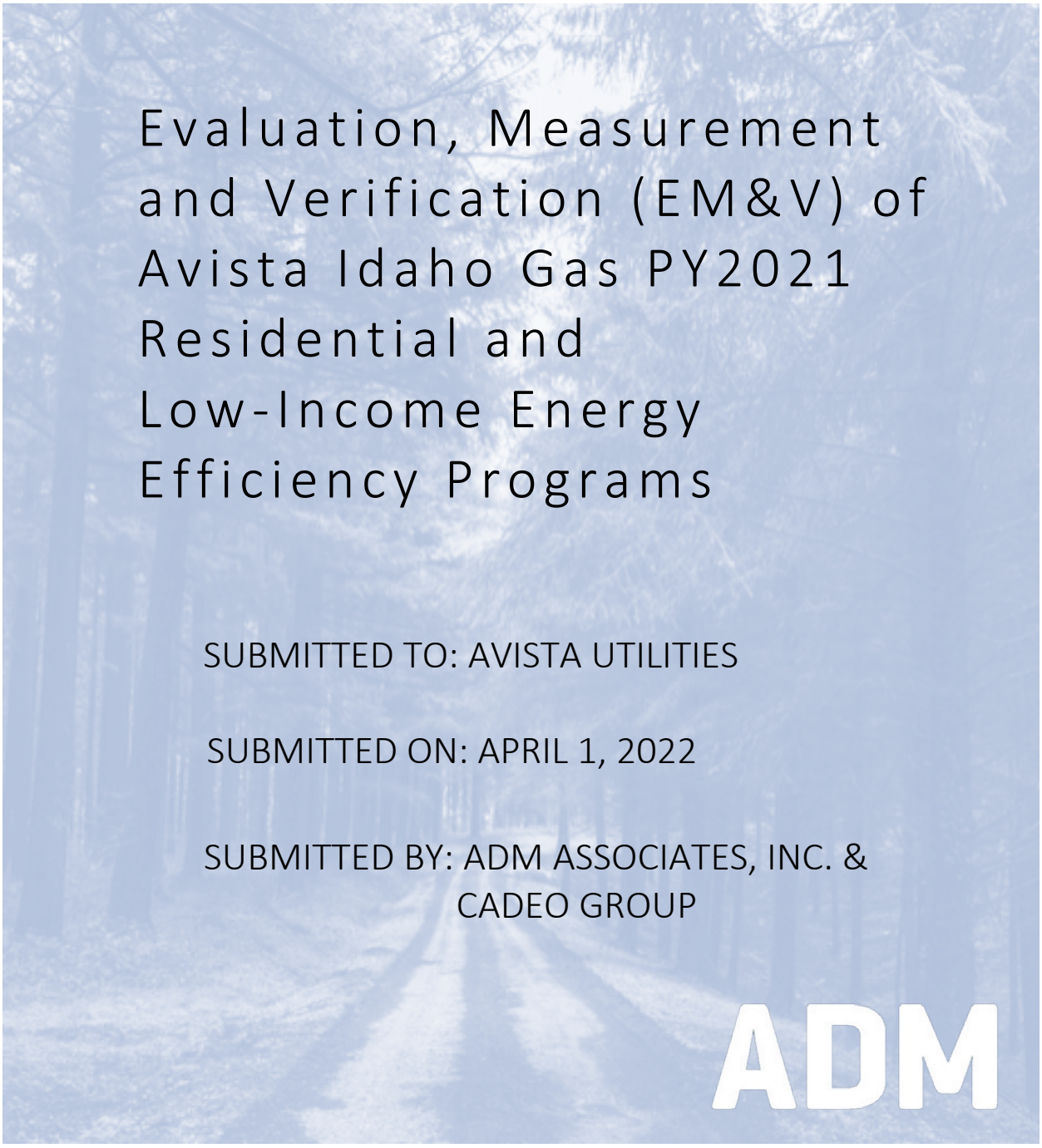
The Evaluators asked respondents to provide information regarding their home, as displayed in Table 6-2. Similar to the previous impact evaluation findings, the majority of respondents noted owning a single-family home between 1,000 and 3,000 square feet with central air conditioning.

Table 6-2: Survey Respondent Home Characteristics[10]

Question	Response	Percent
Do you rent or your home? (n=300)	Own	98%
	Rent	2%
Which of the following best describe your home? (n=301)	Single-family house detached from any other house	85%
	Single-family house attached to one or more other houses (e.g., duplex, condominium, townhouse)	4%
	Mobile or manufactured home	10%
	Apartment	1%
Does your home have central air conditioning, window air conditioning, or neither? (n=301)	Window air conditioning / a room AC unit	18%
	Central air conditioning	73%
	Neither	8%
	Don't Know	1%
About how many square feet is your home? (n=300)	Less than 1,000 square feet	8%
	1,000-1,999 square feet	48%
	2,000-2,999 square feet	25%
	3,000-3,999 square feet	11%
	4,000 or more square feet	6%
	Don't know	2%
When was your home built? (n=301)	Before 1960	27%
	1960 to 1969	6%
	1970 to 1979	15%
	1980 to 1989	9%
	1990 to 1999	13%
	2000 to 2009	11%
	2010 to 2018	18%
	Don't know	1%

[10] Four contractors or construction companies were not asked these questions.

APPENDIX D



Evaluation, Measurement and Verification (EM&V) of Avista Idaho Gas PY2021 Residential and Low-Income Energy Efficiency Programs

SUBMITTED TO: AVISTA UTILITIES

SUBMITTED ON: APRIL 1, 2022

SUBMITTED BY: ADM ASSOCIATES, INC. & CADEO GROUP

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1. Executive Summary

This report is a summary of the Residential and Low-Income Gas Evaluation, Measurement, and Verification (EM&V) effort of the 2021 program year (PY2021) portfolio of programs for Avista Corporation (Avista) in the Idaho service territory. The evaluation was administered by ADM Associates, Inc. and Cadeo Group, LLC (herein referred to as the "Evaluators").

1.1 Savings Results

The Evaluators conducted an impact evaluation for Avista's Residential and Low-Income programs for PY2021. The Residential portfolio savings amounted to 276,056.86 Therms with a 100.49% realization rate. The Low-Income portfolio savings amounted to 3,217.49 Therms with a 85.17% realization rate. The Evaluators summarize the Residential portfolio verified savings in Table 1-1 and the Low-Income portfolio verified savings in Table 1-2 below.

Table 1-1: Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Water Heat	41,972.20	41,972.20	100.00%
HVAC	212,961.56	212,647.17	99.85%
Shell	18,236.15	18,214.05	99.88%
Fuel Efficiency[1]	0.00	0.00	-
ENERGY STAR Homes[2]	669.90	669.90	100.00%
Small Home & MF Weatherization	547.42	2,300.90	420.32%
Appliances	314.05	252.64	80.44%
AeroBarrier	3,497.63	0.00	-
Total Res	**274,701.28**	**276,056.86**	**100.49%**

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

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Low-Income[3]	3,777.56	3,217.49	85.17%
Total Low-Income	**3,777.56**	**3,217.49**	**85.17%**

Table 1-3 summarizes the gas programs offered to residential and low-income customers in the Idaho Avista service territory in PY2021 as well as the Evaluators' evaluation tasks and impact methodology for each program.

[1] The Fuel Efficiency Program displayed a verified Therms penalty of 14,008.00 Therms due to fuel conversion measures. For the purposes of this report, this penalty is not included in the overall metrics of natural gas-saving energy efficiency measures.
[2] The ENERGY STAR Homes Program displayed a verified Therms savings of 67.00 Therms for the electric measures.
[3] The Low-Income Program displayed a verified Therms penalty of 720.00 Therms due to fuel conversion measures.

Table 1-3: 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			No evaluation completed for PY2021
Low-Income	Low-Income	✓		Avista TRM

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 and Low-Income 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 276,056.86 Therms with a realization rate of 100.49%. All programs except the Appliances Program (80.44% realization) met savings goals based on reported savings.
- The Residential Portfolio impact evaluation resulted in a realization rate of 100.44% due to differences between the applied Avista TRM values and the active RTF UES or applied measure-level quantities for each measure in addition to the difference in savings values between the results from billing analyses and the Avista TRM.
- The Evaluators conducted verification surveys via web survey to collect information from customers who participated in the Water Heat, HVAC, and Appliance Programs. A total of 305 unique customers were surveyed between August 2021 and February 2022. The Evaluators collected information including the functionality of the efficient equipment, the functionality of the replaced equipment, and information on how the COVID19 stay-at-home orders have affected the household energy usage. 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 100.00% with 41,972.20 Therms saved. The Evaluators found no instances in which a project savings deviated from the expected savings.

- 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 99.85% with 212,647.17 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 one project which was verified to be a duplicate. 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 nearly identical billing analysis results to the Avista TRM value (billing analysis indicated 81.5 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. The findings from the PY2021 billing analyses for these measures may have been impacted by the COVID19 pandemic. The Evaluators will explore additional billing analyses for these measures during program year 2022.
- The Shell Program displayed verified savings of 18,214.05 Therms with a realization rate of 99.88% 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 slight differences between R-values or 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 100.00% at 669.90 Therms saved in PY2021. The Evaluators no found expected savings to differ for any of the sampled projects. The Evaluators have no recommendations for improving the program.
- In the Small Home & MF Weatherization Program, the Evaluators found that many projects exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). In addition, the Evaluators note that the current program rebate applications do not provide an option to indicate “Multifamily” home type. Rather, the current rebate application includes an option for “Single family”, “Manufactured”, “New construction”, and “Other”.
- The realization rate for the natural gas savings in the Small Home & MF Weatherization Program are unexpectedly high at 420.32% due to differences between the unit-level savings values Avista had applied to the project quantity for 7 sampled projects and the unit-level savings presented in the Avista TRM.
- The gas measures rebated through the Appliance Program are not contained in the Avista TRM. Therefore, the Evaluators applied savings for these projects by converting Avista TRM electric savings to gas savings by dividing approved Avista TRM savings for the equipment by 29.3. This

application led to 85% realization for clothes dryers and 79% realization for clothes washers, leading to a program realization rate of 80.44%.

- The Evaluators summarize expected savings for the AeroBarrier program in this report as 3,497.63 Therms. The Evaluators did not verify savings for this program. A complete impact analysis will be completed in PY2022.

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 3,217.49 Therms with a realization rate of 85.17%. The Low-Income Portfolio impact evaluation resulted verified savings that exceeded expected savings.
- The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolate each unique measure. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators conducted a whole-home billing analysis for all the natural gas measures combined in the Low-Income 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 85.17% from the desk review with Avista TRM values.
- The Evaluators note that the deviations from 100% realization rate is due verifying 20% annual household energy caps were properly applied. The Evaluators allowed full savings when the 20% annual cap was not reached by the sum of all project savings for the service address. For instances in which the 20% cap was met or exceeded, the Evaluators applied the appropriate cap to those projects, weighted by measure.

1.2.2 Recommendations

The following section details the Evaluator's recommendations resulting from the program evaluations for each the Residential Portfolio and Low-Income 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 found expected savings to differ significantly for 7 of the 13 sampled projects in the Small Home & MF Weatherization Program. The expected savings calculated for these projects did not align with the values indicated in the Avista TRM. The Evaluators recommend updating the CC&B database to correct for these issues.
- The gas measures rebated through the Appliances Program are not contained in the Avista TRM. Therefore, the Evaluators applied savings for these projects by converting Avista TRM electric savings to gas savings by dividing approved Avista TRM savings for the equipment by 29.3. This application led to 85% realization for clothes dryers and 79% realization for clothes washers. The Evaluators recommend Avista include savings estimates for these measures in the Avista TRM for future evaluations.

1.2.2.2 Low-Income Programs

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

- The Evaluators note that the majority of deviations from 100% realization rate in the Low-Income Program is due verifying 20% annual household energy caps were properly applied. The Evaluators recommend verifying each of these values are documented and applied.

2. General Methodology

The Evaluators performed an impact evaluation on each of the programs summarized in Table 1-3. The Evaluators used the following approaches to calculate energy impact defined by the International Performance Measurement and Verification Protocols (IPMVP)[4] and the Uniform Methods Project (UMP)[5]:

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

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

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

- Northwest Regional Technical Forum (RTF)[6]
- National Renewable Energy Laboratory (NREL), United States Department of Energy (DOE) The Uniform Methods Project (UMP): Methods for Determining Energy Efficiency Savings for Specific Measures, April 2013[7]
- International Performance Measurement and Verification Protocol (IPMVP) maintained by the Efficiency Valuation Organization (EVO) with sponsorship by the U.S. Department of Energy (DOE)[8]

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

2.1 Glossary of Terminology

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

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

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

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

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

2.2 Summary of Approach

This section presents our general cross-cutting approach to accomplishing the impact evaluation of Avista's Residential and Low-Income programs listed in Table 1-3. The Evaluators start by presenting our general evaluation approach. This chapter is organized by general task due to several overlap across programs. Section 3.3 describes the Evaluators' program-specific residential impact evaluation methods and results in further detail and Section 4.1 describes the Evaluator's program-specific low-income impact evaluation methods and results.

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.

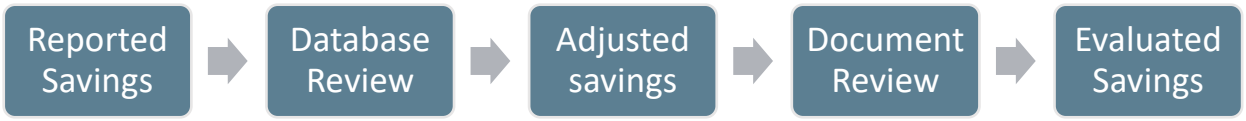
The Evaluators employed the following approach to complete impact evaluation activities for the programs. The Evaluators define two major approaches to determining net savings for Avista's programs:

- 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.

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

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

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



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

The Evaluators analyzed billing data for all natural gas measure participants in the HVAC and Low-Income programs. The Evaluators applied billing analysis results to determine evaluated savings only for measures where savings could be isolated (that is, where a sufficient number of participants could be identified who installed only that measure). Program-level realization rates for the HVAC, Water Heat, and Fuel Efficiency programs incorporate billing analysis results for some measures.

2.2.1 Database Review

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

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

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

2.2.2 Verification Methodology

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

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

Equation 2-1 Sample Size for Infinite Sample Size

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

Equation 2-2 Sample Size for Finite Population Size

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

Where,

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

For a sample that provides 90/10 precision, *Z* = 1.645 (the critical value for 90% confidence) and *d* = 0.10 (or 10% precision). The remaining parameter is *CV*, or the expected coefficient of variation of measures for which the claimed savings may be accepted. A *CV* of .5 was assumed for residential programs due to the homogeneity of participation[9], which yields a sample size of 68 for an infinite population. Sample sizes were adjusted for smaller populations via the method detailed in Equation 2-2.

[9] Assumption based off California Evaluation Framework:

https://www.cpuc.ca.gov/uploadedFiles/CPUC_Public_Website/Content/Utilities_and_Industries/Energy/Energy_Programs/Demand_Side_Management/EE_and_Energy_Savings_Assist/CAEvaluationFramework.pdf

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

2.2.2.1 Document-Based Verification

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

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

This sample of documents was used to cross-verify tracking data inputs. In the case the Evaluators found any deviations between the tracking data and application values, the Evaluators reported and summarized those differences in the Database Review sections presented for each program in Section 3.3 and Section 4.1.

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

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

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

Sector	Program	Gas Population	Sample (With Finite Population Adjustment)*	Precision at 90% CI
Residential	Water Heat	1230	66	±9.9%
Residential	HVAC	9193	70	±9.8%
Residential	Shell	1715	72	±9.5%
Residential	ENERGY STAR® Homes	8	8	±0.0%
Residential	Small Home & MF Weatherization	66	36	±9.3%
Residential	Appliances	253	55	±9.8%
Residential	AeroBarrier	N/A	N/A	N/A
Low-Income	Low-Income	516	102	±7.3%

*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 and Idaho territories. The Evaluators ensured representation of state and fuel type in the sampled rebates for document verification.

2.2.2.2 Survey-Based Verification

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

The Evaluators summarize the final sample sizes shown in Table 2-2 for the Water Heat, HVAC, and Appliances Programs for the Idaho Gas Avista projects. The Evaluators developed a sampling plan that achieved a sampling precision of ±4.24% 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	1,230	66	±9.9%
Residential	HVAC	9,193	117	±7.6%
Residential	Appliances	253	65	±8.8%
Total		**10,676**	**248**	**±5.2%**

The Evaluators implemented a web-based survey to complete the verification surveys. The Evaluators supplemented with phone interviews 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 3.1.

2.2.3 Impact Evaluation Methodology

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

- Deemed Savings
- Billing Analysis (IPMVP Option C)

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

2.2.3.1 Deemed Savings

This section summarizes the deemed savings analysis method the Evaluators employed for the evaluation of a subset of measures for each program. The Evaluators completed the validation for specific measures across each program using the RTF unit energy savings (UES) values, where available.

The Evaluators ensured the proper measure unit savings were recorded and used in the calculation of Avista's ex-ante measure savings. The Evaluators requested and used the technical reference manual Avista employed during calculation of ex-ante measure savings (Avista TRM). The Evaluators documented any cases where recommend values differed from the specific unit energy savings workbooks used by Avista.

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

2.2.3.2 Billing Analysis

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

For the purposes of this analysis, a household is considered a treatment household if it has received a program incentive. Additionally, a household is considered a control household if the household has not received a program incentive. To isolate measure impacts, treatment households are eligible to be included in the billing analysis if they installed only one measure during the 2019 and 2021 program years. Isolation of individual measures are necessary to provide valid measure-level savings. Households that installed more than one measure may display interactive energy savings effects across multiple measures that are not feasibly identifiable. Therefore, instances where households installed isolated measures are used in the billing analyses. In addition, the pre-period identifies the period prior to measure installation while the post-period refers to the period following measure installation.

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

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

Cohort Creation

The PSM approach estimates a propensity score for treatment and control customers using a logistic regression model. A propensity score is a metric that summarizes several dimensions of household characteristics into a single metric that can be used to group similar households. The Evaluators created a post-hoc control group by compiling billing data from a subset of nonparticipants in the Avista territory to compare against treatment households using quasi-experimental methods. This allowed the Evaluators to select from a large group of similar households that have not installed an incented measure. With this information, the Evaluators created statistically valid matched control groups for each measure via seasonal pre-period usage. The Evaluators matched customers in the control group to

customers in the treatment group based on nearest seasonal pre-period usage (e.g., summer, spring, fall, and winter) and exact 3-digit zip code matching (the first three digits of the five-digit zip code). After matching, the Evaluators conducted a *t*-test for each month in the pre-period to help determine the success of PSM.

While it is not possible to guarantee the creation of a sufficiently matched control group, this method is preferred because it is likely to have more meaningful results than a treatment-only analysis. Some examples of outside variables that a control group can sufficiently control for are changes in economies and markets, large-scale social changes, or impacts from weather-related anomalies such as flooding or hurricanes. This is particularly relevant in 2021 due to COVID-19 related lockdowns and restrictions.

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

- Fixed effect Difference-in-Difference (D-n-D) regression model (recommended in UMP protocols)[10]
- Random effects post-program regression model (PPR) (recommended in UMP protocols)
- 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, 2018 and December 31, 2021)
5. Typical Meteorological Year (TMY3) data

Billing and weather data were obtained for program year 2021 and for one year prior to measure install dates (2020).

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

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

Data Preparation

The following steps were taken to prepare the billing data:

1. Gathered billing data for homes that participated in the program.

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

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, 2021 through June 30, 2021) 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

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

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 PY2021 and perhaps also PY2021 are affected by the stay-at-home orders that had taken effect starting March 2021 in Idaho. The stay-at-home orders most likely affect the post-period household usage. Because there is insufficient post-period data before the shelter-in-place orders, the Evaluators were unable to separate the effects on consumption due to the orders and the effects on consumption due to the measure

installation. Therefore, the results from this additional gross savings analysis are unable to reflect actual typical year savings. However, for planning purposes, these estimates may be useful.

2.2.4 Net-To-Gross

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

2.2.5 Non-Energy Benefits

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

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

3. Residential Impact Evaluation Results

The Evaluators completed an impact evaluation on Avista's Residential portfolio to verify program-level and measure-level energy savings for PY2021. The following sections summarize findings for each natural gas impact evaluation in the Residential Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, RTF, and billing analysis of participants and nonparticipants to evaluate savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data. Table 3-1 summarizes the Residential verified impact savings by program.

Table 3-1: Residential Verified Impact Savings by Program

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Water Heat	41,972.20	41,972.20	100.00%
HVAC	212,961.56	212,647.17	99.85%
Shell	18,236.15	18,214.05	99.88%
ENERGY STAR Homes	669.90	669.90	100.00%
Small Home & MF Weatherization	547.42	2,300.90	420.32%
Appliances	314.05	252.64	80.44%
AeroBarrier	3,497.63	0.00	-
Total Res	**274,701.28**	**276,056.86**	**100.49%**

In PY2021, Avista completed and provided incentives for residential natural gas measures in Idaho and reported total natural gas savings of 276,056.86 Therms. All programs except the Appliances Program met savings goals based on reported savings, leading to an overall achievement of 100.49% of the expected savings for the residential programs. Further details of the impact evaluation results by program are provided in the sections following.

3.1 Simple Verification Results

The Evaluators surveyed 305 unique customers that participated in Avista's residential energy efficiency program from September-October 2021 and in February 2022 using an email survey approach. The Evaluators also conducted targeted follow-up outreach to customers for certain measures.

The Evaluators surveyed customers that received rebates for HVAC, Water Heater, and Appliance Programs.

Table 3-2: Summary of Survey Response Rate

Population	Respondents
Initial email contact list	1,376
Invalid or bounced	53
Invalid or bounced email (%)	*4%*
Invitations sent (unique valid)	1,323
Completions	302
Response rate (%)	23%

3.1.1 In-Service Rates

The Evaluators calculated in-service rates of installed measures from simple verification surveys deployed to program participants for the Water Heat and HVAC Programs. The Fuel Efficiency program was surveyed for the electric measures; the sample is provided in the Idaho Electric Impact Evaluation report and does not contribute to the precision for the Idaho Gas impacts. The Evaluators asked participants if the rebated equipment is currently installed and working, in addition to questions about the new equipment fuel type. The Evaluators achieved ±5.2% precision across the programs surveyed for the natural gas measures in Avista's service territory, summarized in Table 3-3.

Table 3-3: Simple Verification Precision by Program

Sector	Program	Population	Respondents	Precision at 90% CI
Residential	Water Heat	1,230	66	±9.9%
Residential	HVAC	9,193	117	±7.6%
Residential	Appliances	253	65	±8.8%
Total		**10,676**	**248**	**±5.2%**

The measure-level ISRs determined from the verification survey for each program in which simple verification was conducted is presented in the tables below.

Table 3-4: Water Heat Program ISRs by Measure

Measure	Respondents	ISR
G 50 Gallon Natural Gas Water Heater	12	100.00%
G Tankless Water Heater	54	100.00%

Table 3-5: HVAC Program ISRs by Measure

Measure	Respondents	ISR
G Natural Gas Boiler	4	100.00%
G Natural Gas Furnace	56	98.21%
G Smart Thermostat DIY with Natural Gas Heat	14	100.00%
G Smart Thermostat Paid Install with Natural Gas Heat	43	100.00%

Table 3-6: Appliances Program ISRs by Measure

Measure	Respondents	ISR
G Energy Star Rated Clothes Dryer	27	100.00%
G Energy Star Rated Front Load Washer	38	97.37%

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

3.2 Impacts of COVID-19 Pandemic

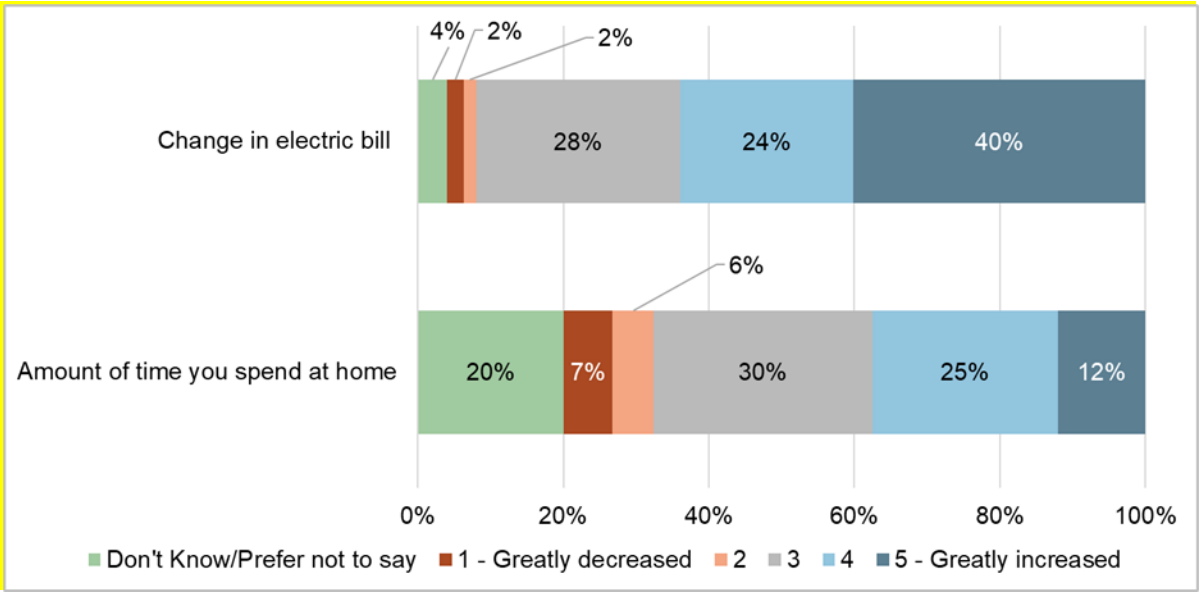
On average, about three people lived at the residence that had the rebated equipment installed and 65% of respondents said that two or fewer lived at the residence that had the rebated equipment installed.

Two-thirds of respondents observed that the pandemic had not changed the number of people in their household that worked or went to school remotely.[11] Eighteen percent of respondents said that more members of their household were attending school remotely or working from home since the COVID-19 pandemic began. Sixteen percent of respondents indicated that more members of their household had gone to work or school remotely before the COVID-19 pandemic.

Sixty-four percent of respondents said that the amount of time they spend at home has increased since the COVID-19 pandemic began. Thirty-seven percent of respondents indicated that their utility bill had increased. Figure 3-1 displays the change in amount of time spent at home and electricity bills since the COVID-19 pandemic began.

[11] n=257

Figure 3-1: Change in amount of time spent at home and electricity bill since COVID-19 pandemic began



3.3 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.

3.3.1 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 3-7 summarizes the measures offered under this program.

Table 3-7: 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 3-8: Water Heat Program Verified Natural Gas Savings

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G 50 Gallon Natural Gas Water Heater	28	632.20	610.40	632.20	100.00%
G Tankless Water Heater	534	41,340.00	41,652.00	41,340.00	100.00%
Total	**562**	**41,972.20**	**42,262.40**	**41,972.20**	**100.00%**

The Water Heat Program displayed verified savings of 41,972.20 Therms with a realization rate of 100.00% against the expected savings for the program. The following table summarizes the incentive costs from the program.

Table 3-9: Water Heat Program Costs

Measure	Incentive Costs
G 50 Gallon Natural Gas Water Heater	$2,900.00
G Tankless Water Heater	$213,200.00
Total	**$216,100.00**

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

3.3.1.1 Database Review & Verification

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

3.3.1.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Water Heat Program. The Evaluators selected a subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

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

In addition, the Evaluators note that the CC&B web rebate data reflected consistent values between the mail-in rebate applications, invoices, and AHRI certification documents submitted with the rebate application. The Evaluators found no deviations in any project rebated through the program.

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

3.3.1.3 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?

In addition, the Evaluators asked participants how the COVID19 pandemic stay-at-home orders have affected their household's energy consumption. The responses to this verification survey were used to calculate ISRs for the measures offered in the Water Heat Program.

Table 3-10 displays the ISRs for each of the Water Heat measures for Idaho and Washington territory combined.

Table 3-10: 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	177	12	±9.9%*	100%
G Tankless Water Heater	1,053	54		100%

*This count includes rebates from Washington and Idaho

All survey respondents for each water heater measure described equipment to be currently functioning, leading to a 100% ISR. The Evaluators applied these ISRs to each rebate to quantify verified savings for each measure.

3.3.1.4 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.

3.3.1.5 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 3-11 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 3-11: 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	✓	107	✓
G Tankless Gas Water Heater	✓	399	✓

*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 3-12.

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 3-12 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 each the G 50 Gallon Natural Gas Water Heater and the G Tankless Water Heater are not statistically significant at the 90% level.

Table 3-12: 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 50 Gallon Natural Gas Water Heater	65	325	37.79*	-16.23	91.81	0.89	Model 2: PPR
G Tankless Water Heater	203	1,013	-3.65*	-25.62	18.32	0.82	Model 2: PPR

*Not statistically significant

Because the results from these two billing analyses are inconclusive, the Evaluators elected to utilize Avista TRM values to estimate verified savings for these measures. The findings from the PY2021 billing analyses for these measures may have been impacted by the COVID19 pandemic. Further details of the billing analysis for the variable speed motor measure can be found Appendix A.

3.3.1.6 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 41,972.20 Therms with a realization rate of 100.00%, as displayed in Table 3-8.

The realization rate for the natural gas savings in the Water Heat Program did not deviate from 100% for the either of the measures. The Evaluators have no recommendations for this program.

3.3.2 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
G Natural Gas Boiler	Natural gas boiler	Avista TRM
G Natural Gas Furnace	Natural gas forced air furnace	IPMVP Option A with billing data
G Natural Gas Wall Heater	Natural gas wall heater	Avista TRM
G Smart Thermostat DIY with Natural Gas Heat	Professionally installed connected thermostats in natural gas-heated home	Avista TRM
G Smart Thermostat Paid Install with Natural Gas Heat	Variable speed motor in natural gas-heated home	Avista TRM

The following table summarizes the verified natural gas savings for the HVAC Program impact evaluation.

Table 3-14: HVAC Program Verified Natural Gas Savings

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Natural Gas Boiler	32	3,596.80	3,596.80	3,596.80	100.00%
G Natural Gas Furnace	2,009	163,891.62	141,718.88	163,570.50	99.80%
G Smart Thermostat DIY with Natural Gas Heat	309	8,374.68	8,350.42	8,375.92	100.01%
G Smart Thermostat Paid Install with Natural Gas Heat	1,367	37,098.46	36,941.81	37,103.95	100.01%
Total	**3,717**	**212,961.56**	**190,607.90**	**212,647.17**	**99.85%**

The HVAC Program displayed verified savings of 219,647.17 Therms with a realization rate of 99.85% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-15: HVAC Program Costs

Measure	Incentive Costs
G Natural Gas Boiler	$14,400.00
G Natural Gas Furnace	$904,950.00
G Smart Thermostat DIY with Natural Gas Heat	$37,116.95
G Smart Thermostat Paid Install with Natural Gas Heat	$205,895.22
Total	**$1,162,362.17**

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

3.3.2.1 Database Review & Verification

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

3.3.2.2 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.

3.3.2.3 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.

Table 3-16 displays the ISRs for each of the HVAC measures for Idaho and Washington natural gas territory combined. The ISRs resulted in 7.6% 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
G Natural Gas Boiler	81	25	±7.6%*	100%
G Natural Gas Furnace	4,840	4		98%
G Smart Thermostat DIY with Natural Gas Heat	1,197	56		100%
G Smart Thermostat Paid Install with Natural Gas Heat	3,075	14		100%
G Natural Gas Boiler	81	25		100%

*This count includes rebates from Washington and Idaho

Survey respondents described equipment to be currently functioning, leading to a 100% ISR for all measures except the G Natural Gas Furnace measure. The Evaluators applied the ISRs listed in Table 3-16 to each rebate to quantify verified savings for each measure.

3.3.2.4 Impact Analysis

This section summarizes the verified savings results for the HVAC Program. The Evaluators conducted a billing analysis for measures where participation allowed, however, the results were inconclusive. The Evaluators calculated verified savings for the remaining measures using active values from the Avista TRM workbook. These values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.3.2.5 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 3-17 displays customer counts for customers considered for billing analysis (i.e. customer with single-measure installations) and identifies measures that met the requirements for a billing analysis. The customers considered for billing analysis include customers in both Washington and Idaho service territories in order to gather the maximum number of customers possible for precise savings estimates.

Table 3-17: 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 Natural Gas Boiler	✓	35	
G Natural Gas Furnace	✓	2,327	✓
G Natural Gas Wall Heater	✓	0	
G Smart Thermostat DIY with Natural Gas Heat	✓	1,067	✓
G Smart Thermostat Paid Install with Natural Gas Heat	✓	1,077	✓

*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 3-18.

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 3-18 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 Smart Thermostat Paid Install and

Smart Thermostat DIY measures. However, savings were statistically significant at the 90% level for the Natural Gas Furnace measure.

Table 3-18: 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 Natural Gas Furnace	671	3,347	16.97	9.82	24.13	0.92	Model 2: PPR
G Smart Thermostat Paid Install with Natural Gas Heat	267	1,335	-7.59	-19.77	4.59	0.91	Model 2: PPR
G Smart Thermostat DIY with Natural Gas Heat	272	1,354	3.12	-7.45	13.68	0.93	Model 2: PPR

Because the results from the two billing analyses for smart thermostats are not statistically significant, the Evaluators elected to utilize Avista TRM values to estimate verified savings for these measures. Further details of the billing analysis can be found Appendix A.

However, the Evaluators explored a retrofit isolation analysis for the G Natural Gas Furnace, 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.

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, 2021 and 11 months of post installation data.

Table 3-19 presents the total number of customers and the number of sampled customers.

Table 3-19: Customer Counts for Natural Gas Furnaces, HVAC Program

Measure	Data Restriction	# of Treatment Customers
G Natural Gas Furnace	Starting Count	2,327
	11 Months of Post Data:2021-02-01 – 2021-12-31	160

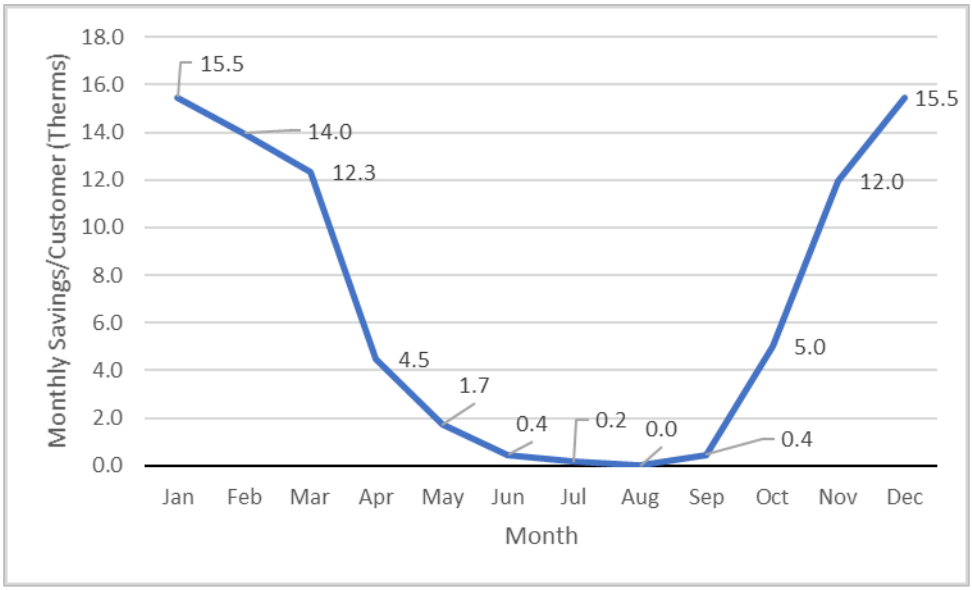
Table 3-20 provides annual savings for Natural Gas Furnaces. The Evaluators estimate the G Natural Gas Furnace measure to display an annual savings of 81.46 Therms. This verified value was applied to all associated rebates in the Idaho gas service territory.

Table 3-20: Measure Savings for Natural Gas Furnaces, HVAC Program

Measure	# of Treatment Customers	Annual Savings/Customer (Therms)	90% Lower CI	90% Upper CI	Relative Precision (90% CI)
G Natural Gas Furnace	160	81.46	78.99	83.94	3.0%

Figure 3-2 provides monthly weather-normalized savings for natural gas furnaces.

Figure 3-2: Natural Gas Furnaces Monthly Savings, HVAC Program



The savings for the natural gas furnace range between 15 and 23 Therms per month in the winter months, with summer months displaying no Therms savings.

3.3.2.6 Verified Savings

The HVAC Program in total displays a realization rate of 99.85% with 212,647.17 Therms verified natural gas savings in the Idaho service territory, as displayed in Table 3-14.

The realization rate for the natural gas savings in the HVAC Program deviate from 100% due to small differences in savings values between the applied expected savings value and the Avista TRM value for the measure. The furnace measure has nearly identical billing analysis results to the Avista TRM value (billing analysis indicated 81.5 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. The findings from the PY2021 billing analyses for these measures may have been impacted by the COVID19 pandemic. The Evaluators will explore additional billing analyses for these measures during program year 2022.

3.3.3 Shell Program

The Shell Program provides incentives to customers for improving the integrity of the home's envelope with upgrades to windows and storm windows. Rebates are issued after the measure has been installed for insulation and window measures. Participating homes must have natural gas or natural gas heating and itemized invoices including measure details such as insulation levels, window values, and square footage. In order to be eligible for incentive, the single-family households, including fourplex or less, must demonstrate an annual electricity usage of at least 8,000 kWh or an annual gas usage of at least 340 Therms. Multifamily homes have no usage requirement. This program includes free manufactured home duct sealing implemented by UCONS. Table 3-21 summarizes the measures offered under this program.

Table 3-21: Shell Program Measures

Measure	Description	Impact Analysis Methodology
G Attic Insulation With Natural Gas Heat	Attic insulation for homes heated with natural gas	Avista TRM
G Floor Insulation With Natural Gas Heat	Floor insulation for homes heated with natural gas	Avista TRM
G IGU Window Replc With Natural Gas Heat	IGU window replacement for homes heated with natural gas	Avista TRM
G Storm Windows with Natural Gas Heat	High-efficiency storm window replacement for homes heated with natural gas	Avista TRM
G Wall Insulation With Natural Gas Heat	Wall insulation for homes heated with natural gas	Avista TRM
G Window Replc With Natural Gas Heat	High-efficiency window replacement for homes heated with natural gas	Avista TRM

The following table summarizes the adjusted and verified natural gas savings for the Shell Program impact evaluation.

Table 3-22: Shell Program Verified Natural Gas Savings

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Attic Insulation With Natural Gas Heat	50	8,643.30	8,643.30	8,643.30	100.00%
G Floor Insulation With Natural Gas Heat	7	630.12	630.12	630.12	100.00%
G IGU Window Replc With Natural Gas Heat	1	17.04	4.97	16.96	99.54%
G Storm Windows with Natural Gas Heat	1	0.00	0.00	0.00	-
G Wall Insulation With Natural Gas Heat	7	389.69	389.69	389.69	100.00%

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Window Replc With Natural Gas Heat	304	8,556.00	8,517.03	8,533.98	99.74%
Total	**370**	**18,236.15**	**18,185.11**	**18,214.05**	**99.88%**

The Shell Program displayed verified savings of 18,214.05 Therms with a realization rate of 99.88% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-23: Shell Program Costs

Measure	Incentive Costs
G Attic Insulation With Natural Gas Heat	$43,185.50
G Floor Insulation With Natural Gas Heat	$7,876.50
G IGU Window Replc With Natural Gas Heat	$284.00
G Storm Windows with Natural Gas Heat	$282.00
G Wall Insulation With Natural Gas Heat	$4,084.21
G Window Replc With Natural Gas Heat	$142,892.00
Total	**$198,604.21**

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

3.3.3.1 Database Review & Verification

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

3.3.3.2 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 no instances in which square footage quantity in the rebate application did not match the values presented in the project data.

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 one duplicate rebate in which no expected savings was quantified and no verified savings was applied (the single G Storm Windows with Natural Gas Heat measure) in the project data. This did not impact the program realization rate, as no expected savings were quantified for the project. The Evaluators recommend Avista indicate which projects are corrections and do not require additional claimed savings in order to avoid inappropriate claimed savings in the future.

3.3.3.3 Verification Surveys

The Evaluators did not conduct verification surveys for the Shell Program. Weatherization measures historically have high verification rates.

3.3.3.4 Impact Analysis

This section summarizes the verified savings results for the Shell Program. The Evaluators calculated verified savings for the natural gas measures using the active Avista TRM values. The Evaluators calculated adjusted savings for each measure using the active Avista TRM values and verified tracking data. The Evaluators conducted a billing analysis for measures where participation allowed. However, the billing analysis results were not used due to unexpectedly low savings values. Therefore, the Avista TRM values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.3.3.5 Billing Analysis

The results of the billing analysis for the Shell program are provided in this section. The methodology for the billing analysis is provided in Section 2.2.3.2.

Table 3-24 displays customer counts for customers considered for billing analysis (i.e. customer with single-measure installations) and identifies measures that met the requirements for a billing analysis. The customers considered for billing analysis include customers in both Washington and Idaho service territories to gather the maximum number of customers possible for precise savings estimates.

Table 3-24: Measures Considered for Billing Analysis, Shell Program

Measure	Measure Considered for Billing Analysis	Number of Customers w/ Isolated-Measure Installations	Sufficient Participation for Billing Analysis
G Attic Insulation With Natural Gas Heat	✓	230	✓
G IGU Window Replc With Natural Gas Heat	✓	11	
G Floor Insulation With Natural Gas Heat	✓	9	
G Storm Windows with Natural Gas Heat	✓	4	
G Wall Insulation With Natural Gas Heat	✓	32	
G Window Replc With Natural Gas Heat	✓	1,075	✓

The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. The final number of customers in each the treatment and control group are listed in Table 3-25.

The Evaluators performed three tests to determine the success of PSM:

1. *t*-test on pre-period usage by month
2. Joint chi-square test to determine if any covariates are imbalanced
3. Standardized difference test for each covariate employed in matching

All tests confirmed that PSM performed well for each measure and the Evaluators conducted a linear regression using the matched participant and nonparticipant monthly billing data.

Table 3-25 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Shell Program as it provided the highest adjusted R-squared among the regression models. Savings are statistically significant at the 90% level for all measures and the adjusted R-squared shows the model provided an excellent fit for the data (adjusted R-squared > 0.90).

Table 3-25: Measure Savings, Shell Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
G Attic Insulation With Natural Gas Heat	49	245	26.35	6.09	46.62	0.93	Model 2: PPR
G Window Replc With Natural Gas Heat	425	2,107	20.27	10.98	29.56	0.92	Model 2: PPR

The Evaluators found the G Attic Insulation With Natural Gas Heat measure to display a statistically significant verified savings value of 26.35 Therms per year. In addition, the Evaluators found statistically significant savings of 20.27 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. Further details of the billing analysis for the variable speed motor measure can be found Appendix A.

3.3.3.6 Verified Savings

The Shell Program in total displays a realization rate of 99.88% with 18,214.05 Therms verified natural gas savings in the Idaho service territory, as displayed in Table 3-22. The realization rate for the natural gas savings in the Shell Program are close to 100% and only deviate due to slight differences in quantity or applied Avista TRM values.

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

3.3.4 Fuel Efficiency Program

The Residential Fuel Efficiency Program encourages customers to consider converting their resistive electric space and water heating equipment to natural gas. This program is offered to residential customers in the Idaho service territory. Customers must use Avista electricity for electric straight-resistance heating or water heating in order to qualify for the rebate, which is verified by evaluating their energy use. The home's electric baseboard or furnace heat consumption must indicate at least 8,000 kWh during the previous heating season. Customers receive incentives after installation and after submitting a completed rebate form. Table 3-26 summarizes the measures offered under this program.

Table 3-26: Fuel Efficiency Program Measures

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

The following table summarizes the verified electric energy savings for the Fuel Efficiency Program impact evaluation. The program does not contain any natural gas saving measures; however, the program includes a Therms penalty due to converting electric equipment to natural gas equipment. The verified Therms penalty is 14,008.00 Therms and represents a 105.64% realization rate against the expected Therms penalty amount of 13,260.00 Therms. The following table displays the Therms penalty by measure.

Table 3-27: Fuel Efficiency Program Verified Natural Gas Penalty

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
E Electric To Natural Gas Furnace	23	-7,820.00	-10,327.00	-4,968.00	63.53%
E Electric To Natural Gas Furnace & Water Heat	16	-5,440.00	-9,040.00	-9,040.00	166.18%
Total	**39**	**-13,260.00**	**-19,367.00**	**-14,008.00**	**105.64%**

The Therms penalties represented in the table above are not aggregated in the Residential portfolio impact evaluation and are summarized here for planning purposes. The costs associated with this program are claimed in the Idaho Electric Impact Evaluation Report. The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Fuel Efficiency Program in Idaho Electric Impact Evaluation Report for PY2021.

3.3.5 ENERGY STAR® Homes Program

The ENERGY STAR® Homes Program provides rebates for homes within Avista's service territory that attain an ENERGY STAR® certification. This program incentivizes for ENERGY STAR® Eco-rated homes. Table 3-28 summarizes the measures offered under this program.

Table 3-28: ENERGY STAR® Homes Program Measures

Measure	Description	Impact Analysis Methodology
G Energy Star Home - Manufactured, Natural Gas	ENERGY STAR-rated manufactured home with natural gas furnace	RTF UES
G Energy Star Home - Manufactured, Gas & Electric	ENERGY STAR-rated manufactured home with natural gas and electric	RTF UES

The following table summarizes the verified natural gas savings for the ENERGY STAR® Homes Program impact evaluation.

Table 3-29: ENERGY STAR® Homes Program Verified Natural Gas Savings

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Energy Star Home - Manufactured, Gas & Electric	3	267.96	0.00	267.96	100.00%
G Energy Star Home - Manufactured, Natural Gas	3	401.94	401.94	401.94	100.00%
Total	**6**	**669.90**	**401.94**	**669.90**	**100.00%**

The ENERGY STAR® Homes Program displayed verified savings of 669.90 Therms with a realization rate of 100.00% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-30: ENERGY STAR® Homes Program Costs

Measure	Incentive Costs
G Energy Star Home - Manufactured, Gas & Electric	$2,000.00
G Energy Star Home - Manufactured, Natural Gas	$1,800.00
Total	**$3,800.00**

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

3.3.5.1 Database Review & Verification

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

3.3.5.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the ENERGY STAR® Homes Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

The Evaluators found no deviations between the program tracking data and the information provided in the documentation for each project.

3.3.5.3 Verification Surveys

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

3.3.5.4 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.

3.3.5.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate adjusted program savings for each of the ENERGY STAR® Homes measures. In addition, the Evaluators reviewed and applied the current RTF UES values for each measure along with verified tracking data to estimate net program savings.

The ENERGY STAR® Homes Program in total displays a realization rate of 100.00% with 669.90 Therms verified natural gas energy savings in the Idaho service territory, as displayed in Table 3-29. The Evaluators found no deviations between the expected Therms savings quantified in the Avista tracking data and the verified Therms savings from the Avista TRM, leading to a 100% realization rate for the program. The Evaluators, however, recommend updating the applied expected savings for electric savings for these measures, as they do not currently align with the Avista TRM. These differences do not affect the Idaho Gas program savings.

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

3.3.6 Small Home & MF Weatherization Program

The Small Home & MF Weatherization Program is a residential prescriptive program that waives the energy usage requirement that is typically employed for residential prescriptive programs. This benefits small homes (less than 1,000 square feet in size) and multifamily dwellings (specifically customers in condominiums larger than five units in size). While this program is designed for all customers, it could also benefit members of Named Communities who reside in smaller homes.

This section summarizes the impact results of the evaluation results for the Small Home & MF Weatherization Program. Table 3-31 summarizes the measures offered under this program.

Table 3-31: 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 Floor Insulation With Natural Gas Heat	Floor insulation for multifamily homes with natural gas heat	Avista TRM
G Multifamily Window Replc With Natural Gas Heat	Window replacement for multifamily homes with natural gas heat	Avista TRM
G Natural Gas Wall Heater	Wall heater 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 3-32: Small Home & MF Weatherization Program Verified Natural Gas Savings

Measure	PY2021 Units	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Multifamily Attic Insulation With Natural Gas Heat	2	28.11	76.18	70.56	251.01%
G Multifamily Floor Insulation With Natural Gas Heat	1	0.04	42.60	42.60	-
G Multifamily Window Replc With Natural Gas Heat	16	437.61	1,203.24	2,117.20	483.81%
G Natural Gas Wall Heater	1	81.66	70.54	70.54	86.39%
Total	**20**	**547.42**	**1,392.56**	**2,300.90**	**420.32%**

The Small Home & MF Weatherization Program displayed verified savings of 2,300.90 Therms with a realization rate of 420.32% against the expected savings for the program. The following table summarizes the incentive costs associated with the program.

Table 3-33: Small Home & MF Weatherization Program Costs

Measure	Incentive Costs
G Multifamily Attic Insulation With Natural Gas Heat	$1,587.00
G Multifamily Floor Insulation With Natural Gas Heat	$532.50
G Multifamily Window Replc With Natural Gas Heat	$6,423.00
G Natural Gas Wall Heater	$450.00
Total	**$8,992.50**

The Evaluators summarize the program-specific and measure-specific impact analysis activities, results, conclusions, and recommendations for the Small Home & MF Weatherization Program in the section below.

3.3.6.1 Database Review & Verification

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

3.3.6.2 Database Review & Document Verification

Before conducting the impact analysis, the Evaluators conducted a database review for the Small Home & MF Weatherization Program. The Evaluators selected a random subset of rebate applications to cross-verify tracking data inputs, summarized in Section 2.2.2.1.

The rebate application form sufficiently collects all required RTF measure specification details. 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 7 of the 13 sampled projects. The expected savings calculated for these projects did not align with the values indicated in the Avista TRM. The quantities aligned for these projects, but the applied savings values to the quantity were unexpectedly low, leading to high realization rates when the Evaluators applied verified Avista TRM values to the quantities presented in the documents. The Evaluators recommend updating the CC&B database to correct for these issues.

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

3.3.6.3 Verification Surveys

The Evaluators did not conduct verification surveys for the gas measures in the Small Home & MF Weatherization Program. The insulation measures offered typically display high in-service rates.

3.3.6.4 Impact Analysis

This section summarizes the verified savings results for the Small Home & MF Weatherization Program. The Evaluators calculated verified savings for the natural gas measures using the most recent RTF workbook for the Small Home & MF Weatherization measures. These RTF UES values were applied to a random sample of participants, with verification of project documents such as rebate applications to verify installation, quantity, and efficiency of the equipment.

3.3.6.5 Verified Savings

The Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net adjusted program savings for those measures. Final verified savings were estimated using the RTF UES values associated with each measure. The Small Home & MF Weatherization Program displayed 420.32% realization with 2,300.90 Therms saved, as displayed in Table 3-32.

The realization rate for the natural gas savings in the Small Home & MF Weatherization Program are unexpectedly high due to differences between the unit-level savings values Avista had applied to the project quantity for 7 of the 13 sampled projects and the unit-level savings presented in the Avista TRM. The values presented in the Avista tracking data displayed deflated savings compared to the Avista TRM. The Evaluators quantified verified savings using the Avista TRM values, leading to a significantly high realization rate for the 7 projects and the program overall. The Evaluators recommend Avista investigate the reasoning for the large difference in applied UES values in the tracking data and the values present in the Avista TRM. This change will lead to more accurate expected savings outlook for the program.

The Evaluators did not conduct a verification survey for the gas measures in the Small Home & MF Weatherization Program and therefore did not adjust verified savings with an ISR.

3.3.7 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 3-34 summarizes the measures offered under this program.

Table 3-34: 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 clothes washer for residential homes	RTF UES

The following table summarizes the verified natural gas savings for the Appliance Program impact evaluation.

Table 3-35: Appliance Program Verified Natural Gas Savings

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Energy Star Rated Clothes Dryer	29	78.88	67.30	67.30	85.32%
G Energy Star Rated Front Load Washer	39	235.17	190.34	185.33	78.81%
Total	**68**	**314.05**	**257.65**	**252.64**	**80.44%**

The Appliance Program displayed verified savings of 252.64 Therms with a realization rate of 80.44% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 3-36: Appliance Program Costs

Measure	Incentive Costs
G Energy Star Rated Clothes Dryer	$580.00
G Energy Star Rated Front Load Washer	$1,950.00
Total	**$2,530.00**

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

3.3.7.1 Database Review & Verification

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

3.3.7.2 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 gas measures rebated through this program are not contained in the Avista TRM. Therefore, the Evaluators applied savings for these projects by converting Avista TRM electric savings to gas savings by dividing approved Avista TRM savings for the equipment by 29.3. This application led to 85% realization for clothes dryers and 79% realization for clothes washers. The Evaluators recommend Avista include savings estimates for these measures in the Avista TRM for future evaluations.

3.3.7.3 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 3-37 displays the ISRs for each of the Appliance measures for Idaho and Washington natural gas territory combined. The ISRs resulted in ±8.8% precision at the 90% confidence interval for the program.

Table 3-37: 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	94	27	±8.8%	100%
G Energy Star Rated Front Load Washer	159	38		97%

*This count includes rebates from Washington and Idaho

Survey respondents described equipment to be currently functioning, leading to a 97-100% ISR for all measures. Although less than 100%, the ISR for the G Energy Star Rated Front Load Washer still exceeded an ISR of 95%. The Evaluators applied the ISRs listed in Table 3-37 to each rebate to quantify verified savings for each measure.

3.3.7.4 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.

3.3.7.5 Billing Analysis

The Evaluators did not complete a billing analysis for the measures in the Appliance Program.

3.3.7.6 Verified Savings

The Appliance Program in total displays a realization rate of 80.44% with 252.64 Therms verified natural gas savings in the Washington service territory, as displayed in Table 3-35. The realization rate for the natural gas savings in the Appliance Program deviate from 100% due to lack of Avista TRM values for the measure. The Evaluators estimated savings by converting measure electric savings into Therms savings.

In addition, the Evaluators applied in-service rates for each of these measures, leading to a downward adjustment for the clothes washer measure.

3.3.8 AeroBarrier Program

The AeroBarrier program provides incentives for customers 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 Program. The Evaluators did not conduct an impact evaluation for the measures in this program for PY2021 due to low participation. A full impact analysis will be completed for PY2022 projects. Table 3-38 summarizes the measures offered under this program. Table 3-39 summarizes the measures offered under this program.

Table 3-38: AeroBarrier Program Measures

Measure	Description	Impact Analysis Methodology
G AeroBarrier Rebate	Whole home insulation with AeroBarrier	No impact evaluation completed for PY2021

The following table summarizes the estimated natural gas savings for the AeroBarrier Program impact evaluation.

Table 3-39: AeroBarrier Program Verified Natural Gas Savings

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G AeroBarrier Rebate	25	3,497.63	3,497.63	3,497.63	100.00%
Total	**25**	**3,497.63**	**3,497.63**	**3,497.63**	**100.00%**

The AeroBarrier Program displayed estimated savings of 3,497.63 Therms. The following table summarizes the incentive costs associated with the program.

Table 3-40: AeroBarrier Program Costs

Measure	Incentive Costs
G AeroBarrier Rebate	$30,747.97
Total	**$30,747.97**

The Evaluators did not conduct an impact analysis for this program for PY2021.

3.4 Conclusions and Recommendations

The Evaluators provide the following conclusions and recommendations for Avista's Residential Portfolio program implementation.

3.4.1 Conclusions

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

- The Evaluators found the Residential portfolio to demonstrate a total of 276,056.86 Therms with a realization rate of 100.49%. All programs except the Appliances Program (80.44% realization) met savings goals based on reported savings.
- The Residential Portfolio impact evaluation resulted in a realization rate of 100.44% due to differences between the applied Avista TRM values and the active RTF UES or applied measure-level quantities for each measure in addition to the difference in savings values between the results from billing analyses and the Avista TRM.
- The Evaluators conducted verification surveys via web survey to collect information from customers who participated in the Water Heat, HVAC, and Appliance Programs. A total of 305 unique customers were surveyed between August 2021 and February 2022. The Evaluators collected information including the functionality of the efficient equipment, the functionality of the replaced equipment, and information on how the COVID19 stay-at-home orders have affected the household energy usage. 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 100.00% with 41,972.20 Therms saved. The Evaluators found no instances in which a project savings deviated from the expected savings.
- 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 99.85% with 212,647.17 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 one project which was verified to be a

duplicate. 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 nearly identical billing analysis results to the Avista TRM value (billing analysis indicated 81.5 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. The findings from the PY2021 billing analyses for these measures may have been impacted by the COVID19 pandemic. The Evaluators will explore additional billing analyses for these measures during program year 2022.
- The Shell Program displayed verified savings of 18,214.05 Therms with a realization rate of 99.88% 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 slight differences between R-values or 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 100.00% at 669.90 Therms saved in PY2021. The Evaluators no found expected savings to differ for any of the sampled projects. The Evaluators have no recommendations for improving the program.
- In the Small Home & MF Weatherization Program, the Evaluators found that many projects exceed the "Small Home" definition from Avista - that a home is single family with less than 1,000 SQFT or is a multifamily home (5 or more units). In addition, the Evaluators note that the current program rebate applications do not provide an option to indicate “Multifamily” home type. Rather, the current rebate application includes an option for “Single family”, “Manufactured”, “New construction”, and “Other”.
- The realization rate for the natural gas savings in the Small Home & MF Weatherization Program are unexpectedly high at 420.32% due to differences between the unit-level savings values Avista had applied to the project quantity for 7 sampled projects and the unit-level savings presented in the Avista TRM.
- The gas measures rebated through the Appliance Program are not contained in the Avista TRM. Therefore, the Evaluators applied savings for these projects by converting Avista TRM electric savings to gas savings by dividing approved Avista TRM savings for the equipment by 29.3. This application led to 85% realization for clothes dryers and 79% realization for clothes washers, leading to a program realization rate of 80.44%.
- The Evaluators summarize expected savings for the AeroBarrier program in this report as 3,497.63 Therms. The Evaluators did not verify savings for this program. A complete impact analysis will be completed in PY2022.

3.4.2 Recommendations

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 found expected savings to differ significantly for 7 of the 13 sampled projects in the Small Home & MF Weatherization Program. The expected savings calculated for these projects did not align with the values indicated in the Avista TRM. The Evaluators recommend updating the CC&B database to correct for these issues.
- The gas measures rebated through the Appliances Program are not contained in the Avista TRM. Therefore, the Evaluators applied savings for these projects by converting Avista TRM electric savings to gas savings by dividing approved Avista TRM savings for the equipment by 29.3. This application led to 85% realization for clothes dryers and 79% realization for clothes washers. The Evaluators recommend Avista include savings estimates for these measures in the Avista TRM for future evaluations.

4. Low-Income Impact Evaluation Results

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies (“Agencies”) and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

The Evaluators completed an impact evaluation on Avista’s Low-Income portfolio to verify program-level and measure-level energy savings for PY2021. The following sections summarize findings for each natural gas impact evaluation in the Low-Income Portfolio in the Idaho service territory. The Evaluators used data collected and reported in the tracking database, online application forms, Avista TRM, and RTF values to evaluate verified savings. This approach provided the strongest estimate of achieved savings practical for each program, given its delivery method, magnitude of savings, number of participants, and availability of data. Table 4-1 summarizes the Low-Income verified impact savings by program.

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

Program	Expected Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
Low-Income	3,777.56	3,217.49	85.17%
Total Low-Income	**3,777.56**	**3,217.49**	**85.17%**

In PY2021, Avista completed and provided incentives for low-income gas measures in Idaho and achieved total natural gas savings of 3,217.49 Therms. The Low-Income Program did not meet savings expectations based on reported savings with an achieved realization rate of 85.17%. Further details of the impact evaluation results by program are provided in the sections following.

4.1 Program-Level Impact Evaluation Results

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

4.1.1 Low-Income Program

The Low-Income Program delivers energy efficiency measures to low-income residential customers in its Idaho service territory with a partnership with five network Community Action Agencies ("Agencies") and one tribal weatherization organization. The Agencies qualify income to prioritize and treat households based on several characteristics. In-house or contract crews install approved program measures. In addition, the Agencies have access to other monetary resources which allow them to weatherize a home or install additional energy efficiency measures.

Avista provides CAP agencies with the following approved measure list, which are reimbursed in full by Avista. Avista also provides a rebate list of additional energy saving measures the CAP agencies are able to utilize which are partially reimbursed. The following table summarizes the measures offered under this program.

Table 4-2 summarizes the measures offered under this program.

Table 4-2: Low-Income Program Measures

Measure	Impact Analysis Methodology
Air Infiltration	Avista TRM
Air source heat pump	
Attic insulation	
Duct insulation	
Duct sealing	
Natural gas to air source heat pump	
Natural gas to ductless heat pump	
ENERGY STAR® door	

Measure	Impact Analysis Methodology
ENERGY STAR® refrigerator	
ENERGY STAR® window	
Floor insulation	
Heat pump water heater	
LED lighting	
Wall insulation	
High efficiency furnace	
High efficiency tankless natural gas water heater	
Natural gas boiler	

Table 4-3 summarizes the verified natural gas savings for the Low-Income Program impact evaluation.

Table 4-3: Low-Income Program Verified Natural Gas Savings

Measure	PY2021 Participation	Expected Savings (Therms)	Adjusted Savings (Therms)	Verified Savings (Therms)	Verified Realization Rate
G Air Infiltration	25	290.83	283.36	283.36	97.43%
G Duct Sealing	2	36.17	35.83	35.83	99.06%
G Energy Star Doors	13	199.22	199.46	199.46	100.12%
G Energy Star Windows	17	379.75	374.81	374.81	98.70%
G HE Furnace	25	1,530.76	1,531.14	1,531.14	100.02%
G HE WH 50G	10	66.40	66.11	66.11	99.56%
G INS - Attic	5	942.76	390.51	390.51	41.42%
G INS - Duct	2	49.50	49.28	49.28	99.56%
G INS - Floor	7	272.09	277.58	277.58	102.02%
G INS - Wall	1	10.08	9.41	9.41	93.35%
Health And Safety	26	0.00	0.00	0.00	N/A
Total	**133**	**3,777.56**	**3,217.49**	**3,217.49**	**85.17%**

The Low-Income Program displayed verified savings of 3,217.49 Therms with a realization rate of 85.17% against the expected savings for the program. The following table summarizes the incentive and non-incentive costs associated with the program.

Table 4-4: Low-Income Program Costs

Measure	Incentive Costs
G Air Infiltration	$2,285.32
G Duct Sealing	$399.30
G Energy Star Doors	$16,014.19
G Energy Star Windows	$52,267.80
G HE Furnace	$131,729.93
G HE WH 50G	$40,450.22
G INS - Attic	$6,626.48
G INS - Duct	$1,026.37

Measure	Incentive Costs
G INS - Floor	$5,198.04
G INS - Wall	$160.36
Health And Safety	$74,645.06
Total	**$330,803.07**

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 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. The Evaluators, updated two project quantities quantity based on project documentation.

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. In addition, the Evaluators found some instances in which electric savings were applied to gas measures.

4.1.1.3 Verification Surveys

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

4.1.1.4 Impact Analysis

This section summarizes the verified savings results for the Low-Income Program. The Evaluators calculated verified savings for Low-Income Program measures using the Avista TRM. However, a whole building billing analysis was completed to supplement the findings from the desk review.

4.1.1.5 Billing Analysis

The results of the billing analysis for the Low-Income Program are provided below.

The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolated each unique measure. In doing so, the Evaluators also isolate the

measure effects using the customer's consumption billing data. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators were unable to estimate measure-level savings through billing analysis.

The Evaluators instead conducted a whole-home billing analysis for all the natural gas measures combined in order to estimate savings for the average household participating in the program, across all measures. The Evaluators successfully created a matched cohort for the natural gas measure households. Customers were matched on zip code (exact match) and their average pre-period seasonal usage, including summer, fall, winter, and spring for each control and treatment household. The Evaluators were provided a considerable pool of control customers to draw upon. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers.

Table 4-5 provides annual savings per customer for each measure. Model 2 (PPR) was selected as the final model for the Low-Income Program as it provided the highest adjusted R-squared among the regression models. However, savings for this model are not statistically significant at the 90% level, indicated by the lower 90% confidence bound at 0 Therms saved per year.

Table 4-5: Measure Savings, Low-Income Program

Measure	Treatment Customers	Control Customers	Annual Savings per Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
All Gas Measures (Therms)*	67	335	1	0	16.31	0.9	Model 2: PPR

*Not statistically significant

Due to lack of statistical significance from the billing analysis results, The Evaluators did not apply these regression savings estimates to the program. Instead, the Evaluators estimated savings through the program by applying Avista TRM values to verified quantities. Further details of the billing analysis can be found in Appendix A.

4.1.1.6 Verified Savings

Due to lack of significance in the billing analyses, the Evaluators reviewed the Avista TRM values along with verified tracking data to estimate net program savings for those measures. Adjusted savings were estimated using the Avista TRM. The Low-Income Program in total displays a realization rate of 98.51% with 12,454.82 Therms verified natural gas savings in the Washington service territory, as displayed in Table 4-3.

The Evaluators note that the deviations from 100% realization rate is due verifying 20% annual household energy caps were properly applied. The Evaluators allowed full savings when the 20% annual cap was not reached by the sum of all project savings for the service address. For instances in which the 20% cap was met or exceeded, the Evaluators applied the appropriate cap to those projects, weighted by measure.

4.2 Conclusions and Recommendations

The Evaluators provide the following conclusions and recommendations for Avista's Low-Income Portfolio program implementation.

4.2.1 Conclusions

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

- The Evaluators found the Low-Income portfolio to demonstrate a total of 3,217.49 Therms with a realization rate of 85.17%. The Low-Income Portfolio impact evaluation resulted verified savings that exceeded expected savings.
- The Evaluators attempted to estimate measure-level Low-Income Program energy savings through billing analysis regression with a counterfactual group selected via propensity score matching. The Evaluators attempted to isolate each unique measure. However, participation for the Low-Income program resulted in a small number of customers with isolated measures and therefore the Evaluators conducted a whole-home billing analysis for all the natural gas measures combined in the Low-Income 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 85.17% from the desk review with Avista TRM values.
- The Evaluators note that the deviations from 100% realization rate is due verifying 20% annual household energy caps were properly applied. The Evaluators allowed full savings when the 20% annual cap was not reached by the sum of all project savings for the service address. For instances in which the 20% cap was met or exceeded, the Evaluators applied the appropriate cap to those projects, weighted by measure.

4.2.2 Recommendations

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

- The Evaluators note that the majority of deviations from 100% realization rate in the Low-Income Program is due verifying 20% annual household energy caps were properly applied. The Evaluators recommend verifying each of these values are documented and applied.

5. Appendix A: Billing Analysis Results

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

5.1 Water Heat Program

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 5-1 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 Evaluators attempted to estimate measure-level Water Heat 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.

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 billing analysis included participants in both PY2019 and PY2021 in order to acquire the maximum number of customers possible. However, results from billing analyses are only extrapolated to PY2021 participants.

Table 5-1: 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	✓	107	✓
G Tankless Gas Water Heater	✓	399	✓

The Evaluators were provided a considerable pool of control customers to draw upon for each measure, as shown in Table 5-2.

The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 5-2, 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 5-2: Cohort Restrictions, Water Heat Program

Measure	Data Restriction	Treatment Customers	Control Customers
G 50 Gallon Natural Gas Water Heater	Starting Count	107	70,444
	Install Date Range: 2021-01-01 to 2021-08-31	72	70,444
	Customers w/ Multiple Accounts for one Premise in Tracking Data	71	70,444
	Treatment Customers Found in Billing Data	68	70,444
	Control Group Usage Outlier (>2X Maximum Avg. Treatment Usage)	68	70,228
	Restrict to Pre- Post-Period	68	56,803
	Post-Period Date Range Restriction: 2021-09-01 through 2021-12-31	68	55,266
	Require Minimum Post Period: 3 Months	67	41,612

Measure	Data Restriction	Treatment Customers	Control Customers
	Incomplete Pre-Period Bills	65	31,782
	Ending Count (Matched by PSM)	65	325
G Tankless Water Heater	Starting Count	399	70,444
	Install Date Range: 2021-01-01 to 2021-06-30	253	70,444
	Customers w/ Multiple Accounts for one Premise in Tracking Data	251	70,444
	Treatment Customers Found in Billing Data	247	70,444
	Control Group Usage Outlier (>2X Maximum Avg. Treatment Usage)	247	70,393
	Restrict to Pre- Post-Period	247	56,930
	Post-Period Date Range Restriction: 2021-07-01 through 2021-12-31	247	55,986
	Require Minimum Post Period: 5 Months	235	39,856
	Incomplete Pre-Period Bills	204	31,827
	Ending Count (Matched by PSM)	203	1,013

Figure 5-1 through Figure 5-4 display the density of each variable employed in propensity score matching for the G Tankless Gas Water Heater and G 50 Gallon Natural Gas Water Heater, before and after conducting matching. The figures following display the density of each variable employed in propensity score matching for the other billing analysis measures, before and after matching.

The distributions prior to matching show only small differences between the treatment and controls groups. After matching, the pre-period usage distribution is very similar between the groups, indicating little differences exist on average between the groups prior to matching and validating the initial selection of control customers.

Figure 5-1: Covariate Balance Before Matching, 50 Gallon Water Heater

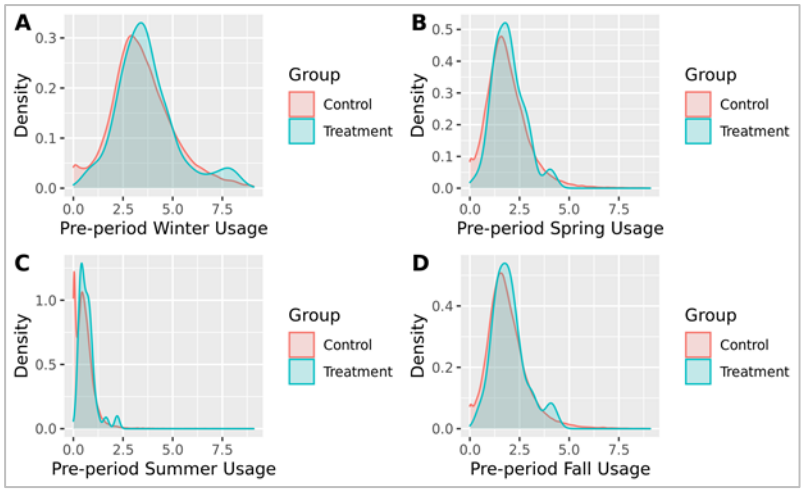


Figure 5-2: Covariate Balance After Matching, 50 Gallon Water Heater

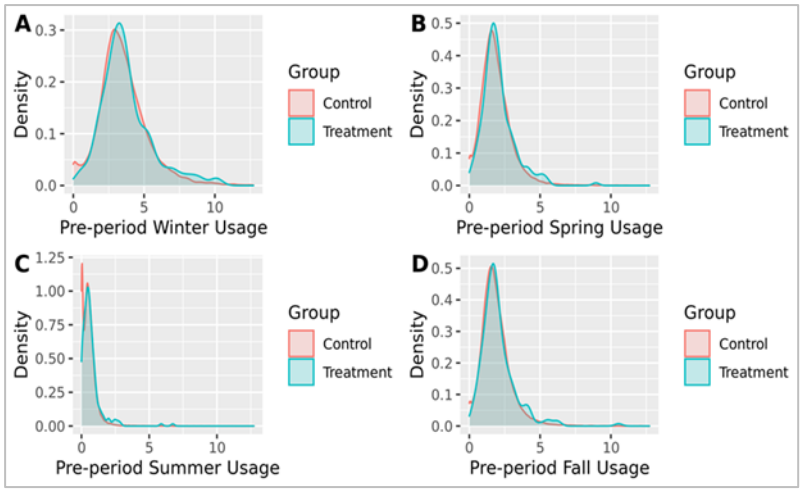


Figure 5-3: Covariate Balance Before Matching, G Tankless Gas Water Heater

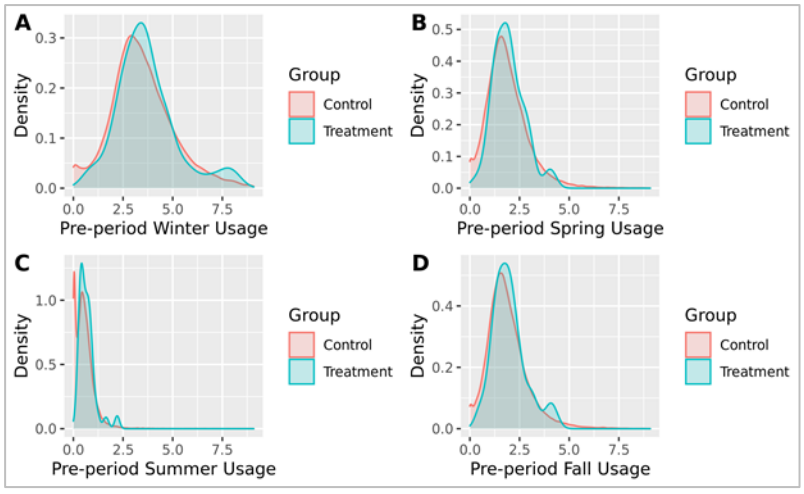
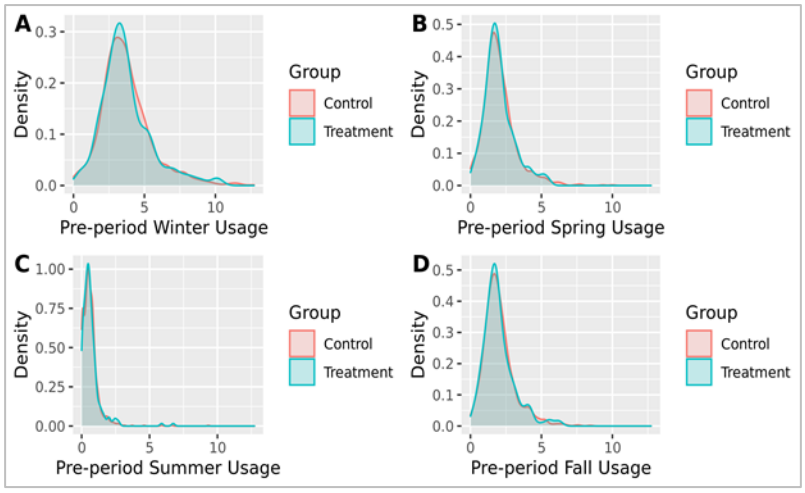


Figure 5-4: Covariate Balance After Matching, G Tankless Gas Water Heater



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 5-3 and Table 5-4 provide results for the *t*-test on pre-period usage between the treatment and control groups after matching for the Water Heat 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 5-3: Pre-period Usage T-test for 50 Gallon Water Heater, Water Heat Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	3.877	3.728	0.696	0.215	0.488	No
Feb	3.648	3.485	0.814	0.200	0.417	No
Mar	3.008	2.926	0.483	0.169	0.630	No
Apr	1.834	1.834	-0.003	0.117	0.997	No
May	1.070	1.088	-0.240	0.076	0.811	No
Jun	0.765	0.814	-0.782	0.064	0.436	No
Jul	0.530	0.635	-1.598	0.066	0.113	No
Aug	0.493	0.593	-1.683	0.059	0.095	No

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Sep	0.684	0.744	-1.002	0.060	0.319	No
Oct	1.953	1.910	0.363	0.119	0.717	No
Nov	3.416	3.284	0.659	0.199	0.512	No
Dec	3.830	3.719	0.498	0.223	0.620	No

Table 5-4: Pre-period Usage T-test for Tankless Gas Water Heater, Water Heat Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	3.880	3.806	0.492	0.150	0.623	No
Feb	3.667	3.577	0.660	0.137	0.510	No
Mar	3.147	3.067	0.672	0.118	0.502	No
Apr	1.961	1.899	0.762	0.082	0.447	No
May	1.141	1.138	0.045	0.061	0.964	No
Jun	0.812	0.864	-0.770	0.067	0.442	No
Jul	0.565	0.611	-0.863	0.053	0.389	No
Aug	0.528	0.564	-0.665	0.054	0.507	No
Sep	0.727	0.730	-0.055	0.053	0.956	No
Oct	1.968	1.956	0.147	0.085	0.883	No
Nov	3.348	3.310	0.294	0.129	0.769	No
Dec	3.771	3.787	-0.110	0.146	0.912	No

Table 5-5 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 5-5: TMY Weather, Water Heat Program

Measure	USAF Station ID	Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
G 50 Gallon Natural Gas Water Heater	727830	2	727830	5,511	907	6,334	500
G 50 Gallon Natural Gas Water Heater	727834	6	727834	6,915	376	6,334	500
G 50 Gallon Natural Gas Water Heater	727850	3	727850	6,707	379	6,334	500
G 50 Gallon Natural Gas Water Heater	727855	1	727855	7,360	439	6,334	500

Measure	USAF Station ID	Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
G 50 Gallon Natural Gas Water Heater	727856	50	727856	6,246	519	6,334	500
G 50 Gallon Natural Gas Water Heater	727857	3	727857	6,467	299	6,334	500
G Tankless Water Heater	720322	2	727834	6,915	376	6,560	457
G Tankless Water Heater	720923	2	727834	6,915	376	6,560	457
G Tankless Water Heater	726817	7	727834	6,915	376	6,560	457
G Tankless Water Heater	727830	7	727830	5,511	907	6,560	457
G Tankless Water Heater	727834	80	727834	6,915	376	6,560	457
G Tankless Water Heater	727850	8	727850	6,707	379	6,560	457
G Tankless Water Heater	727855	3	727855	7,360	439	6,560	457
G Tankless Water Heater	727856	82	727856	6,246	519	6,560	457
G Tankless Water Heater	727857	4	727857	6,467	299	6,560	457
G Tankless Water Heater	727870	8	727856	6,246	519	6,560	457

Table 5-6 provides annual savings/customer for the Water Heat program for each measure and regression model. However, savings are not statistically significant at the 90% level for any of the models explored for the Tankless Gas Water Heater and 50 Gallon Natural Gas Water Heater measures.

Table 5-6: Measure Savings for All Regression Models, Water Heat Program

Measure	Model	Treatment Customers	Control Customers	Annual Savings per Customer (Therms)	90% Lower CI	90% Upper CI	Adjusted R-Squared
G 50 Gallon Natural Gas Water Heater	Diff-in-diff	65	325	37.39*	-97.33	172.11	0.52
G 50 Gallon Natural Gas Water Heater	PPR	65	325	37.79*	-16.23	91.81	0.89
G 50 Gallon Natural Gas Water Heater	Treatment Only (Gross)	65	N/A	30.69*	-53.88	115.27	0.83
G Tankless Water Heater	Diff-in-diff	203	1,013	0.86*	-50.96	52.68	0.49
G Tankless Water Heater	PPR	203	1,013	-3.65*	-25.62	18.32	0.82
G Tankless Water Heater	Treatment Only (Gross)	203	N/A	20.47*	-10.17	51.10	0.81

*Not statistically significant

5.2 HVAC Program

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. The Evaluators attempted to estimate measure-level HVAC 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.

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 billing analysis included participants in both in both Washington and Idaho service territories in order to acquire the maximum number of customers possible.

Table 5-7 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 Evaluators attempted to estimate measure-level HVAC 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.

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 billing analysis included participants in both in both Washington and Idaho service territories in order to acquire the maximum number of customers possible.

Table 5-7: 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 Natural Gas Boiler	✓	35	
G Natural Gas Furnace	✓	2,327	✓
G Natural Gas Wall Heater	✓	0	
G Smart Thermostat DIY with Natural Gas Heat	✓	1,067	✓
G Smart Thermostat Paid Install with Natural Gas Heat	✓	1,077	✓

The Evaluators conducted a separate analysis for the G Natural Gas Furnace measure, displayed in Section 3.3.2.5 as it provided more reasonable and statistically significant results than the billing analysis. The following details the billing analysis for the remaining measures.

The Evaluators were provided a considerable pool of control customers to draw upon, as shown in Table 5-8. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 5-8, 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 5-8: Cohort Restrictions, HVAC Program

Measure	Data Restriction	Treatment Customers	Control Customers
G Natural Gas Furnace	Starting Count	2,327	70,444
	Install Date Range: 2021-01-01 to 2021-06-30	1,170	70,444
	Customers w/ Multiple Accounts for one Premise in Tracking Data	1,104	70,444
	Treatment Customers Found in Billing Data	1,089	70,444
	Control Group Usage Outlier (>2X Maximum Avg. Treatment Usage)	1,089	70,422
	Restrict to Pre- Post-Period	1,063	56,957
	Post-Period Date Range Restriction: 2021-07-01 through 2021-12-31	1,004	56,013
	Require Minimum Post Period: 5 Months	801	39,877
	Incomplete Pre-Period Bills	672	31,845
	Ending Count (Matched by PSM)	671	3,347
G Smart Thermostat Paid Install with Natural Gas Heat	Starting Count	1,077	70,444
	Install Date Range: 2021-01-01 to 2021-06-30	465	70,444
	Customers w/ Multiple Accounts for one Premise in Tracking Data	429	70,444
	Treatment Customers Found in Billing Data	426	70,444
	Control Group Usage Outlier (>2X Maximum Avg. Treatment Usage)	426	70,436
	Restrict to Pre- Post-Period	425	56,969
	Post-Period Date Range Restriction: 2021-07-01 through 2021-12-31	423	56,025
	Require Minimum Post Period: 5 Months	404	39,887
	Incomplete Pre-Period Bills	268	31,855
	Ending Count (Matched by PSM)	267	1,335
G Smart Thermostat DIY with Natural Gas Heat	Starting Count	1,067	70,444
	Install Date Range: 2021-01-01 to 2021-06-30	461	70,444
	Customers w/ Multiple Accounts for one Premise in Tracking Data	460	70,444
	Treatment Customers Found in Billing Data	430	70,444
	Control Group Usage Outlier (>2X Maximum Avg. Treatment Usage)	430	70,379
	Restrict to Pre- Post-Period	430	56,920
	Post-Period Date Range Restriction: 2021-07-01 through 2021-12-31	430	55,976
	Require Minimum Post Period: 5 Months	412	39,850
	Incomplete Pre-Period Bills	272	31,821
	Ending Count (Matched by PSM)	272	1,354

The figures below display the density of each variable employed in propensity score matching for each installed HVAC measure, before and after matching.

The distributions prior to matching show only small differences between the treatment and controls groups. After matching, the pre-period usage distribution is very similar between the groups, indicating little differences exist on average between the groups prior to matching and validating the initial selection of control customers.

Figure 5-5: Covariate Balance Before Matching, Natural Gas Furnace

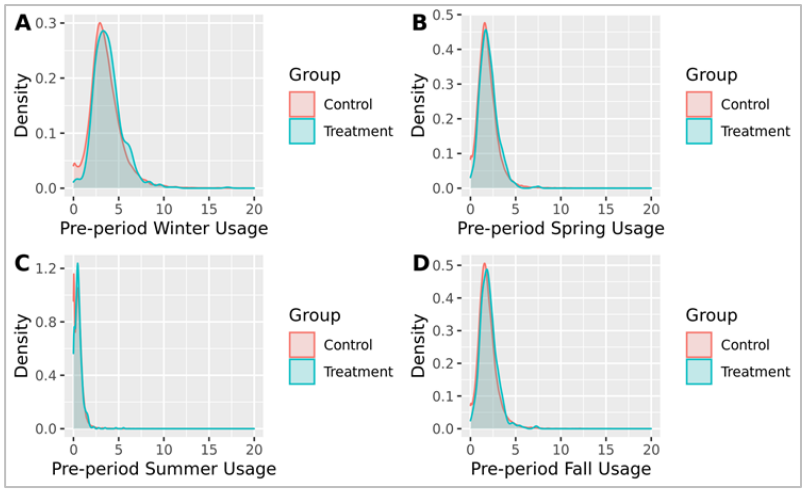


Figure 5-6: Covariate Balance After Matching, Natural Gas Furnace

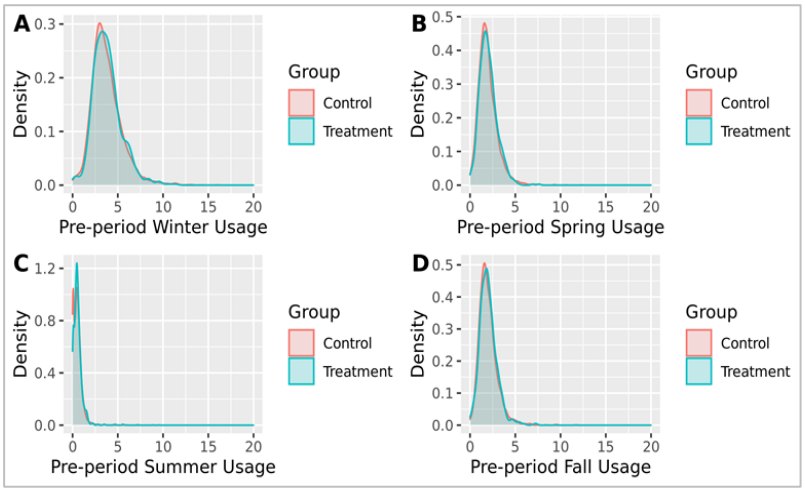


Figure 5-7: Covariate Balance Before Matching, Smart Thermostat Paid Install with Natural Gas Heat

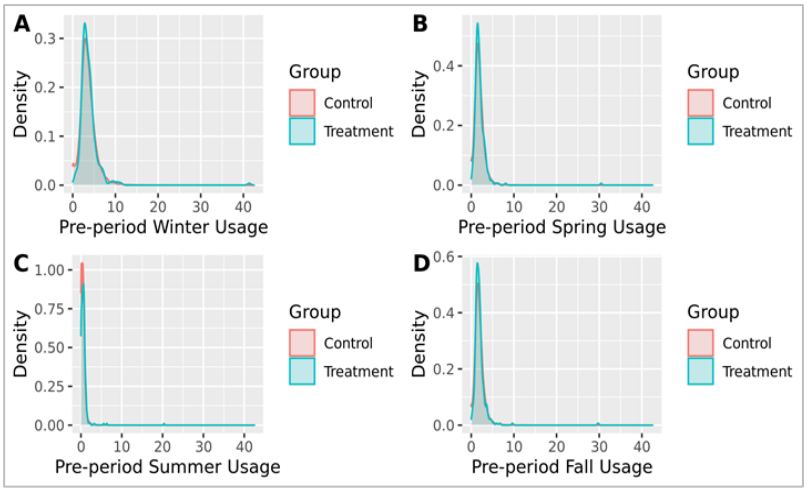


Figure 5-8: Covariate Balance After Matching, Smart Thermostat Paid Install with Natural Gas Heat

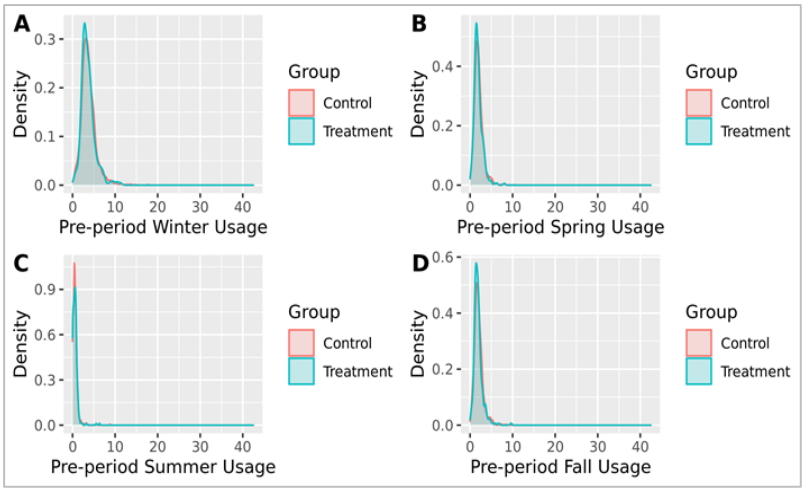


Figure 5-9: Covariate Balance Before Matching, Smart Thermostat DIY with Natural Gas Heat

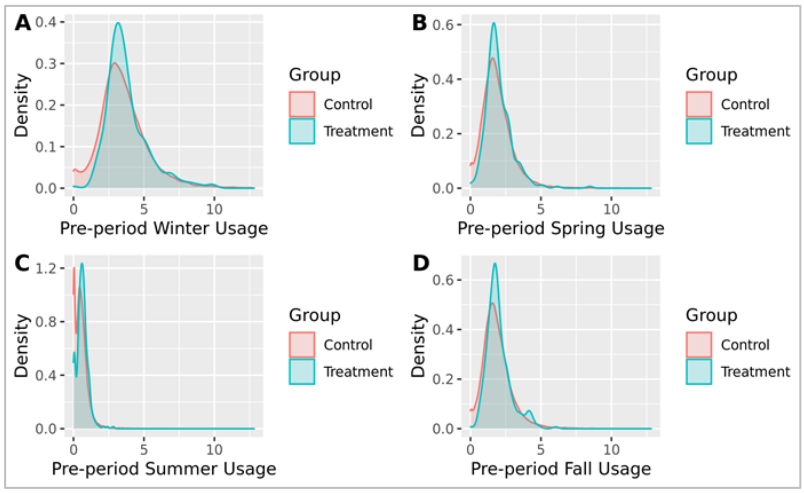
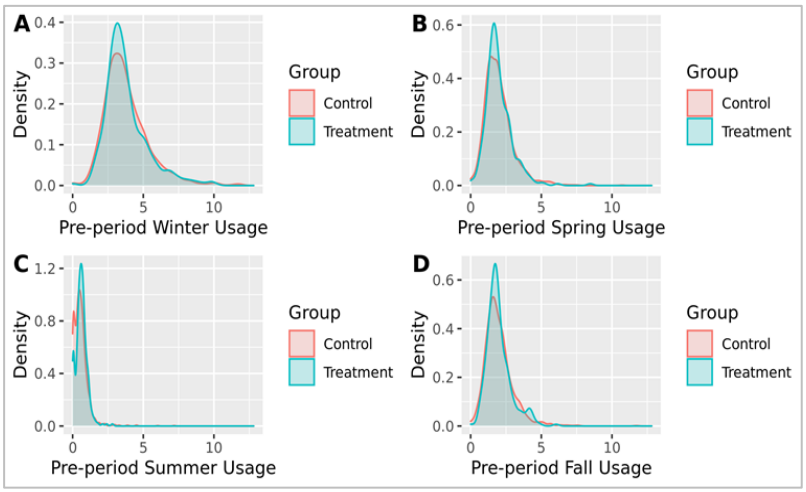


Figure 5-10: Covariate Balance After Matching, Smart Thermostat DIY with Natural Gas Heat



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

For Natural Gas Furnace and Smart Thermostat DIY With Natural Gas Heat, all tests confirmed that PSM performed well. 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.

For Smart Thermostat Paid Install with Natural Gas Heat, the t-test showed statistically significant differences at the 95% level for two summer months. However, the overall pre-period t-test across all

months showed no statistically significant difference between treatment and control groups after matching.

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.

The tables below provide results for the *t*-test on pre-period usage between the treatment and control groups after matching for the HVAC program. A P-Value over 0.05 indicates pre-period usage between treatment and control groups is similar at the 95% confidence level.

Table 5-9: Pre-period Usage T-test for Natural Gas Furnace, HVAC Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	3.882	3.914	-0.456	0.070	0.649	No
Feb	3.642	3.685	-0.648	0.067	0.517	No
Mar	3.052	3.103	-0.851	0.059	0.395	No
Apr	1.860	1.906	-1.094	0.042	0.274	No
May	1.032	1.089	-1.782	0.032	0.075	No
Jun	0.713	0.749	-1.413	0.026	0.158	No
Jul	0.490	0.502	-0.591	0.021	0.555	No
Aug	0.449	0.460	-0.553	0.020	0.580	No
Sep	0.641	0.647	-0.278	0.021	0.781	No
Oct	1.923	1.969	-1.124	0.042	0.261	No
Nov	3.378	3.427	-0.727	0.068	0.467	No
Dec	3.829	3.881	-0.702	0.074	0.483	No

Table 5-10: Pre-period Usage T-test for Smart Thermostat Paid Install with Natural Gas Heat, HVAC Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	3.842	3.754	0.753	0.117	0.452	No
Feb	3.630	3.548	0.739	0.111	0.460	No
Mar	3.101	2.962	1.509	0.092	0.132	No
Apr	1.924	1.813	1.608	0.069	0.109	No
May	1.112	1.057	0.953	0.058	0.341	No
Jun	0.795	0.781	0.235	0.059	0.815	No

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jul	0.554	0.541	0.357	0.036	0.722	No
Aug	0.511	0.497	0.383	0.036	0.702	No
Sep	0.705	0.678	0.563	0.048	0.574	No
Oct	1.959	1.845	1.586	0.072	0.114	No
Nov	3.328	3.182	1.414	0.103	0.158	No
Dec	3.762	3.658	0.875	0.119	0.382	No

Table 5-11: Pre-period Usage T-test for Smart Thermostat DIY with Natural gas Heat, HVAC Program

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Jan	3.908	3.903	0.044	0.110	0.965	No
Feb	3.735	3.654	0.759	0.106	0.448	No
Mar	3.139	3.080	0.658	0.090	0.511	No
Apr	1.880	1.886	-0.083	0.068	0.934	No
May	1.069	1.093	-0.482	0.050	0.630	No
Jun	0.745	0.786	-1.113	0.037	0.266	No
Jul	0.508	0.578	-2.673	0.026	0.008	Yes
Aug	0.475	0.524	-2.010	0.025	0.045	Yes
Sep	0.668	0.701	-0.941	0.035	0.347	No
Oct	1.943	1.941	0.036	0.063	0.971	No
Nov	3.385	3.330	0.591	0.093	0.555	No
Dec	3.842	3.775	0.657	0.103	0.512	No

Table 5-12 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 5-12: TMY Weather, HVAC Program

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
G Natural Gas Furnace	720322	10	727834	6,915	376	6,365	509

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
G Natural Gas Furnace	720923	2	727834	6,915	376	6,365	509
G Natural Gas Furnace	726817	12	727834	6,915	376	6,365	509
G Natural Gas Furnace	726988	2	726988	4,561	882	6,365	509
G Natural Gas Furnace	727827	1	727827	5,428	731	6,365	509
G Natural Gas Furnace	727830	71	727830	5,511	907	6,365	509
G Natural Gas Furnace	727834	116	727834	6,915	376	6,365	509
G Natural Gas Furnace	727850	11	727850	6,707	379	6,365	509
G Natural Gas Furnace	727855	23	727855	7,360	439	6,365	509
G Natural Gas Furnace	727856	353	727856	6,246	519	6,365	509
G Natural Gas Furnace	727857	54	727857	6,467	299	6,365	509
G Natural Gas Furnace	727870	16	727856	6,246	519	6,365	509
G Natural Gas Furnace	727918	0	726980	4,301	296	6,365	509
G Smart Thermostat Paid Install with Natural Gas Heat	720322	2	727834	6,915	376	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	720923	0	727834	6,915	376	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	726817	0	727834	6,915	376	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	727827	0	727827	5,428	731	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	727830	5	727830	5,511	907	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	727834	103	727834	6,915	376	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	727850	8	727850	6,707	379	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	727855	4	727855	7,360	439	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	727856	139	727856	6,246	519	6,528	463

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
G Smart Thermostat Paid Install with Natural Gas Heat	727857	2	727857	6,467	299	6,528	463
G Smart Thermostat Paid Install with Natural Gas Heat	727870	4	727856	6,246	519	6,528	463
G Smart Thermostat DIY with Natural Gas Heat	720322	3	727834	6,915	376	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	720923	0	727834	6,915	376	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	726817	3	727834	6,915	376	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727827	0	727827	5,428	731	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727830	12	727830	5,511	907	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727834	44	727834	6,915	376	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727850	14	727850	6,707	379	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727855	4	727855	7,360	439	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727856	170	727856	6,246	519	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727857	14	727857	6,467	299	6,388	490
G Smart Thermostat DIY with Natural Gas Heat	727870	8	727856	6,246	519	6,388	490

Table 5-13 provides estimated 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 Smart Thermostat Paid Install with Natural Gas Heat and DIY Smart Thermostat with Natural Gas Heat.. However, savings are statistically significant for Natural Gas Furnace. The adjusted R-squared shows the model provided an excellent fit for the data.

Table 5-13: 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 Natural Gas Furnace	671	3,347	16.97	9.82	24.13	0.92	Model 2: PPR
G Smart Thermostat Paid Install with Natural Gas Heat	267	1,335	-7.59	-19.77	4.59	0.91	Model 2: PPR
G Smart Thermostat DIY with Natural Gas Heat	272	1,354	3.12	-7.45	13.68	0.93	Model 2: PPR

The figures below provide monthly TMY savings per customer for the HVAC program.

Figure 5-11: Natural Gas Furnace Monthly Savings, HVAC Program

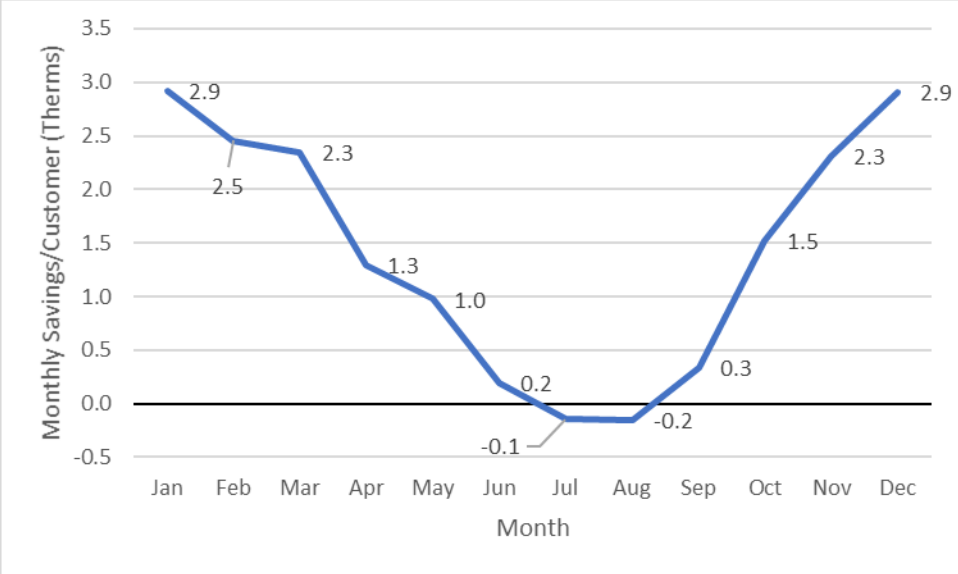


Figure 5-12: Smart Thermostat Paid Install with Natural Gas Heat Monthly Savings, HVAC Program

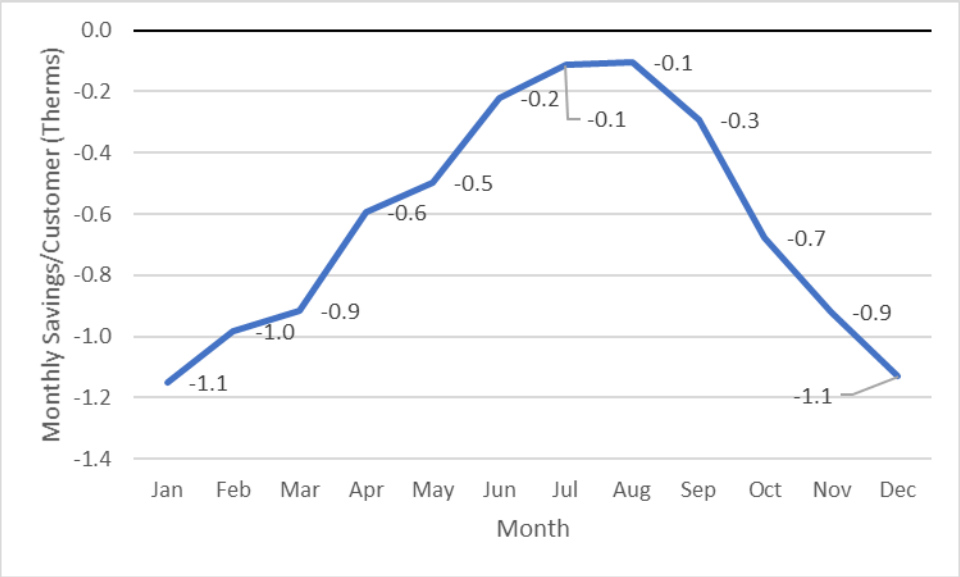
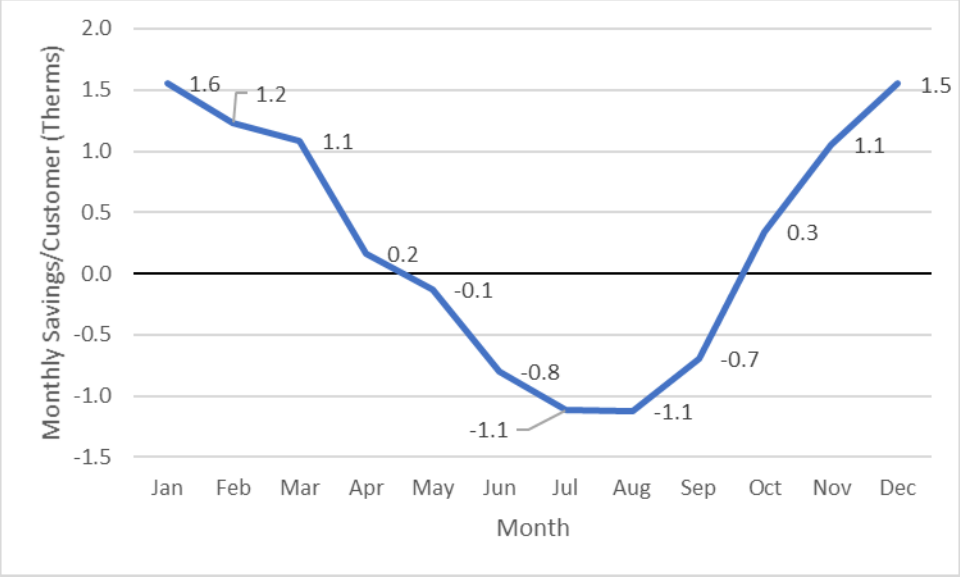


Figure 5-13: Smart Thermostat DIY with Natural Gas Heat Monthly Savings, HVAC Program



5.3 Shell Program

The results of the billing analysis for the Shell program are provided below. Table 5-14 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 billing analysis included participants in both in both Washington and Idaho service territories in order to acquire the maximum number of customers possible.

Table 5-14: 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	✓	230	✓
G IGU Window Replc With Natural Gas Heat	✓	11	
G Floor Insulation With Natural Gas Heat	✓	9	
G Storm Windows with Natural Gas Heat	✓	4	
G Wall Insulation With Natural Gas Heat	✓	32	
G Window Replc With Natural Gas Heat	✓	1,075	✓

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 5-15. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 5-15, 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 5-15: Cohort Restrictions, Shell Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
G Attic Insulation With Natural Gas Heat	Starting Count	230	70,444
	Install Date Range: 2021-01-01 to 2021-04-30	62	70,444
	Customers w/ Multiple Accounts for one Premise in Tracking Data	62	70,444
	Treatment Customers Found in Billing Data	62	70,444
	Control Group Usage Outlier (>2X Maximum Avg. Treatment Usage)	62	70,365
	Restrict to Pre- Post-Period	62	56,911
	Post-Period Date Range Restriction: 2021-05-01 through 2021-12-31	62	56,496
	Require Minimum Post Period: 6 Months	58	39,457
	Incomplete Pre-Period Bills	49	32,092
	Ending Count (Matched by PSM)	49	245
G Window Replc With Natural Gas Heat	Starting Count	1,075	70,444
	Install Date Range: 2021-01-01 to 2021-06-30	514	70,444
	Customers w/ Multiple Accounts for one Premise in Tracking Data	514	70,444

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
	Treatment Customers Found in Billing Data	501	70,444
	Control Group Usage Outlier (>2X Maximum Avg. Treatment Usage)	501	70,404
	Restrict to Pre- Post-Period	500	56,941
	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 5-14 and Figure 5-15 display the density of each variable employed in propensity score matching for the attic insulation measure, before and after conducting matching. In addition, Figure 5-16 and Figure 5-17 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 5-14: Covariate Balance Before Matching, Shell Attic Insulation

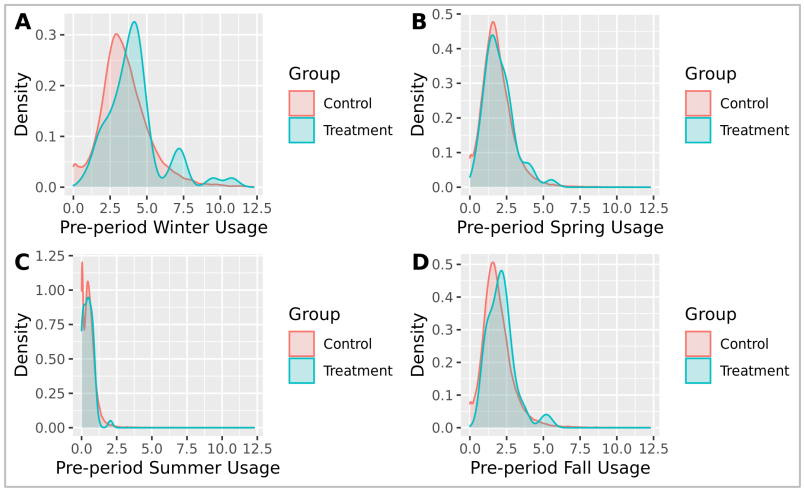


Figure 5-15: Covariate Balance After Matching, Shell Attic Insulation

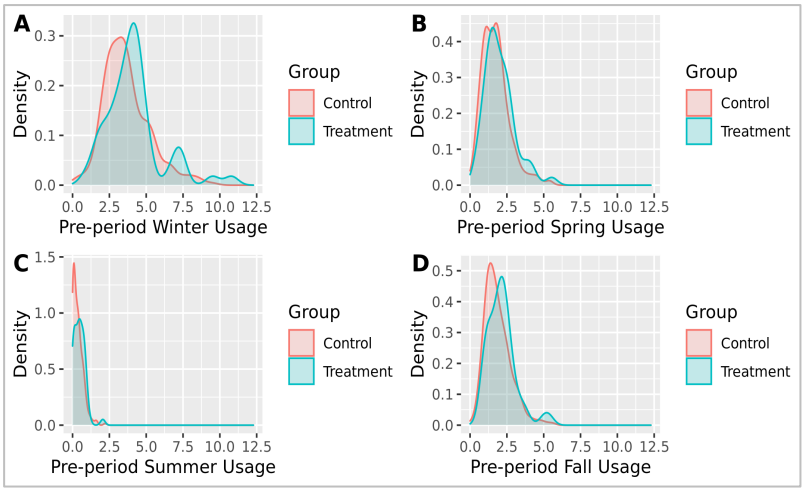


Figure 5-16: Covariate Balance Before Matching, Shell Window Replacement

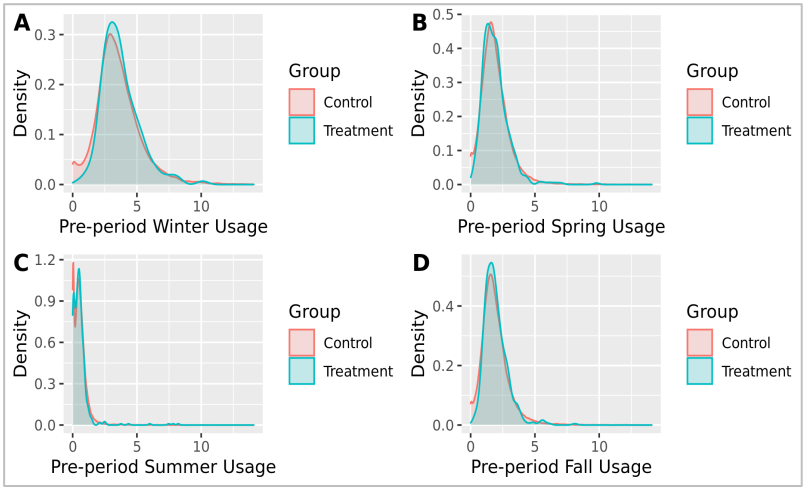
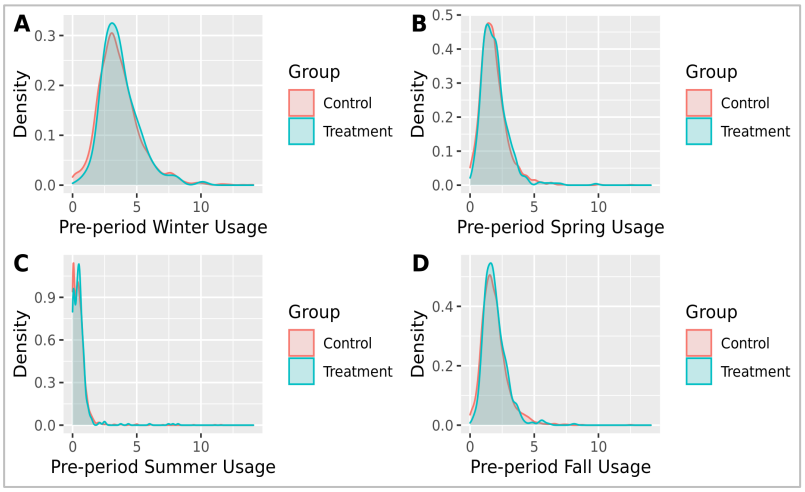


Figure 5-17: Covariate Balance After Matching, Shell Window Replacement



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 5-16 and Figure 5-18 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 5-16: 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	3.785	4.148	-1.097	0.330	0.277	No
Feb	3.503	3.916	-1.349	0.306	0.182	No
Mar	2.850	3.242	-1.539	0.255	0.129	No
Apr	1.648	1.905	-1.621	0.158	0.110	No
May	0.812	0.961	-1.597	0.094	0.115	No
Jun	0.506	0.626	-1.735	0.070	0.087	No
Jul	0.311	0.417	-1.852	0.057	0.069	No
Aug	0.286	0.384	-1.726	0.057	0.089	No
Sep	0.463	0.584	-1.774	0.068	0.081	No
Oct	1.802	2.083	-1.890	0.149	0.063	No
Nov	3.330	3.751	-1.649	0.256	0.104	No
Dec	3.772	4.296	-1.854	0.283	0.068	No

Table 5-17: 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	3.727	3.807	-0.905	0.089	0.366	No
Feb	3.486	3.530	-0.529	0.083	0.597	No
Mar	2.876	2.941	-0.904	0.073	0.367	No

Month	Average Daily Usage (Therms), Control	Average Daily Usage (Therms), Treatment	T Statistic	Std Error	P-Value	Reject Null?
Apr	1.722	1.798	-1.373	0.055	0.170	No
May	0.957	1.030	-1.249	0.058	0.212	No
Jun	0.670	0.726	-1.088	0.052	0.277	No
Jul	0.461	0.496	-0.902	0.039	0.367	No
Aug	0.435	0.459	-0.642	0.038	0.521	No
Sep	0.615	0.614	0.043	0.037	0.965	No
Oct	1.836	1.884	-0.930	0.052	0.353	No
Nov	3.250	3.345	-1.236	0.077	0.217	No
Dec	3.685	3.760	-0.918	0.082	0.359	No

Table 5-18 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 5-18: 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	3	727834	6,915	376	6,303	518
G Attic Insulation With Natural Gas Heat	720923	1	727834	6,915	376	6,303	518
G Attic Insulation With Natural Gas Heat	726817	5	727834	6,915	376	6,303	518
G Attic Insulation With Natural Gas Heat	727827	2	727827	5,428	731	6,303	518
G Attic Insulation With Natural Gas Heat	727830	44	727830	5,511	907	6,303	518
G Attic Insulation With Natural Gas Heat	727834	39	727834	6,915	376	6,303	518
G Attic Insulation With Natural Gas Heat	727850	15	727850	6,707	379	6,303	518
G Attic Insulation With Natural Gas Heat	727855	10	727855	7,360	439	6,303	518
G Attic Insulation With Natural Gas Heat	727856	252	727856	6,246	519	6,303	518
G Attic Insulation With Natural Gas Heat	727857	37	727857	6,467	299	6,303	518
G Attic Insulation With Natural Gas Heat	727870	17	727856	6,246	519	6,303	518
G Window Replc With Natural Gas Heat	727827	1	727827	5,428	731	6,266	519
G Window Replc With Natural Gas Heat	727830	3	727830	5,511	907	6,266	519
G Window Replc With Natural Gas Heat	727834	3	727834	6,915	376	6,266	519
G Window Replc With Natural Gas Heat	727850	0	727850	6,707	379	6,266	519
G Window Replc With Natural Gas Heat	727855	1	727855	7,360	439	6,266	519
G Window Replc With Natural Gas Heat	727856	37	727856	6,246	519	6,266	519

Measure	USAF Station ID	# of Treatment Customers	TMY USAF ID	TMY HDD	TMY CDD	Weighted TMY HDD	Weighted TMY CDD
G Window Replc With Natural Gas Heat	727857	4	727857	6,467	299	6,266	519
G Window Replc With Natural Gas Heat	727870	0	727856	6,246	519	6,266	519

Table 5-19 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 5-19: 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	49	245	26.21*	-51.23	103.66	0.63
G Attic Insulation With Natural Gas Heat	PPR	49	245	26.35	6.09	46.62	0.93
G Attic Insulation With Natural Gas Heat	Treatment Only (Gross)	49	N/A	111.93	19.97	203.89	0.79
G Window Replc With Natural Gas Heat	Diff-in-diff	425	2,107	23.40*	-8.58	55.38	0.54
G Window Replc With Natural Gas Heat	PPR	425	2,107	20.27	10.98	29.56	0.92
G Window Replc With Natural Gas Heat	Treatment Only (Gross)	425	N/A	35.41	16.44	54.39	0.83

*Not statistically significant

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.

Table 5-20: 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	49	245	26.35	6.09	46.62	0.93	Model 2: PPR
G Window Replc With Natural Gas Heat	425	2,107	20.27	10.98	29.56	0.92	Model 2: PPR

Figure 5-18 and Figure 5-12 provide monthly TMY savings per customer for the Shell program. As expected for gas weatherization measures, the greatest savings occur during the winter months.

Figure 5-18: Attic Insulation Monthly Savings, Shell Program

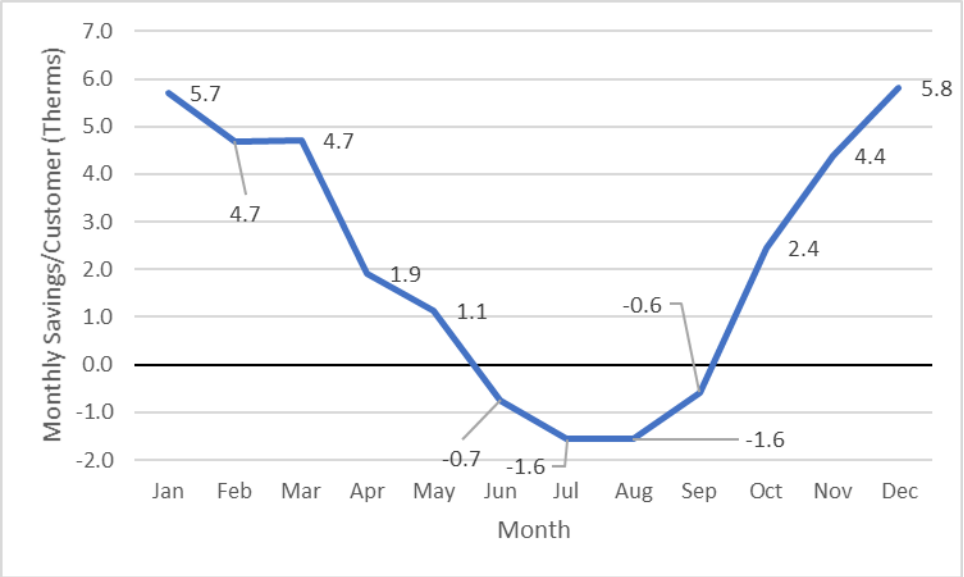
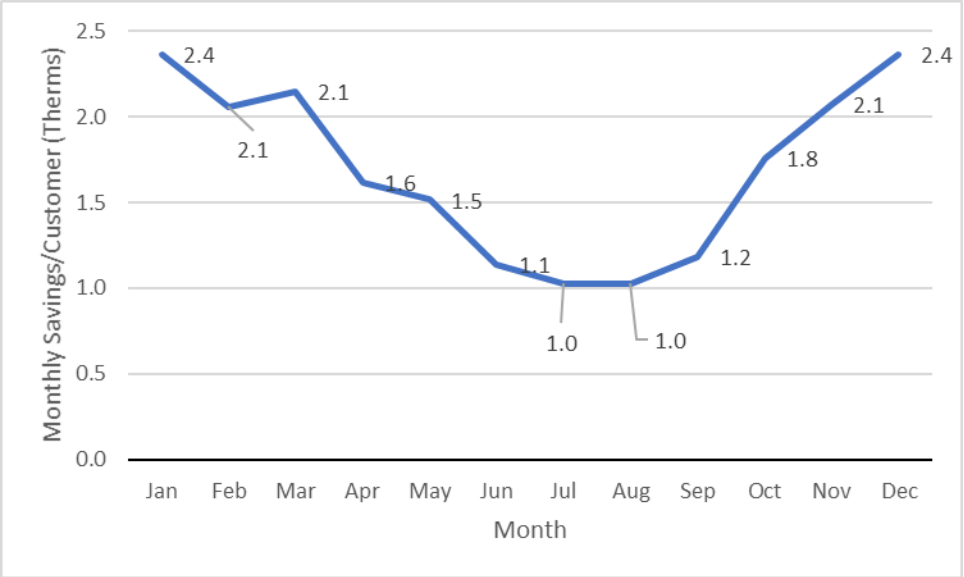


Figure 5-19: Window Replacement Monthly Savings, Shell Program



5.4 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 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 5-21. The Evaluators used nearest neighbor matching with a 5 to 1 matching ratio. Therefore, each treatment customer was matched to 5 similar control customers. Also shown in Table 5-21, 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 5-21: Cohort Restrictions, Low-Income Program

Measure	Data Restriction	# of Treatment Customers	# of Control Customers
Whole home natural gas	Starting Count	258	3,274
	Install Date Range: January 1, 2020 to June 30, 2021	100	3,274
	Control Group Usage Outlier (>2X max treatment usage)	100	3,274
	Incomplete Post-Period Bills (<4 months)	94	2867
	Incomplete Pre-Period Bills (<10 months)	67	1995
	Ending Count (Matched by PSM)	67	335

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 5-20 and Figure 5-21 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 5-20: Covariate Balance Before Matching, Low Income Gas Measures

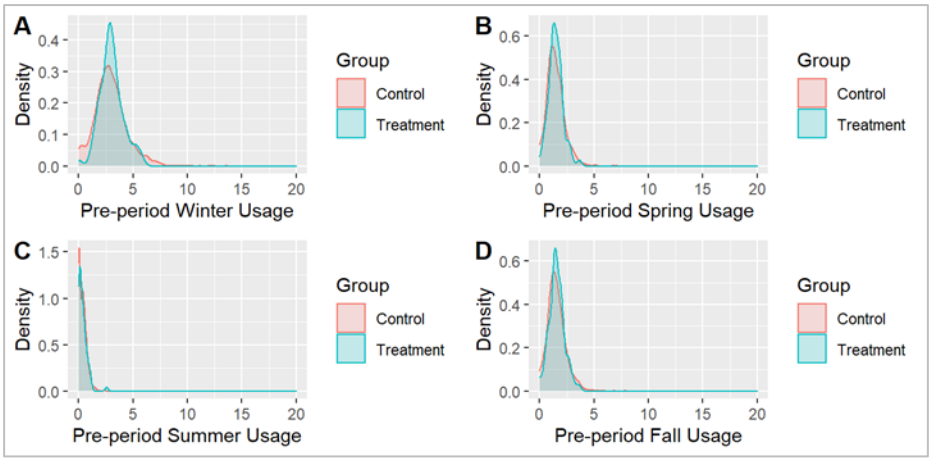
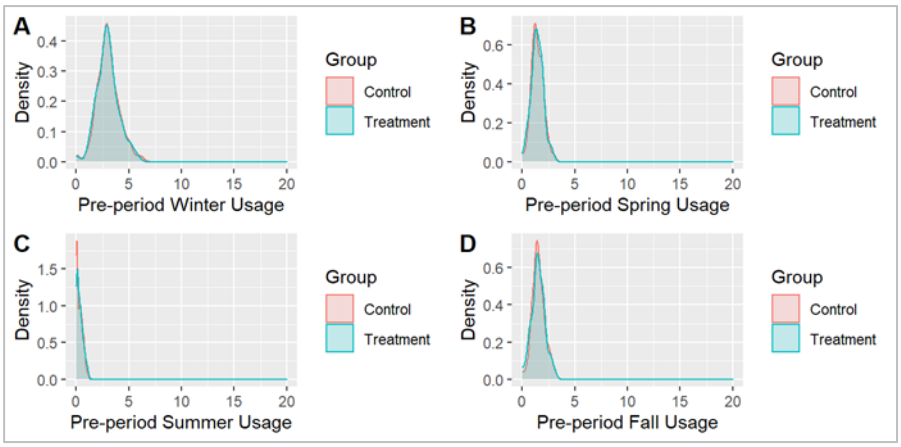


Figure 5-21: Covariate Balance After Matching, Low Income Gas Measures



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. Further details on the results of the three tests performed to determine PSM success are available in the Appendix.

Table 5-22 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 5-22: 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	727827	1	727827	5,428	731	6,314	498
All Gas Measures	727830	13	727830	5,510	906	6,314	498
All Gas Measures	727834	18	727834	6,915	376	6,314	498
All Gas Measures	727850	6	727850	6,246	519	6,314	498
All Gas Measures	727855	0	727855	7,360	439	6,314	498
All Gas Measures	727856	73	727856	6,246	519	6,314	498
All Gas Measures	727857	21	727857	6,467	299	6,314	498

Table 5-23 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 5-23: Measure Savings for All Regression Models, Low-Income Program

Measure	# of Treatment Customers	# of Control Customers	Annual Savings/Customer	90% Lower CI	90% Upper CI	Adjusted R-Squared	Model
All Gas Measures (Therms)	67	335	.78	0	16.31	0.90	Model 2: PPR

*Not statistically significant

The results of the billing analysis indicate no statistically significant savings were found for the gas measures.

6. 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 6-1.

Table 6-1: Type and Number of Measures Received by Respondents

Measure Category	Total	Percent (n=305)
One Measure	171	56%
Two Measures	91	30%
Three Measures	34	11%
Four Measures	7	2%
Five Measures	2	1%
HVAC	108	35%
Water Heater	87	29%
Smart Thermostat	127	42%
Clothes Washer	99	32%
Clothes Dryer	66	22%

The Evaluators asked respondents to provide information regarding their home, as displayed in Table 6-2. 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.

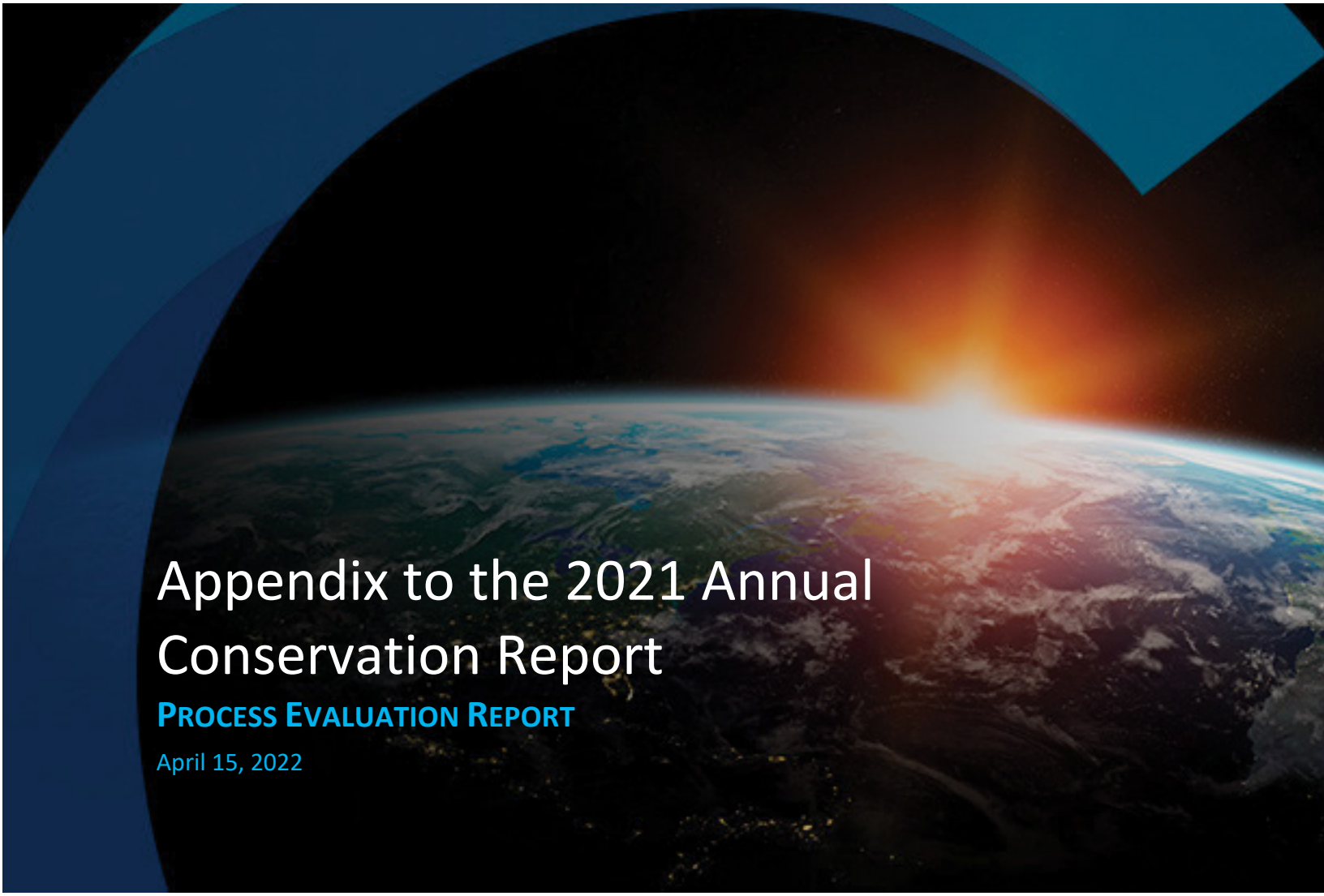
Table 6-2: Survey Respondent Home Characteristics[12]

Question	Response	Percent
Do you rent or your home? (n=300)	Own	98%
	Rent	2%
Which of the following best describe your home? (n=301)	Single-family house detached from any other house	85%
	Single-family house attached to one or more other houses (e.g., duplex, condominium, townhouse)	4%
	Mobile or manufactured home	10%
	Apartment	1%
Does your home have central air conditioning, window air conditioning, or neither? (n=301)	Window air conditioning / a room AC unit	18%
	Central air conditioning	73%
	Neither	8%
	Don't Know	1%
About how many square feet is your home? (n=300)	Less than 1,000 square feet	8%
	1,000-1,999 square feet	48%
	2,000-2,999 square feet	25%
	3,000-3,999 square feet	11%
	4,000 or more square feet	6%
	Don't know	2%
When was your home built? (n=301)	Before 1960	27%
	1960 to 1969	6%
	1970 to 1979	15%
	1980 to 1989	9%
	1990 to 1999	13%
	2000 to 2009	11%
	2010 to 2018	18%
	Don't know	1%

[12] Four contractors or construction companies were not asked these questions.

APPENDIX E

CADMUS



Appendix to the 2021 Annual Conservation Report

PROCESS EVALUATION REPORT

April 15, 2022

Prepared for:

Avista

1411 E. Mission Avenue

Spokane, WA 99202

CADMUS

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Figures

Tables

Executive Summary

As part of the Avista 2021 demand-side management portfolio evaluation, Cadmus conducted process evaluation activities for program year (PY) 2021. The process evaluation focused on three fundamental objectives:

- Assess participant and market actor program journey, including motivation for participation, barriers to participation, and satisfaction
- Assess Avista staff experiences, including program changes, impact of the COVID-19 pandemic, and program processes
- Document areas of success, challenges, and changes to the program

This report describes Cadmus' data collection and process methods, presents analysis results, summarizes findings, draws conclusions, and recommends possible improvements for the nonresidential, low-income, and residential programs listed in Table 1.

Table 1. PY 2021 Process Evaluations

Program[a]	Idaho	Washington
Nonresidential Programs		
Site Specific	✓	✓
Prescriptive[b]	✓	✓
Low-Income		
Low-Income	✓	✓
Low-Income Fuel Efficiency	✓	
Community Energy Efficiency Program		✓
Residential		
HVAC	✓	✓
Water Heat	✓	✓
Shell and Windows	✓	✓
Fuel Switching	✓	

[a] Cadmus completed all evaluation activities for the Multifamily Direct Install, Multifamily Market Transformation, and ENERGY STAR® Homes programs in 2020. Refer to the PY 2020 report for these findings.

[b] Includes the Lighting, Food Service Equipment, Green Motors, Commercial HVAC, Insulation, HVAC Motor Controls, Grocer, Fleet Heat, and Compressed Air programs.

Summary of Milestones and Deliverables

Cadmus conducted the evaluation by reviewing documents, surveying participants, and interviewing program and implementation staff and contractors. Table 2 lists the completed process evaluation activities.

Table 2. PY 2021 Completed Milestones and Deliverables

Milestones and Deliverables	Completed
Document and Database Review	✓
Avista and Implementer Interviews	✓
Participant Surveys	✓
Trade Ally Interviews	
Contractors	✓
Community Action Program Agency Representatives	✓

Key Conclusions

Nonresidential

- **Overall, respondent satisfaction with the PY 2021 Site Specific and Prescriptive programs was high.**
  - Overall, 91% of Site Specific respondents and 98% of Prescriptive program respondents said they were *very* or *somewhat satisfied* with the program.
  - While most Site Specific respondents reported increased satisfaction across most categories in PY 2021, satisfaction with the technical assistance received from Avista staff decreased slightly from 100% in PY 2020 to 86% in PY 2021.
  - While satisfaction with all aspects of the Prescriptive programs remained high, some respondents expressed dissatisfaction with completing and submitting the rebate application, communication with trade allies and their account executive, and information about program requirements.
- **PY 2021 Site Specific and Prescriptive respondents' top motivations to participate aligned with their top benefits from the program.**
  - Site Specific respondents were motivated to participate in the program to save energy (nine of 11), to save money (nine of 11), and to receive the rebate (eight of 11).
  - Site Specific respondents said that saving money on their utility bills was the main benefit of participation for their company (eight of 11), followed by using less energy (seven of 11) and improved aesthetics (seven of 11). Although receiving the rebate was not one of the top three benefits, a majority of respondents named it as a benefit (six of 11).
  - Prescriptive respondents most frequently cited saving energy (63%; n=56), receiving the rebate (59%; n=56), and reducing energy (57%; n=56) as reasons for participating in the programs.
  - They similarly cited these three items as benefits: saving energy (76%; n=54), reducing energy (61%; n=54), and receiving the rebate (59%; n=54). While not one of the top three benefits, prescriptive respondents also cited improved aesthetics as a top benefit (56%; n=54).
- **In PY 2021, the relationship between Site Specific respondents and vendors/contractors worked well for different aspects of the program.**

  - All Site Specific respondents were especially satisfied with their vendors and contractors, specifically with their communication with program contractors. Five of 11 respondents said that their contractor, vendor, or retailer was involved in the design of the project and took the lead in preparing their application.

- **Respondents in all nonresidential programs continued to report a lack of knowledge as a challenge to participation.**
  - Most Site Specific respondents (eight of 11) said their lack of knowledge about the program was a challenge and three recommended increasing communication about the program to participants.
  - Most Prescriptive respondents said their lack of awareness about the program was the biggest challenge to participation (42%, n=24). Some respondents (nine of 18) said that more information about the program requirements would improve the Prescriptive program.
- **In PY 2021, Site Specific and Prescriptive respondents said the programs were easy to participate in and provided other aspects of the program that worked well, such as energy savings, receiving the rebate, and communication.**
  - Site Specific survey respondents said the Avista engineering and utility account executives were helpful (two responses), the program was easy to participate in and worked out well (two responses), and that they appreciated the rebates (one response).
  - Seven of 33 Prescriptive program participants said the program had an easy/fast process and six of 33 said savings received due to improvements worked especially well.
- **While most respondents stated they did not experience any impacts due to the continued COVID-19 pandemic, a small number of respondents said that timing delays continued to persist in PY 2021.**
  - Most of the Site Specific respondents said that there were no COVID-19 impacts to their project (six of 10), while those who experienced challenges said their project timeline was impacted due to delays (three of 10) and one respondent said the project scope was impacted.
  - A majority of the Prescriptive respondents (78%, n=51) reported no impact on their projects. Among those who did report COVID impacts, respondents most frequently mentioned time labor/supply chain problems (eight responses) and time delays (one response) as roadblocks.

Low-Income

- **CAP agencies and participating customers were highly satisfied with the Low-Income program.**
  - Avista and all six CAP agencies interviewed emphasized positive, well-established relationships that were communicative and collaborative. Despite facing challenges with participation, some CAP agencies noted that Avista was working with them to market the program and increase outreach in an effort to bring in potential customers.

  - All four CAP agencies that had participated reported that customers generally provided positive feedback. These agencies said that customers were typically happy with the equipment they received through the program and appreciative of the work provided.
- **The COVID-19 pandemic impacted program implementation and participation.**
  - Both Avista and CAP agencies reported that COVID-19 impacted the program in PY 2021. After Avista temporarily suspended the program in PY 2020 to establish health and safety protocols, participation was slow to rebound in some areas. While some CAP agencies had returned to steady work, others (especially newer agencies) have struggled to reach customers. Other customer bases, such as elderly clients and clients with health vulnerabilities, were still difficult to serve at the time of the interviews.
  - Program marketing also suffered as a result of the pandemic. Certain in-person events that were previously used to market the program were cancelled, which made particular groups of clients more difficult to reach.

Residential

- **Survey respondents and contractors are highly satisfied with most aspects of the program.**
  - All survey respondents were *very* or *somewhat satisfied* (90% *very satisfied* and 10% *somewhat satisfied*) with the program overall, with over 99% of respondents satisfied with interactions with Avista staff and 99% satisfied with their overall experience with Avista.
  - All contractors were *very* or *somewhat satisfied* with the program overall. They said that the rebate application process was simple, straightforward, and user-friendly.
- **While contractors said the rebate application was simple and straightforward to complete, some survey respondents suggested simplifying the application as a way to improve the program.**
  - All of the contractors who said they have completed the application for their customers did not find the rebate application process difficult (nine of nine) and rated their satisfaction with the rebate application process as a 4.7 on a 5-point scale where 1 means *not at all satisfied* and 5 means *very satisfied* (n=10). As a program improvement, two contractors suggested Avista create an application status tracker in the portal.
  - Most survey respondents who provided improvement suggestions said the program should increase advertising to increase awareness among residential customers (16 of 29) or simplify the rebate application as a program improvement (six of 29).
- **Contractors said the program rebate influenced their decision to recommend equipment to their customers and influenced their customers decisions to purchase and install new energy-efficient equipment.**
  - The majority of the contractors said that their participation in the Avista rebate programs was the defining reason that influenced their customers to receive energy-efficient equipment. They rated the programs influence on their decision to recommend equipment as a 4.7 on a scale from 1 to 5, where 1 is *not influential* and 5 is *very influential*.

  - They rated how influential the program was on their customers decision to purchase new equipment as a 4.9, on a 1 to 5 scale, where 1 meant *not at all influential* and 5 meant *very influential*.
  - Additionally, a majority of survey respondents said the most important reason they decided to purchase and install energy efficiency equipment was because of information from their retailer or installer (70%; n=134).
- **While most residential customers learned about the programs from their contractor, installer or trade ally, they prefer to learn about the program though emails and bill inserts from Avista.**
  - Respondents in both states most frequently learned about Avista programs through contractors, installers, or trade allies (39% in Washington and 42% in Idaho).
  - Most respondents preferred to learn about the programs from Avista's emails (31% in Washington and 37% in Idaho) or bill inserts (29% in Washington and 27% in Idaho). A smaller portion of the respondents preferred learning about the program from contractors, installers, and trade allies (13% of Washington respondents and 14% of Idaho respondents) .
- **Saving money or energy are the key drivers of motivation to participate in the program according to survey respondents.**
  - Respondents participated in Avista's programs primarily to save money (80% of Washington respondents and 69% of Idaho respondents) and save energy (63% of Washington respondents and 55% of Idaho respondents).
- **The COVID-19 pandemic continued to impact customer participation, but Avista pivoted throughout the year to find ways to address customer challenges related to the pandemic.**
  - Some of pandemic-related issues impacted project completion but Avista was lenient with project completion schedules to account for these challenges. Additionally, costs of equipment increased due to supply-chain issues, but Avista was able to increase some incentives to help customers alleviate this challenge.

Recommendations

Nonresidential

Nonresidential Recommendation 1: Consider developing and using customer testimonials in targeted outreach to customers who have not historically participated in programs. The testimonials from satisfied participants could focus on the ease of participating in the programs and the benefits of participation, such as reduced energy use, bill savings, and receiving the rebate. The marketing could also provide information to prospective participants on potential energy savings for businesses with similar profiles.

Nonresidential Recommendation 2: Continue to look for ways to provide contractor and installer training, educational resources about program requirements, and application completion tips to remove roadblocks or communication issues between Avista and participants.

Low-Income

Low-Income Recommendation 1: Increase and adjust program marketing efforts to target hard-to-reach members of the income-eligible community. As more in-person events are offered, market the program to increase potential customer participation. Along with in-person events, offer virtual marketing opportunities to reach more vulnerable customers, such as the elderly or those with health vulnerabilities, who may not be able to attend in-person events. Work with community groups in rural areas to help identify customer bases and strategize marketing efforts to inform them of the program.

Low-Income Recommendation 2: Continue to work with newer CAP agencies to help increase customer participation. Providing support in more rural areas where these new CAP agencies are working will be essential to helping them gain customers. Understanding the needs of people within their territories can also help inform targeted marketing offerings or ways to promote the program.

Residential

Residential Recommendation 1: Continue to use emails and bill inserts as the primary forms of program outreach to advertise Avista's residential programs and incentives. In outreach materials, consider using messaging focused on program benefits: energy savings, lower maintenance costs, and increased home comfort.

Residential Recommendation 2: Consult with contractors and identify tips for completing the rebate application that could be shared with customers who complete their own application. These tips could highlight the technical aspects of submitting the application, the steps involved in the application process, and the amount of detail needed for an application so that it can be approved quickly. Additionally, continue to encourage contractors and installers to complete the rebate application for customers to eliminate the confusion some customers feel when they fill out and submit the application themselves.

***Residential Recommendation 3*:** If not already available or planned for development, consider adding a way to track rebate status to the online portal so that contractors and customers can track the status of their applications and follow-up with Avista if anything seems incorrect.

Introduction

In program year (PY) 2021, Avista provided rebates and services to its nonresidential and residential electric and natural gas customers throughout its Washington and Idaho service territories. Through the PY 2021 portfolio process evaluation, Cadmus sought to identify and document each program's successes and challenges by reviewing program materials, conducting interviews with program and implementation staff and trade allies, and conducting surveys with nonresidential and residential program participants.

Program Descriptions

Table 3 provides a summary of programs included in Avista's PY 2021 demand-side management portfolio's evaluation.

Table 3. PY 2021 Evaluated Program Descriptions

Program	Measure(s)	Implementer	Program Summary
Nonresidential			
Site Specific	Custom measure(s)	Avista	Customers design energy efficiency projects with documented energy savings and a minimum 10-year measure life for a technical review and possible rebates.
Prescriptive	Lighting, HVAC, variable frequency drives, food service equipment, grocer, shell	Avista	Customers identify potential energy efficiency projects, submit paperwork, and receive Prescriptive rebates for projects.
Fleet Heat[a]	Smart block heating system	Avista	Electric customers receive a smart block heating system to install on vehicles. The device controls the water temperature in the block and the air temperature outside the block.
Green Motors	Repair/rewind of motors	The Green Motors Practices Group	Electric customers who receive a green motor rewind at a participating service receive a rebate. The rebate applies to 15 hp to 5,000 hp industrial motors.
Compressed Air[a]	Compressed air leak reduction device	Avista	Following a compressed air audit, electric customers receive direct installation of a compressed air leak reduction device.
Low-Income			
Low-Income and Low-Income Fuel Efficiency	HVAC, insulation, water heaters, windows, appliances	Community Action Program (CAP) Agencies	Customers qualify through income level and receive reimbursement for cost of work completed on their home. CAP agencies install measures in homes based on their approved measure list.
Community Energy Efficiency Program (CEEP)	Multifamily housing energy efficiency improvements, removal of alternative heating sources, small business education	Avista and CAP Agencies	Three focus areas that aim to improve the efficiency and education of targeted customer groups through home improvements and education efforts.

Program	Measure(s)	Implementer	Program Summary
Residential			
HVAC	Space heat and smart thermostats	Avista	Customers complete energy efficiency projects, submit paperwork, and receive Prescriptive rebates for projects.
Water Heat	Water heat		
Shell and Windows	Wall, floor, and attic insulation; standard and storm windows		
Fuel Efficiency	Space and water heat and smart thermostats (offered only in Idaho)		

[a] Cadmus planned to evaluate the Fleet Heat and Compressed Air programs, but there were no participants in PY 2021.

Methodology

This section describes the interview and survey methodology.

Program Administrator and Implementer Interviews

Cadmus conducted telephone interviews with the program staff and third-party implementers listed in Table 4. Interviews focused on the following program topics:

- Program roles and responsibilities
- Program goals and objectives
- Program design and implementation
- Data tracking
- Program participation
- Marketing and outreach
- Program successes
- Program impacts on the market

Table 4. PY 2021 Stakeholder Interviews

Program	Avista Staff	Implementer Staff
Nonresidential Programs		
Site Specific	–	N/A
Prescriptive[a]	✓	-
Low-Income		
Low-Income and Fuel Efficiency	✓	✓
CEEP	✓	N/A
Residential Programs		
HVAC	✓	N/A
Water Heat	✓	
Shell and Windows	✓	
Fuel Efficiency	✓	

[a] Includes Lighting, Food Service Equipment, Green Motors Rewind, Commercial HVAC, Insulation, HVAC Motor Controls, Grocer, Fleet Heat, and Compressed Air.

CAP Agency Interviews

In September 2021, Cadmus conducted interviews with six CAP agencies participating in the Low-Income program to assess experiences, successes, and challenges. Avista provided the contact list for the

interviews. Table 5 lists the program, audience, number of records provided by Avista, interview target, and number of interviews.

Table 5. PY 2021 Trade Ally Interviews

Program	Audience	Number of Records	Target	Number of Interviews
Low-Income Program	Participating CAP Agencies	8	5	6

Residential Contractor Interviews

Cadmus conducted 10 interviews with contractors who serve residential customers (five serving customers in Idaho and five serving customers in Washington). Avista provided a list of 927 contractors to Cadmus. We selected a random sample of 64 contractors from the list and averaged four attempts to contact each contractor in the sample.

The telephone interviews focused on these program topics:

- Program awareness and motivation
- Program benefits
- Program delivery experience, including marketing and fulfilling rebates
- Effects of program on success of business
- Interaction with Avista staff
- Perception of customer experience, including awareness and satisfaction
- Successes and challenges
- Feedback and recommendations

Participant Surveys

In PY 2021, Cadmus completed 150 online surveys with residential participants in Idaho and Washington and 67 online surveys with nonresidential program participants in both states. Cadmus completed telephone reminder calls to increase Site Specific survey participation. The participant survey guides gathered critical insights into participants' program journey, covering the following topics:

- Program awareness
- General program participation
- Reasons for participation
- Program benefits
- Program delivery experience
- Overall program satisfaction
- Satisfaction with Avista
- Suggestions for program improvements

Residential Sampling

To prepare the participant contact list for the residential survey, Cadmus removed duplicate records and records with incorrect or missing email addresses. After preparing the list, we randomly selected a sufficient number of records proportionate to participation in each of the programs to include in the sample frame. We sent an email invitation to participants included in the sample frame, followed by a reminder email. Overall, we collected 150 responses for process evaluation purposes, as shown in Table 6.

Table 6. Residential Participant Survey Sample Frame, Target, and Completes by Program

Program	Idaho and Washington Total		
	Sample Frame[a]	Target	Completed Surveys
Space Heating	1,990	80	73
Shell and Windows	744		50
Water Heating	351		20
Fuel Switching	71		7
Total	**3,156**	**80**	**150**

[a] Sample frame refers to the records selected for the survey contact list.

Nonresidential Sampling

To prepare the contact lists for each nonresidential survey, Cadmus removed duplicate records and records with incorrect or missing email addresses. We sent an email invitation to a census of all participants with email addresses in each program, followed by two reminder emails. Additionally, because of low initial participation in the Site Specific survey, we made a telephone attempt to Site Specific participants to increase participation. As shown in Table 7, nonresidential participants completed 67 surveys in PY 2021.

Table 7. Nonresidential Participant Survey Sample Frame, Target, and Completes by Program

Program	PY 2021 Total		
	Sample Frame[a]	Target	Completed Surveys
Nonresidential Site Specific			
Electric	67	All eligible	**8**
Gas	2		**1**
Dual	4		**2**
Nonresidential Prescriptive			
Lighting	793	30 to 40	**50**
Food Service Equipment	4	As many as possible	**2**
Green Motors Rewind	-		**-**
Commercial HVAC	12		**3**
Insulation	4		**-**
HVAC Motor Controls	3		**1**
Grocer	1		**-**
Fleet Heat	-		**-**
Compressed Air	-		**-**
Total	**890**		**67**

[a] Sample frame refers to the records available for surveys after removing duplicate records, records with only installer contact information, records without email addresses, and records with incomplete or bad contact information.

Nonresidential Programs

This section focuses on two nonresidential programs: Site Specific and Prescriptive. The Site Specific program provides incentives to customers who install custom energy efficiency projects, while the Prescriptive programs[1] offer incentives for specific measures and services.

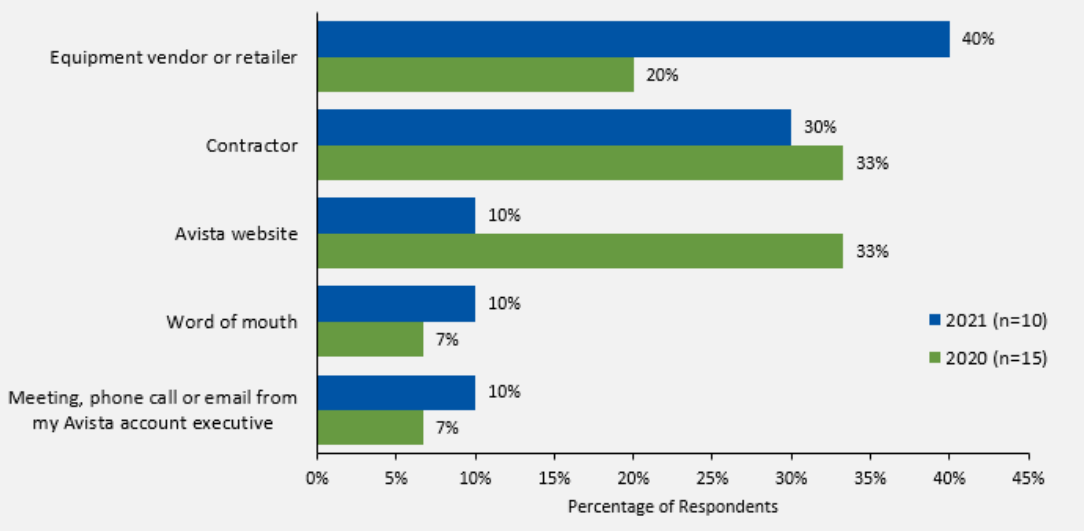
Nonresidential Site Specific Findings

This section describes the findings from 11 surveys completed with PY 2021 Site Specific participants. Where meaningful, Cadmus compared PY 2020 results to PY 2021.

Customer Awareness

The majority of the PY 2021 Site Specific survey respondents (seven of 101) had previously participated in an Avista energy efficiency program, which is consistent with PY 2020 results. As shown in Figure 1, survey respondents first learned about the Site Specific program through a variety of sources. Equipment vendors or retailers were the most common sources (40%), followed by contractors (30%). PY 2021 respondents were more likely to mention equipment vendor or retailer compared to the PY 2020 respondents but were less likely to mention contractors and the Avista website compared to PY 2020 respondents.

Figure 1. How Participants First Learned of Program



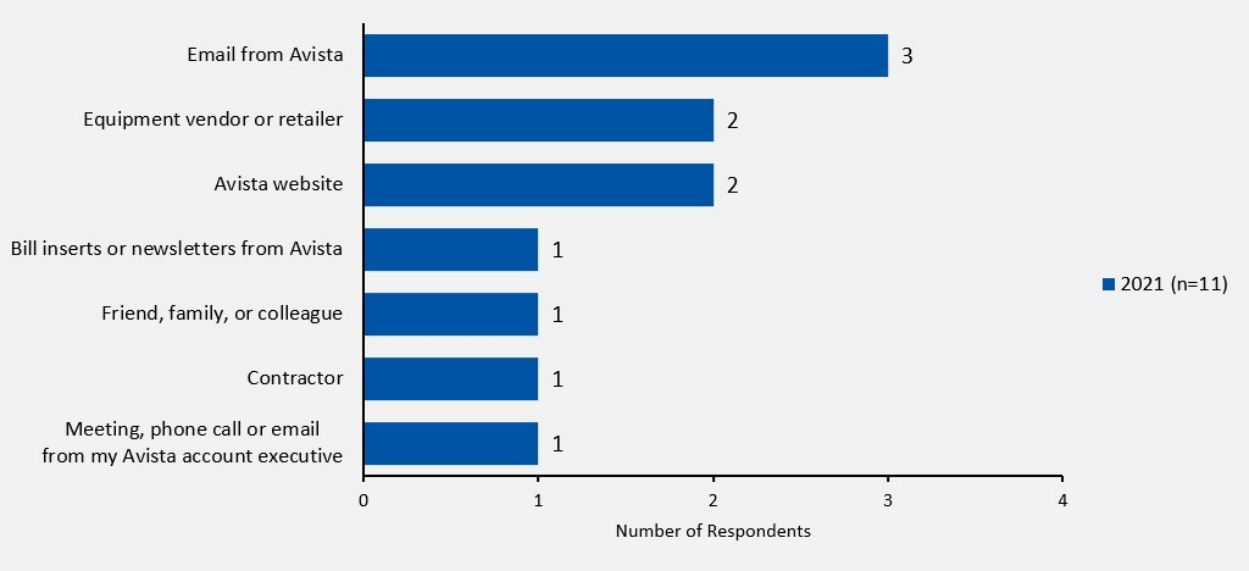
Source: Site Specific survey questions C2: "How did you first hear about the Site Specific program?"

When asked how they preferred to learn of rebates and incentives, PY 2021 respondents were most likely to select email (three respondents), followed by their equipment vendor or retailer and the Avista

[1] Prescriptive includes Lighting, Food Service Equipment, Green Motors Rewind, Commercial HVAC, Insulation, HVAC Motor Controls, Grocer, Fleet Heat, and Compressed Air.

website (two respondents each). This is slightly different from the actual channel through which they learned about the program, as discussed above.

Figure 2. How Participants Prefer to Learn of Programs and Offers

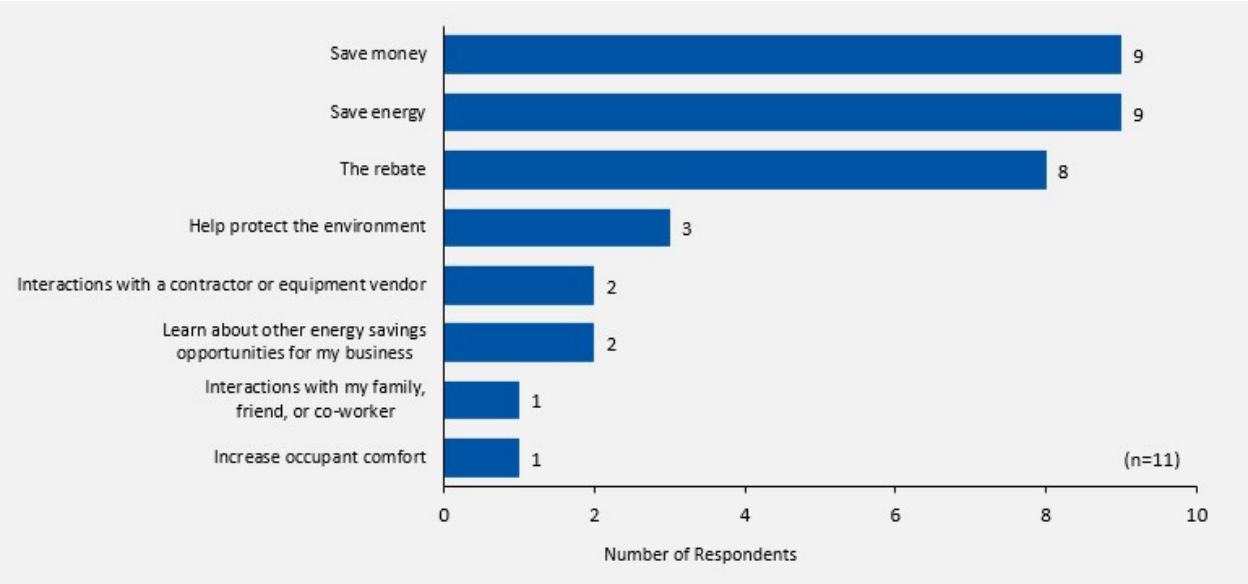


Source: Site Specific survey questions C3: "What is the best way for Avista to inform commercial customers like you about their rebates and incentives for energy efficiency improvements?"

Participation Motivations and Benefits

Figure 3 shows the distribution of motivations reported by PY 2021 Site Specific survey respondents. Respondents were primarily driven by economic motivations, including saving money (nine respondents), saving energy (nine respondents), and utilizing the Avista rebate (eight respondents).

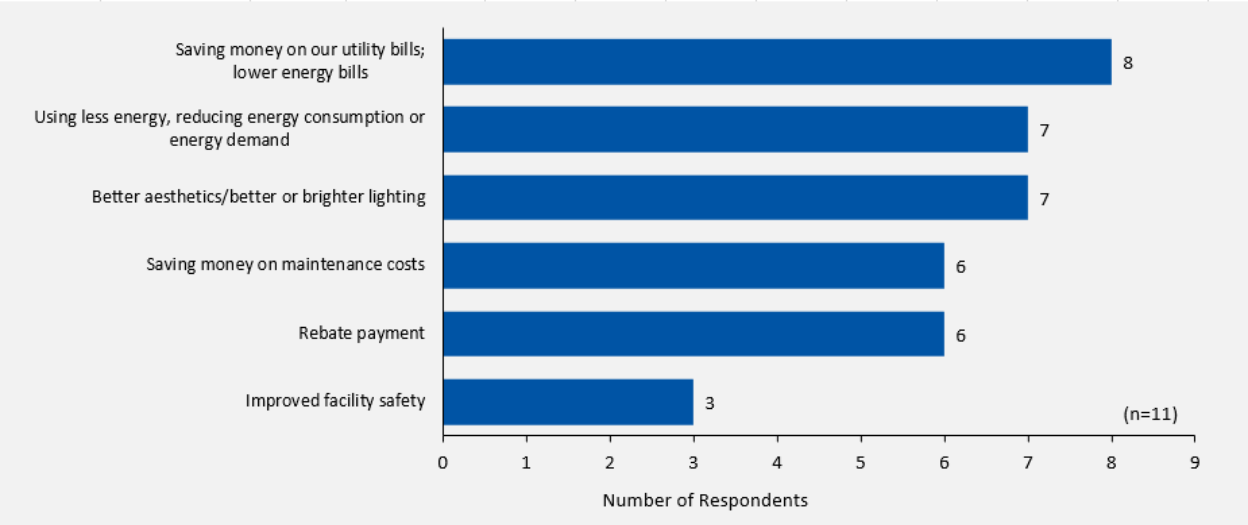
Figure 3. Site Specific Participant Motivation



Source: Site Specific survey question C4: "What motivated you to participate in the Site Specific Program?" Multiple responses allowed.

Respondents' perceived benefits aligned closely with their motivations, as shown in Figure 4. The majority (eight respondents) cited saving money on utility bills, followed by using less energy as benefits (seven respondents) and better aesthetics from improved lighting (seven respondents).

Figure 4. Site Specific Participation Benefits



Source: Site Specific survey question C6: "What would you say are the main benefits your company has experienced as a result of participating in the Avista Site-Specific Program?" Multiple responses allowed.

Customer Experience

Program Delivery

Most PY 2021 respondents (five of 11) reported their contractor, vendor, or retailer was involved in the design or implementation of their project, four said their Avista account executive was involved, and two completed the project with internal resources. Over half of the respondents (five of 9) said the contractor, vendor, or retailer took the lead in preparing the application, three respondents completed the application themselves, and one said their Avista account executive took the lead in completing their application. Three respondents said the contractor, vendor, or retailer provided a discount on the cost of their project and most received a check from Avista directly (six of 9).

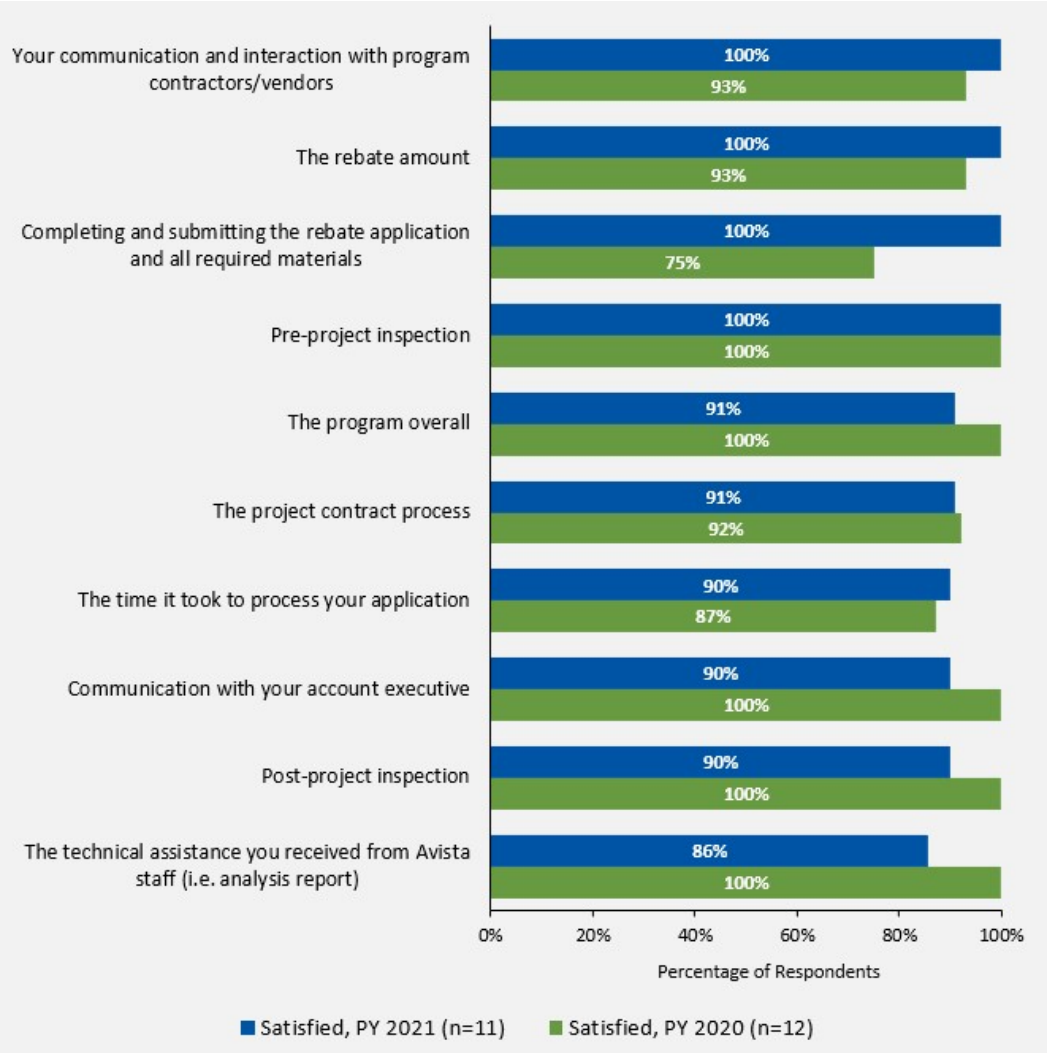
Of the three respondents who did not mention a contractor helping implement their project, one said their Avista account representative was involved in the design of the project, and two said they completed the projects on their own.

Program Satisfaction

Figure 5 shows the percentage of PY 2021 respondents and PY 2020 respondents who rated each program component as *very* or *somewhat satisfied*. Ten of the 11 respondents were *very* or *somewhat satisfied* with the overall program.

Respondents were more likely to be satisfied with several components in PY 2021 than in PY 2020: communication with vendors (100% in PY 2021 vs 93% in PY 2020), the rebate amount (100% in PY 2021 vs 93% in PY 2020), and completing the rebate application/materials (100% in PY 2021 vs 75% in PY 2020). Respondents were less satisfied in PY 2021 than in PY 2020 with the technical assistance they received, their post-project inspection and their communication with their Avista account representative.

Figure 5. Respondents Satisfied with Site Specific Program Components



Source: PY 2021 and 2020 Site Specific survey question E1: "In terms of the Site Specific program, how satisfied were you with the following aspects? Please think about each item individually as you select your answer." Showing only respondents that indicated they were *very satisfied* or *somewhat satisfied*.

Program Challenges and Successes

As shown in Table 8, eight of 11 respondents provided feedback about their program participation challenges. The most common challenge reported by respondents was their lack of knowledge about the program (four respondents), which is consistent with PY 2020. Two respondents reported that coordinating internal resources and external contractors were challenges for them.

Table 8. PY 2021 Participation Challenges

Challenge	PY 2021 (n=8)
Knowledge of the programs, costs and/or the rebates	4
Coordinating internal resources and external contractors	2
COVID-19 restrictions	1
Coordinating with Avista	1

Source: Site Specific survey question E4: "What do you so see as the biggest challenges to participating in Avista's Site-Specific Program for your company or other companies like yours (n=8)?"

On the other hand, PY 2021 respondents commented on many aspects of the program that worked well:

- "The Avista energy efficiency program engineering and utility account executive teams were very helpful."
- "Communication from Avista account executive."
- "It was relatively easy and fast to participate in, so that was appreciated."
- "[The] rebates are a great incentive."
- "Keep doing what you're doing. It worked out well."

Four of the 11 survey respondents provided suggestions about improving the program, which primarily fell into categories listed below:

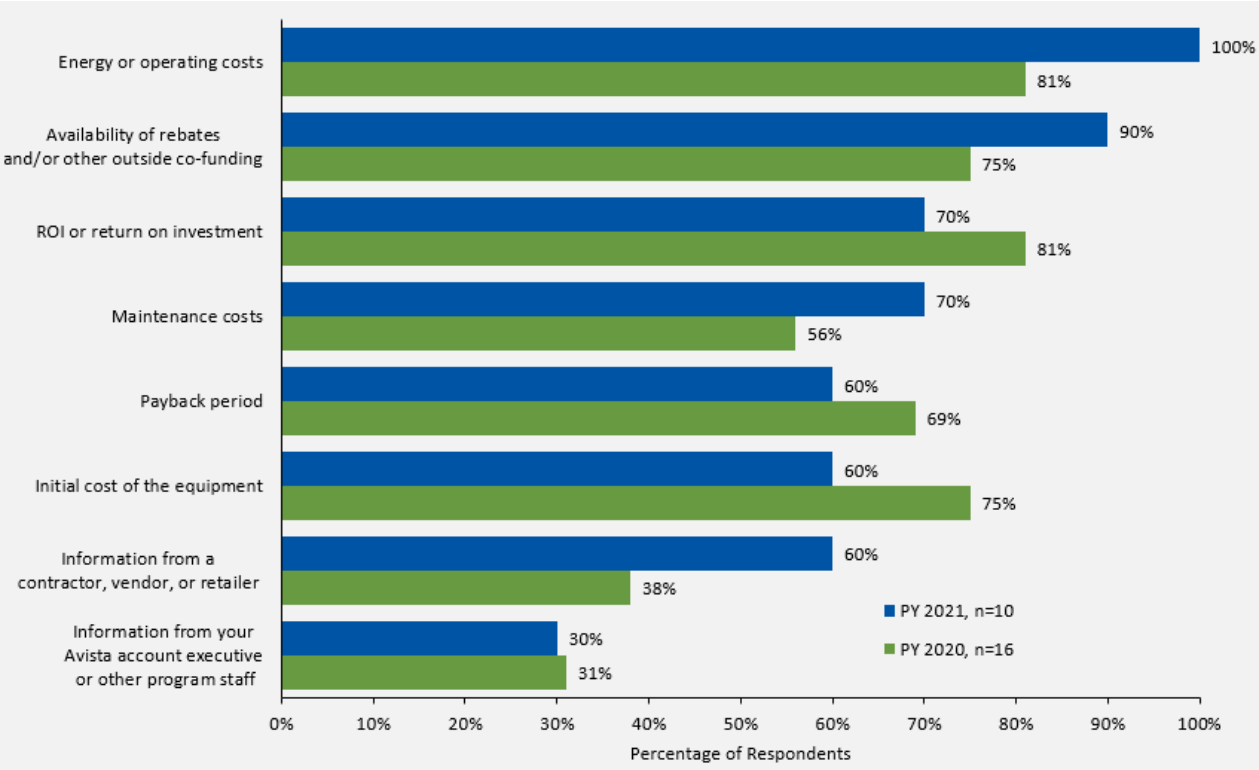
- Increase communication about programs (three respondents)
- Increase rebate amounts (one respondent)

Energy Efficiency Attitudes and Behaviors

Eight of 11 PY 2021 respondents said the rebate provided by Avista was *very important* in their decision to complete their project. Another three said it was *somewhat important*. When making capital upgrades, eight respondents said energy efficiency was *very important*, two said it was *somewhat important* and only one said it was *not too important*.

As shown in Figure 6, respondents most frequently selected energy or operating costs as the most important criteria for making energy efficiency improvements (100%). This was followed closely by the rebate or the availability of outside funding (90%).

Figure 6. Important Criteria for Making Energy Efficiency Improvements



Source: Site Specific survey question F5: "Which of the following criteria are important in deciding whether your company makes energy efficiency improvements?" Multiple responses allowed.

Since participating in the Site Specific program, three PY 2021 respondents purchased energy-efficient equipment, and one adopted new energy-efficient protocols and purchased new equipment. Three respondents who mentioned purchasing new equipment had invested in lighting upgrades. One had purchased compressor upgrades and one upgraded to digital programmable thermostats.

COVID-19 Impacts

In PY 2021, respondents faced potential obstacles related to the COVID-19 pandemic. However, six respondents said there were no impacts to their project from the pandemic. Most respondents (three of 10) who experienced challenges related to COVID-19, experienced issues with delays. These respondents mentioned general delays and delays on receiving equipment. One respondent said their project scope was impacted because it was difficult to get supplies and one respondent said both their project scope and timeline were affected.

Looking forward, two respondents thought the COVID-19 impacts would not affect their organization's interest in or ability to complete other energy efficiency projects. However, two respondents thought there would be less budget available, and two respondents thought there would be more interest in cost-cutting projects like efficiency. One respondent noted that their organization's interest would not be impacted unless there were new guidelines and policies mandated.

Survey Respondent Profile

The majority of PY 2021 Site Specific survey respondents (nine of 11) owned their facilities. Seven of the 11 facilities used gas for heating, and three used electricity. The PY 2021 sample included a range of sectors, including wholesale, retail trade, real estate, education, agriculture, arts, and emergency services.

Nonresidential Prescriptive Findings

This section describes findings from 56 online surveys completed with Prescriptive participants in PY 2021. Because 50 of the 56 respondents installed lighting projects, the results primarily represent lighting participants rather than non-lighting participants. Where meaningful, Cadmus compared PY 2020 results to PY 2021.

Program Delivery

This section provides an overview of program delivery and the impact of COVID-19 in PY 2021:

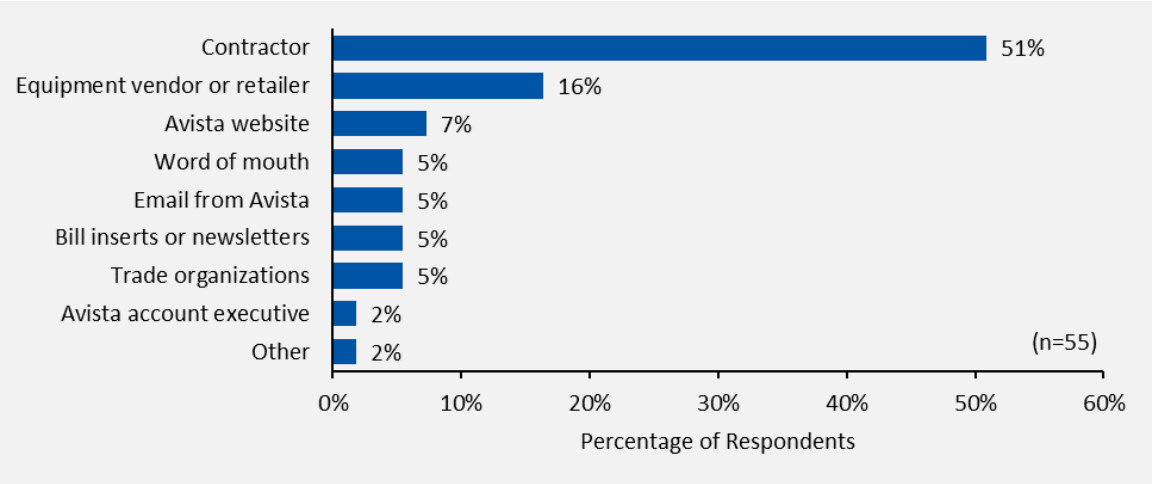
- **Program Changes.** Avista increased incentives for lighting measures in July 2021.
- **Program Participation.** Participation in programs was lower due to COVID-19. Additionally, interest in the Fleet Heat program was lower because there was a mild winter, so customers were less concerned with the potential benefits of this program.
- **Marketing and Outreach.** Most customers learned about the HVAC, variable frequency drives, shell, and grocer measures through their account executive or through the website. Food service equipment participants typically learned about the program through equipment retailers. Customers who installed lighting measures typically learned about the program from their electrician or lighting vendor.
- **Data Tracking.** iENERGY is used to track program data and allows program managers to capture all important data fields. This system has improved reporting capabilities compared to previous systems. Some lighting and food services vendors are able to enter rebate information directly into the system which will continue to increase efficiencies.
- **COVID-19 Impact.** Program goals were not met due to the impacts of COVID-19. This included businesses being unable to complete projects, supply chain issues regarding equipment materials, decreases in installer availability, and general labor shortages.
- **Successes.** Communication with customers was positive and they continued to thank Avista for offering the programs and providing incentives to encourage energy efficiency. Vendor and trade allies continued to successfully support the programs.

Customer Awareness

Just over one-third of PY 2021 survey respondents (34%, n=56) previously participated in an Avista business energy efficiency program, a decrease from PY 2020 (50%, n=60). Of the 19 respondents who participated previously, 15 provided details about programs in which they participated. Most reported installing lighting (87%, n=15), with one respondent reporting they participated multiple projects in previous years and another reporting having previously upgraded a furnace.

Most respondents said they first learned about the program from a contractor (51%, n=55), followed by a vendor or retailer (16%). The top two results are consistent with PY 2020 results.[2] Figure 7 shows the frequency that each information channel was mentioned.

Figure 7. How Participants First Learned of Program



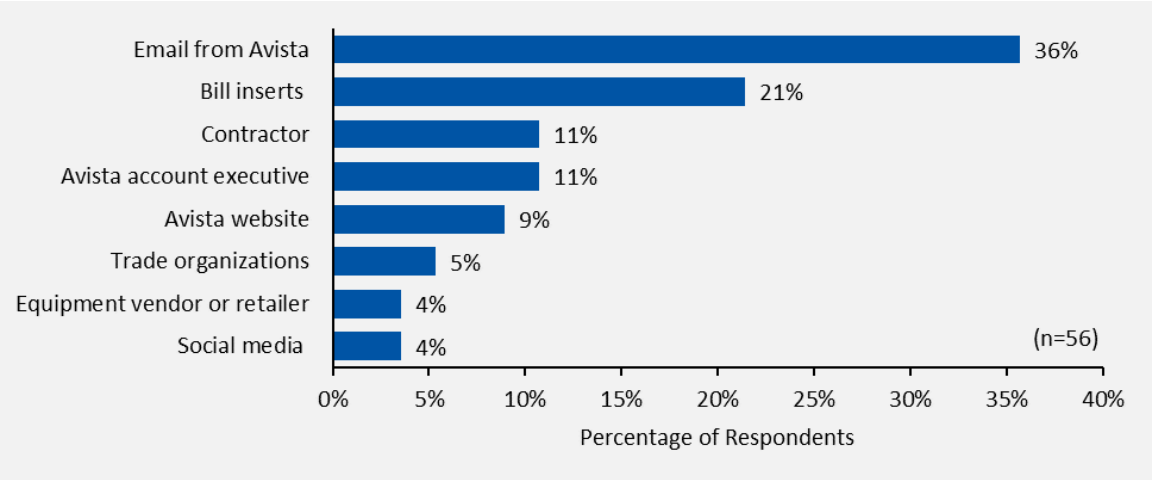
Source: Prescriptive survey questions C2: "How did you first hear about the program?"
Percentages may not total 100% due to rounding.

Respondents most frequently said that the best way for Avista to inform them of rebate programs was by an email from Avista (36%, n=56) or through a bill insert (21%). These were also the top responses in PY 2020. [3] Figure 8 shows the distribution of preferred methods across all respondents in PY 2021.

[2] In PY 2020, most respondents selected contractors (44%, n=63), followed by equipment vendor or retailer (25%).

[3] In PY 2020, most respondents said an email from Avista (31%, n=64), followed by bill inserts (19%).

Figure 8. How Participants Preferred to Learn of Programs and Offers

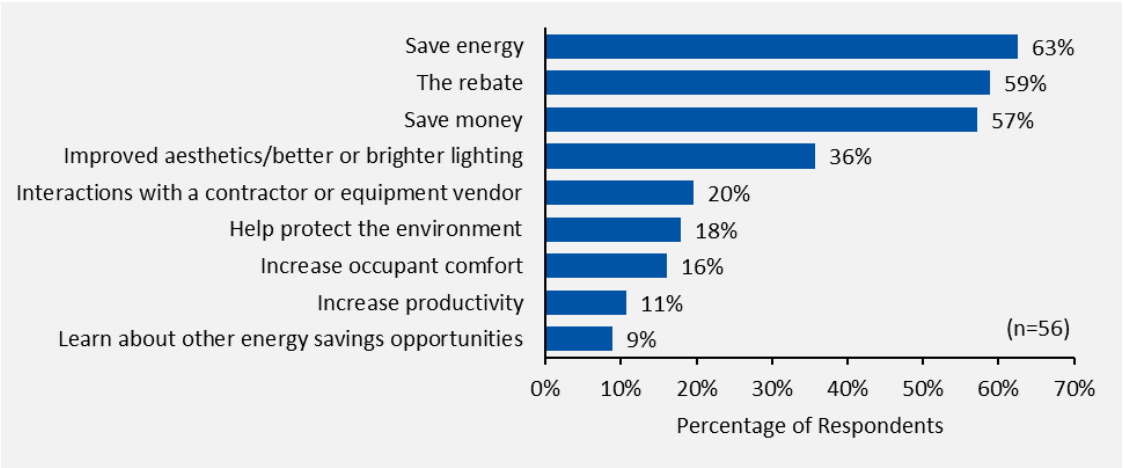


Source: Prescriptive survey question C3: "What is the best way for Avista to inform business customers like you about their rebates and incentives for energy efficiency improvements?" Percentages may not total 100% due to rounding.

Participation Motivations and Benefits

In PY 2021, most respondents said saving energy (63%, n=56) and utilizing the rebate (59%) motivated them to participate in the program, followed closely by saving money (57%). These top three results are similar to the PY 2020 result.[4] As shown in Figure 9, in PY 2021, many respondents said they were motivated by improved aesthetics and better lighting (36%), which was not reported in the PY 2020.

Figure 9. Prescriptive Participant Motivation

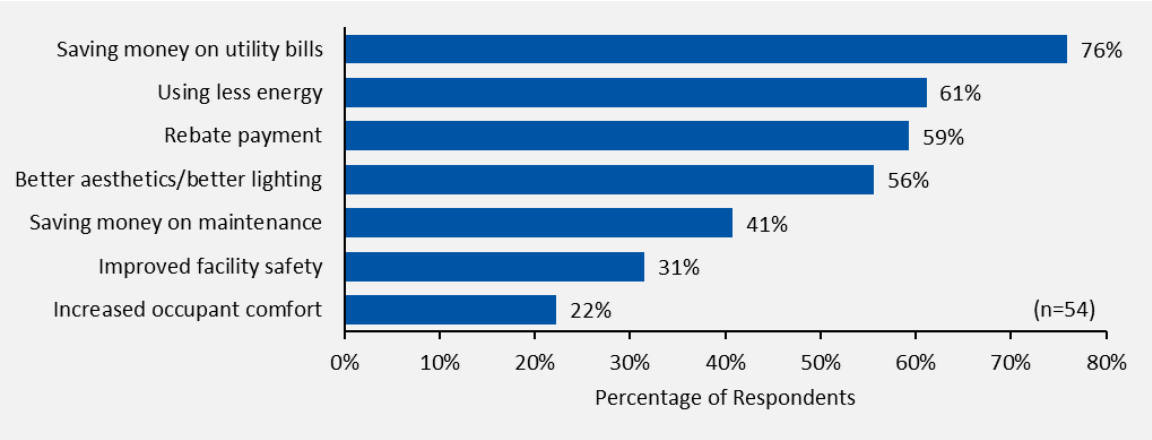


Source: Prescriptive survey question C4: "What motivated you to participate in the program?" Multiple responses accepted.

[4] PY 2020 respondents (n=66) top three motivations for participating were saving money (70%), receiving the rebate (59%), and saving energy (55%).

As shown in Figure 10, PY 2021 respondents' top program benefits align with their motivations to participate, with most respondents reporting that saving money on utility bills was the primary benefit of participation (76%, n=54). This was followed by reducing energy consumption (61%) and receiving the rebate (59%). The top three benefits reported in PY 2021 are consistent with PY 2020 results.

Figure 10. Prescriptive Participation Benefits



Source: Prescriptive survey question C6: "What would you say are the main benefits your company has experienced as a result of participation in Avista's program?" Multiple responses accepted.

Customer Experience

Program Delivery

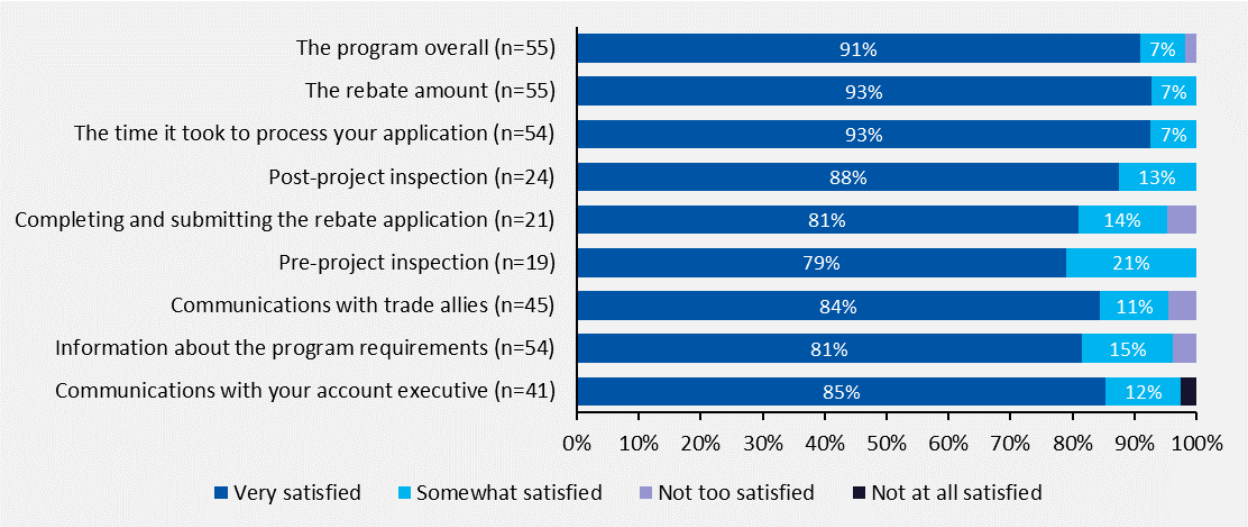
Although the majority of PY 2021 respondents reported a contractor or vendor (85%, n=54) or an Avista account executive (15%) was involved in a project's design or implementation, nearly half of respondents (45%) took the lead on their own applications. These results are similar to PY 2020.

Most PY 2021 respondents (80%; n=44) also received their rebate checks directly, rather than as instant discounts from a contractor or vendor. Of nine PY 2021 respondents who did receive an instant discount, seven of them explained why they chose to receive an instant discount. Two said they chose the instant discount because it was easier for them due to less cash outlay and the process being simple. Two other respondents chose the instant discount as the contractor had set it up as such and they had no problem with it. One respondent reported less wait time, while another respondent was happy with the contractor services from past experience. The last respondent reported not having an option.

Program Satisfaction

PY 2021 respondents were nearly all *somewhat* or *very satisfied* with all aspects of the Avista program, as shown Figure 11. One respondent was *not too satisfied* with the overall program citing challenges in filling out the forms due to lack of instructions from the contractor. None of the other respondents who were *not too* or *not at all satisfied* provided specific reasons for being less satisfied.

Figure 11. Satisfaction with Prescriptive Program Components

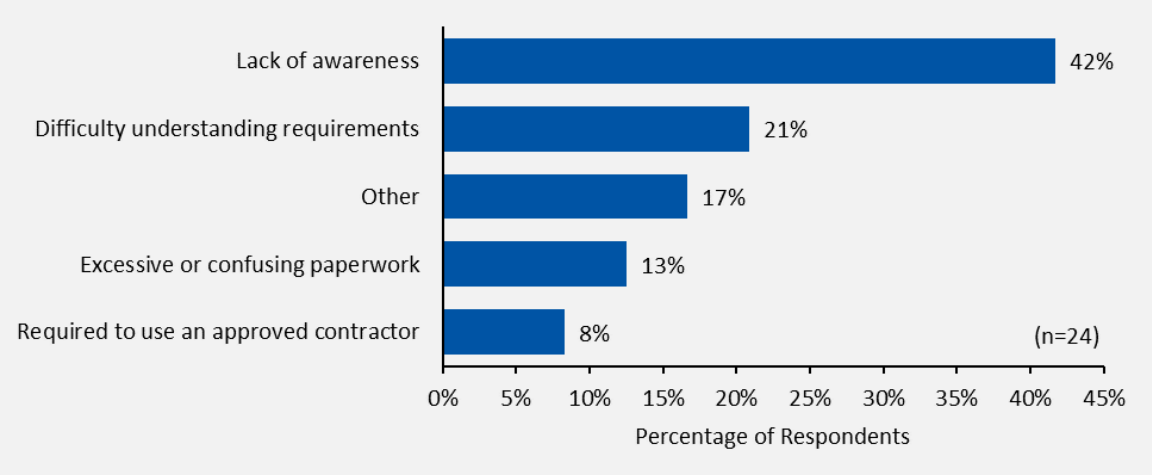


Source: Prescriptive survey questions H1: "In terms of the program, how satisfied were you with the following aspects? Please think about each item individually as you select your answer."

Program Challenges and Successes

When asked what challenges the program presented, 39% of respondents (n=56) provided no response and 18% reported there were no problems or complimented the program. As shown in Figure 12, respondents most frequently cited lack of awareness as their biggest challenge to participation (42%, n=24) followed by difficulty understanding the lighting requirements and rebate form. Two respondents had issues using an approved contractor, for example one respondent mentioned they did not want to use an approved contractor, but would have liked to complete the work themselves. Responses in the "other" category include difficulty disposing of old lighting, internal company challenges such as budget and labor, differing lighting preferences, and finding the decision-maker.

Figure 12. Participation Challenges



Source: Prescriptive survey question H10: "What do so see as the biggest challenges to participating in Avista's program for your company or other companies like yours?" Percentage may not sum to 100% due to rounding.

PY 2021 respondents provided feedback about what worked well in Avista's Prescriptive programs. As shown in Table 9, respondents most commonly mentioned the fast or easy application process (seven respondents, followed by the opportunity to save energy and money on utility bills (six respondents).

Table 9. Aspects of the Prescriptive Programs that Worked Well

Program Aspects	Number of Respondents
Easy/fast process	7
Saving energy and money on utility bills	6
Overall program works well	5
Good customer service	5
Rebate amount	4
Contractor support	3
Program duration	2
Access to better lighting	1

Source: Prescriptive survey question H12: "What would you say is working particularly well with Avista's program?" (n=33)

As shown in Table 10, 18 respondents made suggestions for improvements to the Prescriptive programs. Respondents most frequently suggested providing more information about the program requirements (nine respondents).

Table 10. Suggestions to Improve Avista Prescriptive Programs

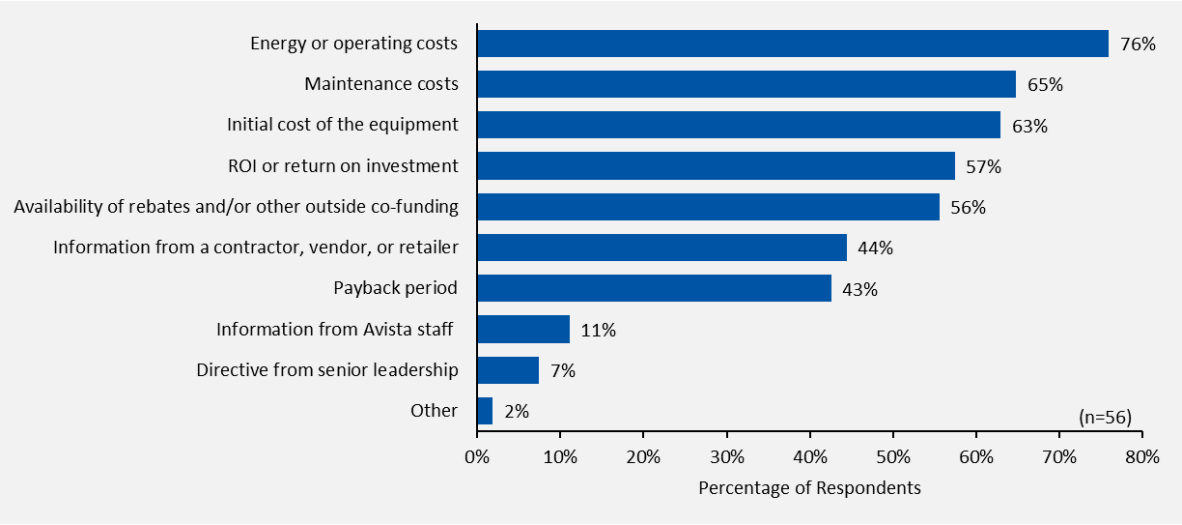
Suggestion	Number of Respondents
More information about program requirements	9
More marketing to customers	3
Expansion of prescriptive list to include motion sensors and other lighting options	2
Vendor motivation	1
More time to submit rebate application	1
Bigger rebates	1
List of available contractors	1

Source: Prescriptive survey question H11: "What recommendations, if any, would you make to improve the program?" (n=18)

Energy Efficiency Attitudes and Behaviors

A majority of the PY 2021 respondents (98%, n=55) considered energy efficiency either *somewhat* or *very important* to their organization when making capital upgrades or improvements. As shown in Figure 13, respondents cited energy or operating costs (76%, n=56) as the most important criteria in their decision to undertake energy efficiency improvements, followed by maintenance costs (65%) and initial cost of equipment (63%).

Figure 13. Important Criteria for Making Energy Efficiency Improvements



Source: Prescriptive survey question I4: "Which of the following criteria are important in deciding whether your company makes energy efficiency improvements?" Multiple responses allowed.

The survey asked respondents how the COVID-19 pandemic affected their project. The majority of respondents (78%, n=51) reported there was no impact, while 16% said the pandemic impacted the project timeline, and 6% said it impacted both the timeline and the scope. One respondent mentioned that COVID-19 impacted the project positively as they could complete the project faster. Those who reported negative impacts described the following factors:

- Supply chain problems (six responses)
- Labor shortages (two responses)
- Delay in project (one responses)

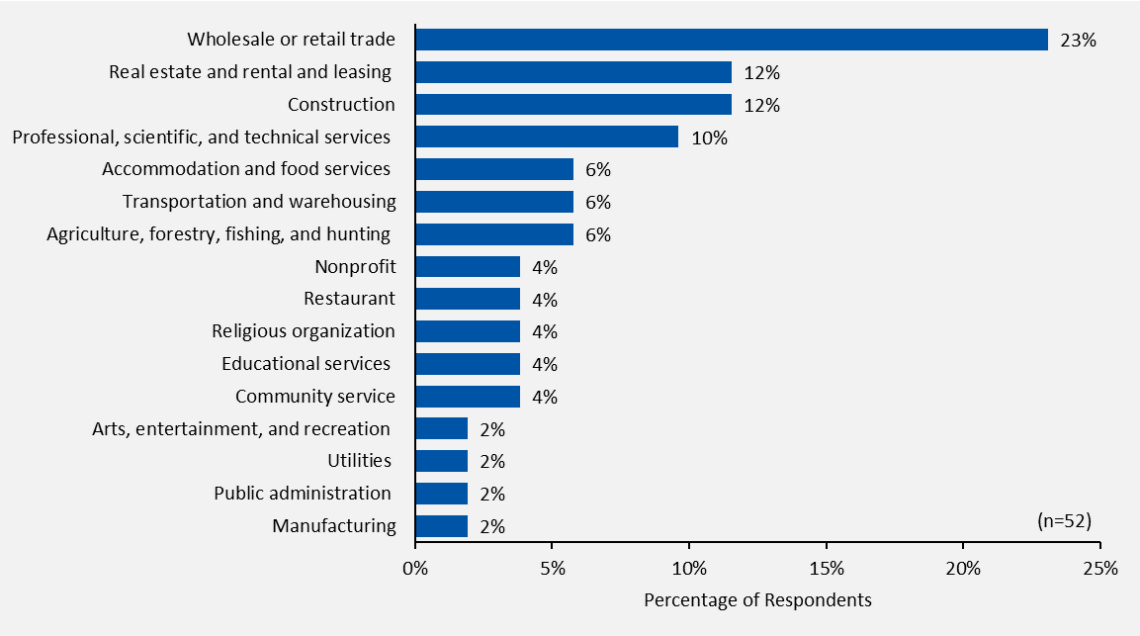
Survey Respondent Profile

The PY 2021 participant survey collected firmographic information about Prescriptive program survey respondents. The majority of the survey respondents had the following characteristics:

- Natural gas as their primary heating fuel (64%; n=50)
- Owned their own facilities (81%; n=52)
- Fewer than 100 employees (95%; n=34)

Figure 14 shows respondents' organization types. Respondents were most frequently from the wholesale or retail trade industry (23%, n=52), followed by real estate and rental and leasing (12%) and construction (12%).

Figure 14. PY 2021 Prescriptive Survey Organization Types



Source: Prescriptive survey question J1: "What is the primary industry of your organization?" Note: May not sum to 100% due to rounding.

Nonresidential Conclusions and Recommendations

This section includes Cadmus' conclusions and recommendations for Avista's nonresidential Site Specific and Prescriptive programs based on the evaluation findings.

Nonresidential Conclusions

- **Overall, respondent satisfaction with the PY 2021 Site Specific and Prescriptive programs was high.**
  - Overall, 91% of Site Specific respondents and 98% of Prescriptive program respondents said they were *very* or *somewhat satisfied* with the program.
  - While most Site Specific respondents reported increased satisfaction across most categories in PY 2021, satisfaction with the technical assistance received from Avista staff decreased slightly from 100% in PY 2020 to 86% in PY 2021.
  - While satisfaction with all aspects of the Prescriptive programs remained high, some respondents expressed dissatisfaction with completing and submitting the rebate application, communication with trade allies and their account executive, and information about program requirements.
- **PY 2021 Site Specific and Prescriptive respondents' top motivations to participate aligned with their top benefits from the program.**
  - Site Specific respondents were motivated to participate in the program to save energy (nine of 11), to save money (nine of 11), and to receive the rebate (eight of 11).

  - Site Specific respondents said that saving money on their utility bills was the main benefit of participation for their company (eight of 11), followed by using less energy (seven of 11) and improved aesthetics (seven of 11). Although receiving the rebate was not one of the top three benefits, a majority of respondents named it as a benefit (six of 11).
  - Prescriptive respondents most frequently cited saving energy (63%; n=56), receiving the rebate (59%; n=56), and reducing energy (57%; n=56) as reasons for participating in the programs.
  - They similarly cited these three items as benefits: saving energy (76%; n=54), reducing energy (61%; n=54), and receiving the rebate (59%; n=54). While not one of the top three benefits, prescriptive respondents also cited improved aesthetics as a top benefit (56%; n=54).
- **In PY 2021, the relationship between Site Specific respondents and vendors/contractors worked well for different aspects of the program.**
  - All Site Specific respondents were especially satisfied with their vendors and contractors, specifically with their communication with program contractors. Five of 11 respondents said that their contractor, vendor, or retailer was involved in the design of the project and took the lead in preparing their application.
- **Respondents in all nonresidential programs continued to report a lack of knowledge as a challenge to participation.**
  - Most Site Specific respondents (eight of 11) said their lack of knowledge about the program was a challenge and three recommended increasing communication about the program to participants.
  - Most Prescriptive respondents said their lack of awareness about the program was the biggest challenge to participation (42%, n=24). Some respondents (nine of 18) said that more information about the program requirements would improve the Prescriptive program.
- **In PY 2021, Site Specific and Prescriptive respondents said the programs were easy to participate in and provided other aspects of the program that worked well, such as energy savings, receiving the rebate, and communication.**
  - Site Specific survey respondents said the Avista engineering and utility account executives were helpful (two responses), the program was easy to participate in and worked out well (two responses), and that they appreciated the rebates (one response).
  - Seven of 33 Prescriptive program participants said the program had an easy/fast process and six of 33 said savings received due to improvements worked especially well.
- **While most respondents stated they did not experience any impacts due to the continued COVID-19 pandemic, a small number of respondents said that timing delays continued to persist in PY 2021.**
  - Most of the Site Specific respondents said that there were no COVID-19 impacts to their project (six of 10), while those who experienced challenges said their project timeline was

impacted due to delays (three of 10) and one respondent said the project scope was impacted.

- A majority of the Prescriptive respondents (78%, n=51) reported no impact on their projects. Among those who did report COVID impacts, respondents most frequently mentioned time labor/supply chain problems (eight responses) and time delays (one response) as roadblocks.

Nonresidential Recommendations

Nonresidential Recommendation 1: Consider developing and using customer testimonials in targeted outreach to customers who have not historically participated in programs. The testimonials from satisfied participants could focus on the ease of participating in the programs and the benefits of participation, such as reduced energy use, bill savings, and receiving the rebate. The marketing could also provide information to prospective participants on potential energy savings for businesses with similar profiles.

Nonresidential Recommendation 2: Continue to look for ways to provide contractor and installer training, educational resources about program requirements, and application completion tips to remove roadblocks or communication issues between Avista and participants.

Low-Income Programs

The Low-Income program consists of Community Action Program (CAP) agencies providing qualified customers with energy efficiency measures, drawn from an Approved Measures List, at no cost. Avista receives a set funding portion for each state and reimburses CAPs for the measures' cost.

Low-Income Program Findings

For its process evaluation of the Low-Income program, Cadmus conducted stakeholder interviews with Avista staff and with CAP agencies participating in PY 2021.

Stakeholder Interview

In August 2021, Cadmus interviewed Avista staff about its Low-Income program, and they confirmed that, in Washington and Idaho, Avista provided funding to CAP agencies, which ultimately became responsible for qualifying potential customers based on their income.

Successes

Avista staff reported two successes for the PY 2021 Low-Income program:

- **CAP agency relationships:** Avista staff noted an overall positive relationship with CAP agencies. They emphasized that they appreciated their partnership with these agencies and how they serve an integral role in operating the program.
- **Data tracking:** Program data are tracked through the Customer Care and Billing system, which Avista staff said meets the needs of its staff.

Challenges

Avista staff reported a few challenges with the program in PY 2021:

- **Savings and participation goals:** Avista staff reported the program was likely to fall short of savings and participation goals for the year and this was largely due to the COVID-19 pandemic. CAP agencies were still not administering the program to seniors, people with health conditions, or any other customers who may be more vulnerable, which comprised a large portion of their typical base.
- **New CAP agencies:** Avista staff said there were two CAP agencies that were relatively new to the program in 2021. While staff noted that they had good relationships with these agencies, they had struggled to find any customers in their territory due to a small overall customer base.
- **Marketing:** Avista staff reported they had not introduced any new channels for marketing the program, largely due to COVID-19. They noted that marketing is often done through in-person outreach at energy fairs, food banks, and workshops for seniors, all of which were impacted. Staff also said that they put together a post card campaign and email blast to customers with information about the program and the CAP agencies but had not received much response from the effort.

CAP Agency Interviews

In September 2021, Cadmus conducted interviews with six CAP agencies participating in the Low-Income program. Two of the agencies were relatively new to the program and therefore had not completed any projects with Avista funding as of the time of their interviews.

To qualify their clients by income, all of the CAP agencies said they used the Department of Commerce low-income standard to income-qualify new clients.

In terms of prioritizing customers that qualify, the CAP agencies identified certain priority groups, such as elderly clients, clients with small children, Native Americans, clients with high energy usage, and clients with disabilities.

Avista provides funding to the CAP agencies on a calendar-year basis. All six agencies said the schedule of funding by Avista works well for them and how they need to treat their clients' homes. All six agencies also reported that the current level of funding is sufficient to meet their needs, although three noted some caveats. One agency reported that since COVID-19 interrupted participation, it is hard to truly know if the current level of funding is sufficient and added they could potentially add more staff to take on more work if funding increased. Similarly, another agency reported that the current level of funding is sufficient for what they can handle right now, but they could take on more work if they hired additional employees and received more funding. Another agency said the level of funding had fluctuated over time, which makes it difficult to plan their needs for future years.

The CAP agencies have a mix of in-house teams that complete project work and external contractors they work with to complete more specialized work. Three of the agencies reported they had sufficient contractor support, two agencies had not begun work yet, and one agency struggled with contractor availability. This agency had their own crews for some work, but contracts out tasks related to furnaces, heaters, and electrical work. They said there were some issues with availability when construction work started picking back up following shut downs from COVID-19. One CAP agency suggested that Avista promote workshops for crew-based workers coming out of school so there are more trained workers available.

Successes

CAP agencies reported three major successes for the Low-Income program:

- **Relationship with Avista:** All six CAP agencies emphasized a positive relationship with Avista. All CAP agencies also noted the Avista was good at communicating with them about the program and providing them with the proper amount of support to operate in the program.
- **Positive customer feedback:** Four of the CAP agencies reported that they receive mostly positive customer feedback from the work they do through the program. Some agencies noted occasional complaints, but said these are pretty rare. Two CAP agencies were relatively new and had not had any participation in PY 2021 at the time of the interview, so they were unable to provide feedback.

- **Reliable data tracking systems:** Five CAP agencies reported the current data tracking systems in place were meeting their needs for administering the program.

Challenges

CAP agencies mentioned several challenges with the Low-Income program:

- **Program implementation during the COVID-19 pandemic:** All six CAP agencies reported impacts on program participation due to COVID-19. Program participation was initially suspended in PY 2020, while the CAP agencies worked to establish health and safety protocols, and five agencies noted that engagement was slow to return in PY 2021 as a result.
- **Marketing:** Three CAP agencies serving Washington customers reported challenges with customer engagement and marketing efforts. One agency said they noticed fewer clients requesting help in PY 2021 and that they were looking at new ways to market the program and be proactive in engaging with customers. Two other agencies had not completed any projects in PY 2021 at the time of the interview, but said that Avista was working with them to market the program. However, they still faced struggles with recruiting clients to the program.
- **Additional barriers:** Four CAP agencies noted additional barriers for program implementation and customer participation. One agency noted an issue with finding contractors (electricians particularly) to perform work. Two other agencies noted issues with trying to engage with certain members of their communities. One agency serving Washington customers said their county has a higher concentration of Hispanic clients who they have struggled to engage with, while another agency serving Washington customers said their county has clients from the Marshall Islands and they have been unable to find a translator to help communicate with them. One CAP agency serving Idaho customers reported issues with untreatable homes due to things like a damaged roof or sewer line.

Community Energy Efficiency Program Findings

The Community Energy Efficiency program (CEEP) is also implemented by CAP agencies, though the program only operates in Washington. Funding for the program comes from the Washington capital budget for energy efficiency improvements in identified areas that do not tend to benefit from traditional energy efficiency programs. These are typically areas with low- to moderate-income customers, small businesses, multifamily residences, and alternative fuel homes.

For its process evaluation of CEEP, Cadmus conducted a stakeholder interview with Avista staff.

Stakeholder Interview

In August 2021, Cadmus interviewed Avista about CEEP, and Avista staff thought they would have a chance to spend out the funding for the program based on the current level of participation. The funding for the CY 2021 program was set to expire in May of 2021, but an extension was granted through the end of the year due to COVID-19 and its impact on the work. Avista staff stated the current program has three focus areas: (1) energy efficiency improvements to multifamily properties, (2) removal of alternative heating sources (e.g., wood, oil) in favor of heat pumps and weatherization

upgrades, and (3) a small business efficiency effort. The small business effort was combined with a business partner program to target small rural towns and provide them with comprehensive information about the utility to educate and raise awareness of energy efficiency and identify potential projects. Avista staff clarified that CAP agencies only implement the first two focus areas of the program, but that the third focus area operates independently through the partner program, which can use CEEP funding for any projects identified.

Avista staff also reported that while they identified some potential opportunities for program participation, the CAP agencies were the primary way they identified participants. They also noted that they were unable to conduct a large marketing effort for the program due to limited funds.

Staff said they were thinking of shifting the focus from multifamily residences to the removal of wood stoves (which they received some funding from a local clean air agency to help with) and possibly expanding weatherization efforts.

Low-Income Conclusions and Recommendations

This section includes Cadmus' conclusions and recommendations for Avista's Low-Income program based on the evaluation findings.

Low-Income Conclusions

- **CAP agencies and participating customers were highly satisfied with the Low-Income program.**
  - Avista and all six CAP agencies interviewed emphasized positive, well-established relationships that were communicative and collaborative. Despite facing challenges with participation, some CAP agencies noted that Avista was working with them to market the program and increase outreach in an effort to bring in potential customers.
  - All four CAP agencies that had participated reported that customers generally provided positive feedback. These agencies said that customers were typically happy with the equipment they received through the program and appreciative of the work provided.
- **The COVID-19 pandemic impacted program implementation and participation.**
  - Both Avista and CAP agencies reported that COVID-19 impacted the program in PY 2021. After Avista temporarily suspended the program in PY 2020 to establish health and safety protocols, participation was slow to rebound in some areas. While some CAP agencies had returned to steady work, others (especially newer agencies) have struggled to reach customers. Other customer bases, such as elderly clients and clients with health vulnerabilities, were still difficult to serve at the time of the interviews.
  - Program marketing also suffered as a result of the pandemic. Certain in-person events that were previously used to market the program were cancelled, which made particular groups of clients more difficult to reach.

Low-Income Recommendations

Low-Income Recommendation 1: Increase and adjust program marketing efforts to target hard-to-reach members of the income-eligible community. As more in-person events are offered, market the program to increase potential customer participation. Along with in-person events, offer virtual marketing opportunities to reach more vulnerable customers, such as the elderly or those with health vulnerabilities, who may not be able to attend in-person events. Work with community groups in rural areas to help identify customer bases and strategize marketing efforts to inform them of the program.

Low-Income Recommendation 2: Continue to work with newer CAP agencies to help increase customer participation. Providing support in more rural areas where these new CAP agencies are working will be essential to helping them gain customers. Understanding the needs of people within their territories can also help inform targeted marketing offerings or ways to promote the program.

Residential Programs

The Space Heat, Water Heat, Shell, and Windows programs provide residential households with Prescriptive rebates for installing space heat, water heat, smart thermostats, storm and standard windows, and natural gas space and water heat.

Residential Program Findings

For the PY 2021 process evaluation, Cadmus completed interviews with the Avista program manager and conducted 150 online surveys with Space Heat, Water Heat, Shell, Windows, and Fuel Switching program participants. The following sections present results and detail the findings.

The survey sample sizes noted in this report may vary by survey question because respondents could skip questions if they chose not to answer; therefore, not all respondents provided answers to every question. Cadmus included all survey responses.

Program Delivery

This section provides an overview of program delivery and the impact of COVID-19 in PY 2021:

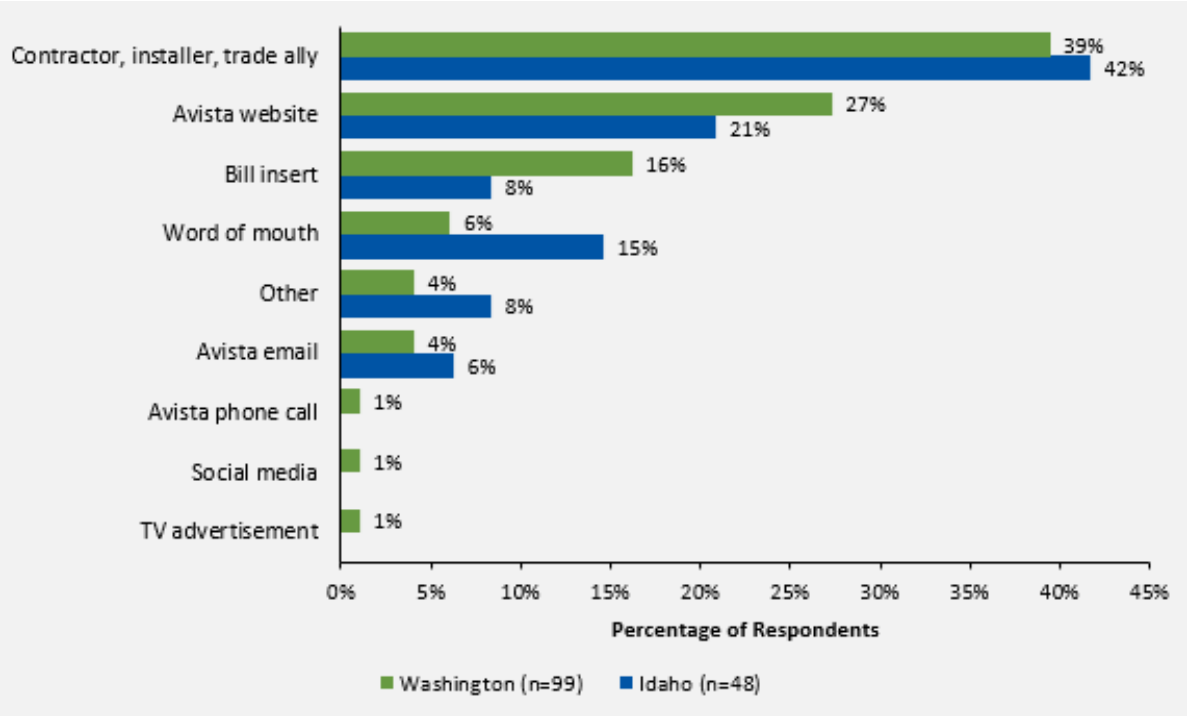
- **Rebate submission.** Customers continued to participate through two avenues of rebate submission: directly by the customer or landlord or through trade allies, such as contractors.
- **Equipment and incentive levels.** Avista increased the rebate amounts on a few equipment categories and added a few new equipment types to the list of eligible equipment.
- **Marketing and outreach.** In PY 2021, the program continued to run the "Ways to Save" advertising campaign and continued to reach out to customers through email blasts. Avista updated the website as needed when program offerings changed.
- **COVID-19 impact.** The pandemic was the main challenge in PY 2021. Not all program goals were met because of the impact of pandemic-specific issues, such as quarantine periods, contractor staffing issues, and customers being less likely to allow contractors in their home. Some of these issues impacted project completion but Avista was lenient with project completion schedules to account for timeline challenges. Additionally, the cost of equipment continued to increase due to supply chain issues caused by the pandemic. This increased equipment cost was a challenge for customers, but Avista was able to increase some incentives in response to this customer challenge.

Space Heat, Water Heat, Shell, and Windows Customer Survey Results

Customer Awareness

Cadmus asked survey respondents where they learned about the program in which they participated. In PY 2021, respondents in both states most frequently said they learned about Avista programs through contractors, installers, or trade allies (39% in Washington and 42% in Idaho). This was followed by the Avista website in both states (27% in Washington and 21% in Idaho), bill inserts in Washington (16%), and word of mouth in Idaho (15%). Figure 15 shows state-specific results.

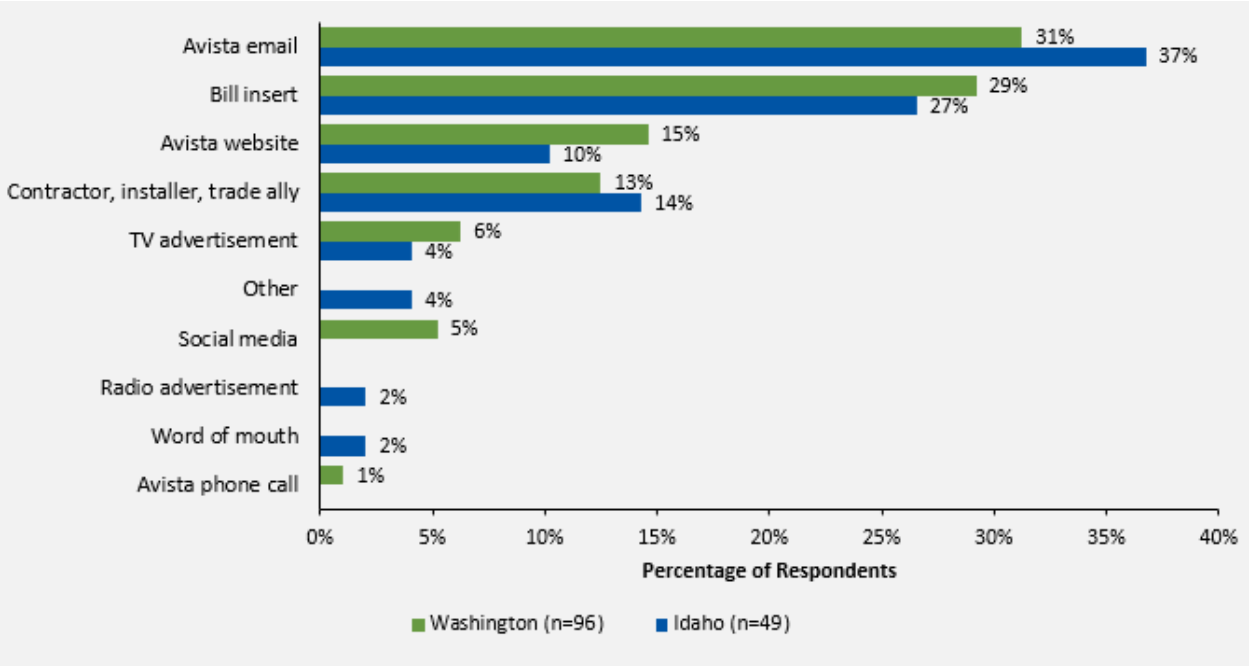
Figure 15. Awareness of Avista Energy Efficiency Programming



Source: Residential Programs Participant Survey, Question D1: "How did you first hear about Avista's Energy Efficiency Rebate program?" Percentages may not add up to 100% due to rounding.

Cadmus also asked respondents how they preferred to learn about Avista's energy efficiency programs. Most PY 2021 respondents in both states preferred Avista's emails or bill inserts (31% in Washington and 37% in Idaho). These preferred methods were consistent with those chosen in PY 2020. Figure 16 shows all state-specific results.

Figure 16. Preferred Method to Learn About Programming

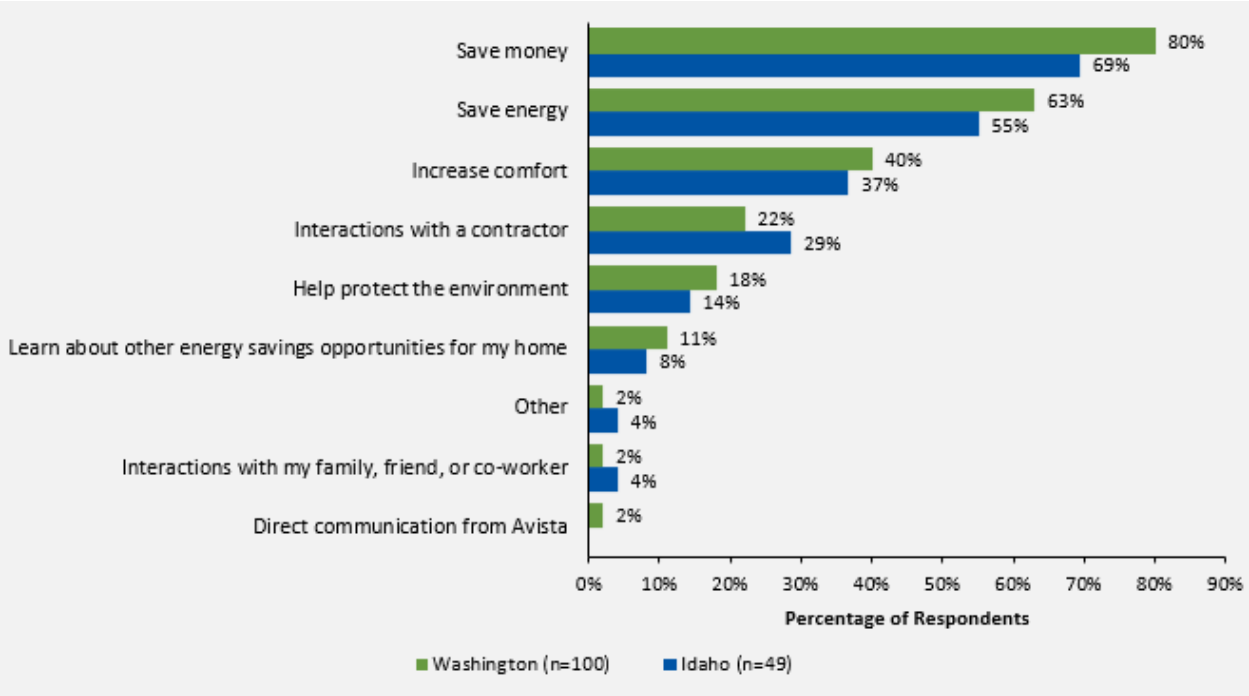


Source: Residential Programs Participant Survey, Question D2: "What is the best way for Avista to inform Residential customers like you about their energy efficiency improvement rebates?"

Motivation and Program Benefits

In PY 2021, respondents participated in Avista's programs primarily to save money (80% in Washington and 69% in Idaho), save energy (63% in Washington and 55% in Idaho), and/ or increase their homes comfort (40% in Washington and 37% in Idaho). Figure 17 shows all state-specific results.

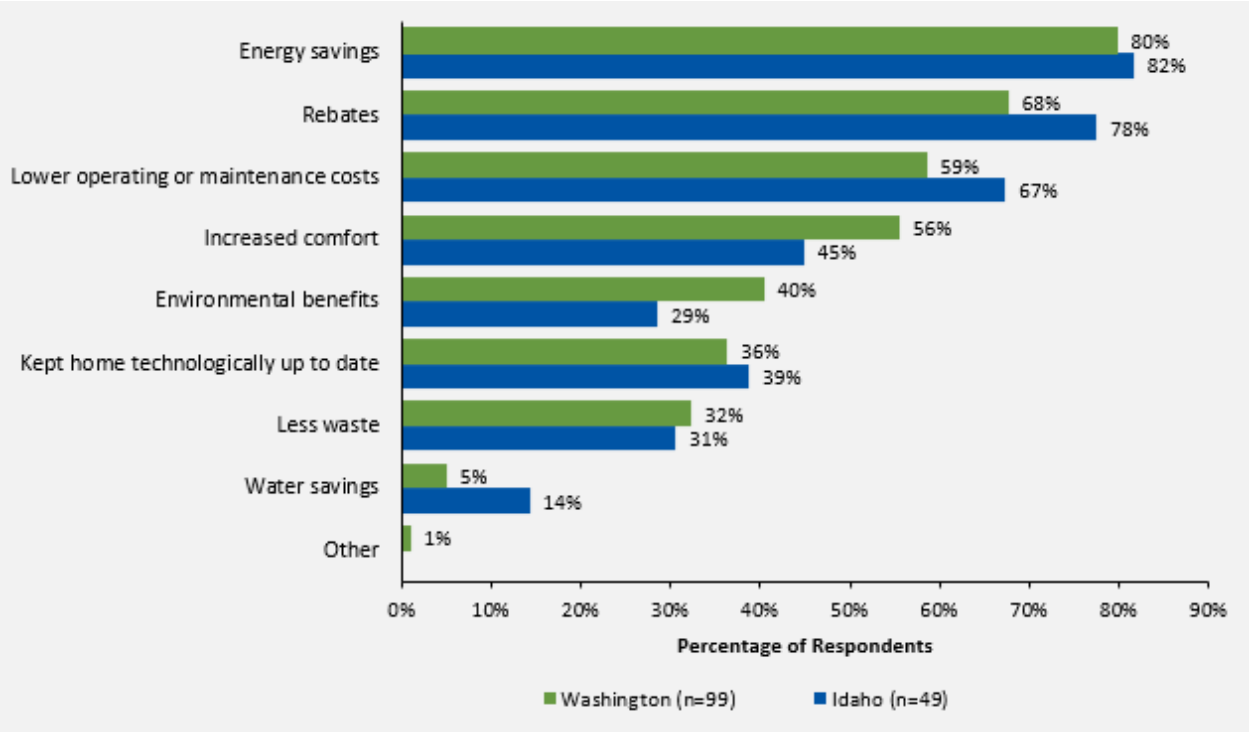
Figure 17. Motivations to Participate in Residential Programs



Source: Residential Programs Participant Survey, Question D3: "What motivated you to participate in Avista's Energy Efficiency Rebate program?" Multiple responses allowed.

Cadmus asked respondents a multiple-response question about benefits they associated with Avista's residential programs. In PY 2021, most respondents cited energy savings (80% in Washington and 82% in Idaho), rebates (68% in Washington and 78% in Idaho), and lower operating or maintenance costs (59% in Washington and 67% in Idaho). While some respondents did note the importance of environmental benefits and less waste, these were not the top responses in either state. Figure 18 shows all state-specific results.

Figure 18. Benefits of Participation in Residential Programs

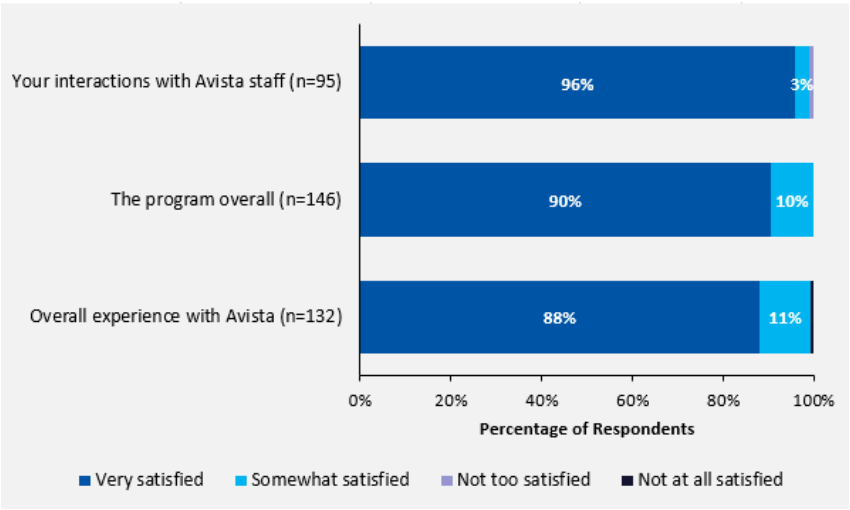


Source: Residential Programs Participant Survey, Question D4. "What benefits come to mind when thinking about your participation in Avista's Energy Efficiency Rebate program?" Multiple responses allowed.

Program Satisfaction

Cadmus asked survey respondents to indicate their satisfaction levels with various program elements associated with their rebate, new equipment, and installing contractor. In PY 2021, all respondents in both states who answered the question said they were *very* or *somewhat* satisfied with the program overall, as shown in Figure 19.

Figure 19. Satisfaction with Avista and Residential Programs Overall

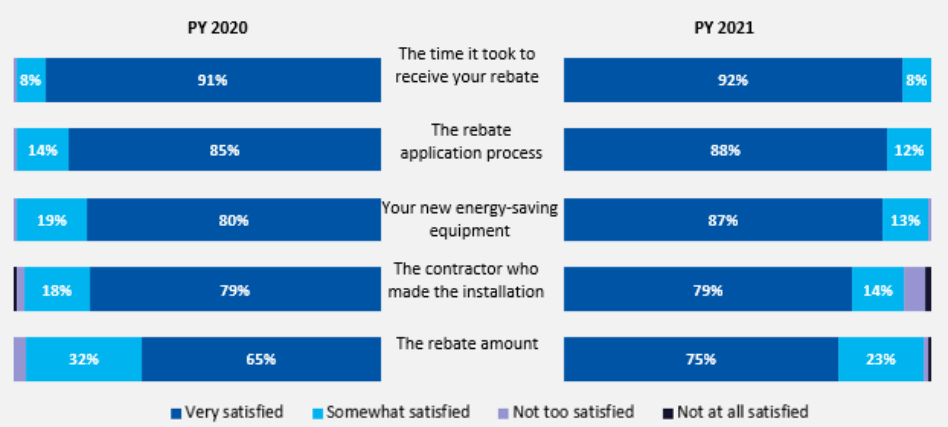


Source: Residential Programs Participant Survey, Questions E1, E4: "How would you rate your overall experience with..."

Figure 20 shows satisfaction with various program components. Respondents were most satisfied with the time it took to receive the rebate (100% said *very* or *somewhat satisfied*; n=141).

The proportion of *very satisfied* ratings increased for four of the components from PY 2020 to PY 2021, while one of them stayed the same, as shown in Figure 20. While satisfaction with rebate amounts still had the lowest *very satisfied* rating of all five elements, the percentage of *very satisfied* responses increased by 10% from 65% in PY 2020 (n=117) to 75% (n=143) in PY 2021.

Figure 20. Satisfaction with Residential Program Elements



Source: Residential Programs Participant Survey, Question E1: "How would you rate your overall experience with..." (PY 2020 n's=101 to 117 and PY 2021 n's=121 to 150)

After asking respondents about their satisfaction with the PY 2021 program and program components, the survey asked respondents' recommendations and feedback regarding possible program improvements. Nineteen percent of respondents (29 of 150) provided feedback, the top two responses—increase awareness/advertising (16 responses) and simplify rebate applications (six responses)—were consistent with PY 2020. This was followed by increase rebate options (three responses), a change from increase the rebate amount in PY 2020. Figure 21 highlights respondents' recommendations and feedback in these program components.

Figure 21. Respondent Feedback and Recommendations for Program and Program Components

Increase awareness/ advertising (16 of 29)

"For us it was a win/win. Communicating how that can be true using examples (smart thermostats) in an email or monthly letter might edge customers closer to a decision. How much one could save in dollars and it's environmental impact, for example."

Simplify rebate applications (6 of 29)

"The request for invoice should be waived when other proof of purchase items are supplied. I tried to get an invoice from the installer but they wouldn't supply me one. The Avista rep was able to get it thankfully."

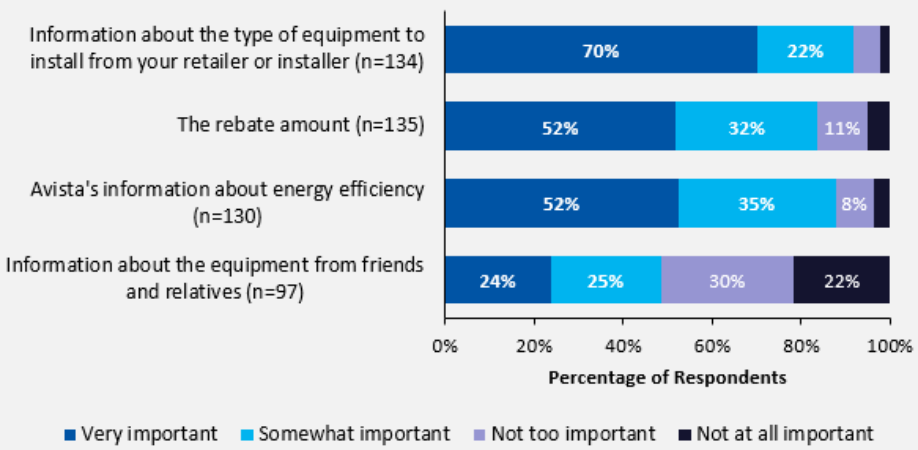
Increase rebate equipment options (3 of 29)

"I would like to see the return of the home insulation program. I did this many years ago and I think my house would benefit from this again."

Decision Influencers

Cadmus asked respondents to rate the importance of several items on their decision to purchase and install the equipment (Figure 22). The majority of respondents rated information about the equipment from retailers and installers as *very important* (70%; n=134), followed by both the rebate amount (52%; n=135) and Avista's information about energy efficiency (52%; n=130).

Figure 22. Influences on Program Participation

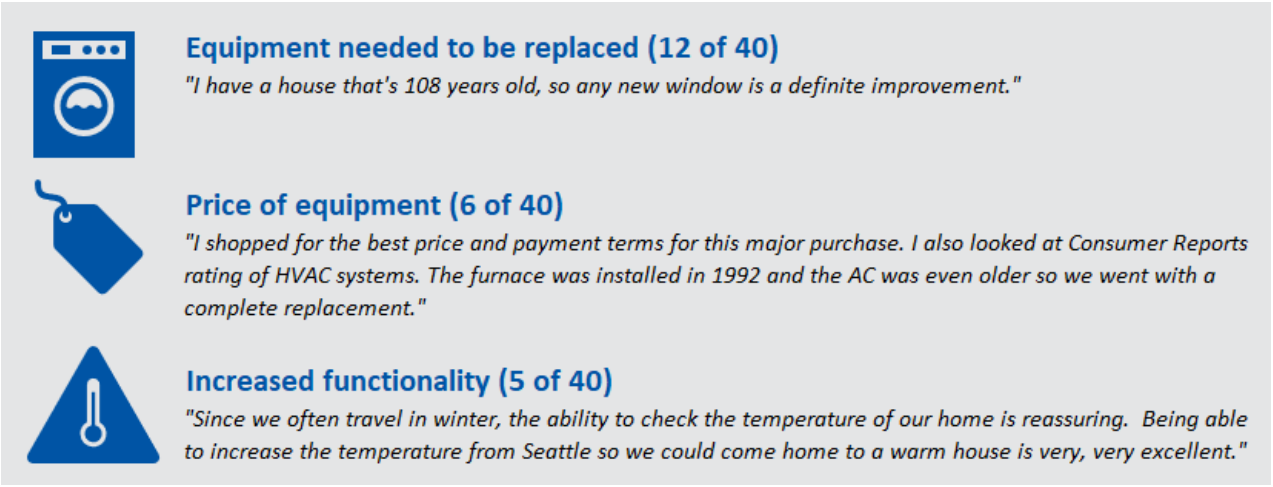


Source: Residential Programs Participant Survey, Question F1: "Please rate the following items on how important each item was on your decision to purchase and install the equipment?"

Cadmus asked respondents if anything else was *very important* in their decision to purchase and install the equipment. Twenty seven percent of respondents (40 of 150) provided an answer that primarily fell

into three categories: equipment needed to be replaced, price of equipment, and increased functionality. Figure 23 provides verbatim feedback from respondents in each category.

Figure 23. Respondent Feedback for Additional Drivers of Equipment Purchases



Survey Respondent Profile

The PY 2021 participant survey collected demographic information about residential survey respondents. The majority of the survey respondents had the following characteristics:

- Had an average household size of 2.3 residents (n=130)
- Owned their homes (99%; n=143)
- Had completed some college or had a four-year university degree (66%; n=140)
- Earned at least $50,000 per year (72%; n=107)

Contractor Interview Findings

In January 2022, Cadmus interviewed 10 contractors, five from Idaho and five from Washington, to collect information about their awareness of and motivation to participate in Avista's residential rebate programs as well as their standard business practices, experiences with the program, and perceptions of customers' experiences with the program.

Program Awareness

Table 11 shows which residential programs contractors said they have participated in.

Table 11. Contractor Program Participation

Residential Programs	Reponses (n=10)
All Programs (unspecified)	2
Most programs (unspecified)	2
Insulation	2
Water heating	1
Fuel switching	1
Appliances	1
Smart thermostats	1
Don't know	1
Source: Interview question B1:, "Which Avista programs have you participated in?" Multiple responses accepted.	

The contractors were also asked about their customers' awareness of the Avista residential rebate programs. Four of the contractors said customers are aware of Avista but were not aware they offered rebate programs while two of the contractors said that their customers had a high level of understanding about the offered programs. The other four did not know whether their customers were aware of Avista or the rebate program offerings.

Motivation to Participate

Eight contractors participated in the residential programs so they could help their customers afford higher efficiency equipment because they would receive a rebate. One contractor said that the programs work well for them and that is why they participate in the program. Another contractor said that by participating in the program, it allows their company to be more competitive among others.

Program Benefits

A majority of contractors said the program benefitted their customers by allowing them to upgrade to more efficient equipment that provided greater comfort and electric bill savings (seven of 10). Two contractors said the program made the difference of whether customers could make such upgrades. One contractor mentioned that customers who participate in the programs, overall, lower their energy bills.

Rebate Application Process

Seven contractors said they typically help their customers complete their rebate forms. Three contractors said they provide their customers with an instant discount on their invoice. All of the contractors who said they have completed the application for their customers did not find the rebate application process difficult (nine of nine).

Table 12 shows the different ways the contractors offered to redeem rebates.

Table 12. Rebate Options

Rebate Type	Description	Count (n=10)
Direct discount	The contractor subtracted the rebate amount up front and invoiced the customer for remaining costs, and the contractor then kept the rebate.	4
Contractor-delivered rebate	The contractor invoiced the customer for the full project cost, received the rebate from Avista, and passed the amount of the rebate along to the customer after the work was completed.	6
Utility-delivered rebate	The contractor invoiced the customer for the full project cost, and Avista delivered the rebate directly to the customer.	0

Source: Interview question D1:, **"**Do you typically help customers complete their rebate forms (and charge the normal price of equipment and installation), or do you provide an instant discount up front and receive the rebate directly through Avista afterward?"

Contractor Experience

Cadmus spoke to contractors about their satisfaction with various program elements and how much the program influenced their businesses' success.

Satisfaction

Contractors rated all program elements shown in Table 13 with high satisfaction marks, ranging from 4.3 to 4.8 on a scale of 1 to 5, where 1 meant *not at all satisfied* and 5 meant *very satisfied*.

Table 13. Satisfaction Ratings by Program Element

Program Element	Average (n=10)
Overall program	**4.8**
Rebate application process	4.7
Rebate levels	4.6
Interaction with Avista	4.5
Equipment covered by rebates	4.3

Source: Interview question D4:, **"**On a scale from 1 to 5, where 1 means *not at all satisfied* and 5 means *very satisfied*, how satisfied are you with…?"

Additional details related to contractors' ratings for each program element above include the following:

- **Rebate application**: All contractors said the application process was simple, straightforward, and user-friendly.
- **Rebate levels**: Contractors were generally satisfied with the rebate levels, although those who did not give a 5 rating (three of 10) said that the rebate amounts could be higher to provide further benefits to customers.
- **Equipment**: Half of the contractors (five of 10) suggested other types of high-efficiency equipment (such as air conditioners, water heaters, and side-arm heat exchangers for boilers and furnaces) that could benefit customers.

Program Influence

Most of the contractors (seven of 10) stated that Avista's rebate program *highly influenced* their decision to recommend its equipment. Six contractors said the program enabled them to sell more higher-efficiency equipment. Two contractors stated that Avista's residential programs did not affect the type of work that their companies perform. No contractors reported negative impacts on their businesses due to participating in the residential programs.

With regard to perceived customer experience, contractors rated the programs' importance on their customers' decisions to purchase high-efficiency equipment on a 5-point scale, where 1 meant *not at all important* and 5 meant *very important*. The overall rating for program importance was 4.9.

> "Participating in Avista's programs can be the deciding factor on whether or not our customers can get the energy-efficient upgrades."
>
> - Contractor

Awareness

Half of the contractors (five of 10) estimated that, on average, 50% of customers already knew about the program when they contacted them and were highly knowledgeable of the program requirements and benefits. Roughly 85% of all customers who contacted the contractors, qualified for a rebate through Avista's residential rebate program.

COVID-19 Impacts

In PY 2021, two contractors in Washington observed sales of energy equipment increase during COVID-19. The contractors explained that the increase in sales was probably because more people were spending time at home and were more aware of the amount of energy their households consumed. Three contractors stated that their customers experienced scheduling issues when trying to find installers. One contractor explained that this issue could be due to the uncertainty of the pandemic or because visits had to be rescheduled due to positive COVID-19 tests. One contractor experienced a delay in receiving equipment. However, none of the contractors said they observed changes in the quality or quantity of the products, nor did they have any issues finding installers. In PY 2021, contractors indicated that most of their work was done via virtual meetings with customers.

Feedback and Recommendations

Four of the contractors stated that they could not think of any recommendations or of any aspect where the program could be improved while two praised Avista's easy and straightforward application process.

> "The programs work well for us."
>
> - Contractor

Six of the contractors provided the following recommendations to improve the contractor and customer experiences:

- Increase rebate amounts (two respondents)
- Provide contractors and customers with an application status tracker in the portal (two respondents)

- Provide contractors with marketing tools (one respondent)
- Provide contractors with a list of certified installers (one respondent)

Residential Conclusions and Recommendations

This section includes Cadmus' conclusions and recommendations for Avista's residential programs based on the evaluation findings.

Residential Conclusions

- **Survey respondents and contractors are highly satisfied with most aspects of the program.**
  - All survey respondents were *very* or *somewhat satisfied* (90% *very satisfied* and 10% *somewhat satisfied*) with the program overall, with over 99% of respondents satisfied with interactions with Avista staff and 99% satisfied with their overall experience with Avista.
  - All contractors were *very* or *somewhat satisfied* with the program overall. They said that the rebate application process was simple, straightforward, and user-friendly.
- **While contractors said the rebate application was simple and straightforward to complete, some survey respondents suggested simplifying the application as a way to improve the program.**
  - All of the contractors who said they have completed the application for their customers did not find the rebate application process difficult (nine of nine) and rated their satisfaction with the rebate application process as a 4.7 on a 5-point scale where 1 means *not at all satisfied* and 5 means *very satisfied* (n=10). As a program improvement, two contractors suggested Avista create an application status tracker in the portal.
  - Most survey respondents who provided improvement suggestions said the program should increase advertising to increase awareness among residential customers (16 of 29) or simplify the rebate application as a program improvement (six of 29).
- **Contractors said the program rebate influenced their decision to recommend equipment to their customers and influenced their customers decisions to purchase and install new energy-efficient equipment.**
  - The majority of the contractors said that their participation in the Avista rebate programs was the defining reason that influenced their customers to receive energy-efficient equipment. They rated the programs influence on their decision to recommend equipment as a 4.7 on a scale from 1 to 5, where 1 is *not influential* and 5 is *very influential*.
  - They rated how influential the program was on their customers decision to purchase new equipment as a 4.9, on a 1 to 5 scale, where 1 meant *not at all influential* and 5 meant *very influential*.
  - Additionally, a majority of survey respondents said the most important reason they decided to purchase and install energy efficiency equipment was because of information from their retailer or installer (70%; n=134).

- **While most residential customers learned about the programs from their contractor, installer or trade ally, they prefer to learn about the program though emails and bill inserts from Avista.**
  - Respondents in both states most frequently learned about Avista programs through contractors, installers, or trade allies (39% in Washington and 42% in Idaho).
  - Most respondents preferred to learn about the programs from Avista's emails (31% in Washington and 37% in Idaho) or bill inserts (29% in Washington and 27% in Idaho). A smaller portion of the respondents preferred learning about the program from contractors, installers, and trade allies (13% of Washington respondents and 14% of Idaho respondents) .
- **Saving money or energy are the key drivers of motivation to participate in the program according to survey respondents.**
  - Respondents participated in Avista's programs primarily to save money (80% of Washington respondents and 69% of Idaho respondents) and save energy (63% of Washington respondents and 55% of Idaho respondents).
- **The COVID-19 pandemic continued to impact customer participation, but Avista pivoted throughout the year to find ways to address customer challenges related to the pandemic.**
  - Some of pandemic-related issues impacted project completion but Avista was lenient with project completion schedules to account for these challenges. Additionally, costs of equipment increased due to supply-chain issues, but Avista was able to increase some incentives to help customers alleviate this challenge.

Residential Recommendations

Residential Recommendation 1: Continue to use emails and bill inserts as the primary forms of program outreach to advertise Avista's residential programs and incentives. In outreach materials, consider using messaging focused on program benefits: energy savings, lower maintenance costs, and increased home comfort.

Residential Recommendation 2: Consult with contractors and identify tips for completing the rebate application that could be shared with customers who complete their own application. These tips could highlight the technical aspects of submitting the application, the steps involved in the application process, and the amount of detail needed for an application so that it can be approved quickly. Additionally, continue to encourage contractors and installers to complete the rebate application for customers to eliminate the confusion some customers feel when they fill out and submit the application themselves.

***Residential Recommendation 3*:** If not already available or planned for development, consider adding a way to track rebate status to the online portal so that contractors and customers can track the status of their applications and follow-up with Avista if anything seems incorrect.

APPENDIX F

Idaho Energy Efficiency Incentive Methodology

Avista Energy Efficiency Programs

Version 2022.1 | 1/1/22 | Avista Corporation

Contents

Purpose and Scope

The purpose of this document is to describe Avista's existing methodology for the modification and setting of rebates (aka incentives) for its Idaho Energy Efficiency Programs. Currently, Avista adjusts incentive levels on an as-needed basis. However, with changes to regional Unit Energy Savings (UES) values, impact evaluation feedback and changing/emerging technology, the result is that some measures are subject to necessary incentive revisions in order to remain cost-effective. The following methodology is designed to functionalize those inputs into an informed approach to modifying incentive levels.

Background

As part of Avista's 2018-2019 application for a prudency determination (Case Nos. AVU-E-20-13/AVU-G-20-08), Commission Staff noted concerns about constant incentive level changes having a negative impact on customer participation, and that incentive level setting for Idaho should be independent from those efforts in Washington. The below comments were provided by Commission Staff in Final Order No. 35129:

> Staff discussed the inconsistency of the Company's energy efficiency rebate and incentive values. Staff noted several occasions where the rebate or incentive amount changed during the year. Staff learned that the Company tries to match rebates for its programs in Idaho and Washington. However, with Washington being evaluated from the TRC perspective and Idaho by the UCT perspective, Staff notes this can be difficult and causes varying rebate amounts between jurisdictions. Staff believed the Company should evaluate its rebates and incentives from the UCT perspective for its Idaho customers before making changes to the rebate and incentive values. Staff believed the Company should consult with its Energy Efficiency stakeholders to formalize a process for evaluating and altering rebate and incentive levels and to document and formalize a process for setting and adjusting rebates and incentives.

In response to these comments, the Idaho Commission provided the following statement, supporting Staff's position:

> The Commission is concerned with the Company's tendency to change some rebate and incentive values frequently. This creates uncertainty for customers who may be interested in the programs, but hesitant to participate due to fluctuations in the rebate and incentive values. An objective standard for changing rebate and incentive levels may encourage participation. We direct the Company, Staff, and interested parties to work together to develop a process to evaluate and change rebate and incentive values. The parties working to address this issue should rely on objective criteria as a baseline for changing the rebate and incentive values and should continue to focus on being cost-effective from a UCT perspective.

Objective Standard to Incentive Level Setting

Avista's approach to incentivizing Energy Efficiency measures is to provide the highest level of benefit to the customer at the lowest resource cost while also remaining cost-effective on an overall portfolio basis. Given that all measures offered within the Demand Side Management (DSM) portfolio have a unique set of UES values, the incentive level for each measure observes the following standards:

1. Maintain a cost-effective energy efficiency portfolio
2. Drive conservation achievements to support Avista's preferred resource strategy of pursuing the lowest cost resources
3. Provide incentives that are meaningful to customers, influencing their decision to pursue energy efficient equipment
4. Structure incentives to avoid unnecessary revisions to promote customer certainty in energy efficiency programs
5. Provide incentives to drive market transformation and/or adoption of emerging technology.

Cost-Effectiveness

As its primary cost test, Avista utilizes the Utility Cost Test (UCT) to set incentive levels for individual measures and to gauge the overall cost-effectiveness (CE) of the DSM program portfolio.

Utility Cost Test (UCT)

The UCT cost-effectiveness analysis approach addresses energy efficiency cost-effectiveness by simply determining which approach has the highest associated net benefit.[1] As the name suggests, the UCT focuses on the overall impact to the utility when pursing DSM by measuring:

1) Benefit: the costs to the company's system that are assumed to be avoided over the life of the measure. These costs included the avoided energy and capacity costs of Avista's system.
2) Cost: the costs are incurred by the company in administering the program which include incentives paid to customers and the program administration costs for the program's entirety.

UCT cost-effectiveness simply comes down to a comparison of reduced utility costs (avoided costs) and the full cost (incentive and non-incentive cost) of delivering the utility program. When the resulting ratio is 1.0 or above, cost-effectiveness is achieved. the below formula provides a simplified calculation of the UCT as it applies to DSM programs.

$$\frac{Levelized\ Avoided\ Cost\ of\ Utility\ Energy}{Incentive\ Cost + Program\ Admin\ Costs} = \boldsymbol{Utility\ Costs}$$

Items that Influence Downward Incentive Revisions

While the goal of this process is to maintain a consistent level for incentive revisions, there are key factors that are considered in incentive modifications.

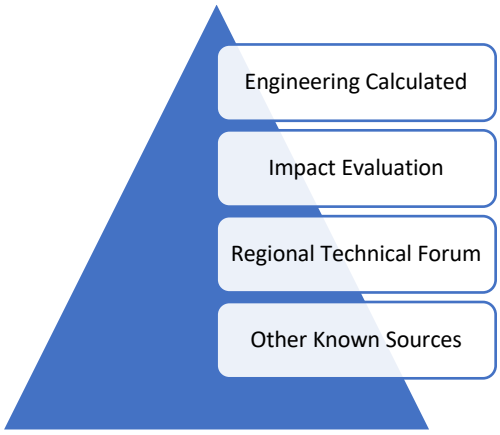
[1] Net benefit is calculated as the avoided cost less the program's cost.

- **Failing the UCT Cost-Effectiveness Test**: When a measure or program achieves a UCT benefit-to-cost ratio lower than 1.0, it is not considered to be cost-effective. This alone does not mean an incentive revision is required; however, it does have a negative impact on individual programs and the overall portfolio.
- **Changes to Avoided Cost:** When the overall system avoided cost is modified as part of Avista's Integrated Resource Plan (IRP) process, the cost avoided per kWh or therm of conservation is impacted. A decrease in the avoided cost value, which is the numerator in the UCT calculation, causes more pressure to be placed on the program cost (i.e. the denominator) to maintain cost-effectiveness.
- **Unit Energy Savings Values:** As with a change to the avoided cost, a reduction in the kWh and/or therms achieved per measure or a reduction in the useful life of the measure will result in less conservation achieved over the unit life.
- **Market impacts/saturation:** The anticipated degree to which a higher or lower incentive level causes the market to react, resulting in higher or lower program participation.
- **Codes and Standards:** As energy codes are adopted, the required efficiency levels may have a determining factor on the ability to offer an incentive, since the baseline efficiency option moves closer to the highest efficiency option for any given measure. Increases in baseline efficiencies result in less kWh and/or therm savings per measure installed.

Conversely, at times these impacts work in the opposite manner and provide more opportunity for increasing incentive levels. For example, an increase to the overall avoided cost per kWh or therm would result in a higher UCT ratio. Likewise, an adjustment to the savings value that results in more savings per measure would also provide the opportunity for a higher incentive. When these adjustments occur, Avista determines if an incentive revision is appropriate.

Sources Used to Determine Savings Values

Avista uses several resources for determining the claimed savings values for programs, projects, and individual measures. The table below illustrates the hierarchy used by Avista to determine the prevalent value to use when multiple savings sources are available.



Engineering Calculated: Avista utilizes customer-specific energy use and savings for calculating incentives for site specific projects. The information used to perform calculations comes directly from the customer and/or their contractor/vendor. Data collected may include prevalent information from

existing equipment specs, nameplate data, hours of operation, setpoints, building automation trend logs when available, etc. Engineering Calculated projects will continue to develop UES specific to the customers site location and improvements.

Impact Evaluation: As part of our annual Evaluation, Measurement and Verification (EM&V) process, Avista's contracted, independent third-party evaluator may adjust UES values that Avista used in its program year. Any adjustments come in a form of "recommendations" from the EM&V vendor. Based on a given recommendation, Avista may update the UES value in the following program year. This adjustment would be applicable to the Company's Residential and Commercial prescriptive (rebate) programs.

Regional Technical Forum: Avista uses values from the Regional Technical Forum (RTF) to inform incentive values for prescriptive measures throughout its portfolio. These values are informed by consistent and reliable program achievements of efficient technologies or actions throughout the Northwest and are frequently updated based on observed changes in measure performance, technology adoption, and codes and standards.

Other Known Sources: When no other sources of savings values are available, Avista may utilize UES values or the energy savings calculation methodology from alternative sources such as other utility TRM workbooks and values or preliminary results from similar programs. This approach relies on the EM&V process to evaluate or "prove" that the UES values are appropriate for Avista's service territory and are expected to be adjusted upon program evaluation.

Process for Evaluating Existing Rebate Levels

Before the start of each program year, Avista reviews its incentive levels to determine if an adjustment is required. This approach takes into consideration inputs from internal and external sources, including those mentioned in the prior section above.

Step 1: Update Avoided Cost and UES Values

Based on the most recent IRP, Avista will update the avoided cost. This impacts the overall "strength" of 1 kWh or 1 therm of conservation.

Based on the source of the UES value, Avista will review and update the UES values. This results in a change to the 1st year kWh or therm savings value. This determines the overall conservation achieved per measure.

Step 2: Update Forecasted Admin Costs

The portfolio is update with new projections for labor, implementation, and third-party costs.

Step 3: Test for Changes to Cost-Effectiveness

Based on the updated UES values and avoided costs, Avista estimates the cost-effectiveness per measure, per program and for the overall portfolio. For measures that have a UCT lower than 1.0, Avista further investigates the issue. Options to address a failing UCT may include adjustments to the UCT formula costs components:

1. Reviewing the alignment of allocated administrative costs for appropriateness
2. Lowering Incentive levels

3. Take no action and monitor program cost-effectiveness on an annual basis

The course of action for any given measure depends, in part, on the extent to which a falling UCT will impact the UCT of the overall program portfolio. In the event that Avista learns of a UCT that is dropping more rapidly or further than expected for a measure or set of measures with significant influence on overall cost-effectiveness of the portfolio, Avista will take swift action to correct the issue by lowering incentive levels, not necessarily waiting for the next annual rebate evaluation cycle.

Step 4: Other Indicators

Program Performance

Avista reviews the customer participation of each measure to determine if an increased incentive would result in a higher throughput. Avista reviews the historic throughput and incentive levels to determine if the resulting data informs a relationship between incentive changes and customer participation.

Market Conditions

Avista reviews market conditions and any cost barrier indicators to determine if the current rebate amounts are sufficiently incenting customers to patriciate in energy efficiency programs. Market conditions may include the total cost of equipment installation, technology saturation and maturity, and when possible, aligning incentive levels with neighboring utilities.

Comparison to Other Utilities

On an annual basis, Avista will also compare its residential offerings to those of other utility companies within the region to identify programs that may be under or over incenting. While this step may not result in incentive level changes, it provides additional perspective to our program's composition and identifies areas where adjustments could be made.

Addressing Programs with Cost-Effectiveness below 1.0

When a program's cost-effectiveness is or falls below 1.0, Avista will monitor the program and work with its Idaho Energy Efficiency advisors to determine if a rebate adjustment is needed or if the program should instead be concluded. Avista will assess the impact the program has on the portfolio level cost-effectiveness and the conservation achieved by the program to determine next steps.

Calculation of Incentives for New Measures

In general, Avista bases its incentive/rebate calculation on a cents per kilowatt hour and dollars per therm basis. Energy savings are then used to determine the incentive Avista will provide to ensure the probability that the measure will have a UCT of 1.0 or higher and that the incentive value does not exceed 100% of the incremental cost between the baseline option and the efficient option being installed.

For the purposes of developing a new measure, Avista typically begins with an incentive that is based off 70% of the incremental cost and $0.23/kWh or $3.50/Therm. Setting the incentive back from the upper limits provides some protections to ensure that the measure will be cost-effective in the future if an impact evaluation finds that the savings value was overstated.

Low Income Programs

Avista designs its low-income energy efficiency program with the intent to provide customers with solutions to address their energy burden by helping make the energy used in their homes more affordable. Avista maintains a list of deemed measures that the CAP agency can fully fund with an annual budget of $875,000. Measures may include insulation, HVAC, Lighting along with Health and Safety related projects. By fully funding several measures that are traditionally supported by the Department of Energy weatherization program along with others that are beneficial to Avista's service territory, the costs associated with each project is higher and has historically resulted in UCT less than 1.0. Avista continues to monitor the low income program and will seek out adjustments to improve the cost effectiveness of the program when possible.

Questions

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APPENDIX G – 2021 EXPENDITURES BY PROGRAM

Energy-Efficiency Program	Electric	Natural Gas	Total
Energy-Efficiency Incentives			
Low-Income			
Low-Income	$ 423,973	$ 222,746	$ 646,719
Health and Safety	$ 49,222	$ 69,770	$ 118,992
Residential			
ENERGY STAR Homes	$ 20,000	$ 3,800	$ 23,800
HVAC	$ 103,839	$ 1,162,362	$ 1,266,201
Multifamily Direct Install	$ 110,710	$ 0	$ 110,710
Fuel Efficiency	$ 201,900	$ 0	$ 201,900
Shell	$ 71,766	$ 55,712	$ 127,478
Water Heat	$ 5,590	$ 216,100	$ 221,690
Appliances	$ 5,590	$ 2,530	$ 8,120
Multifamily Weatherization	$ 11,023	$ 8,993	$ 20,015
Commercial/Industrial			
Site-Specific	$ 996,932	$ 0	$ 996,932
Compressed Air	$ 0	$ 0	$ 0
Grocer	$ 725	$ 0	$ 725
Food Services	$ 220	$ 28,100	$ 28,320
Green Motors	$ 4,259	$ 0	$ 4,259
HVAC	$ 0	$ 17,966	$ 17,966
Multifamily Market Transformation	$ 890,123	$ 0	$ 890,123
Motor Control HVAC (VFD)	$ 7,850	$ 0	$ 7,850
Shell	$ 1,375	$ 1,416	$ 2,791
Exterior Lighting	$ 550,711	$ 0	$ 550,711
Interior Lighting	$ 649,136	$ 0	$ 649,136
Energy-Efficiency Incentives Total	**$ 4,104,944**	**$ 1,789,495**	**$ 5,894,439**
Market Transformation			
Northwest Energy Efficiency Alliance	$ 557,659	$ 157,375	$ 715,034
Brio Eastside Market Transformation	$ 87,233	$ 0	$ 87,233
Market Transformation Total	**$ 644,891**	**$ 157,375**	**$ 802,266**
Other Programs and Activities			
General Implementation	$ 1,566,938	$ 425,531	$ 1,992,469
Idaho Research and Development	$ 186,307	$ 0	$ 186,307
Pilot Programs	$ 72,912	$ 31,277	$ 104,190
EM&V/CPA	$ 187,909	$ 42,971	$ 230,880
Other Programs and Activities	**$ 2,014,066**	**$ 499,779**	**$ 2,513,845**
Grand Total	**$ 6,763,901**	**$ 2,446,649**	**$ 9,210,550**

APPENDIX H – 2021 ENERGY EFFICIENCY ACTIVITY BY PROGRAM

Energy-Efficiency Program	Electric				Natural Gas			
	Participants		Evaluated Savings (kWh)	Utility Cost	Participants		Evaluated Savings (Therms)	Utility Cost
Low-Income								
Weatherization	67	Homes	28,834	$ 151,580	72	Homes	1,620	$ 108,812
Fuel Conversions	32	Units	109,381	$ 460,830	-	Units	0	$ 0
HVAC	5	Units	15,081	$ 62,745	25	Units	1,531	$ 148,367
Water Heat	0	Units	0	$ 0	10	NA	66	$ 36,634
Outreach/Giveaways	32	HHS	191	$ 956	-	HHS	0	$ 0
Health and Safety	21		0	$ 49,222	26		0	$ 69,770
ENERGY STAR Refrigerator	1	Units	16	$ 705	-	Units	0	$ 0
Low-Income Total			**153,503**	**$ 726,038**			**3,217**	**$ 363,583**
Residential								
ENERGY STAR Homes	22	Homes	72,093	$ 43,960	6	Homes	670	$ 4,076
HVAC	239	Furnace, Tstat	323,274	$ 176,705	3,717	Furnace, Tstat	212,647	$ 1,230,267
Water Heat	26	Units	30,726	$ 9,642	562	Units	41,972	$ 229,601
Fuel Conversions	50	Furnaces, Water Heat	586,226	$ 359,619	-	Furnaces, Water Heat	-	$ 0
Multifamily Direct Install	121	Units (Measures)	118,613	$ 155,623	-	Units (Measures)	-	$ 0
Shell	130	Windows, Insulation	219,690	$ 179,111	370	Windows, Insulation	18,214	$ 66,420
Appliances	152	Washer/ Dryer	13,420	$ 8,056	68	Washer/ Dryer	253	$ 2,597
Multifamily Weatherization	25	Units (Measures)	49,193	$ 35,059	16	Units (Measures)	2,301	$ 10,345
Residential Total			**1,413,235**	**$ 967,775**			**276,057**	**$ 1,543,307**
Commercial/Industrial								
Site-Specific	174	Projects	5,470,488	$ 1,282,706	-	Projects	-	$ 0
Compressed Air	-	Units	-	$ 0	-	NA	-	$ 0
Multifamily Market Transformation	5	Projects	711,593.00	$ 989,860	-	Projects	-	$ 0
Grocer	3	Projects	7,443	$ 867	-	Projects	-	$ 0
Food Services	21	Projects	977	$ 253	21	Projects	14,480	$ 103,680
Green Motors	8	Motor Rewinds	23,986	$ 6,578	-	NA	-	$ 0
HVAC	15	Units	56,210	$ 11,908	16	Units	5,885	$ 61,287
Shell	3	Projects	2,547	$ 1,766	3	Projects	360	$ 5,000
Prescriptive Lighting	499	Projects	5,669,622	$ 1,514,671	-	NA	-	$ 0
Commercial/Industrial Total			**11,942,866**	**$ 3,808,611**			**20,725**	**$ 169,968**
Grand Total			**13,509,604**	**$ 5,502,423**			**300,000**	**$ 2,076,859**

APPENDIX I – COST-EFFECTIVENESS TABLES

Electric

2020-21 Combined Cost-Effectiveness Tables

Total Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 22,006,918	$ 14,320,309	1.54
Utility Cost Test (UCT)	$ 18,417,778	$ 10,671,962	1.73
Participant Cost Test (PCT)	$ 35,670,127	$ 11,009,248	3.24
Ratepayer Impact (RIM)	$ 18,309,141	$ 38,981,188	0.47

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 7,954,360	$ 4,455,564	1.79
Utility Cost Test (UCT)	$ 6,320,137	$ 2,837,861	2.23
Participant Cost Test (PCT)	$ 12,943,343	$ 3,028,998	4.27
Ratepayer Impact (RIM)	$ 6,320,137	$ 14,369,909	0.44

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 1,304,264	$ 1,120,179	1.16
Utility Cost Test (UCT)	$ 508,283	$ 1,314,445	0.39
Participant Cost Test (PCT)	$ 1,529,744	$ 625,558	2.45
Ratepayer Impact (RIM)	$ 399,645	$ 2,024,366	0.20

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 12,748,295	$ 8,744,566	1.46
Utility Cost Test (UCT)	$ 11,589,359	$ 6,519,656	1.78
Participant Cost Test (PCT)	$ 21,197,039	$ 7,354,692	2.88
Ratepayer Impact (RIM)	$ 11,589,359	$ 22,586,913	0.51

2021 Electric Cost Effectiveness

Total Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 8,349,163	$ 7,554,710	1.11
Utility Cost Test (UCT)	$ 6,778,064	$ 5,453,202	1.24
Participant Cost Test (PCT)	$ 15,934,301	$ 6,157,230	2.59
Ratepayer Impact (RIM)	$ 6,728,843	$ 17,331,781	0.39

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,334,452	$ 1,805,380	1.29
Utility Cost Test (UCT)	$ 1,467,936	$ 967,775	1.52
Participant Cost Test (PCT)	$ 3,737,848	$ 1,368,023	2.73
Ratepayer Impact (RIM)	$ 1,467,936	$ 4,175,204	0.35

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 389,481	$ 587,932	0.66
Utility Cost Test (UCT)	$ 196,283	$ 676,816	0.29
Participant Cost Test (PCT)	$ 731,308	$ 335,089	2.18
Ratepayer Impact (RIM)	$ 147,061	$ 984,151	0.15

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 5,625,230	$ 5,161,398	1.09
Utility Cost Test (UCT)	$ 5,113,845	$ 3,808,611	1.34
Participant Cost Test (PCT)	$ 11,465,145	$ 4,454,119	2.57
Ratepayer Impact (RIM)	$ 5,113,845	$ 12,172,425	0.42

2020 Electric Cost Effectiveness

Total Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 13,657,755	$ 6,765,599	2.02
Utility Cost Test (UCT)	$ 11,639,714	$ 5,218,760	2.23
Participant Cost Test (PCT)	$ 19,735,826	$ 4,852,018	4.07
Ratepayer Impact (RIM)	$ 11,580,299	$ 21,649,408	0.53

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 5,619,907	$ 2,650,184	2.12
Utility Cost Test (UCT)	$ 4,852,201	$ 1,870,086	2.59
Participant Cost Test (PCT)	$ 9,205,496	$ 1,660,975	5.54
Ratepayer Impact (RIM)	$ 4,852,201	$ 10,194,705	0.48

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 914,783	$ 532,247	1.72
Utility Cost Test (UCT)	$ 311,999	$ 637,629	0.49
Participant Cost Test (PCT)	$ 798,437	$ 290,469	2.75
Ratepayer Impact (RIM)	$ 252,584	$ 1,040,215	0.24

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 7,123,065	$ 3,583,168	1.99
Utility Cost Test (UCT)	$ 6,475,514	$ 2,711,045	2.39
Participant Cost Test (PCT)	$ 9,731,894	$ 2,900,573	3.36
Ratepayer Impact (RIM)	$ 6,475,514	$ 10,414,488	0.62

Natural Gas

2020-21 Combined Cost-Effectiveness

Total Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 5,460,921	$ 8,511,432	0.64
Utility Cost Test (UCT)	$ 5,315,028	$ 4,260,030	1.25
Participant Cost Test (PCT)	$ 13,192,101	$ 7,972,953	1.65
Ratepayer Impact (RIM)	$ 5,160,449	$ 13,730,580	0.38

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 4,805,785	$ 7,312,760	0.66
Utility Cost Test (UCT)	$ 4,805,785	$ 2,971,943	1.62
Participant Cost Test (PCT)	$ 11,652,599	$ 7,173,135	1.62
Ratepayer Impact (RIM)	$ 4,805,785	$ 11,792,224	0.41

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 377,023	$ 857,752	0.44
Utility Cost Test (UCT)	$ 231,130	$ 951,727	0.24
Participant Cost Test (PCT)	$ 919,674	$ 671,513	1.37
Ratepayer Impact (RIM)	$ 76,551	$ 1,105,913	0.07

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 278,112	$ 340,921	0.82
Utility Cost Test (UCT)	$ 278,112	$ 336,361	0.83
Participant Cost Test (PCT)	$ 619,828	$ 128,305	4.83
Ratepayer Impact (RIM)	$ 278,112	$ 832,444	0.33

2021 Natural Gas Cost-Effectiveness

Total Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,629,603	$ 4,346,572	0.60
Utility Cost Test (UCT)	$ 2,483,710	$ 2,007,089	1.24
Participant Cost Test (PCT)	$ 6,221,173	$ 4,059,208	1.53
Ratepayer Impact (RIM)	$ 2,413,940	$ 6,508,537	0.37

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,270,583	$ 3,844,791	0.59
Utility Cost Test (UCT)	$ 2,270,583	$ 1,543,307	1.47
Participant Cost Test (PCT)	$ 5,682,281	$ 3,750,981	1.51
Ratepayer Impact (RIM)	$ 2,270,583	$ 5,776,091	0.39

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 249,432	$ 280,125	0.89
Utility Cost Test (UCT)	$ 103,539	$ 293,813	0.35
Participant Cost Test (PCT)	$ 292,267	$ 209,058	1.40
Ratepayer Impact (RIM)	$ 33,769	$ 363,334	0.09

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 109,588	$ 221,655	0.49
Utility Cost Test (UCT)	$ 109,588	$ 169,968	0.64
Participant Cost Test (PCT)	$ 246,625	$ 99,169	2.49
Ratepayer Impact (RIM)	$ 109,588	$ 369,111	0.30

2020 Natural Gas Cost-Effectiveness

Total Portfolio

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,831,318	$ 4,164,861	0.68
Utility Cost Test (UCT)	$ 2,831,318	$ 2,252,942	1.26
Participant Cost Test (PCT)	$ 6,970,928	$ 3,913,746	1.78
Ratepayer Impact (RIM)	$ 2,746,509	$ 7,222,043	0.38

Residential

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 2,535,203	$ 3,467,969	0.73
Utility Cost Test (UCT)	$ 2,535,203	$ 1,428,636	1.77
Participant Cost Test (PCT)	$ 5,970,318	$ 3,422,155	1.74
Ratepayer Impact (RIM)	$ 2,535,203	$ 6,016,132	0.42

Low-Income

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 127,591	$ 577,627	0.22
Utility Cost Test (UCT)	$ 127,591	$ 657,913	0.19
Participant Cost Test (PCT)	$ 627,407	$ 462,455	1.36
Ratepayer Impact (RIM)	$ 42,782	$ 742,579	0.06

Commercial/Industrial

Cost-Effectiveness Test	Benefits	Costs	Benefit/Cost Ratio
Total Resource Cost (TRC)	$ 168,525	$ 119,266	1.41
Utility Cost Test (UCT)	$ 168,525	$ 166,393	1.01
Participant Cost Test (PCT)	$ 373,203	$ 29,136	12.81
Ratepayer Impact (RIM)	$ 168,525	$ 463,332	0.36

Sandpoint, Idaho