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DEMAND SIDE MANAGEMENT

2011 Annual Report

AVISTA

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I. Executive Summary

The 2011 Demand-Side Management Annual Report summarizes the Company's 35th year of delivering energy-efficiency programs to our Washington and Idaho customers. These programs are intended to deliver a cost-effective resource with funding derived from the Avista DSM "Tariff Rider". The Tariff Rider is a "non-bypassable" systems benefit charge levied upon all retail customers on a materially equal percentage basis.

In 2011 the electric DSM portfolio accumulated 117,103 MWh[1] and the natural gas portfolio delivered 1.4 million therms[2] in annual first year savings. The Company exceeded the system wide (Washington and Idaho) targets established within the electric Integrated Resource Plan (IRP) by approximately 38%. Additionally 2011 is the ending year of the first biennium whereby Avista is required by law to achieve savings acquisition targets established as a consequence of Washington Initiative I-937. The Company exceeded the 2010-2011 Biennial Conservation Plan target by 32% (excludes savings achieved through distribution efficiency). The natural gas IRP target was established prior to the precipitous fall of natural gas commodity prices, which resulted in a retraction of efficiency programs based upon cost-effectiveness challenges resulting from lower avoided costs. Due to the need to manage portfolio cost-effectiveness in the face of these unanticipated market events the Company has achieved only 59% of the 2011 acquisition target established in the 2009 natural gas IRP.

These successes have been delivered based upon a combination of local programs and the local impact of regional market transformation programs delivered in cooperation with the Northwest Energy Efficiency Alliance (NEEA). Avista's local programs are primarily driven by direct financial incentives offered to the customer. In 2011 Avista returned 66% of the total revenue derived from the electric and natural gas tariff riders to customers. A large portion of the funds not returned to the customer were used to fund NEEA's work leading to lower retail prices and greater availability of efficient products to Avista customers.

The savings indicated above are gross savings based upon all program participants, consistent with the standards applied by the Northwest Power and Conservation Council, conditions established by the Washington Utility and Transportation Commission and by the tradition within both our Washington and Idaho jurisdictions. The Company has completed multiple studies of the net-to-gross ratio of our programs, which indicates the likely impact of the programs in comparison to what would occur in the absence of any such program. The most recent results of these evaluations are contained within the appendices of this report as well and are used to as guides to the management of the portfolio.

Avista judges the effectiveness of the energy efficiency program portfolio based upon a number of metrics. The most commonly applied metrics are the Total Resource Cost (TRC) test, a benefit to cost test encompassing the utility ratepayer population, and the Program Administer Cost (PAC) test, a benefit to cost test from the perspective of achieving a minimization of the utility cost of delivering energy services. Benefit to cost ratios in excess of 1.00 indicates that the benefits exceeded the costs. In 2011 the TRC benefit to cost ratio was 1.28 for the electric portfolio and 0.98 for the natural gas portfolio. Given Avista's conservative approach to valuing some of the benefits within these calculations, the Company believes both of these portfolios to be cost-effective. The PAC test benefit to cost ratio was 2.69 for the electric portfolio and 2.62 for the natural gas portfolio.

[1] Does not include the 276 MWh acquired with Avista's service territory through the Department of Commerce.
[2] Does not include 70,714 therms acquired within Avista's service territory through the Department of Commerce.

The measurement of portfolio savings has been independently verified through external third-party evaluators prior to being claimed as portfolio acquisition or being incorporated into the cost-effectiveness calculations. The Cadmus Group was retained as the Company's external evaluator to independently measure and verify 2010 and 2011 electric and natural gas portfolio results.

Avista was able to deliver the achievements documented within this report without the full expenditure of the revenue from the DSM tariff rider surcharges in place during this time period, thus allowing for a planned reduction in the tariff rider surcharges without a reduction in future services.

Though the nature of this report is to look backwards on past performance, these past successes are indicative of the Company's ability and commitment to continue to deliver responsible and cost-effective energy-efficiency programs to our customers in the future.

II. Cost-Effectiveness

Avista's first and foremost objective is to achieve all cost-effective energy efficiency resources. Cost-effectiveness is the primary metric for the Company's DSM program planning and implementation process. For this annual report, cost-effectiveness on DSM programs is based on evaluated gross savings and uses methods consistent with those laid out in the California Standard Practice Manual for Economic Analysis of Demand-Side Programs and Projects as modified by the Council. Shown below are four of the five California Standard Practice Tests - Total Resource Cost, Program Administrator Cost, Participant and Nonparticipant – for Washington and Idaho combined (system).

For estimating cost-effectiveness, the only non-energy benefits included are those that can be documented and quantified and, therefore, these estimates are conservative. There are a number of legitimate non-energy TRC benefits that the Company was unable to quantify with sufficient rigor in order to include within the cost-effectiveness analysis. These non-quantified non-energy benefits would most likely offset the marginal numeric TRC cost-ineffectiveness of the natural gas portfolio.

Electric and natural gas cost-effectiveness results within this report are based on impact evaluations conducted on the 2010-2011 portfolio. Past DSM cost-effectiveness reporting has been due in the first quarter of each year and included realization rates from the most recent impact evaluations on some individual programs, however, this biennium is the first time entire electric and natural gas portfolio impact results have been available. With the implementation of I-937, the Company's annual report due date has been moved to June 1st enabling the Company to provide cost-effectiveness on verified savings of the entire portfolio based on evaluations of that year's programs.

In summary, system electric and natural gas TRC is 1.28 and 0.98, respectively. System electric and natural gas PAC test benefit-cost ratios are 2.69 and 2.62, respectively. The following tables show system electric, natural gas and combined fuel cost-effectiveness. For details by individual state, refer to Appendix 1.

System Electric Cost-Effectiveness

Table 1: Total Resource Cost

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Electric avoided cost	$57,782,999	$1,123,377	$58,906,376
Natural Gas avoided cost	($1,076,040)	$0	($1,076,040)
Non-energy benefits	$1,618,553	$266,608	$1,885,160
TRC benefits	$58,325,512	$1,389,985	$59,715,497
Non-incentive utility cost	$7,481,073	$113,647	$7,594,720
Customer cost	$37,666,986	$1,563,922	$39,230,908
TRC costs	$45,148,059	$1,677,569	$46,825,628
TRC ratio	**1.29**	**0.83**	**1.28**
Net TRC benefits	**$13,177,453**	**($287,584)**	**$12,889,869**

Table 2: Program Administrator Cost

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Electric avoided cost	$57,782,999	$1,123,377	$58,906,376
Natural Gas avoided cost	($1,076,040)	$0	($1,076,040)
PAC benefits	$56,706,959	$1,123,377	$57,830,337
Non-incentive utility cost	$7,481,073	$113,647	$7,594,720
Incentive cost	$12,615,819	$1,297,314	$13,913,133
PAC costs	$20,096,892	$1,410,961	$21,507,853
PAC ratio	**2.82**	**0.80**	**2.69**
Net PAC benefits	**$36,610,068**	**($287,584)**	**$36,322,484**

Table 3: Participant

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Electric Bill Reduction	$40,793,922	$1,544,540	$42,338,462
Natural Gas Bill Reduction	($1,390,696)	$0	($1,390,696)
Non-energy benefits	$1,618,553	$266,608	$1,885,160
Participant benefits	$41,021,778	$1,811,148	$42,832,926
Customer cost	$37,666,986	$1,563,922	$39,230,908
Incentive received	($12,615,819)	($1,297,314)	($13,913,133)
Participant costs	$25,051,167	$266,608	$25,317,775
Participant ratio	**1.64**	**6.79**	**1.69**
Net Participant benefits	**$15,970,611**	**$1,544,540**	**$17,515,151**

Table 4: Rate Impact Measure

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Electric avoided cost savings	$57,782,999	$1,123,377	$58,906,376
Nonparticipant benefits	$57,782,999	$1,123,377	$58,906,376
Electric Revenue loss	$40,793,922	$1,544,540	$42,338,462
Non-incentive utility cost	$4,518,673	$113,647	$4,632,320
Customer incentives	$12,615,819	$1,297,314	$13,913,133
Nonparticipant costs	$57,928,413	$2,955,501	$60,883,914
RIM ratio	**1.00**	**0.38**	**0.97**
Net RIM benefits	**($145,414)**	**($1,832,124)**	**($1,977,538)**

System Natural Gas Cost-Effectiveness

Table 5: Total Resource Cost

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Natural Gas avoided cost	$17,033,873	$382,852	$17,416,725
Electric avoided cost	$2,611,933	$294	$2,612,227
Non-energy benefits	$349,714	$152,895	$502,609
TRC benefits	$19,995,520	$536,040	$20,531,560
Non-incentive utility cost	$1,914,778	$81,886	$1,996,664
Customer cost	$17,803,163	$1,135,192	$18,938,355
TRC costs	$19,717,941	$1,217,078	$20,935,019
TRC ratio	**1.01**	**0.44**	**0.98**
Net TRC benefits	**$277,578**	**($681,038)**	**($403,459)**

Table 6: Program Administrator Cost

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Natural Gas avoided cost	$17,033,873	$382,852	$17,416,725
Electric avoided cost	$2,611,933	$294	$2,612,227
PAC benefits	$19,645,806	$383,145	$20,028,951
Non-incentive utility cost	$1,914,778	$81,886	$1,996,664
Incentive cost	$4,678,261	$982,297	$5,660,558
PAC costs	$6,593,040	$1,064,183	$7,657,223
PAC ratio	**2.98**	**0.36**	**2.62**
Net PAC benefits	**$13,052,766**	**($681,038)**	**$12,371,729**

Table 7: Participant

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Natural Gas bill reduction	$11,760,009	$315,671	$12,075,681
Electric bill reduction	$2,643,680	$470	$2,644,150
Non-energy benefits	$349,714	$152,895	$502,609
Participant benefits	$14,753,403	$469,036	$15,222,439
Customer cost	$17,803,163	$1,135,192	$18,938,355
Incentive received	($4,678,261)	($982,297)	($5,660,558)
Participant costs	$13,124,902	$152,895	$13,277,797
Participant ratio	**1.12**	**3.07**	**1.15**
Net Participant benefits	**$1,628,501**	**$316,141**	**$1,944,643**

Table 8: Rate Impact Measure

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Natural Gas avoided cost savings	$17,033,873	$382,852	$17,416,725
Nonparticipant benefits	$17,033,873	$382,852	$17,416,725
Natural Gas revenue loss	$11,760,009	$315,671	$12,075,681
Non-incentive utility cost	$1,967,178	$81,886	$2,049,064
Customer incentives	$4,678,261	$982,297	$5,660,558
Nonparticipant costs	$18,405,449	$1,379,854	$19,785,304
RIM ratio	**0.93**	**0.28**	**0.88**
Net RIM benefits	**($1,371,576)**	**($997,003)**	**($2,368,579)**

System Combined Electric and Natural Gas Cost-Effectiveness

Table 9: Total Resource Cost

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Electric avoided cost	$74,816,872	$1,506,229	$76,323,101
Natural Gas avoided cost	$1,535,893	$294	$1,536,187
Non-energy benefits	$1,968,267	$419,503	$2,387,769
TRC benefits	$78,321,032	$1,926,025	$80,247,057
Non-incentive utility cost	$9,395,851	$195,533	$9,591,384
Customer cost	$55,470,150	$2,699,113	$58,169,263
TRC costs	$64,866,000	$2,894,646	$67,760,647
TRC ratio	**1.21**	**0.67**	**1.18**
Net TRC benefits	**$13,455,031**	**($968,621)**	**$12,486,410**

Table 10: Program Administrator Cost

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Electric avoided cost	$60,394,932	$1,123,671	$61,518,603
Natural Gas avoided cost	$15,957,833	$382,852	$16,340,685
PAC benefits	$76,352,765	$1,506,523	$77,859,288
Non-incentive utility cost	$9,395,851	$195,533	$9,591,384
Incentive cost	$17,294,080	$2,279,611	$19,573,691
PAC costs	$26,689,931	$2,475,144	$29,165,075
PAC ratio	**2.86**	**0.61**	**2.67**
Net PAC benefits	**$49,662,834**	**($968,621)**	**$48,694,213**

Table 11: Participant

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Electric Bill Reduction	$43,437,601	$1,545,010	$44,982,611
Natural Gas Bill Reduction	$10,369,313	$315,671	$10,684,985
Non-energy benefits	$1,968,267	$419,503	$2,387,769
Participant benefits	$55,775,181	$2,280,184	$58,055,365
Customer cost	$55,470,150	$2,699,113	$58,169,263
Incentive received	($17,294,080)	($2,279,611)	($19,573,691)
Participant costs	$38,176,069	$419,503	$38,595,572
Participant ratio	**1.46**	**5.44**	**1.50**
Net Participant benefits	**$17,599,112**	**$1,860,681**	**$19,459,794**

Table 12: Rate Impact Measure

	Regular Income portfolio	Low Income portfolio	Overall portfolio
Avoided cost savings	$74,816,872	$1,506,229	$76,323,101
Nonparticipant benefits	$74,816,872	$1,506,229	$76,323,101
Electric Revenue loss	$52,553,931	$1,860,212	$54,414,143
Non-incentive utility cost	$6,485,851	$195,533	$6,681,384
Customer incentives	$17,294,080	$2,279,611	$19,573,691
Nonparticipant costs	$76,333,863	$4,335,355	$80,669,218
RIM ratio	**0.98**	**0.35**	**0.95**
Net RIM benefits	**($1,516,991)**	**($2,829,126)**	**($4,346,117)**

III. Evaluation, Measurement and Verification (EM&V)

The Cadmus Group was hired to provide impact and process evaluation for the entire 2010-2011 electric and natural gas portfolio. Originally, as part of the Idaho Public Utilities Commission 2009 Memorandum of Understanding, the Company committed to a three-year cycle to evaluate all programs. By the time, the Request for Memorandum was issued, it was decided that Avista would take a portfolio approach for this first biennium in order to provide a comprehensive benchmark to compare against in future years. The portfolio-wide approach will inform future evaluation efforts that may require a “deeper dive”.

Avista 2010 Multi-Sector Gas Impact Evaluation Report prepared by The Cadmus Group is included in Appendix 2. This summarizes findings and recommendations resulting from the natural gas impact evaluation on 2010 programs.

Avista 2010 Multi-Sector Process Evaluation Report prepared by The Cadmus Group is included in Appendix 3. This summarizes the findings and recommendations resulting from Cadmus’ process evaluation on DSM programs in 2010.

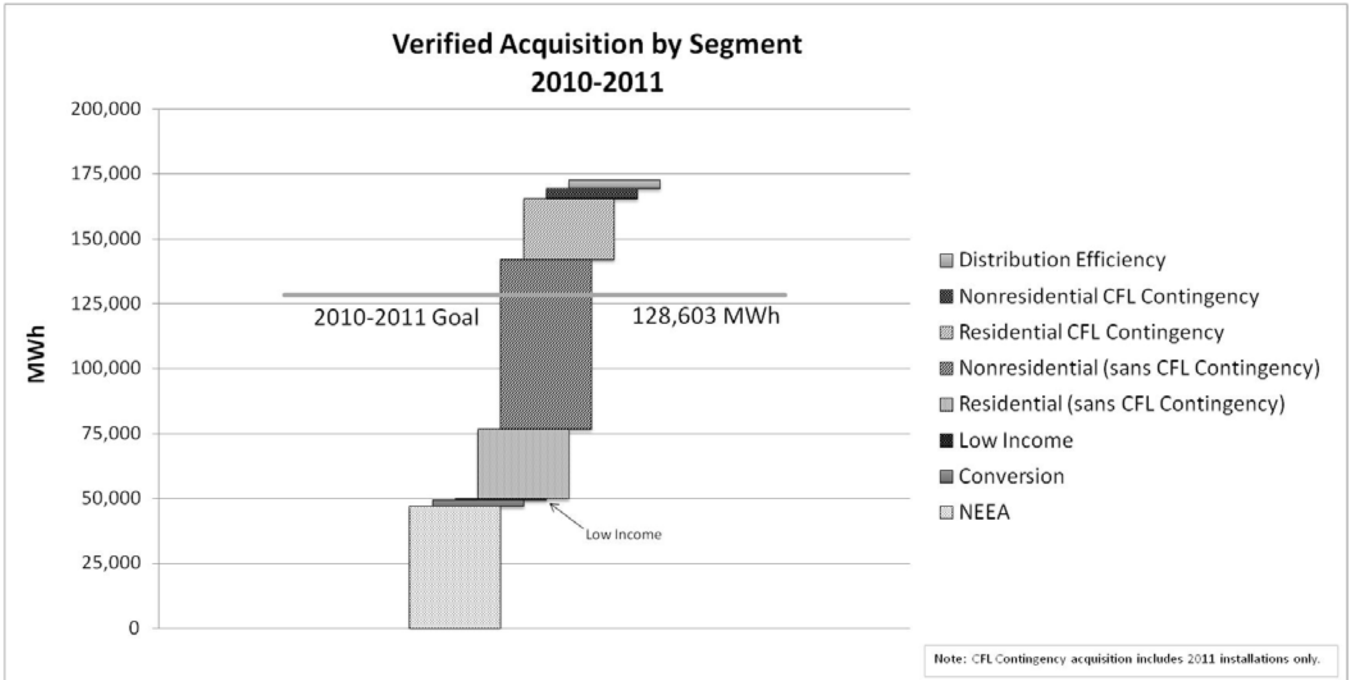
The Cadmus Group also conducted a net-to-gross study on 2010 programs. The net-to-gross analysis was updated in 2011; however, the final report was not available for inclusion in this report at the time this report was filed. Due to the timing of the receipt of the updated net-to-gross analysis, tables with net results have not been included in this annual report. Cost-effectiveness on individual measures and programs will be evaluated using these results and will inform 2013 business planning efforts. The Net-to-Gross Evaluation of Avista’s Demand-Side Management Programs is available in Appendix 4.

IV. Washington I-937 Acquisition of Conservation

In April 2010, the Commission approved the Company’s ten year Achievable Potential and Biennial Conservation Target Report (“Conservation Report”). The Company elected to use the Northwest Power and Conservation Council’s Option 1 of the 6th Power Plan to establish its acquisition target, adjusted to include fuel conversions. The acquisition target was 11 percent greater than the Company’s Integrated Resource Plan’s energy efficiency target for the same period. The Company intent was to acquire 128,603 MWh of energy efficiency as described in its approved Conservation Report during the 2010-2011 Biennium, the first I-937 compliance period. During this biennium, Avista acquired 172,341 MWh (125,212 MWh from local programs and 47,129 MWh from NEEA’s regional ventures), however with the conversion limitation, only 169,467 MWh can be claimed for I-937 energy efficiency purposes. Avista surpassed its I-937 energy efficiency target by 32 percent. Avista also obtained 3,512 MWh from Distribution Efficiency, resulting in a total acquisition of 172,979 MWh, exceeding by 35 percent the total BCP target.

Avista‘s Biennial Conservation Target was approved with conditions as listed in an attachment. The conditions required Avista to use methodologies consistent with those used by the Northwest Power and Conservation Council and a need for a high degree of transparency, and communication and consultation with external stakeholders. Refer to Appendix 5 for a list of the conditions that were met by Avista for the 2010-2011 Biennium.

In addition, I-937 includes savings from distribution and thermal efficiency. The following chart illustrates where the various I-937 savings components are derived as well as comparison to Avista's Biennial Conservation target of 128,603 MWh.



V. Programs

Residential Overview

The Company's residential portfolio is composed almost entirely of measures available through prescriptive rebates. Currently, customers complete the installation of a qualifying energy efficiency measure and then have 90 days to apply to Avista for an incentive. The only efficiency measures that are not prescriptive are those for multifamily residential customers where owners/developers choose to treat entire complexes that affect residential customers. In these unique cases, the projects are treated site-specifically. There are other unique programs that are delivered through third party contractors, for example, refrigerator/freezer recycling and regional manufacturer buy-downs for small devices such as CFLs. In-home energy audits are another exception to a typical prescriptive residential application in that, while administered by Avista, subcontractors schedule and complete in-home audits. There are also residential savings acquired through cooperation with regional market transformation efforts discussed later under the Regional Overview section.

Current Idaho and Washington residential programs include high-efficiency equipment, refrigerator/freezer recycling, fuel conversions from electric straight resistance, weatherization and appliances upgrades. Based on evaluated results, approximately 41 percent of electric and 36 percent of the natural gas savings were acquired through Avista's local residential programs. The percent of residential electric is up from past years, primarily due to the boxes of CFLs mailed to all residential customers who chose not to opt out of the distribution. Participation in residential prescriptive rebates was down approximately 30 percent as compared with 2010. This is largely due to the discontinuation of state and federal tax credits.

During 2011, over 23,000 prescriptive rebates were processed, over 2,000 refrigerators/freezers were recycled by a third-party, over 10,000 lamps were distributed at regional community events and 643 home energy audits were completed. Over $3.8 million in rebates were provided directly to residential customers to offset the cost of implementing energy efficiency measures. Residential programs contributed over 8,412 MWh and over 493,000 therms in annual first-year energy savings.

In 2011, window replacements were discontinued and the "do-it-yourself" option for weatherization was eliminated. Electric to natural gas water heater conversions were reduced. Effective January 1, 2012, rebates for Energy Star dishwashers, fireplace dampers and shade trees have been discontinued. The rebate for Energy Star clothes washers was reduced to $25. In late February 2012, online rebate processing was launched enabling customers the option to submit energy efficiency forms online. The rebate automation provides customer self-service, automated data transfer for tracking purposes into the customer service system (CSS) and automated file transfer to accounts payable. This will provide streamlining of rebate processing, avoid redundant data entry, reduce the number of checks issues and will reduce processing time.

Residential programs continue to be subjected to EM&V in 2012, including impact analysis and process evaluation. These impact and process evaluations provide an on-going opportunity to improve program design and delivery as well as optimizing the savings achieved for the dollars spent. As recommendations become available, the DSM team continues to evaluate, respond and implement changes in order to improve program offerings.

Residential programs have benefited from the sustained customer outreach campaign, *everylittlebit*, which educates on the availability of Avista's energy efficiency programs and encourages customers to take action through participation in these programs. Outreach efforts have included broad media, online, print and participation at several events. In 2011, Avista reduced DSM-led outreach events (e.g. energy fairs) while maintaining DSM tools for other departments to leverage for use at their public engagements. This new approach was well received as DSM-led events reduced from over 50 to less than a dozen while making DSM messaging and support available to other Avista departments wanting to include energy efficiency awareness in their efforts.

The following tables summarize Residential electric and natural gas results through traditional DSM offerings operated in-house by Avista. These include number of projects, savings acquisition as well as interactive effects associated with electric and natural gas measures.

Table 13: Residential Electric Program Summary

Program	State	Projects	Incentives (000s)	Energy Savings (MWh)	Interactive Natural Gas[3] (therms)
Space and Water Direct Use	ID	43	$24	261	(16,886)
	WA	143	$65	815	(48,877)
Energy Star Products	ID	2,870	$96	342	0
	WA	5,818	$191	688	3
Energy Star Homes	ID	13	$11	47	768
	WA	118	$105	184	12,636
Geographic Saturation[4]	ID	2,960	$4	58	0
	WA	7,200	$12	141	0
Home Energy Audit	WA	643	$35	87	0
Heating and Cooling	ID	792	$184	1,067	0
	WA	1,326	$276	1,607	0
Refrigerator/Freezer Recycling	ID	554	$17	575	0
	WA	1,494	$45	1,554	0
Water Heaters	ID	84	$4	20	0
	WA	369	$19	91	0
Home Weatherization	ID	135	$40	298	0
	WA	282	$77	576	0
	ID	7,451	$380	2,669	(16,118)
	WA	17,393	$824	5,743	(36,238)
	System	24,844	$1,205	8,412	(52,356)

[3] For conversions, the interactive therms are the increase in therms due to the electric to natural gas conversion. The increase in therms is included in the cost-effective analysis of these programs/measures. For Energy Star Homes, the therms are those associated with electric upgrades within electric or dual fuel homes.
[4] Number of projects is actual lamps distributed through community events throughout the region.

Table 14: Residential Natural Gas Program Summary

Program	State	Projects	Incentives (000s)	Energy Savings (therms)	Interactive Electric[5] (MWh)
Energy Star Products	ID	1,200	$48	7,794	19
	WA	2,997	$119	18,390	48
Energy Star Homes	ID	13	$8	1,665	0
	WA	2	$1	248	0
Heating and Cooling	ID	932	$374	72,758	0
	WA	2,069	$816	174,201	1
Water Heaters	ID	80	$4	364	0
	WA	382	$20	1,712	0
Home Weatherization	ID	982	$319	60,277	613
	WA	3,119	$934	177,779	1,490
	ID	3,207	$754	142,858	632
	WA	8,569	$1,889	372,330	1,539
	System	11,776	$2,643	515,187	2,171

CFL Contingency
Avista's first and foremost objective is to achieve all cost-effective energy efficiency resources. The 2010-2011 Biennium was the first under the I-937 requirements and was the first period for which penalties could be levied for insufficient acquisition. Consequently, the Company integrated the timing of the acquisition of identified cost-effective resources into our business planning strategy to assure compliance with I-937 requirements. This included launching a $4.0 million Compact Fluorescent Lamp (CFL) contingency program in the summer of 2011. The results of this program, in conjunction with the breadth of standard programs and higher than anticipated realization rates in general, allowed the Company to surpass its I-937 targets.

During the second half of 2011, boxes of CFLs were mailed to Avista residential and small commercial customers in multiple waves. Over 2.2 million lamps were distributed to residential customers while small commercial customers received over 138,000 lamps. This program was extremely cost-effective and resulted in 39,005 MWh related to measured 2011 installations. Additional impact analysis and surveying will be completed in 2012 and 2013 to measure and quantify the amount of savings attributable to post-2011 installations.

Simple Steps Smart Savings
Avista continues to participate in the cost-effective regional upstream, manufacturer buy-down of twists and specialty bulbs through Fluid Market Strategies. This program resulted in 14,321 MWh in annual first-year savings during 2011 at approximately $675,000. Over 523,000 bulbs were distributed to Avista customer through this regional program.

[5] There are electric savings associated with some residential natural gas measures. An example would be air conditioning savings on insulation installed in a natural gas home.

Low-Income Overview

Avista's residential low-income portfolio is composed primarily of holistic, site-specific programs delivered by six local Community Action Partner (CAP) agencies. This utilizes existing infrastructure and leverages similar Federal Weatherization Assistance Programs while also screening customers for complimentary energy assistance and other income-qualified programs.

Low-income efficiency measures are typically similar to measures offered under the traditional residential prescriptive programs due to cost-effectiveness guidelines. Low-income efficiency measures include other measures, like infiltration improvements, that have not been included within residential programs but are well-suited to a site-specific approach.

A list of approved measures with a high predictability of adequate cost-effectiveness is provided to the CAP agencies. CAPs may submit other measures for approval if cost-effectiveness is in question. The approval process is supported by tracking cost-effectiveness in a near real-time basis. The historical mix of measures available to CAP agencies remains basically unchanged.

Health and human safety measures which are deemed necessary to ensure the habitability of the home in order for residents to benefit from energy saving investments are also allowed within these low-income programs. CAP agencies complete installation of the efficiency measures at no cost to qualified customers through Avista's funding. Administrative fees are paid to the CAP agencies for delivery of all of the programs discussed above.

Based on evaluated results, approximately 2 percent of electric and nearly 3 percent of the natural gas savings were acquired through Avista's local low-income programs. During 2011, nearly 1,900 rebates were processed. Avista contributed over $2.3 million for energy efficiency upgrades to low-income households. Low-income programs contributed 1,736 MWh and over 35,877 therms in annual first-year energy savings.

Low-income programs benefit from the comprehensive *everylittlebit* energy efficiency awareness campaign that is delivered broadly to all residential customers. Another valuable outreach approach for low-income customers has been offering energy fairs. Energy fairs are led by the Consumer Affairs department to build awareness of non-weatherization low-income programs. The fairs are a natural fit to also communicate weatherization opportunities for low-income customers.

Nearly $400,000, funded outside the DSM tariff rider, was spent in 2011 for conservation education in Washington and Idaho. In Washington, $321,552 was spent on education and outreach activities to reach 971 senior and low-income customers through Avista workshops, 475 customers at energy fairs, and 33,175 parents and children were reach by Wattson (energy dog) community appearances. In Idaho, $29,776 was spent on education and outreach activities to reach 120 senior and low-income customers through Avista workshops, 300 customers at energy fairs, and 3,400 parents and children were reached by Wattson (energy dog) community appearances. The attendance numbers at Wattson community appearances do not include media coverage or reach/frequency estimates from print or television ad campaigns.

Additionally in Idaho, a $40,000 conservation education grant, funded outside the DSM tariff rider, was provided to the Community Action Partnership in Lewiston. The grant covered the costs for brochures, flyers and video to reach 8,291 people, workshops and community events for 842 people, and 11 one-on-one education activities in conjunction with home weatherization.

Table 15: Low-Income Electric Program Summary

Program	State	Projects	Incentives (000s)	Energy Savings (MWh)	Interactive Natural Gas (therms)
Space and Water Direct Use	ID	0	$0	0	0
	WA	236	$624	1,234	0
Energy Star Products	ID	0	$0	0	0
	WA	47	$36	25	0
Heating and Cooling	ID	0	$0	0	0
	WA	3	$1	2	0
Water Heaters	ID	3	$3	0	0
	WA	12	$17	3	0
Home Weatherization	ID	375	$380	237	0
	WA	176	$236	235	0
	ID	378	$383	237	0
	WA	474	$914	1,499	0
	System	852	$1,297	1,736	0

Table 16: Low-Income Natural Gas Program Summary

Program	State	Projects	Incentives (000s)	Energy Savings (therms)	Interactive Electric (MWh)
Heating and Cooling	ID	0	$0	0	0
	WA	99	$156	3,488	1
Water Heaters	ID	0	$0	0	0
	WA	3	$7	10	0
Home Weatherization	ID	281	$212	12,835	0
	WA	655	$607	19,545	0
	ID	281	$212	12,835	0
	WA	757	$771	23,042	1
	System	1,038	$982	35,877	1

Department of Commerce

In Docket No. UE-100176, the Commission approved Avista's Ten-year Achievable Conservation Potential and Biennial Conservation Target Report ("Biennial Conservation Plan" or "BCP"). Avista elected to use the Northwest Power Planning and Conservation Council's Option #1 of its 6th Power Plan to establish the Company's acquisition target. Since the 6th Power Plan includes all conservation that occurs within Avista's service territory, Avista has also worked with the Department of Commerce to document additional energy efficiency that occurred within the Company's service territory incremental to Avista's ongoing programs.

According to the Department of Commerce, 189 electric and 597 natural gas projects were completed on Avista customers resulting in 276 MWh and 70,714 therms in annual first-year savings for 2011.

Nonresidential Overview

Tariff Schedules 90 and 190 authorizing Avista's DSM programs for nonresidential customers allow energy efficiency projects with a simple payback of greater than one year and less than 13 years for non-lighting technologies and 8 years for lighting measures.

Within the nonresidential portfolio, programs are offered through a combination of prescriptive programs geared towards relatively common and uniform measures, applications and energy savings and site-specific program for all other efficiency measures and applications.

In the past, Avista has sought to use prescriptive programs to reduce the implementation expense as well as to simplify the communications to trade allies and customers. The use of prescriptive programs for measures with uniform savings and applications with significant throughput leads to minimal implementation cost relative to serving the same customer demand through the site-specific program. Prescriptive programs with large variability in savings estimates coupled with low through-put have been determined to be better served through a site-specific approach to ensure better savings estimates and savings in evaluation and implementation costs.

Any efficiency measures not included within a prescriptive program can be considered under the site-specific approach. This program requires a pre-project contractual agreement which is done after the project audit and analysis is complete. The analysis estimates the potential savings opportunity and the estimated incentive.

Based on evaluated results, approximately 56 percent of electric and 60 percent of the natural gas savings were acquired through Avista's local nonresidential programs. During 2011, over 2,400 projects were rebated. Avista contributed over $9.0 million for energy efficiency upgrades in nonresidential applications. Nonresidential programs contributed over 53,629 MWh and 832,374 therms in annual first-year energy savings.

Table 17: Nonresidential Electric Program Summary

Program	State	Projects	Incentives (000s)	Energy Savings (MWh)	Interactive Natural Gas[6] (therms)
Energy Smart Grocer	ID	144	$343	2,430	(8,317)
	WA	289	$761	5,028	(8,788)
Prescriptive Programs	ID	376	$456	4,385	(20,210)
	WA	648	$752	6,582	(31,981)
Renewable	ID	8	$6	25	0
	WA	30	$27	118	0
Site Specific Lighting	ID	77	$272	1,972	(5,351)
	WA	151	$1,075	8,075	(34,864)
Site Specific HVAC	ID	49	$325	3,335	(12,648)
	WA	80	$680	5,221	(2,958)
Site Specific Shell	ID	25	$37	193	0
	WA	55	$184	1,054	(87)
Site Specific Other	ID	52	$197	4,662	(4,874)
	WA	64	$1,869	10,550	(11,470)
	ID	731	$1,637	17,002	(51,400)
	WA	1,317	$5,349	36,626	(90,148)
	System	2,048	$6,986	53,629	(141,548)

[6] Interactive therms (e.g. increases to heating load due to more efficient lighting applications) or therms associated with electric programs.

Table 18: Nonresidential Natural Gas Program Summary

Program	State	Projects	Incentives (000s)	Energy Savings (therms)	Interactive Electric[7] (MWh)
Prescriptive Programs	ID	41	$23	13,595	0
	WA	132	$148	75,311	0
Site Specific HVAC	ID	35	$233	81,172	(7)
	WA	66	$1,025	467,198	(40)
Site Specific Shell	ID	34	$87	27,019	(10)
	WA	78	$459	156,025	(10)
Site Specific Other	ID	5	$13	3,932	0
	WA	11	$46	8,124	0
	ID	115	$356	125,717	(17)
	WA	287	$1,679	706,657	(50)
	System	402	$2,035	832,374	(67)

Regional Overview

Avista's local portfolio consists of programs and supporting infrastructure designed to enhance and accelerate the saturation of energy efficiency measures through a combination of financial incentives, technical assistance, program outreach and education. It is not feasible for Avista, or any individual utility, to independently have a meaningful impact upon regional or national markets. Attempts to do so would fail by virtue of the lack of scale and would suffer from leakage of many of the benefits to other utility service territories, which would benefit by being "free riders".

Consequently, utilities within the northwest have cooperatively worked together to develop the Northwest Energy Efficiency Alliance (NEEA) to address those opportunities that are beyond the ability of individual utilities to capitalize upon. Avista has been a participating and funding member of NEEA since the 1997 founding of the organization. NEEA is presently operating in a fourth funding cycle (2010 to 2014 inclusive). The current funding cycle has seen a doubling of the contractual funding from $20 million regionally to $40 million with actual expenditures subject to approval by the NEEA Board of Directors. The current funding cycle has also seen Avista's share of NEEA funding increase from 4.0% to 5.4% due to shifts in the distribution of regional retail end-use load.

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 achieved through the Company's local portfolio alone. The Company believes that these criteria will continue to be met in the foreseeable future.

The future of NEEA is not without challenges. Many of the benefits derived from the successful transformation of the residential lighting market are past. Though Avista believes that there is no single measure that can replace the success that NEEA has achieved within this market, there are favorable

[7] Interactive MWh or those MWh associated with natural gas programs.

prospects within multiple markets that could collectively form the foundation of an ongoing cost-effective portfolio. Avista has a particular interest in the consumer electronics field, a field which in many ways shares the market characteristics where NEEA has been successful in the past. Avista continues to review progress within these markets for potential leveraging through local program efforts.

In order to provide NEEA with the additional flexibility to deliver a high-value portfolio, Avista has taken the position that sector equity (across residential, commercial, industrial and agricultural markets) will not play a significant role in our evaluation of the regional portfolio. Historically NEEA's success has most frequently been in large markets composed of individually small, homogeneous customers (predominately the residential market). Avista believes that those local utilities that value sector equity are responsible for implementing local programs that, when aggregated with the regional portfolio, meet their desired equity objectives. Avista has a strong nonresidential local program founded upon an account executive marketing structure that meets our needs for sector equity should NEEA adopt a strategy of disproportionately pursuing residential markets.

The Company has explicitly communicated with NEEA that the delivery of cost-effectiveness resources to our service territory is our primary criteria for success. This demands a strong consideration for the geographic equity in the distribution of NEEA benefits throughout the region. This has been a primary focus of Avista since the founding of NEEA and will remain so in 2012 and beyond.

NEEA continues to work toward improvements in its ability to quantify the distribution of energy savings throughout the region. Avista intends to use the best available methodology for determining the benefits that accrue to Avista customers for purposes of monitoring geographic equity and Avista cost-effectiveness as well as for Washington I-937 acquisition claims and measurement against electric IRP targets within Idaho.

During 2011, Avista contributed $1.5 million to NEEA and its activities. NEEA reported that Avista's portion of savings attributable to Washington for 2011 were 32,149 MWh, which includes 9,899 MWh for a one-time adjustment[8]. Avista's portion of NEEA savings attributable to Idaho was not yet available at the time of this report.

It is important, in 2012 and beyond, for Avista to continue to play an active role in the organizational oversight of NEEA. This is critical to ensure that geographic equity, cost-effectiveness and resource acquisition continue to be the primary areas of focus.

NEEA has initiated a preliminary investigation of the prospects for a natural gas market transformation portfolio. In the past, Avista has actively encouraged that NEEA explore such a role. The Company has participated in and funded a preliminary evaluation of the prospects for a natural gas portfolio during 2011. Despite the challenges that natural gas efficiency currently faces (in terms of lower avoided costs and economic impediments to customer investments created by current macroeconomic conditions), Avista believes that regional market transformation may be a valuable addition to the tools available to the utility industry in cost-effectively acquiring additional natural gas resources. The addition of this tool

[8] The one-time adjustment is the difference between NEEA's Total Regional Savings calculation (using the Fifth Power Plan baseline) and the Local Program savings (using the Fifth Power Plan baseline) that counts toward the Fifth Power Plan targets (Eckman, Tom March 20, 2012 via communications between NEEA staff and Tom Eckman, Conservation Manager, Northwest Power and Conservation Council).

during the current challenging market for natural gas efficiency may lend to future success within this market.

Preliminary investigation yielded five prospective measures suitable for market transformation which are being evaluated by NEEA (with input from the funding natural gas utilities).

Avista will continue to follow and contribute to NEEA's exploration of a natural gas market transformation portfolio during 2012. Avista's key criteria for a successful effort are the same as those that have been applied to the electric portfolio for the previous 14 years; a cost-effective augmentation to the DSM portfolio delivering measurable resources to Avista customers with an acceptable geographic equity.

VI. DSM Expenditures

During 2011, the Company incurred over $24.6 million in electric expenditures and nearly $7.7 million in natural gas expenditures, for a total of nearly $32.3 million supporting energy efficiency. Of this amount, more than $1.5 million was contributed to the Northwest Energy Efficiency Alliance in support of its market transformation ventures. Approximately, 63% of electric expenditures and 74% of natural gas expenditures were returned to ratepayers in the form of incentives or products (e.g. CFLs). In addition, nearly $1.8 million, or 5.6%, or 2011 expenditures were spent on evaluation of our energy efficiency programs in an effort to continually improve the design and implementation of our program offerings.

Incentives are directly charged to the state where the customers are located. Nonresidential site-specific incentives can be "lumpy" in nature due to the size and timing of these projects. Implementation and EM&V expenditures can be directly charged to the state and segment or in cases where the work benefits multiple states/segments, these expenditures are allocated based on avoided costs.

Table 19: Electric DSM Expenditures

Segment	State	Incentives	Implementation	EM&V	NEEA	Total
Residential	ID	$2,115,644	$1,155,884	$29,380	$0	$3,300,908
	WA	$4,120,122	$2,311,975	$56,254	$0	$6,488,351
Low-Income	ID	$489,164	$26,550	$0	$0	$515,714
	WA	$1,185,713	$23,874	$0	$0	$1,209,587
Nonresidential	ID	$1,611,919	$301,630	$1,498	$0	$1,915,047
	WA	$5,994,025	$597,287	$3,012	$0	$6,594,324
Regional	ID	$0	$3,662	$5,112	$518,931	$527,706
	WA	$0	$7,012	$9,788	$993,591	$1,010,397
General	ID	$0	$648,274	$360,402	$0	$1,008,677
	WA	$0	$1,336,467	$717,546	$0	$2,054,012
	ID	$4,216,727	$2,136,001	$396,393	$518,931	$7,268,052
	WA	$11,299,860	$4,276,613	$786,600	$993,591	$17,356,665
	System	$15,516,588	$6,412,614	$1,182,993	$1,512,522	$24,624,717

Table 20: Natural Gas DSM Expenditures

Segment	State	Incentives	Implementation	EM&V	Total
Residential	ID	$759,773	$56,848	$939	$817,561
	WA	$1,947,336	$115,187	$1,766	$2,064,289
Low-Income	ID	$204,874	$23,545	$0	$228,419
	WA	$772,606	$19,057	$0	$791,662
Nonresidential	ID	$326,739	$56,017	$119	$382,875
	WA	$1,655,736	$109,531	$0	$1,765,267
Regional	ID	$0	$0	$0	$0
	WA	$0	$0	$0	$0
General	ID	$0	$328,123	$203,585	$531,708
	WA	$0	$674,006	$407,941	$1,081,946
	ID	$1,291,386	$464,533	$204,643	$1,960,562
	WA	$4,375,677	$917,781	$409,707	$5,703,165
	System	$5,667,063	$1,382,314	$614,350	$7,663,727

Tariff Rider Balances

As of January 1, 2011, Washington and Idaho electric and natural gas (aggregate) tariff rider balances were $3.4 million underfunded. During 2011, $36.7 million in tariff rider revenue was collected while $32.3 million was expended for the operation of energy efficiency programs. The $4.4 million excess collection eliminated the $3.4 million underfunded balances and a $994,000 overfunded balance remained at the end of 2011.

Since year end of 2011, the overfunded tariff rider balances have continued to grow resulting in an overfunded balance of more than $2.4 million for Washington electric, $699 thousand for Idaho electric, $344 thousand for Washington natural gas and $1.3 million for Idaho natural gas. On June 1, 2012, Avista will be filing for reductions to the Washington electric and natural gas tariff rider surcharges. This will result in an approximate decrease of $8.2 million for Schedule 91 (electric) and a decrease of $1.9 million for Schedule 191 (natural gas). Tariff rider adjustments will be filed for Idaho electric and natural gas later this year.

The following table illustrates individual tariff rider activity for 2011 by state and fuel.

Table 21: Tariff Rider Balances

	Idaho Electric	Washington Electric	Idaho Natural Gas	Washington Natural Gas
2011 Beginning Balance *(Underfunded)*	($466,308)	$823,051	($814,739)	($2,970,264)
2011 Funding	$7,707,719	$17,314,341	$3,763,884	$7,924,966
Total 2011 Funds for Operations	$7,241,411	$18,137,392	$2,949,145	$4,954,702
2011 Expenditures	$7,268,135	$17,333,350	$1,960,562	$5,726,397
2011 Ending Balance *(Underfunded)*	($26,723)	$804,042	$988,582	($771,695)

Actual to Business Plan Comparison

During 2011, Avista spent $3.5 million more than the business plan budget in order to achieve all cost-effective energy efficiency. While the budget is a tool for operational planning, Avista is required to rebate all energy efficiency that qualifies under Schedules 90 and 190. Since customer rebates are the largest component of the DSM budget, customer demand can easily impact the funding level of the Tariff Riders – Schedule 91 and 191. The Company currently had an overfunded balance, so in spite of greater customer demand of energy efficiency programs than budgeted in the business plan, the aggregate Tariff Rider balance remains in an overfunded state.

Refer to the table below for detail by state and fuel.

Table 22: Actual to Business Plan Expenditures

	Idaho Electric	Washington Electric	Idaho Natural Gas	Washington Natural Gas
Budget per 2011 Business Plan	$5,534,119	$14,402,524	$2,108,309	$5,211,814
Actual 2011 Expenditures	$6,749,121	$16,363,074	$1,960,562	$5,703,165
Variance (unfavorable)	($1,215,002)	($1,960,550)	$147,747	($491,351)

VII. External Stakeholder Involvement

During 2011, Avista facilitated eight all-day energy efficiency meetings and one technical advisory committee as part of its Integrated Resource Planning process with a focus on energy efficiency. In addition, Avista participated in six all-day Washington Conservation Working Group meetings in Olympia. Finally, Avista facilitated six energy efficiency webinars with participation from Avista's energy efficiency stakeholders.

Appendices

Appendix 1

Summary Cost-Effectiveness Tests

Summary of Electric Cost-Effectiveness Tests

Total Resource Cost	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Electric avoided cost	$18,698,479	$155,866	$18,854,345	$39,084,520	$967,512	$40,052,031	$57,782,999	$1,123,377	$58,906,376
Natural Gas avoided cost	($463,506)	$0	($463,506)	($612,534)	$0	($612,534)	($1,076,040)	$0	($1,076,040)
Non-energy benefits	$1,060,627	$40,587	$1,101,214	$557,925	$226,021	$783,946	$1,618,553	$266,608	$1,885,160
TRC benefits	$19,295,601	$196,452	$19,492,053	$39,029,911	$1,193,533	$40,223,444	$58,325,512	$1,389,985	$59,715,497
Non-incentive utility cost	$2,429,468	$31,937	$2,461,405	$5,051,605	$81,710	$5,133,315	$7,481,073	$113,647	$7,594,720
Customer cost	$7,963,748	$423,831	$8,387,578	$29,703,238	$1,140,091	$30,843,329	$37,666,986	$1,563,922	$39,230,908
TRC costs	$10,393,216	$455,768	$10,848,984	$34,754,843	$1,221,801	$35,976,644	$45,148,059	$1,677,569	$46,825,628
TRC ratio	**1.86**	**0.43**	**1.80**	**1.12**	**0.98**	**1.12**	**1.29**	**0.83**	**1.28**
Net TRC benefits	**$8,902,385**	**($259,316)**	**$8,643,069**	**$4,275,068**	**($28,268)**	**$4,246,800**	**$13,177,453**	**($287,584)**	**$12,889,869**

Program Administrator Cost	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Electric avoided cost	$18,698,479	$155,866	$18,854,345	$39,084,520	$967,512	$40,052,031	$57,782,999	$1,123,377	$58,906,376
Natural Gas avoided cost	($463,506)	$0	($463,506)	($612,534)	$0	($612,534)	($1,076,040)	$0	($1,076,040)
PAC benefits	$18,234,973	$155,866	$18,390,839	$38,471,986	$967,512	$39,439,498	$56,706,959	$1,123,377	$57,830,337
Non-incentive utility cost	$2,429,468	$31,937	$2,461,405	$5,051,605	$81,710	$5,133,315	$7,481,073	$113,647	$7,594,720
Incentive cost	$3,532,756	$383,244	$3,916,000	$9,083,063	$914,070	$9,997,133	$12,615,819	$1,297,314	$13,913,133
PAC costs	$5,962,224	$415,181	$6,377,405	$14,134,668	$995,780	$15,130,448	$20,096,892	$1,410,961	$21,507,853
PAC ratio	**3.06**	**0.38**	**2.88**	**2.72**	**0.97**	**2.61**	**2.82**	**0.80**	**2.69**
Net PAC benefits	**$12,272,750**	**($259,316)**	**$12,013,434**	**$24,337,318**	**($28,268)**	**$24,309,050**	**$36,610,068**	**($287,584)**	**$36,322,484**

Participant	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Electric Bill Reduction	$11,862,200	$208,513	$12,070,713	$28,931,722	$1,336,027	$30,267,748	$40,793,922	$1,544,540	$42,338,462
Gas Bill Reduction	($500,995)	$0	($500,995)	($889,701)	$0	($889,701)	($1,390,696)	$0	($1,390,696)
Non-energy benefits	$1,060,627	$40,587	$1,101,214	$557,925	$226,021	$783,946	$1,618,553	$266,608	$1,885,160
Participant benefits	$12,421,832	$249,100	$12,670,932	$28,599,946	$1,562,048	$30,161,994	$41,021,778	$1,811,148	$42,832,926
Customer cost	$7,963,748	$423,831	$8,387,578	$29,703,238	$1,140,091	$30,843,329	$37,666,986	$1,563,922	$39,230,908
Incentive received	($3,532,756)	($383,244)	($3,916,000)	($9,083,063)	($914,070)	($9,997,133)	($12,615,819)	($1,297,314)	($13,913,133)
Participant costs	$4,430,992	$40,587	$4,471,579	$20,620,175	$226,021	$20,846,196	$25,051,167	$266,608	$25,317,775
Participant ratio	**2.80**	**6.14**	**2.83**	**1.39**	**6.91**	**1.45**	**1.64**	**6.79**	**1.69**
Net Participant benefits	**$7,990,841**	**$208,513**	**$8,199,354**	**$7,979,771**	**$1,336,027**	**$9,315,797**	**$15,970,611**	**$1,544,540**	**$17,515,151**

Rate Impact Measure	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Electric avoided cost savings	$18,698,479	$155,866	$18,854,345	$39,084,520	$967,512	$40,052,031	$57,782,999	$1,123,377	$58,906,376
Nonparticipant benefits	$18,698,479	$155,866	$18,854,345	$39,084,520	$967,512	$40,052,031	$57,782,999	$1,123,377	$58,906,376
Electric Revenue loss	$11,862,200	$208,513	$12,070,713	$28,931,722	$1,336,027	$30,267,748	$40,793,922	$1,544,540	$42,338,462
Non-incentive utility cost	($532,932)	$31,937	($500,995)	$5,051,605	$81,710	$5,133,315	$4,518,673	$113,647	$4,632,320
Customer incentives	$3,532,756	$383,244	$3,916,000	$9,083,063	$914,070	$9,997,133	$12,615,819	$1,297,314	$13,913,133
Nonparticipant costs	$14,862,024	$623,694	$15,485,718	$43,066,390	$2,331,806	$45,398,196	$57,928,413	$2,955,501	$60,883,914
RIM ratio	**1.26**	**0.25**	**1.22**	**0.91**	**0.41**	**0.88**	**1.00**	**0.38**	**0.97**
Net RIM benefits	**$3,836,456**	**($467,829)**	**$3,368,627**	**($3,981,870)**	**($1,364,295)**	**($5,346,165)**	**($145,414)**	**($1,832,124)**	**($1,977,538)**

Summary of Natural Gas Cost-Effectiveness Tests

Total Resource Cost	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Natural gas avoided cost	$3,528,835	$138,104	3,666,940	$13,505,037	$244,748	$13,749,785	$17,033,873	$382,852	$17,416,725
Electric avoided cost	$752,660	$0	$752,660	$1,859,273	$294	$1,859,567	$2,611,933	$294	$2,612,227
Non-energy benefits	$15,694	$64,464	$80,158	$334,020	$88,431	$422,451	$349,714	$152,895	$502,609
TRC benefits	$4,297,189	$202,568	$4,499,757	$15,698,331	$333,472	$16,031,803	$19,995,520	$536,040	$20,531,560
Non-incentive utility cost	$625,606	$43,570	$669,177	$1,289,172	$38,316	$1,327,487	$1,914,778	$81,886	$1,996,664
Customer cost	$4,348,979	$276,170	$4,625,149	$13,454,184	$859,022	$14,313,206	$17,803,163	$1,135,192	$18,938,355
TRC costs	$4,974,585	$319,740	$5,294,325	$14,743,356	$897,338	$15,640,694	$19,717,941	$1,217,078	$20,935,019
TRC ratio	**0.86**	**0.63**	**0.85**	**1.06**	**0.37**	**1.03**	**1.01**	**0.44**	**0.98**
Net TRC benefits	**($677,396)**	**($117,172)**	**($794,568)**	**$954,975**	**($563,865)**	**$391,109**	**$277,578**	**($681,038)**	**($403,459)**

Program Administrator Cost	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Natural gas avoided cost	$3,528,835	$138,104	$3,666,940	$13,505,037	$244,748	$13,749,785	$17,033,873	$382,852	$17,416,725
Electric avoided cost	$752,660	$0	$752,660	$1,859,273	$294	$1,859,567	$2,611,933	$294	$2,612,227
PAC benefits	$4,281,495	$138,104	$4,419,599	$15,364,311	$245,041	$15,609,352	$19,645,806	$383,145	$20,028,951
Non-incentive utility cost	$625,606	$43,570	$669,177	$1,289,172	$38,316	$1,327,487	$1,914,778	$81,886	$1,996,664
Incentive cost	$1,109,759	$211,706	$1,321,465	$3,568,503	$770,591	$4,339,094	$4,678,261	$982,297	$5,660,558
PAC costs	$1,735,365	$255,276	$1,990,641	$4,857,675	$808,907	$5,666,581	$6,593,040	$1,064,183	$7,657,223
PAC ratio	**2.47**	**0.54**	**2.22**	**3.16**	**0.30**	**2.75**	**2.98**	**0.36**	**2.62**
Net PAC benefits	**$2,546,130**	**($117,172)**	**$2,428,958**	**$10,506,636**	**($563,865)**	**$9,942,771**	**$13,052,766**	**($681,038)**	**$12,371,729**

Participant	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Natural gas bill reduction	$2,488,286	$117,368	$2,605,654	$9,271,724	$198,303	$9,470,027	$11,760,009	$315,671	$12,075,681
Electric bill reduction	$721,577	$0	$721,577	$1,922,103	$470	$1,922,573	$2,643,680	$470	$2,644,150
Non-energy benefits	$15,694	$64,464	$80,158	$334,020	$88,431	$422,451	$349,714	$152,895	$502,609
Participant benefits	$3,225,556	$181,832	$3,407,388	$11,527,847	$287,205	$11,815,051	$14,753,403	$469,036	$15,222,439
Customer cost	$4,348,979	$276,170	$4,625,149	$13,454,184	$859,022	$14,313,206	$17,803,163	$1,135,192	$18,938,355
Incentive received	($1,109,759)	($211,706)	($1,321,465)	($3,568,503)	($770,591)	($4,339,094)	($4,678,261)	($982,297)	($5,660,558)
Participant costs	$3,239,220	$64,464	$3,303,684	$9,885,681	$88,431	$9,974,113	$13,124,902	$152,895	$13,277,797
Participant ratio	**1.00**	**2.82**	**1.03**	**1.17**	**3.25**	**1.18**	**1.12**	**3.07**	**1.15**
Net Participant benefits	**($13,664)**	**$117,368**	**$103,704**	**$1,642,165**	**$198,773**	**$1,840,939**	**$1,628,501**	**$316,141**	**$1,944,643**

Rate Impact Measure	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Natural Gas avoided cost savings	$3,528,835	$138,104	$3,666,940	$13,505,037	$244,748	$13,749,785	$17,033,873	$382,852	$17,416,725
Nonparticipant benefits	$3,528,835	$138,104	$3,666,940	$13,505,037	$244,748	$13,749,785	$17,033,873	$382,852	$17,416,725
Natural Gas revenue loss	$2,488,286	$117,368	$2,605,654	$9,271,724	$198,303	$9,470,027	$11,760,009	$315,671	$12,075,681
Non-incentive utility cost	$678,006	$43,570	$721,577	$1,289,172	$38,316	$1,327,487	$1,967,178	$81,886	$2,049,064
Customer incentives	$1,109,759	$211,706	$1,321,465	$3,568,503	$770,591	$4,339,094	$4,678,261	$982,297	$5,660,558
Nonparticipant costs	$4,276,051	$372,645	$4,648,695	$14,129,398	$1,007,210	$15,136,608	$18,405,449	$1,379,854	$19,785,304
RIM ratio	**0.83**	**0.37**	**0.79**	**0.96**	**0.24**	**0.91**	**0.93**	**0.28**	**0.88**
Net RIM benefits	**($747,215)**	**($234,540)**	**($981,756)**	**($624,361)**	**($762,462)**	**($1,386,823)**	**($1,371,576)**	**($997,003)**	**($2,368,579)**

Summary of Combined Electric and Natural Gas Cost-Effectiveness Tests

	Idaho			Washington			System		
Total Resource Cost	**Regular Income portfolio**	**Low Income portfolio**	**Overall portfolio**	**Regular Income portfolio**	**Low Income portfolio**	**Overall portfolio**	**Regular Income portfolio**	**Low Income portfolio**	**Overall portfolio**
Electric avoided cost	$22,227,315	$293,970	$19,607,005	$52,589,557	$1,212,259	$53,801,816	$74,816,872	$1,506,229	$76,323,101
Natural Gas avoided cost	$289,154	$0	($383,348)	$1,246,740	$294	$1,247,033	$1,535,893	$294	$1,536,187
Non-energy benefits	$1,076,321	$105,050	$5,600,971	$891,945	$314,452	$1,206,397	$1,968,267	$419,503	$2,387,769
TRC benefits	$23,592,790	$399,020	$24,824,627	$54,728,242	$1,527,005	$56,255,247	$78,321,032	$1,926,025	$80,247,057
Non-incentive utility cost	$3,055,074	$75,508	$3,130,582	$6,340,777	$120,025	$6,460,802	$9,395,851	$195,533	$9,591,384
Customer cost	$12,312,727	$700,000	$13,012,727	$43,157,423	$1,999,113	$45,156,536	$55,470,150	$2,699,113	$58,169,263
TRC costs	$15,367,801	$775,508	$16,143,309	$49,498,199	$2,119,138	$51,617,338	$64,866,000	$2,894,646	$67,760,647
TRC ratio	**1.54**	**0.51**	**1.54**	**1.11**	**0.72**	**1.09**	**1.21**	**0.67**	**1.18**
Net TRC benefits	**$8,224,989**	**($376,488)**	**$8,681,318**	**$5,230,043**	**($592,133)**	**$4,637,909**	**$13,455,031**	**($968,621)**	**$12,486,410**

	Idaho			Washington			System		
Program Administrator Cost	**Regular Income portfolio**	**Low Income portfolio**	**Overall portfolio**	**Regular Income portfolio**	**Low Income portfolio**	**Overall portfolio**	**Regular Income portfolio**	**Low Income portfolio**	**Overall portfolio**
Electric avoided cost	$19,451,139	$155,866	$19,607,005	$40,943,793	$967,805	$41,911,598	$60,394,932	$1,123,671	$61,518,603
Natural Gas avoided cost	$3,065,329	$138,104	$3,203,434	$12,892,504	$244,748	$13,137,251	$15,957,833	$382,852	$16,340,685
PAC benefits	$22,516,469	$293,970	$22,810,438	$53,836,297	$1,212,553	$55,048,850	$76,352,765	$1,506,523	$77,859,288
Non-incentive utility cost	$3,055,074	$75,508	$3,130,582	$6,340,777	$120,025	$6,460,802	$9,395,851	$195,533	$9,591,384
Incentive cost	$4,642,515	$594,950	$5,237,465	$12,651,566	$1,684,661	$14,336,227	$17,294,080	$2,279,611	$19,573,691
PAC costs	$7,697,589	$670,458	$8,368,046	$18,992,343	$1,804,686	$20,797,029	$26,689,931	$2,475,144	$29,165,075
PAC ratio	**2.93**	**0.44**	**2.73**	**2.83**	**0.67**	**2.65**	**2.86**	**0.61**	**2.67**
Net PAC benefits	**$14,818,880**	**($376,488)**	**$14,442,392**	**$34,843,954**	**($592,133)**	**$34,251,821**	**$49,662,834**	**($968,621)**	**$48,694,213**

Participant	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Electric Bill Reduction	$12,583,777	$208,513	$12,792,290	$30,853,824	$1,336,497	$32,190,321	$43,437,601	$1,545,010	$44,982,611
Gas Bill Reduction	$1,987,291	$117,368	$2,104,659	$8,382,023	$198,303	$8,580,326	$10,369,313	$315,671	$10,684,985
Non-energy benefits	$1,076,321	$105,050	$1,181,372	$891,945	$314,452	$1,206,397	$1,968,267	$419,503	$2,387,769
Participant benefits	$15,647,389	$430,932	$16,078,321	$40,127,793	$1,849,252	$41,977,045	$55,775,181	$2,280,184	$58,055,365
Customer cost	$12,312,727	$700,000	$13,012,727	$43,157,423	$1,999,113	$45,156,536	$55,470,150	$2,699,113	$58,169,263
Incentive received	($4,642,515)	($594,950)	($5,237,465)	($12,651,566)	($1,684,661)	($14,336,227)	($17,294,080)	($2,279,611)	($19,573,691)
Participant costs	$7,670,212	$105,050	$7,775,263	$30,505,857	$314,452	$30,820,309	$38,176,069	$419,503	$38,595,572
Participant ratio	**2.04**	**4.10**	**2.07**	**1.32**	**5.88**	**1.36**	**1.46**	**5.44**	**1.50**
Net Participant benefits	**$7,977,177**	**$325,881**	**$8,303,058**	**$9,621,936**	**$1,534,800**	**$11,156,736**	**$17,599,112**	**$1,860,681**	**$19,459,794**

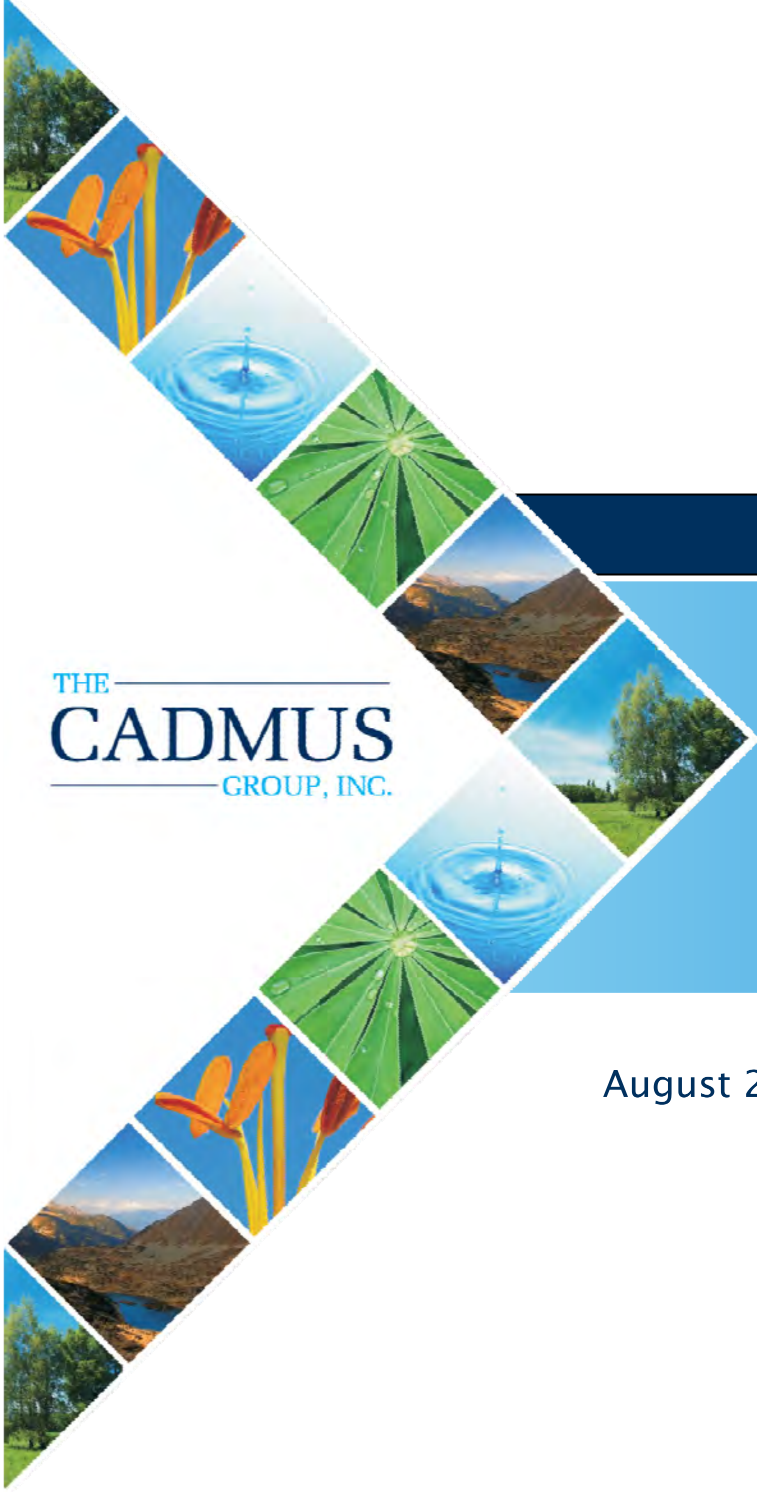
Rate Impact Measure	Idaho Regular Income portfolio	Idaho Low Income portfolio	Idaho Overall portfolio	Washington Regular Income portfolio	Washington Low Income portfolio	Washington Overall portfolio	System Regular Income portfolio	System Low Income portfolio	System Overall portfolio
Avoided Cost Savings	$22,227,315	$293,970	$22,521,284	$52,589,557	$1,212,259	$53,801,816	$74,816,872	$1,506,229	$76,323,101
Nonparticipant benefits	$22,227,315	$293,970	$22,521,284	$52,589,557	$1,212,259	$53,801,816	$74,816,872	$1,506,229	$76,323,101
Revenue Loss	$14,350,486	$325,881	$14,676,367	$38,203,445	$1,534,330	$39,737,776	$52,553,931	$1,860,212	$54,414,143
Non-incentive utility cost	$145,074	$75,508	$220,582	$6,340,777	$120,025	$6,460,802	$6,485,851	$195,533	$6,681,384
Customer incentives	$4,642,515	$594,950	$5,237,465	$12,651,566	$1,684,661	$14,336,227	$17,294,080	$2,279,611	$19,573,691
Nonparticipant costs	$19,138,074	$996,339	$20,134,414	$57,195,788	$3,339,016	$60,534,804	$76,333,863	$4,335,355	$80,669,218
RIM ratio	**1.16**	**0.30**	**1.12**	**0.92**	**0.36**	**0.89**	**0.98**	**0.35**	**0.95**
Net RIM benefits	**$3,089,240**	**($702,369)**	**$2,386,871**	**($4,606,231)**	**($2,126,757)**	**($6,732,988)**	**($1,516,991)**	**($2,829,126)**	**($4,346,117)**

Appendix 2

Avista 2010 Multi-Sector Gas Impact Evaluation Report

August 2, 2011

The Cadmus Group, Inc.



THE CADMUS GROUP, INC.

Avista 2010 Multi-Sector Gas Impact Evaluation Report

August 2, 2011

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Table of Contents

Portfolio Executive Summary

The Cadmus Group, Inc. was contracted by Avista Corporation to complete process and impact evaluations of the 2010 and 2011 gas and electric demand-side management (DSM) programs. This report only presents our impact findings for the PY 2010 gas portfolio. A process evaluation report is due to Avista in September 2011.

Evaluation Activities

For each of the three sectors—residential, non-residential, and low-income—we employed a variety of evaluation methods and activities. These are shown in Table 1-1.

Table 1-1. 2010 Gas Programs Evaluation Activities

Sector	Program	Document/ Database Review	Metering	Verification Site Visit	Survey	Billing Analysis	Modeling
Residential	ENERGY STAR Products	✓		✓	✓		
	Heating and Cooling Efficiency	✓		✓	✓	✓	
	Weatherization/Shell	✓		✓	✓		
	Water Heater Efficiency	✓		✓	✓		
	ENERGY STAR Homes	✓		✓			✓
Non-Residential	Prescriptive Programs	✓		✓	✓		
	Site-Specific	✓	✓	✓	✓	✓	✓
	Energy Smart Grocer	✓		✓			
Low-Income	Low-Income Programs	✓			✓	✓	

Key Findings and Conclusions

Residential

The major residential program conclusions are:

- Overall, residential gas program customers responded well to the programs and often installed several measures within the same program year.
- Avista's program and tracking databases were sufficient for evaluation purposes, providing adequate contact information, measure and savings information, and the database review confirmed that the information was reliable and accurate.
- The great majority of measures were determined to meet program qualification standards.
- The billing analysis performed to calculate average annual gas savings for furnaces produced interesting and conclusive results. The subsequent electric savings report will further inspect the interaction of gas furnaces and electric heat pumps to determine the overall energy usage of the home for heating.

Non-Residential

The Cadmus team successfully evaluated 104 of 453 measures installed through the program, representing 65 percent of reported savings.

In general, Cadmus determined that Avista implemented the programs well. Gross *ex post* evaluated savings achieved 76 percent of IRP program savings *goal* (892,886 compared to 1,172,269 therms). The overall portfolio achieved a 113 percent realization rate (comparing gross *ex post* evaluated savings at 892,886 therms to gross *ex ante* reported savings at 791,983 therms).

Cadmus developed a number of additional conclusions:

- The evaluation process was complicated due to some limitations in Avista's database extract. Cadmus could have streamlined the sampling process with the addition of site addresses and contact information. Measure-level data for each project, such as specific measure type and quantity, would have improved the range and depth of our evaluation activities.
- Cadmus is unable to reliably estimate interactive savings (e.g., between HVAC and lighting) impacts through the data available in Avista's current database extracts.

Low-Income

Overall, gross savings for program participants from the billing analysis averaged 123 therms in Idaho, 104 in Washington, and 112 across both states. This is approximately 15 percent energy savings for participants in both Washington and Idaho relative to their pre-participation annual consumption.

By comparing the estimated model savings to the expected savings, we calculated realization rates of 60 percent in Idaho, 30 in Washington, and 38 overall. The average expected savings provided by Avista appeared particularly high for Washington participants (46 percent of pre-usage), which accounts for the lower realization rate. Several other factors may have contributed to the low results:

- High saturation of alternative heating sources (e.g., wood, fuel oil, portable electric heaters) not accounted for when developing expected savings estimates.
- Different approaches in developing expected savings estimates are not accounting for pre-weatherization annual consumption, square footage, or measure interaction.

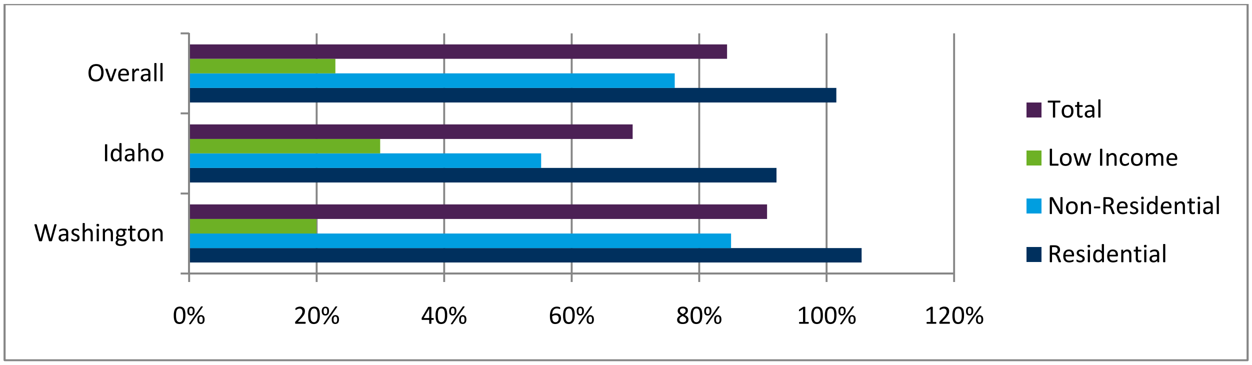
There were some homes not included in the billing analysis because they were converted from electric to gas heating.

Overall sector realization rate was 23% compared to the program goal.

Savings Results

Figure 1 displays the portfolio achieved gross savings relative to reported goals by sector, state, and overall. The residential sector exceeded goals in Washington and overall. The portfolio overall achieved 84% of the stated goals.

Figure 1. Gross Achieved Savings Percentages of IRP Goals



The following four tables show sector-level gross and net savings values and realization rates compared to reported savings and IRP goals. Net savings were estimated using results of a recent study conducted by Cadmus for Avista.

Table 1-2. Reported and Gross Verified Savings by State and Sector

Sector	Washington			Idaho			Total		
	Reported Savings	Gross Verified Savings	Real-ization Rate	Reported Savings	Gross Verified Savings	Real-ization Rate	Reported Savings	Gross Verified Savings	Real-ization Rate
Residential	823,926	683,313	83%	303,069	251,757	83%	1,126,995	935,070	83%
Non-Residential	611,681	700,883	115%	180,302	192,003	106%	791,983	892,886	113%
Low-Income	45,990	14,049	31%	15,286	8,886	58%	61,276	22,937	37%
Total	1,481,597	1,398,245	94%	498,657	452,646	91%	1,980,254	1,850,893	93%

Table 1-3. Reported and Net Verified Savings by State and Sector

Sector	Washington			Idaho			Total		
	Reported Savings	Net Verified Savings	Real-ization Rate	Reported Savings	Net Verified Savings	Real-ization Rate	Reported Savings	Net Verified Savings	Real-ization Rate
Residential	823,926	425,336	52%	303,069	155,630	51%	1,126,995	580,966	52%
Non-Residential	611,681	524,358	86%	180,302	147,986	82%	791,983	672,344	85%
Low-Income	45,990	14,049	31%	15,286	8,886	58%	61,276	22,937	37%
Total	1,481,597	963,743	65%	498,657	312,502	63%	1,980,254	1,276,247	64%

Table 1-4. IRP Goals and Gross Verified Savings by State and Sector

Sector	Washington			Idaho			Total		
	Savings Goal	Gross Achieved	Achiev-ement Rate	Savings Goal	Gross Achieved	Achiev-ement Rate	Savings Goal	Gross Achieved	Achiev-ement Rate
Residential	647,788	683,313	105%	273,281	251,757	92%	921,069	935,070	102%

Non-Residential	824,457	700,883	85%	347,812	192,003	55%	1,172,269	892,886	76%
Low-Income	70,330	14,049	20%	29,670	8,886	30%	100,000	22,937	23%
Total	1,542,575	1,398,245	91%	650,763	452,646	70%	2,193,338	1,850,893	84%

Table 1-5. IRP Goals and Net Verified Savings by State and Sector

	Washington			Idaho			Total		
Sector	Savings Goal	Net Achieved	Achieve-ment Rate	Savings Goal	Net Achieved	Achieve-ment Rate	Savings Goal	Net Achieved	Achieve-ment Rate
Residential	647,788	425,336	66%	273,281	155,630	57%	921,069	580,966	63%
Non-Residential	824,457	524,358	64%	347,812	147,986	43%	1,172,269	672,344	57%
Low-Income	70,330	14,049	20%	29,670	8,886	30%	100,000	22,937	23%
Total	1,542,575	963,743	62%	650,763	312,502	48%	2,193,338	1,276,247	58%

In summary, using gross savings as the primary measure, the 2010 gas portfolio achieved a realization rate of 93 (Table 2) percent from reported savings, and an 84 percent achievement rate from the IRP goals (Table 4). The non-residential sector had the highest realization rate of 113 percent from reported savings (Table 2), but the residential sector had the highest achievement rate of 102 percent of Avista stated goals (Table 4). Washington overall had consistently higher realization rates from reported savings and achievement rates from goals in comparison to Idaho. The low-income sector was the exception to this overall conclusion, with both realization rates and achievement rates higher in Idaho than Washington.

Recommendations and Further Analysis

Residential

The majority of our recommendations center around increasing measure level detail capture on the applications and inclusion in the databases. Some of this information includes:

- List energy factors, or at least model numbers, for appliances
- Include baseline information, such as for insulation
- Request square footage, particularly for ENERGY STAR homes

- The interaction of gas furnaces and heat pumps on both savings and incentive structure will be revisited in both the electric report and the 2010 process report. Residential heat pumps, many homes with a gas furnace as well, are currently undergoing a metering study and those data will provide important information to assist the Heating and Cooling Efficiency program going forward.

Non-Residential

Cadmus recommends that Avista continue to offer incentives for measure installation through the evaluated programs. We have the following recommendations for potentially improving program energy savings impacts and evaluability:

- While Avista's databases house the information necessary to streamline evaluation, such as site addresses, site contact information, and measure-level details, a simpler extraction process could help improve the process.
- Avista may want to consider providing incentives for demand controlled ventilation, refrigerated warehouses, and steam trap replacements through the Site Specific program.
- Avista should consider revising the methods for calculating and tracking HVAC/lighting interactive effects.

Low-Income

Our suggestions for enhancements that could help improve program impact results include:

- Standardize Expected Savings Calculations. Standardizing expected savings calculations across both states will help avoid discrepancies in realization rates.
- Account for Additional Factors in Savings Calculations. Accounting for pre-period annual consumption, square footage, and interaction effects will help create a more robust savings estimate and avoid over-estimates that may occur through a prescriptive application of deemed estimates.
- Track Alternative Heating Sources. Collecting information on a customer's primary heating usage at the time of weatherization will allow for more reasonable estimates in cases where, despite being a gas customer, gas is used as a secondary heating source.
- Include High-Use Customers in Program Targeting. Targeting high-use customers may help to achieve higher energy savings and aid overly burdened customers with usage higher than average customers.

1 2010 Residential Gas Impact Report

Executive Summary

Avista's residential gas demand-side management (DSM) programs claimed savings of 1,126,990 therms during the 2010 program year. This report explains the methods undertaken to qualify and verify these savings and the adjustments made to the final savings values. The Avista 2010 DSM residential gas programs included ENERGY STAR® Products, ENERGY STAR® Homes, Heating and Cooling Efficiency, Water Heating, and Weatherization measures. Cadmus reviewed every prescriptive measure in Avista's DSM programs to create a TRM.

Evaluation Methodology

For each of the programs we employed a variety of evaluation methods and activities. These are shown in Table 1-1.

Table 1-1. 2010 Gas Programs Evaluation Activities

Sector	Program	Document/ Database Review	Verification Site Visit	Survey	Billing Analysis	Modeling
Residential	ENERGY STAR Products	✓	✓	✓		
	Heating and Cooling Efficiency	✓	✓	✓	✓	
	Weatherization/Shell	✓	✓	✓		
	Water Heater Efficiency	✓	✓	✓		
	ENERGY STAR Homes	✓	✓			✓

Energy Savings

Cadmus adjusted the claimed savings associated with each measure to reflect our TRM updates. This resulted in significant changes in savings for all programs except ENERGY STAR Homes (which was not listed in the most recent version of the TRM). Most of the changes were due to updated baseline and measure levels of efficiency as a result of changes in federal and ENERGY STAR standards.

A billing analysis for gas furnaces was completed on a total of 1,714 sites with efficient gas furnace installations. As can be seen in Table 1-2, the results of the billing analysis model had a large effect on furnace measures savings, which impacted the overall savings for the Heating and Cooling Efficiency program and for the entire gas portfolio (furnaces have the largest share of savings).

Table 1-2. Furnace Billing Model and Reported Savings

Group	N	Model Savings (Therms)	Avista Reported Savings	Realization Rate
Idaho	586	100	123	81%
Washington	1,128	105	124	85%
Overall	1,714	103	124	83%

The aggregated adjusted gross savings and resulting realization rates for each program are shown in Table 1-3. Overall, the residential gas programs achieved an adjusted gross realization rate of 84 percent.

Table 1-3. Reported and Adjusted Gross Savings

Program Name	Reported Savings (Therms)	Adjusted Gross (Therms)	Total Realization Rates
ENERGY STAR Products	44,400	60,878	137%
Heating and Cooling Efficiency	483,882	408,015	84%
Weatherization/Shell	553,876	434,960	79%
Water Heater Efficiency	12,010	7,511	63%
ENERGY STAR Homes	32,822	34,146	104%
Total	1,126,990	945,510	84%

Table 1-4. Reported and Adjusted Gross Savings by State

	Washington			Idaho		
Program Name	Reported Savings (Therms)	Adjusted Gross (Therms)	Realization Rates	Reported Savings (Therms)	Adjusted Gross (Therms)	Realization Rates
ENERGY STAR Products	32,377	44,599	138%	12,028	16,282	135%
Heating and Cooling Efficiency	324,228	273,371	84%	159,654	134,644	84%
Weatherization/Shell	432,891	340,397	79%	120,985	94,563	78%
Water Heater Efficiency	9,049	5,701	63%	2,961	1,810	61%
ENERGY STAR Homes	25,381	26,423	104%	7,441	7,724	104%
Total	823,926	690,491	84%	303,069	255,023	84%

In order to produce applicable results and findings that could be used for evaluating the residential gas programs, we chose a sample of 230 records for surveys and 68 measures for on-site verification, and used that sample to calculate qualification and verification. We chose these sample sizes to ensure industry standard levels of confidence and precision within and across programs.

We first analyzed the collected data to determine the number of measures with verified installs. Out of 230 surveys, we verified a total of 305 measures, as some participants had more than one measure. Cadmus determined measure characteristics to ensure that all qualifications were met. We analyzed application records for qualification either by visual inspection during our site visits or by conducting online database searches of model numbers when applicable. Table 1-5 shows the final verified adjusted gross savings and verified savings rates after we applied verification to each programs' savings, followed by state level savings tables. The overall realization rate for all the residential programs was 83 percent after application of the verification rates. Tables are also provided to break out Washington and Idaho savings.

Table 1-5. Avista 2010 DSM Programs Total Gross Gas Savings

Program	Measure Count	Adjusted Gross (Therms)	Verification Rate	Verified Savings (Therms)	Overall Realized Savings Rate
ENERGY STAR Products	5,876	60,878	96%	58,475	132%
Heating and Cooling Efficiency	3,934	408,015	98%	400,317	83%
Weatherization/Shell	5,667	434,960	100%	434,960	79%
Water Heater Efficiency	774	7,511	95%	7,170	60%
ENERGY STAR Homes	168	34,146	100%	34,146	104%
Total	16,419	945,510	98%	935,068	83%

Table 1-6. Avista 2010 DSM Programs Total Gross Gas Savings - Washington

Program	Measure Count	Adjusted Gross (Therms)	Verification Rate	Verified Savings (Therms)	Overall Realized Savings Rate
ENERGY STAR Products	4,269	44,599	96%	42,815	132%
Heating and Cooling Efficiency	2,636	273,371	98%	267,904	83%
Weatherization/Shell	4,426	340,397	100%	340,397	79%
Water Heater Efficiency	603	5,701	95%	5,416	60%
ENERGY STAR Homes	130	26,423	100%	26,423	104%
Total	12,064	690,491	98%	682,955	83%

Table 1-7. Avista 2010 DSM Programs Total Gross Gas Savings - Idaho

Program	Measure Count	Adjusted Gross (Therms)	Verification Rate	Verified Savings (Therms)	Overall Realized Savings Rate
ENERGY STAR Products	1,608	16,282	96%	15,631	130%
Heating and Cooling Efficiency	1,298	134,644	98%	131,951	83%
Weatherization/Shell	1,241	94,563	100%	94,563	78%
Water Heater Efficiency	171	1,810	95%	1,720	58%
ENERGY STAR Homes	38	7,724	100%	7,724	104%
Total	4,356	255,023	98%	251,588	83%

We verified that a total of 935,068 therms have been saved through the installation of 16,419 measures during PY 2010 of the gas DSM programs.

Net-to-gross values per program were computed in a previous Cadmus study in 2011. Table 1-8 shows the net savings per program.

Table 1-8. Total Program Gross and Net Verified Savings and Realization Rates

Program	Reported Savings (Therms)	NTG Ratio	Net Verified (Therms)	Net Realization Rate
ENERGY STAR Products	44,400	52%	30,408	68%
Heating and Cooling Efficiency	483,882	61%	244,193	50%
Weatherization/Shell	553,876	63.8%	277,505	50%
Water Heater Efficiency	12,010	52%	3,728	31%
ENERGY STAR Homes	32,822	73.6%	25,131	77%
Total	1,126,990	N/A	580,965	52%

1.1 Introduction

The Avista PY 2010 DSM residential gas programs included ENERGY STAR Products, ENERGY STAR Homes, Heating and Cooling Efficiency, Water Heating, and Weatherization. The electric savings associated with these programs will be reported in the Q2 2012 electric programs savings report.

We designed our impact evaluation to verify reported program participation and energy savings. For the evaluation, we utilized data collected and reported in the program tracking database, online application forms, on-site visits, phone surveys, and applicable deemed values we developed for the Avista TRM.[1]

Throughout the impact evaluation, Cadmus documented program achievements, validated savings, and identified items that should be investigated further, such as potential discrepancies in calculation assumptions and methodology.

1.2 Methodology

1.2.1 Sampling

We chose a statistically significant sample for the surveys and site visits separately, based on industry standard levels of confidence and precision. The following subsections describe the methods we employed to select a sufficient sample.

1.2.1.1 Survey Sampling

Cadmus determined sample sizes for participant surveys based on the desired confidence and precision levels for the derived verification rates. A 90 percent confidence level ensured that the findings adequately represent the larger population, and a 10 percent precision level ensured an error margin of 10 percent or less. The 90 percent confidence interval and 10 percent precision (90/10) are generally accepted as the industry standard. Table 1-9 shows our sample size goals and completions for participant surveys across the various programs.

1 Cadmus created a TRM in the first quarter of 2011 for use in deemed measure savings.

Table 1-9. Participant Survey Sample Sizes for Residential 2010 Gas Savings Programs

Program	Sample Size	Surveys Completed
ENERGY STAR Products	70	73
Heating and Cooling Efficiency	70	72
Weatherization and Shell	70	70
Water Heater Efficiency	20	20
Total Residential Gas Surveys	230	235

Cadmus determined that the smaller sample size for the Water Heater Efficiency program (with a consequential higher margin of error) was appropriate, given the program's relatively small size within the portfolio.

Cadmus also determined that no impact-related participant surveys were necessary for the ENERGY STAR Homes program or the Home Audit Pilot program. Although the ENERGY STAR Homes program produces gas savings, the evaluation examines these homes through methods other than survey-based verification. Savings that are attributable to the Home Audit Pilot program appear in the other residential programs, and therefore do not need to be verified separately.

1.2.1.2 Site Visit Sampling

Avista provided Cadmus with the final FY 2010 database extract, which we used to revise the initially proposed sample distribution based on the final program populations and energy savings.

Our final proposed set of site visit verifications by measure is shown in Table 1-10.

Table 1-10. Gas Measure Level Site Visit Goals and Completes

Measure	Proposed Site Visits	Completed Site Visits
ENERGY STAR Home	5	4
High-Efficiency Boiler	4	2
High-Efficiency Furnace	27	32
Insulation – Ceiling/Attic	8	7
Insulation – Wall	8	5
Insulation – Floor	0	1
Windows	16	14
ENERGY STAR Clothes Washer	0	3
High-Efficiency Water Heater - 50 gallon	0	1
High-Efficiency Water Heater - Tankless	0	1
Total	68	70

Cadmus attempted to verify savings for every incented measure at each site, regardless of whether it achieved gas or electric savings. As noted previously, Cadmus will report electric measure savings in 2012.

1.2.2 Data Collection and Analysis

1.2.2.1 Document Reviews

Cadmus completed document reviews for our sample to ensure that each measure met all program specifications and that rebate amounts were properly calculated. This involved a careful review of rebate applications and invoices. We found all model numbers in online databases and matched the measure characteristics to what was claimed in the invoice and application.

1.2.2.2 Surveys

Cadmus contracted with market-research firm Discovery Research Group (DRG) to conduct surveys with participants of the four gas-saving programs with the greatest impact: ENERGY STAR Products, Heating and Cooling Efficiency, Weatherization, and Water Heater Efficiency.

To minimize response bias, DRG called customers during various hours of the day and evening, as well as on weekends, and made multiple attempts to contact individual participants. Cadmus monitored survey phone calls to ensure accuracy, professionalism, and objectivity. DRG delivered response data to Cadmus in Microsoft Excel® format, and Cadmus conducted analysis using SAS. We analyzed the survey data at the program level, rather than at the measure level, and in order to ensure accuracy, we included a random and proportional distribution of measures in each program-level sample.

1.2.2.3 Site Visits

Cadmus randomly selected a sample of the participant population and performed site visits to verify measure installation and record measure characteristics. This on-site verification of measures included a visual inspection of the measure(s), verifying documentation, ensuring that the unit is still operable, recording make and model information, recording home characteristics, and determining program qualification. Specific details on our verification and analysis activities for each measure are included in the Program Results and Findings section below.

1.2.2.4 Database Analysis

We analyzed the database to make sure that savings for measures were accurate and to check for any duplications or deletions. The analysis revealed that the database does not exhibit any systematic problems and that it accurately reflects the information provided by the applicant. We did not find any inaccuracies on the part of the applicant through our verification and qualification analysis during the documentation review.

1.2.2.5 Engineering Analysis

Cadmus reviewed every prescriptive measure in Avista's DSM programs to create a TRM. Avista's DSM prescriptive measure information was listed in a MS Excel spreadsheet with deemed savings values. According to Avista, the savings numbers required a detailed review and updating where necessary.

Cadmus' review required:

- In depth knowledge and understanding of the specifics of each measure to ensure that the appropriate baseline was used and that savings calculations reflect the best possible *ex ante* value for the region;

- Engineer coordination to ensure consistency in inputs and calculations and to ensure that the most up-to-date sources were referenced;
- Knowledge and understanding of federal minimum codes and standards; and
- Detailed review of the engineering calculations Avista used.

Ultimately, Cadmus provided recommendations for every measure and included source references, engineering algorithms, and inputs for algorithms.

Cadmus reviewers examined savings methodologies from the Regional Technical Forum (RTF) that are applicable for gas savings, as well as Northwest Power Planning 6th Plan savings. Reviewers also assessed other TRMs and engineering studies from the Northwest and around the country when applicable. Reviewers also interviewed our internal industry experts for each technology type. For certain measures, engineering modeling was necessary to validate savings estimates.

Cadmus completed our review at the end of March 2011, and presented the findings to Avista on April 6. The Implementation Team program managers and engineers reviewed the TRM document and held a meeting on April 26 to discuss the findings and address questions. One final review meeting was held on May 12, 2011.

1.2.3 Billing Analysis

Cadmus conducted a statistical billing analysis to determine the adjusted gross savings and realization rates for the gas furnace measures installed through the residential Heating and Cooling Efficiency gas rebate program in PY 2010.

To estimate the furnace energy savings due to the program, Cadmus used a pre and post-installation combined Conditional Savings Analysis (CSA) and Princeton Score Keeping Method (PRISM) approach using monthly billing data. We calculated model savings estimates for Idaho, Washington, and for the states in combination.

1.2.3.1 Billing Analysis Methodology

Avista provided Cadmus with monthly billing data for all the furnace participants from January 2008 through April 2011. Avista also provided us with a measure detail file that contains participation and measure data for the furnace participants, including all additional gas and electric measures installed in conjunction with the gas furnaces. The participant information included customer details, account numbers, type of measure installed, rebate amounts, measure installation costs, measure installation dates, and deemed savings per measure.

The first step Cadmus performed was to match up the furnace measure information with the gas furnace billing data. We obtained daily average temperature weather data from 2008 to 2011 for the 10 National Oceanic and Atmospheric Administration (NOAA) weather stations that represent all the zip codes in Avista’s Washington and Idaho service territories. From the daily temperatures, we determined base 65 heating degree days (HDDs) for each station. Using a zip code mapping for all of the U.S. weather stations, we determined the nearest station for each zip code. We then matched the billing data periods with the HDDs from the associated station.

In order to prevent bias from the differing reading cycles in assigning the pre and post periods, and to simplify the analysis, we allocated the therm billing usage and the associated matched HDDs to calendar months. Since the latest available billing data were in April 2011, and the furnaces were installed in 2010, we defined the analysis *pre* period as 2009, before any participation installations occurred. We defined the *post* period as the months following the installation date.

Due to post-period data limitations (with the available data only extending through April 2011), most participants had fewer than the standard 12 months of pre- and post-installation billing data months. For this reason, we paired the pre and post months used in the billing analysis. For example, if a customer installed measures in August 2010, we defined the post-period as September 2010 through April 2011, while the pre-period was the corresponding months from September 2009 through April 2010. This ensured that we used the same months in both the pre and post periods, in order to prevent bias from using mismatched months.

Furthermore, for Washington participants, we were able to perform automated queries on a realty website (www.zillow.com) to obtain the square footage of homes by address.

1.2.3.2 Data Screening

General Screens

We performed the following screens to remove accounts that could possibly skew our furnace savings estimation.

- **Furnace participants that installed other gas measures.** To accurately isolate gas furnace savings, participants installing additional measures were excluded from the analysis. [2]
- **Customers that indicated unit numbers in the address.** These could potentially indicate furnace installations that occurred in apartments.
- **Accounts with fewer than three paired months (90 days) of billing data in either the pre or post period**. This screen also excluded customers that moved between the pre and post periods, since there would not be sufficient pre-month data for analysis. It is unlikely that the household characteristics and furnace usage behavior of the previous tenants would match that of the current tenant who installed the furnace.

PRISM Modeling Screens

The second step in our screening process was to run PRISM models for the pre and post billing data. We used these models to obtain weather-normalized pre and post annual usage for each account, and to provide an alternate check of the furnace savings obtained from the CSA model.

For each participant home, we estimated a heating model in both the pre and post periods to weather-normalize raw billing data.

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[2] For the 654 furnace participants that installed other measures, the expected savings from the new furnace was 110 therms. The expected savings from the other measures is nearly as high as for the furnace installs. As a result, the model would have difficulty disaggregating the impacts from a furnace from another measure that affects the space heating usage.

The PRISM model specification we used was:

$$ADC_{it} = \alpha_i + \beta_1 AVGHDD_{it} + \varepsilon_{it}$$

Where for each customer ‘i’ and calendar month ‘t’:

ADC_{it}	=	the average daily therm consumption in the post program period
α_i	=	the participant intercept; represents the average daily therm base load
β_1	=	the model space heating slope
$AVGHDD_{it}$	=	the base 65 average daily HDDs for the specific location
ε_{it}	=	the error term

From the model above, we computed the weather-normalized annual consumption (NAC) as follows:

$$NAC_i = \alpha_i * 365 + \beta_1 LRHDD_i + \varepsilon_i$$

Where for each customer ‘i’:

NAC_i	=	the normalized annual therm consumption
α_i	=	the intercept that is the average daily or base load for each participant; represents the average daily base load from the model
$\alpha_i * 365$	=	the annual base load therm usage (non-weather sensitive)
β_1	=	the heating slope; in effect, this is the usage per heating degree from the model above
$LRHDD_i$	=	the annual, long-term HDDs of a typical month year (TMY2) in the 1971-2000 series from NOAA, based on home location[3]
$\beta_1 * LRHDD_i$	=	the weather-normalized annual weather sensitive (heating) usage, also known as HEATNAC
ε_i	=	the error term

Once we ran the models, we applied the following first set of screens on the PRISM model output to remove participant from the furnace billing analysis:

- **Accounts with a PRISM model r-squared of less than 0.75.** These indicate a bad fit of the monthly gas usage and the actual HDDs, which is unexpected when a furnace is used in both the pre and post periods.
- **Accounts with a HEATNAC of less than 100 therms in either the pre or post period**. If the annual heating usage is that low, the heating system was likely not used at all, and gas

[3] In billing analysis we typically use 30 year normal heating degree averages to weather normalize the usage. The latest 30 year series available for this analysis was the TMY2 (1971-2000) series from NOAA/NCDC. We also ran the billing analysis using the 15 year TMY3 (1991-2005) heating degree days and the overall savings were not very different (5% lower).

was probably only used for backup secondary heating. This screen also removed accounts with negative heating slopes from the analysis, since it is unlikely that the usage would have decreased in the heating months.

- **Accounts where the post-weather-normalized (POSTNAC) usage was more than 70 percent of the pre-weather-normalized (PRENAC) usage**. Such large changes could indicate property vacancies when adding or removing "other" gas equipment, such as pools or spas, that are unrelated to the furnace installation.
- **Accounts where the pre-period base load was 0 and the post-period base load was greater than 0.** Since the base load indicates the usage that occurs in non-winter and shoulder months, this outcome suggests that a gas water heater, gas dryer, or gas range was added to the participant home. In this situation, the additional base load usage in the post period is not related to the furnace installation.
- **Accounts with negative intercepts, and hence negative base load,** were included in the analysis but truncated to 0. These negative intercepts typically occur in homes with gas space heating and without gas water heating. The base load for these homes is expected to be 0, thus we set the base load to 0.

Once we placed these screens on the data, there were 1,714 participants remaining that we used in the CSA model outlined below to determine the overall savings.

Table 1-11 summarizes the account attrition from the various screens listed above.

Table 1-11. Furnace Account Attrition

Screen	Number Remaining	Percent Remaining	Number Dropped	Percent Dropped
Original	3,800	100%	0	0%
Accounts that Installed Other Measures	3,146	83%	654	17%
Insufficient Pre/Post Months or Moved During Pre or Post	2,437	64%	709	19%
PRISM Screens: Low R-Squared, Low Heating Usage	1,942	51%	495	13%
Changed Usage Between Pre and Post Period (> 70%)	1,918	50%	24	1%
Added Base Load	1,741	46%	177	5%
Multifamily (Unit Number Present)	1,714	45%	27	1%
Final Analysis Group	1,714	45%	2,086	55%

1.2.3.3 CSA Modeling Approach

To estimate furnace energy savings from this program, we used a pre-post CSA fixed-effects modeling method that uses pooled monthly time-series (panel) billing data. The fixed-effects modeling approach corrects for differences between the pre- and post-installation weather conditions, as well as for differences in usage consumption between participants with the inclusion of a separate intercept for each participant. Our modeling approach ensures that model savings estimates will not be skewed by any unusually high usage or low usage participants. We used the following model specification to determine the state-level furnace savings

$$ADC_{it} = \alpha_i + \beta_1 AVGHDD_{it} + \beta_2 POST\_ID_i * AVGHDD_{it} + \beta_3 POST\_WA_i * AVGHDD_{it} + \beta_{4..14} M_t + \varepsilon_{it}$$

Where for participant ‘i’ and monthly billing period ‘t’:

ADC_{it} = the average daily therm consumption during the pre- or post-program period

α_i = the average daily therm base load intercept for each participant (this is part of the fixed effects specification)

$AVGHDD_{it}$ = the average daily base 65 HDDs based on home location

β_2 = the therm savings per HDD for the efficient furnace measure in Idaho

$POST\_ID_i$ = an indicator variable that is 1 in the post-period (after the furnace installation) for Idaho participants, and 0 in the pre-weatherization period

$POST\_ID_i * AVGHDD_{it}$ = an interaction between the post indicator ($POST\_ID_i$) and the HDDs ($AVGHDD_{it}$)

β_3 = the therm savings per HDD for the efficient furnace measure in Washington

$POST\_WA_i$ = an indicator variable that is 1 in the post-period (after the furnace installation) for Washington participants, and 0 in the pre-weatherization period

$POST\_WA_i * AVGHDD_{it}$ = an interaction between the Washington post indicator ($POST\_WA_i$) and the HDDs ($AVGHDD_{it}$)

M_t = an array of bill month dummy variables (Feb, Mar, …, Dec), 0 otherwise[4]

ε_{it} = the modeling estimation error

The model above estimates the savings per heating degree for Idaho and Washington respectively with β_2 and β_3. In order to obtain the actual annual savings under normal weather conditions, we applied the 1971-2000 TMY2 normal HDDs from NOAA.

The per-HDD modeling approach resolves much of the potential bias from customers where predominantly winter month data were available. Since furnaces have seasonality to their usage, a per heating degree savings allows for allocating savings across all the calendar months, as well as being based on the HDDs. Using just a post-period indicator would have had a predominance of the winter months, resulting in savings being biased upwards.

[4] We excluded one of the dummy variables from the independent variables, otherwise the 12 monthly indicators would form perfect co-linearity with the intercepts. We excluded January, thus the intercepts include the seasonality from January.

1.2.4 Measure Qualification Rates

Cadmus considered a measure as qualified if it met the various requirements in its category, such as being ENERGY STAR certified or meeting the minimum efficiency standards for the program. We conducted online database searches of the model numbers when applicable, and noted the necessary qualifying characteristics to ensure that all qualifications were met.

The only non-qualified measure we found (out of the entire site visit verification sample) was a wall insulation project. The installed foam board insulation is listed on the invoice as R-9.4, but program qualification requires a minimum increase of R-10. Since all of the existing insulation was removed prior to installation, the final R-value does not meet the qualifying criterion, but results in a qualification rate of 96 percent. All other measures had qualification rates of 100 percent, and the total qualification rate for all residential gas programs was 99 percent.

1.2.5 Verification Rates

Cadmus determined verification rates for each program, but not for each measure. We administered verification site visits and surveys, where applicable. This verification included checking that the correct measure was tracked in the database, the correct quantity was accounted for, and that the unit was still in place and operable. We gave equal weight to the site visit and survey observations.

1.3 Program Results and Findings

1.3.1 Overview

After completing surveys and site visits, we analyzed and applied the data to the reported savings. We applied the savings from the updated TRM to each measure and then applied the verification rates to each program. The end result is the total adjusted gross savings for each measure and program, as well as the overall realized savings for each program. In the following sections, we describe each program, explain our analysis steps, and discuss the results and findings.

1.3.2 ENERGY STAR Products

1.3.2.1 Program Description

The ENERGY STAR Products program includes the following measures:

- Clothes Washer (Electric and Gas)
- Dishwasher (with Electric or Gas water heater)
- Freezer
- Refrigerator

The program offers direct financial incentives to motivate customers to use appliances that are more energy efficient. The program indirectly encourages market transformation by increasing demand for ENERGY STAR products. Both electric and gas measures are included in the program, but this report only considers gas savings.[5]

1.3.2.2 Analysis

The energy savings credited to the ENERGY STAR Products program must meet several criteria. First, the measure must still be installed and operating properly at the time of verification. Second, the number of installed pieces of equipment and their corresponding model numbers (if available) need to match Avista's database. Lastly, the unit must have been ENERGY STAR-qualified at the time of the program offering.

The method we used for verifying measure savings entailed the following steps:

1. Conducting a phone survey or site visit to verify installation of the measure within Avista's service territory.
2. Calculating a realization rate, which is the ratio of verified to claimed units by measure type within the sample.
3. Apply the realization rate to the entire population.

Clothes washer savings have a single deemed value in the TRM, which we applied directly to the entire verified and qualified population of ENERGY STAR clothes washers. There are, however, two savings values for dishwashers depending on the baseline and efficient energy factor (EF) values. Due to the lack of baseline and efficient EF values being collected on the application and in the database tracking system, Cadmus applied an average of the two savings values to the entire verified and qualified population of ENERGY STAR dishwashers.

1.3.2.3 Results and Findings

Table 1-12 shows the total reported and adjusted gross savings for the gas ENERGY STAR Products program by measure.

Table 1-12. ENERGY STAR Products Measure and Program Reported and Adjusted Savings

Measures	Reported Values			Adjusted Gross	
	Count	Unit Savings (Therms)	Reported Savings	Average Unit Savings (Therms)	Total Adj Gross Savings
ENERGY STAR Clothes Washer	3,755	9.0	33,795	14.8	55,649
ENERGY STAR Dishwasher	2,121	5.0	10,605	2.5	5,229
Program Total	5,876	7.6	44,400	10.1	60,878

As can be seen in Table 1-12, there are considerable differences between the savings per measure from the reported savings and those derived from the TRM. This difference is driven by the adjustments Cadmus made to the TRM savings values. The adjusted clothes washer savings of 14.8 therms are the result of an exhaustive study we performed for the California Public Utilities

5 We will complete the 2010-2011 electric savings report in Q2 of 2012.

Commission, where we determined greater savings than the 9.0 therms/measure reported by Avista. The new ENERGY STAR dishwasher values are based on calculations using federal standards and averages of dishwashers in the market that meet ENERGY STAR standard of 0.72 EF.

Our site visits and participant surveys produced a verification rate of 96 percent using a sample of 76 participants.[6] Table 1-13 shows program-level reported, adjusted gross, and verified savings.

Table 1-13. ENERGY STAR Products Total Gas Savings

Region	Measure Count	Reported Savings	Adjusted Gross Savings	Verification Rate	Verified Savings	Verified Savings Rate
WA	4,269	32,377	44,599	96%	42,838	132%
ID	1,608	12,028	16,282	96%	15,639	130%
Total	5,876	44,400	60,878	96%	58,475	132%

The decreased dishwasher savings are offset by the increased clothes washer savings, and are due to considerably more clothes washer than dishwasher installations. The realized adjusted gross savings rate is 137 percent for the ENERGY STAR gas measure savings. This verification rate decreased the savings slightly to 58,475 therms, and produced an overall verified realized savings of 132 percent of the reported savings.

1.3.3 Heating and Cooling Efficiency

1.3.3.1 Program Description

The Heating and Cooling Efficiency program includes the following measures:

- Gas Boiler
- Gas Furnace
- Ductless Heat Pump (Electric)
- Air Source Heat Pump (Electric)
- Variable Speed Furnace Fan (Electric)

This program offers five categories of incentives for residential electric and gas customers seeking to purchase high-efficiency heating and cooling equipment. In this report, we only discuss installations resulting from the $400 incentive available for installing a high-efficiency natural gas furnace of 90 percent AFUE (heating efficiency) or greater, or a natural gas boiler of 90 percent AFUE or greater.

[6] Confidence and precision information on verification rates are presented in the Verification Confidence and Precision section of this report.

1.3.3.2 Analysis

In PY 2010, 3,860 efficient furnaces were installed in 3,800 residences. Of these residences, 3,146 (83 percent) installed only a furnace measure. The remainder also installed additional gas measures in their home. The 2010 Avista deemed savings estimate for each furnace installation was 123 therms, based on converting a standard code 78 percent efficient furnace to a 90 percent or more efficient furnace. Cadmus conducted a statistical billing analysis to determine the adjusted gross savings and realization rates to modify this value.

With only 74 efficient boilers being installed during PY 2010, we decided that a billing analysis would not be feasible for determining the adjusted gross savings. Engineering algorithms assume a baseline boiler of 80 AFUE and an efficient boiler of 95 AFUE. We chose the value of 95 AFUE due to the results of our site visit analysis, in which all the efficient boilers we reviewed were at least 95 AFUE.

1.3.3.3 Results and Findings

Table 1-14 shows the total reported and adjusted savings for the gas Heating and Cooling Efficiency program measures.

Table 1-14. Heating and Cooling Efficiency Measures and Reported and Adjusted Savings

Measures	Reported Values			Adjusted Gross	
	Count	Unit Savings (Therms)	Reported Savings	Average Unit Savings (Therms)	Total Adj Gross Savings
High-Efficiency Boiler	74	123.0	9,102	141.0	10,435
High-Efficiency Furnace	3,860	123.0	474,780	103.0	397,580
Program Total	3,934	123.0	483,882	103.7	408,015

As can be seen in Table 1-14, the adjusted gross savings increased significantly for boilers. This is due to Cadmus increasing the measure efficient level from 90 to 95 AFUE. Furnace savings decreased as a result of our furnace billing analysis, explained in greater detail below.

Furnace Billing Analysis Model Results

Table 1-15 summarizes the model savings results for the 1,714 furnace measure participants. The model savings for Idaho are 100 therms, 105 for Washington, and 103 overall.[7] The precision level indicates that the percent error of the savings estimate is less than 10 percent.

[7] Cadmus also ran the analysis including participants who received rebates for a water heater and a furnace. Savings for the furnace measure increased by approximately 0.5%.

Table 1-15. Furnace Savings Summary

Group	N	PRENAC	Model Savings Per HDD	Normal HDDs	Model Savings (Therms)	Precision at 90% Confidence	Savings Lower 90% (Therms)	Savings Upper 90% (Therms)
Idaho	586	1,009	0.01458	6,873	100	7%	94	107
Washington	1,128	1,031	0.01566	6,700	105	5%	100	110
Overall	1,714	1,024	0.01527	6,759	103	4%	99	107

Table 1-16 compares the modeled savings with the expected deemed savings to obtain realization rates (81 and 85 percent for Idaho and Washington, respectively).[8] The percent savings are similar in each state, at 10 percent of the weather-normalized pre-period usage.

Table 1-16. Realization Rate Summary

Group	N	PRENAC	Model Savings (Therms)	Expected Savings*	Realization Rate	Savings as Percent of Pre
Idaho	586	1,009	100	123	81%	10%
Washington	1,128	1,031	105	124	85%	10%
Overall	1,714	1,024	103	124	83%	10%

* The deemed per measure savings are 123 therms; however, since some customers installed multiple furnaces, the per customer savings are closer to 124 therms.

In our review of the measure data, we found that approximately 10 percent of furnace participants also installed heat pumps. In these cases, the additional furnaces were installed mainly to supplement the heat pump space heating usage, and to provide backup heating when the weather is too cold for the heat pumps to cover the entire homes' heating requirements.

Table 1-17 summarizes the savings, comparing the 10 percent of customers that installed heat pumps to the 90 percent of customers that only received a furnace.[9] The savings are considerably lower when excluding the heat pump group (82 versus 103 overall). The savings from the heat pump participants is 285 therms, because a portion of the gas heating load is being supplied by the heat pump.

[8] The average home size for the Washington furnace participants was 1,728 square feet. It is possible that the engineering assumptions use a larger home average. Moreover, the homes in the bottom quartile of usage saved only 38 therms. Since the furnace measure was offered to all homes, participants with smaller homes were not expected to yield high furnace savings. Finally, we examined the participant surveys to determine if gas is used as a secondary heating system, as wood and electric may also used to heat the homes, which would lead to lower savings.

[9] In the population of furnace installations, 385 out of 3,800 customers (10 percent) installed a heat pump as well as a furnace.

Table 1-17. Furnace Savings Summary With Heat Pumps and Without Heat Pumps

State	Heat Pumps Installed	N	PRENAC	Model Savings Per HDD	Normal HDDs	Model Savings (Therms)	Precision 90%	Savings Lower 90% (Therms)	Savings Upper 90% (Therms)
Idaho	No	524	1,008	0.01130	6,880	78	9%	71	85
Washington	No	1,017	1,034	0.01250	6,700	84	6%	79	89
Overall	No	1,541	1,025	0.01207	6,761	82	5%	77	86
Idaho	Yes	62	1,018	0.04051	6,814	276	7%	256	296
Washington	Yes	111	1,010	0.04341	6,702	291	5%	275	307
Overall	Yes	173	1,013	0.04230	6,742	285	5%	272	298
Idaho	Overall	586	1,009	0.01458	6,873	100	7%	94	107
Washington	Overall	1,128	1,031	0.01566	6,700	105	5%	100	110
Overall	Overall	1,714	1,024	0.01527	6,759	103	4%	99	107

The overall results should be used, since they represent the savings that occurred as a result of the program.

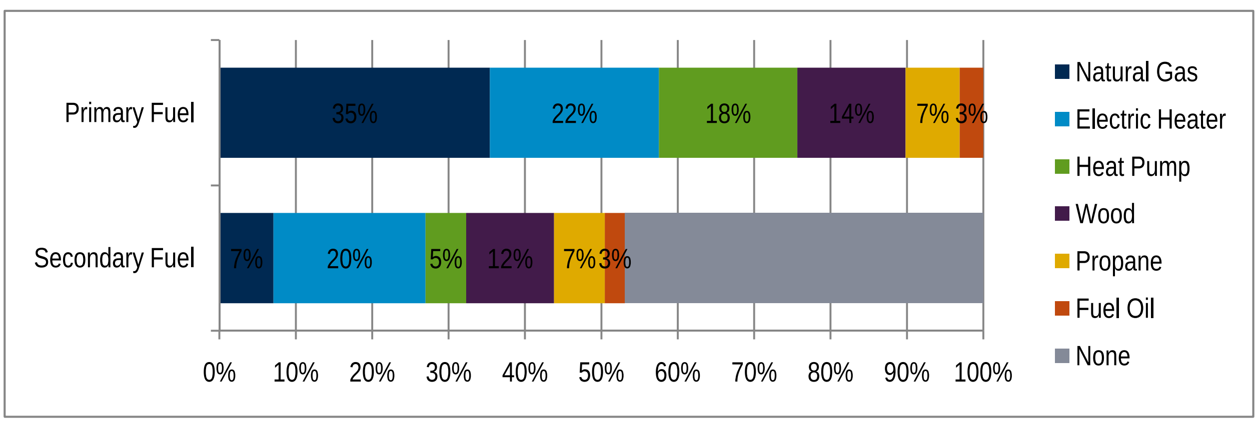
Findings from Participant Surveys

To inform the results of the gas furnace billing analysis (and other heating efficiency measures), the residential participant survey asked homeowners what fuel they "primarily" use to heat their homes, and whether they use "any other kind of heating in addition."

Figure 1-1 shows the responses from 226 participants surveyed. It is apparent that Avista customers use a diverse mix of fuels. Also, slightly more than half of the households reported using a secondary fuel, with electric heaters and wood being the most frequently mentioned.

We explored a few possible reasons for the lower-than-expected savings from the gas furnace measure. One possibility is that Avista customers that primarily heat with natural gas are supplementing their heating with other fuels. A second explanation is that customers may use their gas furnace only as a secondary heating device.

Figure 1-1. Primary and Secondary Heating Fuel Reported by Residential Participants



Expected savings from gas furnace measures assume that an inefficient furnace was replaced with a high-efficiency unit AND that the gas furnace is the only heating method for the home. Whenever these assumptions are not correct, realized savings are likely to be lower than expected.

Table 1-18Table 1-18. Heating Fuel Reported by Furnace Measure Participants summarizes the survey results for participants who received the furnace measure. These data are generally consistent with the results of the billing analysis and the fuel mix data above. As noted, expected savings assume that natural gas is the only fuel used for heating the home; which the survey results show as being the case for 67 percent of participants.[10] As shown, the other 33 percent of participants either supplement with electric heat or wood, or they use the natural gas furnace itself as a supplement to their heat pump.

Table 1-18. Heating Fuel Reported by Furnace Measure Participants

Primary Fuel	Secondary Fuel	Responses	Percent
Natural Gas	None	28	67%
Natural Gas	Electric Heater / Wood	6	14%
Heat Pump	Natural Gas	8	19%
Total		42	100%

Furnace Billing Analysis Conclusions

At present, our billing analysis provides a strong basis for assigning savings to the gas furnace measures during the evaluation period. However, our billing analysis and survey data also show that a significant number of participants receive incentives for installing both a heat pump and a gas furnace. The gas savings for these participants are much larger than expected, because they are presumably using heat pumps to heat their homes until extreme temperatures require the use of a gas furnace. The high savings reflect replacement of an older furnace with BOTH a heat pump and a gas furnace. Our current analysis does not consider the electric impact of the heat pump on the household's overall energy usage, but will in future reports.

Future research can focus on the issues we found with our present study. These include:

- Whether the energy benefits from participants that receive multiple incentives are consistent with Avista's objectives. Specifically, determine whether it is cost-effective to incent customers to install heat pumps, gas furnaces, and (in some cases) to also pay a conversion incentive.
- Whether incentives for gas furnaces are cost-effective in all cases or if some additional restrictions, such as minimum square footage requirements or use of other fuels, might improve program performance.

[10] We designed the survey to provide statistical validity across all Heating and Cooling Efficiency program measures. Since furnaces are just one measure in this program, only 45 furnace participants were surveyed for this study. Generally, a sample size of 67 is expected to produce results at the 90/10 levels of confidence and precision.

Overall Program Savings

Our site visits and participant surveys produced a verification rate of 98 percent from 106 total observations.[11] Table 1-19 shows program-level reported, adjusted gross, and verified savings.

Table 1-19. Heating and Cooling Efficiency Total Gas Savings

Region	Measure Count	Reported Savings	Adjusted Gross Savings	Verification Rate	Verified Savings	Verified Savings Rate
WA	2,636	324,228	273,371	98%	268,213	83%
ID	1,298	159,654	134,644	98%	132,104	83%
Total	3,934	483,882	408,015	98%	400,317	83%

The decreased furnace savings are not offset by the increased boiler savings due to considerably more furnace than boiler installations. We determined the realized adjusted gross savings rate to be 84 percent for the Heating and Cooling Efficiency program gas savings. The verification rate decreased the savings slightly, to 400,317 therms, and the program produced an overall verified realized savings rate of 83 percent.

1.3.4 Weatherization/Shell

1.3.4.1 Program Description

This program incents six categories of measures, which are available to residential electric and gas customers whose homes are heated with fuel provided by Avista:

- Fireplace Dampers (Electric and/or Gas Savings)
- Insulation - Ceiling/Attic (Electric and/or Gas Savings)
- Insulation - Floor (Electric and/or Gas Savings)
- Insulation - Wall (Electric and/or Gas Savings)
- Window Replacement (Electric and/or Gas Savings)
- Programmable Thermostat with AC (Electric and/or Gas Savings)

Avista customers who heat primarily with electric or natural gas and that have a wood burning fireplace may receive up to $100 for installing a rooftop damper.

To qualify for the program, ceiling and attic insulation (both fitted/batt type and blown-in) must increase the R-value by 10 or more, and is incented at $0.25 per square foot of new insulation. Homes are eligible if their existing attic insulation is less than R-19. Floor and wall insulation (both fitted/batt type and blown-in) that increases the R-value by 10 or more is incented at $0.50 per square foot of new insulation. Homes are eligible if their existing floor and/or wall insulation is less than R-5.

[11] Confidence and precision on verification rates are presented in the Verification Confidence and Precision section.

For upgrading windows with a U-factor of 0.30 or lower, the program provides an incentive of $3.00 per square foot of qualifying windows installed. This measure in the program ended on April 1, 2011. Customers have until June 30, 2011 to install windows and submit a rebate form to Avista.

1.3.4.2 Analysis

For all insulation and efficient windows measures, the square footage and baseline and efficient R-values (insulation) and U-factors (windows) were not reported in the program tracking database. The records we sampled contained these values in both the application and supporting invoices. Using these data, we determined qualification rates, but the sample size was too small to apply area and type of insulation or windows to the entire population. In order to safely assume an amount of area for each measure, we averaged the total rebate amount for each measure for each database applicant by measure type. We then divided these averages by the respective rebate amount per square foot, which resulted in an average of installed area by measure.

The main source of error in this methodology is the assumption that all total rebates were calculated correctly. With a large total quantity being averaged—1,295 ceiling, 205 floor, and 388 wall insulations, and 3,762 window records in the database—any rebate mistakes should be diluted. The resulting area of installation per measure was 103 (ceiling), 497 (floor), 526 (wall), and 97.6 (window) square feet.

1.3.4.3 Results and Findings

Table 1-20 shows the total reported and adjusted savings for the gas Weatherization program measures.

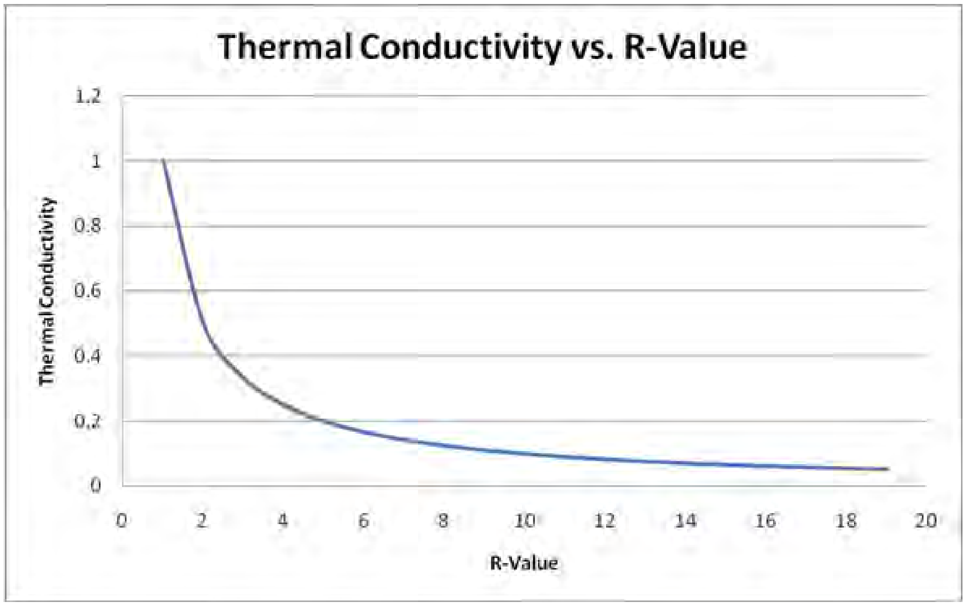
Table 1-20. Weatherization Measure and Program Reported and Adjusted Savings

	Reported Values			Adjusted Gross	
Measures	Count	Unit Savings (Therms)	Reported Savings	Average Unit Savings (Therms)	Total Adj. Gross Savings
Fireplace Damper	14	76.0	1,064	5.6	78
Insulation – Ceiling/Attic	1,295	102.9	133,212	102.6	132,775
Insulation – Floor	205	230.5	47,261	163.6	33,542
Insulation – Wall	388	227.0	88,078	154.6	59,985
Programmable Thermostat with AC	3	31.0	93	87.3	262
Replacement Windows	3,762	75.5	284,168	55.4	208,318
Program Total	5,667	76.8	553,876	57.6	434,960

It can be seen in Table 1-20 that for most measures (excluding ceiling insulation), we significantly adjusted savings from reported values due to updated TRM values. We applied TRM values to these measures on an installed area basis. The process we used for extracting the average area is detailed in the Analysis section above.

Residential insulation for a floor or wall has a relatively low baseline R-value compared to roof insulation. Thermal conductivity and the associated heat loss do not vary linearly with increasing R-value. For example, upgrading from R-4 to R-9 creates a much greater savings per square foot than upgrading from R-25 to R-30. This variability, shown in Figure 1-2, cannot be accounted for in the adjusted savings due to the lack of baseline and efficient R-values being documented in the database. We could apply more accurate savings adjustments in the future with the documentation of the amount of change in R-value for all sites.

Figure 1-2. Thermal Conductivity as a Function of R-value of Insulation



The fireplace damper savings reported in the "*Avista Technical Reference Manual Prescriptive.xls*" is 5.56 therms. The gas savings reported by Avista for 2010 measures was 76 therms. Since this measure accounts for less than 0.1 percent of the overall therm savings, we could not complete a detailed review of these estimates. There were 14 participants in 2010, so a billing analysis would not show savings with a sufficient level of certainty. Heat loss from an open draft is described with air flow heat loss calculations in the tool "*ChimneyCapCalculations (2_24_10).xlsm.*" Cadmus did not verify the parameters used to estimate these savings. We believe that a gap size of 5/8-inch and a chimney of 8-inch width and 20-foot height might represent a typical home in Avista's service territory. The result is an estimated savings of 52 therms/year.

According to the ENERGY STAR calculator, a programmable thermostat saves 11 percent of the heating energy consumed with a 5-degree setback. Assuming that a typical home uses 794 therms in a season, 11 percent energy savings is 87 therms. Avista reports 31 therms of savings for installing a programmable thermostat. Although this measure is not separately metered, we will estimate temperature setback use and percent savings based on our winter meter data from 67 heat pumps. Most of these heat pumps have programmable thermostats, and we will also meter the thermostat set points to determine operational characteristics.

Our site visits and participant surveys produced a verification rate of 79 percent and a qualification rate of 96 percent from 97 total observations. Table 1-21 shows program-level reported, adjusted gross, and verified savings.

Table 1-21. Weatherization Total Gas Savings

Region	Measure Count	Reported Savings	Adjusted Gross Savings	Verification Rate	Verified Savings	Verified Savings Rate
WA	4,426	432,891	340,397	100%	340,397	79%
ID	1,241	120,985	94,563	100%	94,563	78%
Total	5,667	553,876	434,960	100%	434,960	79%

We determined the realized adjusted gross savings rate to be 79 percent for the Weatherization program. The 100 percent verification rate did not affect the savings of 434,960 therms, resulting in an overall verified savings of 79 percent.

1.3.5 Water Heater Efficiency

1.3.5.1 Program Description

The Water Heater Efficiency program includes the following measures:

- High-Efficiency Water Heater (Electric)
- High-Efficiency 40-Gallon Water Heater (Gas)
- High-Efficiency 50-Gallon Water Heater (Gas)
- High-Efficiency Tankless Water Heater (Gas)

Through this program, Avista offers a $50 incentive to residential electric customers who install an eligible high-efficiency water heater. Electric water heaters with a tank must have 0.93 EF or greater to qualify for the program, and natural gas water heaters with a tank must have 0.60 EF or greater for 50-gallon, and 0.62 EF or greater for 40-gallon. We only consider the above gas measures in our analysis for this report.

1.3.5.2 Analysis

All of the water heaters we analyzed were qualified for rebates. Our calculations of the adjusted savings for water heaters are lower than the reported savings due to using figures from the updated TRM.

1.3.5.3 Results and Findings

Table 1-22 shows the total reported and adjusted savings for the gas Water Heater Efficiency program measures.

Table 1-22. Water Heater Efficiency Measure and Reported and Adjusted Savings

Measures	Reported Values			Adjusted Gross	
	Count	Unit Savings (Therms)	Reported Savings	Average Unit Savings (Therms)	Total Adj Gross Savings
High-Efficiency Water Heater - 40G	174	8.0	1,392	8.2	1,425
High-Efficiency Water Heater - 50G	518	11.0	5,698	6.4	3,303
High-Efficiency Water Heater - Tankless	82	60.0	4,920	33.9	2,783
Program Total	774	15.5	12,010	9.7	7,511

Our site visits and participant surveys produced a verification rate of 95 percent from 22 total observations. Table 1-23 shows program-level reported, adjusted gross, and verified savings.

Table 1-23. Water Heater Efficiency Total Gas Savings

Region	Measure Count	Reported Savings	Adjusted Gross Savings	Verification Rate	Verified Savings	**Verified Savings Rate**
WA	603	9,049	5,701	95%	5,442	60%
ID	171	2,961	1,810	95%	1,728	58%
Total	774	12,010	7,511	95%	7,170	60%

Due to using numbers from the updated TRM, we calculated the realized adjusted gross savings rate as 63 percent for the Water Heater Efficiency program. The verification rate slightly lowered the adjusted gross savings to a verified 7,170 therms, giving an overall verified realized savings rate of 60 percent.

1.3.6 ENERGY STAR Homes

1.3.6.1 Program Description

This program offers incentives to builders for constructing single family or multifamily homes that comply with ENERGY STAR criteria and are verified as ENERGY STAR Homes. Avista provides a $900 incentive for homes using their electric or electric and natural gas service for space and water heating. Avista provides a $650 incentive for homes that use only their natural gas service (both the hot water and space heating must be natural gas).

1.3.6.2 Analysis

Using the ENERGY-10 modeling software, we simulated models of an ENERGY STAR home and a standard built-to-code home. We completed one model for each state (Washington and Idaho) to account for all the differences in state building codes (see Appendix B). We averaged the savings results of each simulation according to the proportion of ENERGY STAR home rebates given in each state. Finally, we applied the weighted averaged savings to the entire population of ENERGY STAR homes that Avista provided rebates for during PY 2010. We calculated the square footage from RASS survey data of newly constructed homes specific for the PacifiCorp service territory.

1.3.6.3 Results and Findings

Table 1-24 shows the total reported and adjusted savings for the gas and electric/gas ENERGY STAR Home program measures.

Table 1-24. ENERGY STAR Home Measure and Program Reported and Adjusted Savings

Measures	Reported Values			Adjusted Gross	
	Count	Unit Savings (Therms)	Reported Savings	Average Unit Savings (Therms)	Total Adj Gross Savings
ENERGY STAR Home - Electric/Gas	140	195.0	27,306	203.3	28,455
ENERGY STAR Home - Gas Only	28	197.0	5,516	203.3	5,691
Program Total	168	195.4	32,822	203.3	34,146

Our site visits produced a verification rate of 100 percent from four observations. Table 1-25 shows program-level reported, adjusted gross, and verified savings.

Table 1-25. ENERGY STAR Home Total Gas Savings

Region	Measure Count	Reported Savings	Adjusted Gross Savings	Verification Rate	Verified Savings	Verified Savings Rate
WA	130	25,381	26,423	100%	26,423	104%
ID	38	7,441	7,724	100%	7,724	104%
Total	168	32,822	34,146	100%	34,146	104%

All of the ENERGY STAR Homes we analyzed met program requirements. We determined a savings of 203 therms through modeling as the verified savings value for a home that operates with gas and electric energy.

We determined the realized adjusted gross savings rate to be 104 percent for the ENERGY STAR Home program measure savings. The verification rate did not change the savings of 34,146 therms, and the overall verified realized savings is also 104 percent.

1.3.7 Net-To-Gross

In Q1 of 2011, Cadmus performed a net-to-gross (NTG) analysis on 2011 program participants. Table 1-26 shows the results from that study. These results span both Washington and Idaho and are applied to adjusted gross savings to determine the net verified savings per program.

Table 1-26. ENERGY STAR Home Total Gas Savings

Program Category	Responses	FR %	Spillover %	NTG
Residential Appliances and Water Heaters	67	48%	0.0%	52.0%
Residential HVAC	67	39%	0.0%	61.0%
Residential Shell	67	45%	8.8%	63.8%
EnergyStar Homes	7	26%	0.0%	73.6%

1.3.8 Verification Confidence and Precision

We determined the precision of verification activities for each program given a 90 percent confidence level. We calculated verification rates using site visits and surveys as equally weighted observations. Table 1-27 shows the number of observations for each program and the corresponding precision level.

Table 1-27. Program Verification Observations and Precision

Program	Measure Count	Verification Observations	Verification Rate	Precisions at 90% Confidence
ENERGY STAR Products	5,876	76	96%	4%
Heating and Cooling Efficiency	3,934	106	98%	2%
Weatherization/Shell	5,667	97	100%	N/A
Water Heater Efficiency	774	22	95%	8%
ENERGY STAR Homes	168	4	100%	N/A
Total	16,419	305	98%	1.3%

The ENERGY STAR Products, Heating and Cooling Efficiency, and Weatherization programs comprised 96 percent of the reported savings for the PY 2010 gas portfolio. Therefore, we focused the majority of our verification activities on those programs, which resulted in the greatest possible confidence and precision levels. The Water Heating Efficiency program had a small proportion of savings, and therefore we concentrated less effort for this program. The same was true for ENERGY STAR Homes; however, we did prepare ENERGY 10 models to determine the average savings per home to apply to the program population. The verification precision for the portfolio verification rate was 1.3 percent with 90 percent confidence.

1.4 Conclusions

The 2010 residential gas programs achieved 935,068 gross verified therms and 580,966 net verified therms overall. Verification activities produced an overall sector verification rate of 98 percent. Table 1-28 through Table 1-30 show total and state level gross and net savings per program.

Table 1-28. Total Program Gross and Net Verified Savings and Realization Rates

Program	Reported Savings (Therms)	Gross Verified (Therms)	Gross Realization Rate	Net Verified (Therms)	Net Realization Rate
ENERGY STAR Products	44,400	58,475	132%	30,408	68%
Heating and Cooling Efficiency	483,882	400,317	83%	244,193	50%
Weatherization/Shell	553,876	434,960	79%	277,505	50%
Water Heater Efficiency	12,010	7,170	60%	3,728	31%
ENERGY STAR Homes	32,822	34,146	104%	25,131	77%
Total	1,126,990	935,068	83%	580,965	52%

Table 1-29. Program Gross and Net Verified Savings and Realization Rates - Washington

Program	Reported Savings (Therms)	Gross Verified (Therms)	Gross Realization Rate	Net Verified (Therms)	Net Realization Rate
ENERGY STAR Products	32,377	42,815	132%	22,276	69%
Heating and Cooling Efficiency	324,228	267,904	83%	163,610	50%
Weatherization/Shell	432,891	340,397	79%	217,173	50%
Water Heater Efficiency	9,049	5,416	60%	2,830	31%
ENERGY STAR Homes	25,381	26,423	104%	19,447	77%
Total	823,926	682,955	83%	425,336	52%

Table 1-30. Program Gross and Net Verified Savings and Realization Rates - Idaho

Program	Reported Savings (Therms)	Gross Verified (Therms)	Gross Realization Rate	Net Verified (Therms)	Net Realization Rate
ENERGY STAR Products	12,028	15,631	130%	8,132	68%
Heating and Cooling Efficiency	159,654	131,951	83%	80,583	50%
Weatherization/Shell	120,985	94,563	78%	60,331	50%
Water Heater Efficiency	2,961	1,720	58%	898	30%
ENERGY STAR Homes	7,441	7,724	104%	5,684	76%
Total	303,069	251,588	83%	155,630	51%

Table 1-31 shows the rate of achievement of gross savings compared to the IRP goal for the residential sector. Table 1-32 shows the net savings and IRP goals.

Table 1-31 IRP Goals and Gross Verified Savings by State

Sector	Washington			Idaho			Total		
	Savings Goal	Gross Achieved	Achiev-ement Rate	Savings Goal	Gross Achieved	Achiev-ement Rate	Savings Goal	Gross Achieved	Achiev-ement Rate
Residential	647,788	683,313	105%	273,281	251,757	92%	921,069	935,070	102%

Table 1-32 IRP Goals and Net Verified Savings by State

Sector	Washington			Idaho			Total		
	Savings Goal	Net Achieved	Achieve-ment Rate	Savings Goal	Net Achieved	Achieve-ment Rate	Savings Goal	Net Achieved	Achieve-ment Rate
Residential	647,788	425,336	66%	273,281	155,630	57%	921,069	580,966	63%

Overall, residential gas program customers responded well to the programs and often installed several measures within the same program year. The residential programs drew enough participation to meet IRP achievement goals overall, which was the only sector to do so. Avista's program and tracking databases were sufficient for evaluation purposes, providing adequate contact, measure and savings information, and the database review confirmed that the information was reliable and accurate. The majority of measures (all but one) were determined to meet program qualification standards. The billing analysis performed to calculate average annual gas savings for furnaces produced interesting and conclusive results. The subsequent electric savings report will further inspect the interaction of gas furnaces and electric heat pumps to determine the overall energy usage of the home for heating.

1.5 Recommendations

The majority of our recommendations center around increasing measure level detail capture on the applications and inclusion in the databases. These measure detail information includes:

- List energy factors (EF and MEF), or at least model numbers, for appliances
- Include baseline information, such as for insulation R-values, type or thickness
- Request square footage, particularly for ENERGY STAR homes

Customers also indicated some confusion on door rebates. If Avista wishes to give incentives on doors explicitly, customers seem to be receptive.

The interaction of gas furnaces and heat pumps on both savings and incentive structure will be revisited in both the electric report and the 2010 process report. Residential heat pumps, many homes with a gas furnace as well, are currently undergoing a metering study and those data will provide important information to assist the Heating and Cooling Efficiency program going forward.

2 2010 Non-Residential Gas Impact Report

Executive Summary

Program Overview

Avista's non-residential programs promote the purchase of industry-proven, high-efficiency equipment for commercial utility customers. They provide rebates to partially offset the difference in cost between high-efficiency and standard equipment, reducing the first cost barrier and making the high-efficiency equipment a more viable option for commercial customers.

Avista's non-residential gas portfolio has eight programs in three major categories: prescriptive, site specific (custom), and the Energy Smart Grocer program. The full list of programs is:

- Prescriptive:
  - ENERGY STAR Residential Products (APP)
  - Prescriptive Commercial Clothes Washer (PCW)
  - Prescriptive Demand Controlled Ventilation (PDCV)
  - Prescriptive Food Service (PFS)
  - Prescriptive Refrigerated Warehouse (PRW)
  - Prescriptive Steam Trap Replacement (PSTR)
- Energy Smart Grocer (ESG)
- Site Specific (SS)

The Site Specific and prescriptive programs are implemented by Avista, while the Energy Smart Grocer program is implemented by PECI. Cadmus conducted both qualitative (process) and quantitative (impact) evaluations of these programs. For the evaluations, we assessed and documented program savings (both the gross realization rate and savings net of freeriders and adjusted for spillover). We also sought to document the evolution of these programs and provide timely feedback to enable program improvements. Cadmus will examine electric savings impacts and report our process evaluation findings in subsequent reports.

Key Findings

Throughout the impact evaluation, the Cadmus team documented program achievements and identified issues to be resolved in regard to lower than expected achieved savings.

Ex ante reported and *ex post* evaluated savings are shown in Table 2-1 through Table 2-3. The net evaluated program savings were 672,344 therms. Net-to-gross (NTG) was determined in a previous Cadmus study in early 2011, and those results were applied to the verified gross savings in this evaluation.

Table 2-1. Program Summary

Program	Number of Measure Installations	*Ex Ante* Gross Program Reported Savings	*Ex Post* Gross Program Evaluated Savings	Net-to-Gross	*Ex Post* Net Program Evaluated Savings
APP	2	17	17	0.87	15
ESG	5	20,100	15,191	0.9	13,672
PCW	6	1,495	1,495	0.87	1,301
PDCV	5	2,256	2,256	0.87	1,963
PFS	31	29,165	29,115	0.87	25,330
PRW	1	12,542	6,936	0.87	6,034
PSTR	2	43,898	30,612	0.87	26,632
SS	401	682,509	807,293	0.74	597,397
Total	453	791,982	892,915	0.75	672,344

Table 2-2. Program Summary - Idaho

Program	Number of Measure Installations	*Ex Ante* Gross Program Reported Savings	*Ex Post* Gross Program Evaluated Savings	Net-to-Gross	*Ex Post* Net Program Evaluated Savings
APP	1	9	9	0.87	8
ESG	1	2,318	2,318	0.90	2,086
PCW	2	477	477	0.87	415
PDCV	3	1,240	1,240	0.87	1,079
PFS	7	12,001	11,980	0.87	10,423
PSTR	1	39,706	28,686	0.87	24,957
SS	122	124,551	147,323	0.74	109,019
Total	137	180,302	192,033	0.77	147,986

Table 2-3. Program Summary - Washington

Program	Number of Measure Installations	*Ex Ante* Gross Program Reported Savings	*Ex Post* Gross Program Evaluated Savings	Net-to-Gross	*Ex Post* Net Program Evaluated Savings
APP	1	9	9	0.87	8
ESG	3	17,782	12,873	0.90	11,586
PCW	4	1,018	1,018	0.87	886
PDCV	2	1,016	1,016	0.87	884
PFS	24	17,164	17,135	0.87	14,907
PRW	1	12,542	6,936	0.87	6,034
PSTR	1	4,192	1,926	0.87	1,676
SS	279	557,958	659,971	0.74	488,378
Total	316	611,681	700,883	0.75	524,358

Avista did not report participation goals in terms of number of projects, but did report energy savings goals as shown in Table 2-4. The net overall PY 2010 non-residential gas portfolio achieved 57 percent of the original energy savings goal.

Table 2-4. Energy Savings Achievements Compared to Goals

Program	*Ex Ante* Program Gross Goals	Evaluated *Ex Post* Gross Program	Net-to-Gross	Evaluated *Ex Post* Net Program	Net Realization Rate
Idaho	347,812	192,033	55%	147,986	43%
Washington	824,457	700,883	85%	524,358	64%
Total	1,172,269	892,916	76%	672,344	57%

The portfolio results shown in Table 2-4 do not account for therm penalties due to increased lighting efficiency. Lighting systems convert a large portion of their input energy to useful light output, but a substantial fraction is converted to heat. Any reduction in lighting input energy also reduces waste heat. This waste heat reduction lowers the site's required cooling load while increasing the heating load. Cadmus noted that Avista tracked these HVAC interactive effects for calculating cost-effectiveness, but did not include them in energy savings goals or reported savings values. Avista noted their methodology for calculating interactive impacts was not as robust as that for energy savings. The Avista database extract did not provide sufficient detail for Cadmus to calculate those impacts.

2.1 Introduction

Avista's non-residential portfolio of programs promote the purchase of industry-proven, high-efficiency equipment for commercial utility customers. Avista provides rebates to partially offset the difference in cost between high-efficiency equipment and standard equipment, reducing the first cost barrier and making the high-efficiency equipment a more viable option for commercial customers.

The non-residential gas portfolio has eight programs in three major categories: prescriptive, site specific (custom), and the Energy Smart Grocer program.

2.1.1 ENERGY STAR Residential Products (APP)

This program is available to non-residential customers who use residential-grade appliances in a small business application. Savings are determined through deemed estimates.

2.1.2 Prescriptive Commercial Clothes Washer (PCW)

To encourage customers to select high-efficiency clothes washers, this program targets non-residential electric and natural gas customers in multifamily or commercial laundromat facilities. The program's streamlined prescriptive approach is designed to reach customers quickly and effectively to promote ENERGY STAR or Consortium for Energy Efficiency (CEE) listed units.

2.1.3 Prescriptive Demand Controlled Ventilation (PDCV)

Under this program, non-residential electric and natural gas customers receive direct incentives to install DCV in existing buildings. This type of ventilation measures the approximate number of people occupying a space—based on carbon dioxide levels—and resets the outdoor air intake rate for occupant ventilation in accordance with the measurement. To be eligible for the program, the temperature of the conditioned spaces must remain between 65 and 75 degrees during operating hours. Also, the controlled conditioned space must be a minimum of 2,000 square feet.

2.1.4 Prescriptive Food Service (PFS)

Applicable to non-residential electric and gas customers with commercial kitchens, this program provides direct incentives to customers who choose high-efficiency kitchen equipment. The equipment must meet either ENERGY STAR or CEE Tier levels (depending on the unit) to qualify for an incentive.

2.1.5 Prescriptive Refrigerated Warehouse (PRW)

This program offers non-residential electric customers a direct incentive for efficiency improvements in refrigerated warehouses. Although the customer base for this program is limited, there are significant opportunities for energy savings from the program's measures.

2.1.6 Prescriptive Steam Trap Replacement (PSTR)

This program offers rebates to non-residential gas customers who repair or replace failed steam traps on the steam distribution lines of a boiler heating system. The key criteria for this rebate are:

- A replacement must be a new working steam trap of the same duty as what was replaced.
- Each steam trap repair or replacement is only eligible for a rebate once every five years.
- The repaired or replaced trap must include a strainer.

2.1.7 Energy Smart Grocer (ESG)

Refrigeration represents a high potential for energy savings but is often overlooked because of the technical aspects of the equipment. The Energy Smart Grocer program assists non-residential grocery store customers with the technical aspects of their refrigeration systems while providing a clear view of what savings they can achieve. A field energy analyst provides customers with technical assistance, produces a detailed report of the potential energy savings at the facility, and guides customers through the process from inception through the payment of incentives for qualifying equipment.

2.1.8 Site Specific (SS)

The Site Specific program addresses non-residential measures that do not lend themselves to prescriptive applications, and thus must be considered based on their project-specific information. For a measure to be considered, it must have demonstrable kWh and/or therm savings. These measures are available to all commercial, industrial, or pumping customers who receive electric or natural gas service from Avista and want to make cost-effective, energy-efficiency improvements to their business. Electric and gas saving measures included in the program are:

- Appliances
- Compressed air
- HVAC

- LEED
- Industrial process
- Motors and HVAC Variable Frequency Drive
- Shell measures
- Multifamily measures
- Custom lighting projects

The Site Specific and prescriptive programs are implemented by Avista, while the Energy Smart Grocer program is implemented by PECI. As the implementers, Avista and PECI were responsible for designing and managing program details. Avista developed algorithms for use in determining measure savings, as well as measure and customer eligibility.

Avista staff fielded inquiries from potential participants and contractors, and developed a tracking database for projects. Throughout the program, Avista has managed projects by reviewing and approving applications at all stages of the process, determining project savings, and populating the database with relevant information.

2.2 Methodology

We designed the impact evaluation to verify reported program participation and estimate energy and demand savings. Our impact evaluation included:

- Determining *ex post* gross savings through engineering calculations;
- Leveraging freeridership estimates from a previous study we performed; [12] and
- Determining net savings.

Cadmus worked with a subcontractor for this evaluation, SBW (collectively referred to as the Cadmus team). The Cadmus team reviewed *ex ante* gross reported energy savings and available documentation for a sample of sites (e.g., audit reports, savings calculation work papers), giving particular attention to the calculation procedures and documentation for savings estimates. The Cadmus team also verified the appropriate analyses to calculate savings, as well as the operating and structural parameters of the analysis. We then determined *ex post* gross evaluated energy savings through site visits, engineering calculations, and verification surveys of a sample of projects.

The Cadmus team collected baseline, tracking, and program implementation data through on-site interviews with facility staff. We used on-site visits to verify installations and determine any changes to the operating parameters since the measures were first installed. The Cadmus team used the savings realization rate from site visits to estimate savings and develop recommendations for future studies. We also interviewed facility staff to determine the operating

[12] The Cadmus Group, Inc. *Net-to-Gross Evaluation of Avista's Demand-Side Management Programs*. April 19, 2011.

conditions of the installed system and any additional benefits or shortcomings of the installed system.

2.2.1 Sampling

Cadmus developed a sampling calculation tool to estimate the proposed number of metered projects, site verifications, and phone verifications in order to achieve the rigor levels shown in Table 2-5. This table also shows the initial estimates for evaluation activities, which relied on preliminary program population data provided by Avista.

Table 2-5. Originally Proposed PY 2010 Non-Residential Evaluation Activities

Fuel	Proposed Rigor Level*	Proposed Metering Projects	Proposed Site Visits	Proposed Verification Surveys
Electric	90/10	61	58	259
Gas	90/10	49	59	116

* The rigor is the confidence level and interval. These values for gas projects, for example, indicate that Cadmus is 90 percent certain the correct answer is with ±10 percent of the evaluated savings.

After the evaluation contract was awarded, Avista provided Cadmus with the final PY 2010 database extract. Cadmus revised the sample distribution based on the final program populations and energy savings. Cadmus converted both electric and gas savings to MBTUs to more effectively compare savings by fuel, shown in Table 2-6 below.

Table 2-6. PY 2010 Non-Residential Savings Analysis by Fuel

Fuel	Measures	Sites	Savings (kWh)	Savings (therms)	Savings (MBtu)	Portion of Total Savings
Electric	1,891	982	49,484,353	0	168,841	65%
Gas	453	277	2,873,354	791,982	89,002	35%

Based on the weighted proportion of savings, Cadmus determined that 35 percent of the sample should be represented by gas projects. These included purely gas and dual fuel projects in which gas savings exceeded electric savings.

Next, Cadmus selected the appropriate verification activities for each measure type and project, including metering, on-site verification, and phone verification. Cadmus received the final database in the spring of 2011, after the heating season ended. Therefore, we could not effectively meter savings from heating equipment.

The only appropriate measures for metering were for the Site Specific, Energy Smart Grocer, and Prescriptive Steam Trap Replacement programs. However, the Avista PY 2010 population only included a small number of these projects, significantly less than the proposed sample for gas metered projects. Cadmus determined the PY 2010 gas heating measures could be evaluated with on-site verification alone, applying additional rigor. Based on these revisions, we developed a revised evaluation activity sample, shown in Table 2-7.

Table 2-7. Revised PY 2010 Non-Residential Evaluation Activities

Fuel	Metering Projects	Site Visits	Verification Surveys
Electric	61	62	333
Gas	11	55	180

The final achieved evaluation activities for gas measures are shown in Table 2-8. Subsequent sections will detail the variation between revised and achieved evaluation activities. As noted previously, Cadmus will report on electric measure savings in 2012.

Table 2-8. Final FY 2010 Gas Evaluation Activity Sample

Fuel	Achieved Metering Projects	Achieved Site Visits	Achieved Verification Surveys
Gas	7	65	55

The sampling process was iterative, requiring Cadmus to select projects of interest, request data from Avista to determine how many and what types of projects were at various locations, and then obtain contact information and project files for the relevant sites. Cadmus repeated this process until we completed the final primary and backup samples.

In addition, the database extract provided program-level, not measure-level information. The Cadmus team attempted to verify savings for every incented measure at each site, regardless of whether it achieved gas or electric savings. Cadmus was unable to determine whether an accurate distribution of measure types within each program was evaluated. This effort would have required an exhaustive review of project files, which was not within the scope of the evaluation.

2.2.2 Data Collection

The primary methods we used to collect data were metering, on-site verification, and telephone verification. For each activity, we first conducted a document review to determine measure type, quantity, operational parameters, and calculation methodology.

2.2.2.1 Document Review

As the first step in the impact evaluation process, the Cadmus team reviewed documentation, calculation spreadsheets, and energy simulation models relevant to the evaluation effort. Avista provided documentation of the energy-efficiency projects undertaken at the sample sites. The Cadmus team paid particular attention to calculation procedures and documentation for savings estimates. The documentation we reviewed included program forms, the tracking database, audit reports, and savings calculation work papers for each rebated measure.

The Cadmus team reviewed each application to determine whether the following types of information were provided:

- Documentation for the equipment being replaced, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information.
- Documentation for the new equipment installed, including (1) descriptions, (2) schematics, (3) performance data, and (4) other supporting information.

- Information about the savings calculation methodology, including (1) the methodology used, (2) specifications of assumptions and sources for these specifications, and (3) correctness of calculations,

2.2.2.2 Site Visits

The Cadmus team performed on-site visits to verify measure installations, collect primary data to calculate savings impacts, and interview facility staff.

On-site visits accomplished three primary tasks:

1. We verified the implementation status of all measures for which customers received incentives. We verified that the energy-efficiency measures were installed correctly and still functioned properly, and we also verified the operational characteristics of the installed equipment, such as temperature set points and operating hours.
2. We collected the physical data, such as boiler capacity or operational temperature, needed to analyze the energy savings realized from the installed improvements and measures.
3. The Cadmus team conducted interviews with facility personnel to obtain additional information on the installed system to complement the data we collected from other sources.

2.2.2.3 Short-Term Metering

Most metering projects involved a billing analysis to calibrate Avista's hourly meter data against site conditions and production data, where relevant. The Cadmus team metered one Energy Smart Grocer project involving hot water reclamation from a desuperheater. All other ESG gas savings projects involved HVAC equipment, and could not be metered effectively outside the heating season.

2.2.2.4 Surveys

Cadmus also conducted phone verification as a component of the participant process evaluation surveys to supplement the installation rate determined through on-site verification. Cadmus attempted to reach at least one participant for each major measure type and program. We were unable to achieve the full revised sample of verification surveys due to participant refusals and others who could not be reached.

2.2.3 Engineering Analysis

Each of the three major types of programs in Avista's non-residential portfolio (prescriptive and the Site Specific and ESG programs) required significantly different methods for analysis.

2.2.3.1 Overview

The procedures we used to verify savings through an engineering analysis depended on the type of measure being analyzed. The major analyses types included in this evaluation are:

- Prescriptive deemed savings
- Short-term metering
- Billing analysis

- Calculation spreadsheets
- Energy simulation modeling

The following sections describe the procedures we followed to verify savings from the different types of measures installed in the program.

2.2.3.2 Prescriptive Deemed Savings

For most prescriptive measures, Cadmus verified the deemed savings estimates that Avista used for savings calculations, and compared those with values we developed for the new TRM. Our verification activities focused on the installed quantity and equipment nameplate data, as well as the proper installation of equipment and operating hours. Where appropriate, the Cadmus team used data from site verification visits to re-analyze prescriptive measure savings through Avista's Microsoft Excel calculation tools, ENERGY STAR calculation tools, and other secondary sources.

2.2.3.3 Short-Term Metering

The Cadmus team metered one Energy Smart Grocer project involving hot water reclamation from the refrigeration system. The reclaimed hot water offset water heating that would otherwise have been supplied by a natural gas water heater. To determine the amount of heat exchange, the Cadmus team installed temperature sensors with dataloggers on the inlet and outlet streams of both the conventional water heater and the refrigeration heat exchange loops, as well as an ultrasonic meter to record water flow rates.

2.2.3.4 Billing Analysis

Cadmus analyzed the two Prescriptive Steam Trap Replacement and the four largest Site Specific industrial process projects through an analysis of Avista's metered billing data. Our pre–post modeling approach allowed us to directly develop retrofit savings estimates for each site. The modeling approach accounted for differences in HDDs and, where applicable, production. It also determined savings based on normalized weather conditions, since the actual weather conditions may have been milder or more extreme than the 15-year normal weather averages from 1991-2005 we obtained from the National Oceanic and Atmospheric Administration (NOAA).

Cadmus obtained daily weather data from NOAA for each weather station associated with the participant projects. From the daily weather data, we calculated the base 65 reference temperature HDDs. Cadmus matched the participant billing data to the nearest weather station by zip code, and then matched each monthly billing period to the associated base 65 HDDs.

We followed a modified PRISM approach with all the models. Cadmus normalized all dependent and independent variables for the days in each billing period; allowing for model coefficients to be interpreted as average daily values. Cadmus used this methodology to account for differences in the length of billing periods. For each project, we modeled the average daily consumption in therms as a function of some combination of average standing base load, HDD, and (where appropriate) daily consumption.

For each site, Cadmus estimated two demand models: one for the pre period and one for the post period. Cadmus chose this methodology over a single standard treatment effects model to account for structural changes in demand that might occur due to retrofits. For instance, one site eliminated the standing load as a result of the retrofit program. This pre-post modeling approach enabled Cadmus to estimate an intercept model for the pre period and a no-intercept model for the post period to reflect his change.

Cadmus calculated three scenarios after estimating model coefficients for each site. First, we estimated a reference load for the previous 12 billing cycles using the pre period model. This scenario extrapolated the counterfactual consumption; that is, what the consumption would have been in the absence of the program. The difference between this scenario and the actual consumption represents actual savings.

Cadmus then estimated two normalized scenarios: one using the pre model, and one using the post model. Cadmus estimated these scenarios using 15-year TMY3 data as the annual HDD and mean annual values for the production data. The difference between these two scenarios represents the long-term expected annual savings.

2.2.3.5 Calculation Spreadsheets

Avista developed calculation spreadsheets to analyze energy savings for a variety of measures, including building envelope measures such as ceiling and wall insulation. The calculation spreadsheets require input of relevant parameters such as square footage, efficiency value, HVAC system details, and location details. The spreadsheets use these data to estimate energy savings through algorithms programmed by Avista. For each spreadsheet, the Cadmus team reviewed input requirements and output estimates, and determined the approach was reasonable.

2.2.3.6 Energy Simulation Modeling

Avista determined savings for many Site Specific HVAC and shell projects with energy simulation modeling. This approach was chosen due to complex interactions between heating and cooling loads and the building envelope. Avista provided the original energy simulation models, and the Cadmus team reviewed those models to determine the relevant parameters and operating details (such as temperature set points) for the applicable measure. We updated the models as necessary based on our on-site verification data.

2.2.4 Most ESG program measures involved electric savings from more techniques. PECI determined ESG refrigeration measure energy proprietary modeling software based on the DOE 2.2R module. The the capability to run this custom software, and used other techniques ESG gas projects primarily included HVAC measures, such as which we analyzed with the methods outlined in the Energy Smart Grocer (ESG)

Refrigeration represents a high potential for energy savings but is often overlooked because of the technical aspects of the equipment. The Energy Smart Grocer program assists non-residential grocery store customers with the technical aspects of their refrigeration systems while providing a clear view of what savings they can achieve. A field energy analyst provides customers with technical assistance, produces a detailed report of the potential energy savings at the facility, and guides customers through the process from inception through the payment of incentives for qualifying equipment.

Site Specific (SS) section.

2.3 Results and Findings

2.3.1 Overview

The Cadmus team adjusted gross savings estimates based on our evaluated findings. Further details are outlined in the following sections.

2.3.2 Prescriptive

The Cadmus team evaluated savings for a sample of sites across six prescriptive programs. Table 2-9 through Table 2-11 show our evaluated results by program. Specific evaluation details are noted in each program subsection below.

Table 2-9. Evaluated Results for PY10 Non-Residential Gas Prescriptive

Program	Total FY10 Measure Installations	Evaluated Sample	*Ex-Ante* Gross Reported Savings	*Ex-Post* Gross Evaluated Savings	Realization Rate
APP	2	0	17	17	100%
PCW	6	1	463	463	100%
PDCV	5	1	300	300	100%
PFS	31	11	21,002	20,996	100%
PRW	1	1	12,542	6,936	55%
PSTR	2	2	43,898	30,612	70%

Table 2-10. Evaluated Results for PY10 Non-Residential Gas Prescriptive - Idaho

Program	Total FY10 Measure Installations	Evaluated Sample	*Ex-Ante* Gross Reported Savings	*Ex-Post* Gross Evaluated Savings	Realization Rate
PCW	2	1	463	463	100%
PDCV	3	1	300	300	100%
PFS	7	3	10,166	10,149	100%
PSTR	1	1	39,706	28,686	72%

Table 2-11. Evaluated Results for PY10 Non-Residential Gas Prescriptive - Washington

Program	Total FY10 Measure Installations	Evaluated Sample	*Ex-Ante* Gross Reported Savings	*Ex-Post* Gross Evaluated Savings	Realization Rate
PFS	24	8	10,836	10,817	100%
PRW	1	1	12,542	6,936	55%
PSTR	1	1	4,192	1,926	46%

2.3.2.1 ENERGY STAR Residential Products (APP)

Cadmus attempted to perform phone verification surveys with the two participants of this program, but could not reach either. We assigned a 100 percent realization rate due to the low level of participation and reported savings.

2.3.2.2 Prescriptive Commercial Clothes Washer (PCW)

Cadmus performed a phone verification survey with one participant of this program. The participant confirmed that the measure was installed in the appropriate quantity at the program-listed address, and therefore the full savings should be achieved. We determined that the reported deemed savings were appropriate.

2.3.2.3 Prescriptive Demand Controlled Ventilation (PDCV)

Cadmus performed a phone verification survey with one participant of this program. The participant confirmed that the measure was installed in the appropriate quantity at the program-listed address, and therefore the full savings should be achieved. We determined that the reported deemed savings were appropriate.

2.3.2.4 Prescriptive Food Service (PFS)

Cadmus performed verification visits to eight sites with Prescriptive Food Service program measures, as well as three phone surveys. In most cases, the field engineer or participant confirmed that the measure was installed in the appropriate quantity at the program-listed address, and therefore the full savings should be achieved. We determined that the reported deemed savings were appropriate.

The Cadmus team identified two adjustments to the reported savings. The combined effect of both adjustments reduced sample savings by six therms, much less than 1 percent of the total reported value.

- A grocery store installed a new dishwasher and reported electric savings. Our site verification visit determined that hot water was actually provided by a gas water heater, and the dishwasher had a gas booster. Cadmus updated the project savings to reflect the gas dishwasher measure deemed savings.
- During site visits at a series of locations in a school district, we identified a number of measures not listed in the updated deemed savings tables. Cadmus applied values from previous deemed savings tables.

Cadmus calculated an overall realization rate for all projects in both states, and then applied the resulting realization rate to the savings for each state.

2.3.2.5 Prescriptive Refrigerated Warehouse (PRW)

The Cadmus team performed a site visit of the one gas participant in this program. The participant installed 22 doors to further insulate heated spaces within the warehouse, and thereby reduced the heating load. Cadmus determined that site heating was minimal, and deemed savings estimates were likely overstated. The revised savings estimate adjusted savings to 55 percent of the reported value.

2.3.2.6 Prescriptive Steam Trap Replacement (PSTR)

Cadmus performed site visits to both participants of this program. We determined that the deemed savings estimates could be overstated due to potential variation in measure operation and site production. Therefore, we conducted a billing analysis of hourly metered billing data for each participant, calibrated to site conditions and reported production values. The resulting analysis identified large variation from deemed savings estimates, and Cadmus adjusted the reported savings values. The combined impact of these adjustments changed the savings values downward by 30 percent.

2.3.3 Site Specific

Cadmus performed site visits on 54 Site Specific program projects, and conducted verification surveys of an additional 50 projects. The Site Specific program projects represented a variety of measure types. Cadmus calculated an overall realization rate for all projects in both states, and then applied the resulting realization rate to the savings for each state. Table 2-12 through Table 2-14 list the different measure types we evaluated, as well as the number of projects and reported savings. Table 2-15 through Table 2-17 show our evaluated results for the program.

Table 2-12. Site Specific Measure Types and Projects Evaluated

Measure Type	Evaluated Projects	*Ex Ante* Reported Gas Savings
Appliances	4	1,362
HVAC	50	251,290
Industrial Process	3	101,782
Shell	47	61,785
Total	104	416,219

Table 2-13. Site Specific Measure Types and Projects Evaluated - Idaho

Measure Type	Evaluated Projects	*Ex Ante* Reported Gas Savings
Appliances	1	73
HVAC	11	21,059
Industrial Process	2	26,782
Shell	19	12,552
Total	33	60,466

Table 2-14. Site Specific Measure Types and Projects Evaluated - Washington

Measure Type	Evaluated Projects	*Ex Ante* Reported Gas Savings
Appliances	3	1,289
HVAC	39	230,231
Industrial Process	1	75,000
Shell	28	49,233
Total	71	355,753

Table 2-15. Evaluated Results for PY 2010 Non-Residential Gas Site Specific Sample

Program	Total FY10 Measure Installations	Evaluated Sample	*Ex-Ante* Gross Reported Sample Savings	*Ex-Post* Gross Evaluated Sample Savings	Sample Realization Rate
SS	401	104	416,219	492,317	118%

Table 2-16. Evaluated Results for PY 2010 Non-Residential Gas Site Specific - Idaho

Program	Total FY10 Measure Installations	Evaluated Sample	*Ex-Ante* Gross Reported Savings	*Ex-Post* Gross Evaluated Savings	Realization Rate
SS	122	33	124,551	147,323	118%

Table 2-17. Evaluated Results for PY 2010 Non-Residential Gas Site Specific - Washington

Program	Total FY10 Measure Installations	Evaluated Sample	*Ex-Ante* Gross Reported Savings	*Ex-Post* Gross Evaluated Savings	Realization Rate
SS	279	71	557,958	659,971	118%

The Cadmus team identified many adjustments to Site Specific program project reported savings. Site specific projects tend to be more complex, and energy savings parameters and impacts can be more difficult to estimate. In addition, the calculations often rely on participant-supplied building, equipment, and operations data, which may vary from parameters identified during an on-site verification visit.

In aggregate, the adjustments noted by Cadmus increased savings by 18 percent. This indicates that Avista's approach to reporting savings was appropriately conservative when considering the nature of these measures.

Typical adjustments we made to the savings values included corrections to equipment efficiency, operating schedules, temperature set points, and building parameters. The Cadmus team also identified errors in simulation models and MS Excel calculation tools, which resulted in adjustments when corrected. Two project-specific adjustments included:

- One office project involved a lake water cooling system which was modeled in eQuest. The simulation model applied a cooling cutoff to the chilled water system, artificially eliminating cooling during many hours. The building contained a dual duct system, so the cooling reduction also resulted in a large drop in heating energy.

  The Cadmus team revised the model to allow for mechanical cooling during all hours, then subtracted cooling energy for all hours when the outside air temperature was below the cutoff temperature. The resulting impact increased savings by 230 percent of the reported value (a significant increase in savings for this large project). The Cadmus team also confirmed the savings impact through pre- and post-installation utility bills.

- A church installed shell measures, including wall and ceiling insulation. However, the ceiling insulation was installed between the basement and main level. The main level of the church is under construction, and plans to operate out of the basement for one to two years until the main level is complete. For the first two years, the wall insulation will not achieve savings because the main level is unconditioned. Following that time, the basement insulation will not achieve savings because it separates to conditioned spaces. The pastor reported the ceiling insulation was installed primarily for soundproofing purposes.

  Cadmus resolved the analysis by discounting ceiling insulation savings, but allowed the wall insulation savings, which should achieve persistence. Cadmus also adjusted the savings calculator based on our on-site verification visit, and determined that overall savings should be reduced by 7 percent.

2.3.4 Energy Smart Grocer (ESG)

Cadmus performed site visits on all three ESG sites with gas savings, which included four reported measures. Two refrigeration measures involved hot water heat reclaim and case doors on medium temperature reach-in display cases. The two HVAC measures involved demand controlled ventilation and replacement of gas furnace units with heat pumps. Table 2-18 through Table 2-20 show our evaluated results for the program.

Table 2-18. Evaluated Results for FY10 Non-Residential Gas ESG Measures

Program	Total PY 2010 Measure Installations	Evaluated Sample	*Ex Ante* Gross Reported Savings	*Ex Post* Gross Evaluated Savings	Realization Rate
ESG	4	4	20,100	15,191	76%

Table 2-19. Evaluated Results for FY10 Non-Residential Gas ESG Measures - Idaho

Program	Total PY 2010 Measure Installations	Evaluated Sample	*Ex Ante* Gross Reported Savings	*Ex Post* Gross Evaluated Savings	Realization Rate
ESG	1	1	2,318	2,318	100%

Table 2-20. Evaluated Results for FY10 Non-Residential Gas ESG Measures - Washington

Program	Total PY 2010 Measure Installations	Evaluated Sample	*Ex Ante* Gross Reported Savings	*Ex Post* Gross Evaluated Savings	Realization Rate
ESG	3	3	17,782	12,873	72%

The Cadmus team identified three adjustments to the reported savings. The combined effect of these adjustments reduced the sample savings by 24 percent of the total reported value.

- One grocery store installed a heat reclaim measure to use waste heat from the refrigeration process to offset domestic gas water heating. The Cadmus team performed two weeks of temperature and flow metering, and determined that achieved savings were only 18 percent of the reported value. Savings were reduced primarily due to a domestic hot water recirculation loop which returned building hot water back to the inlet side of the reclaim tank, instead of to the gas water heater tank. This resulted in an inlet water temperature greater than the reclaim tank temperature for much of the time.
- The same grocery store also claimed gas savings for fuel switching by replacing gas furnace units with heat pumps. The savings assumed no gas backup heat. However, the site installed gas heating units for low temperature operations. During our site visit, we also determined that operating hours and temperature set points were slightly greater than shown in the energy simulation model, which increased gas savings. The combined impact increased gas savings by 2 percent.
- A grocery store in Clarkston, Washington installed a demand controlled ventilation system. Cadmus determined that the energy simulation model settings were appropriate compared to the data we obtained on the site. However, the simulation used weather data from Spokane to model outdoor temperature impacts. Cadmus corrected the weather file to Lewiston, Idaho (which is directly across the Snake River from Clarkston). This resulted in a 28 percent decrease in gas savings.

2.3.5 Extrapolation to Program Population

For most programs, our measurement and verification process involved a minority of sites with incented projects, but we selected these sites to provide the most impactful information. We designed the site visits to achieve a statistically valid sample for the major strata, as discussed previously. Cadmus calculated realization rates (the ratio of claimed to verified savings) to apply to the programs at the remaining non-sampled sites. Cadmus calculated realization rates as weighted averages, based on the verification sample and using the following equations:

$$RR_{ij} = \frac{Verified_{ij}}{Claimed_{ij}}; \textit{ for measure } j \textit{ at site } i \tag{1}$$

$$RR_j = \frac{\sum_i Verified_i}{\sum_i Claimed_i}; \textit{ for measure } j \textit{ across all sample sites} \tag{2}$$

$$\sum_k Verified_k = RR_j \, x \sum_k Claimed_k; \textit{ for measure } j \textit{ across all sites in measure population} \tag{3}$$

$$RR_l = \frac{\sum_k Verified_k}{\sum_k Claimed_k}; \textit{ for the population (all sites and measures)} \tag{4}$$

Where:

RR	=	the realization rate
i	=	the sample site
j	=	the measure type
k	=	the total population for measure type ‘j’
l	=	the total program population

We calculated realization rates for each individual site in the sample based on measure type (Equation 1). The Cadmus team then calculated the realization rates for the measure types using the ratio of the sum of verified savings to the sum of claimed savings from the sample for each measure type (Equation 2). We calculated the total population verified savings by multiplying the measure type realization rate from the sample by the total claimed savings for the population of each measure type (Equation 3). The program realization rate is the ratio of all verified to all claimed savings (Equation 4).

Cadmus summed these values to determine the total adjusted evaluated savings and program-level realization rates, as shown in Table 2-21 through Table 2-23. The overall portfolio gross realization rate was 113 percent.

Table 2-21. PY 2010 Gas Gross Program Realization Rates

Program	*Ex Ante* Gross Sample Reported Savings	*Ex Post* Gross Sample Evaluated Savings	Realization Rate	*Ex Ante* Gross Program Reported Savings	*Ex Post* Gross Program Evaluated Savings
APP	17	17	100%	17	17
ESG	20,100	15,191	76%	20,100	15,191
PCW	463	463	100%	1,495	1,495
PDCV	300	300	100%	2,256	2,256
PFS	21,002	20,966	100%	29,165	29,115
PRW	12,542	6,936	55%	12,542	6,936
PSTR	43,898	30,612	70%	43,898	30,612
SS	416,219	492,317	118%	682,509	807,293
Total	514,541	566,802	113%	791,982	892,915

Table 2-22. PY 2010 Gas Gross Program Realization Rates - Idaho

Program	*Ex Ante* Gross Sample Reported Savings	*Ex Post* Gross Sample Evaluated Savings	Realization Rate	*Ex Ante* Gross Program Reported Savings	*Ex Post* Gross Program Evaluated Savings
APP	n/a	n/a	100%	9	9
ESG	2,318	2,318	100%	2,318	2,318
PCW	463	463	100%	477	477
PDCV	300	300	100%	1,240	1,240
PFS	10,166	10,149	100%	12,001	11,980
PSTR	39,706	28,686	72%	39,706	28,686
SS	124,551	147,323	118%	124,551	147,323
Total	177,504	189,239	107%	180,302	192,033

Table 2-23. PY 2010 Gas Gross Program Realization Rates - Washington

Program	*Ex Ante* Gross Sample Reported Savings	*Ex Post* Gross Sample Evaluated Savings	Realization Rate	*Ex Ante* Gross Program Reported Savings	*Ex Post* Gross Program Evaluated Savings
APP	n/a	n/a	100%	9	9
ESG	17,782	12,873	72%	17,782	12,873
PCW	n/a	n/a	100%	1,018	1,018
PDCV	n/a	n/a	100%	1,016	1,016
PFS	10,836	10,817	100%	17,164	17,135
PRW	12,542	6,936	55%	12,542	6,936
PSTR	4,192	1,926	46%	4,192	1,926
SS	557,958	659,971	118%	557,958	659,971
Total	603,310	692,523	115%	611,681	700,883

2.3.6 Net-To-Gross

This section outlines Cadmus' approach and results from conducting a NTG analysis. All programs include participants who would have installed an energy-efficiency measure in the program's absence. These customers are described as freeriders: they only participated in the program to take advantage of the rebate or incentive. In those cases, energy savings from the measures they install cannot be attributed to the program because the program did not actually cause them to install the measure. Table 2-24 through Table 2-26 show the net program evaluated savings after accounting for freeridership.

Table 2-24. PY 2010 Gas Net Program Realization Rate

Program	*Ex Ante* Gross Program Reported Savings	*Ex Post* Gross Program Evaluated Savings	Net-to-Gross	*Ex Post* Net Program Evaluated Savings	Realization Rate
APP	17	17	0.87	15	88%
ESG	20,100	15,191	0.9	13,672	68%
PCW	1,495	1,495	0.87	1,301	87%
PDCV	2,256	2,256	0.87	1,963	87%
PFS	29,165	29,115	0.87	25,330	87%
PRW	12,542	6,936	0.87	6,034	48%
PSTR	43,898	30,612	0.87	26,632	61%
SS	682,509	807,293	0.74	597,397	88%
Total	791,982	892,915	N/A	672,344	88%

Table 2-25. PY 2010 Gas Net Program Realization Rate - Idaho

Program	*Ex-Ante* Gross Program Reported Savings	*Ex-Post* Gross Program Evaluated Savings	Net-to-Gross	*Ex-Post* Net Program Evaluated Savings	Realization Rate
APP	9	9	0.87	8	87%
ESG	2,318	2,318	0.90	2,086	90%
PCW	477	477	0.87	415	87%
PDCV	1,240	1,240	0.87	1,079	87%
PFS	12,001	11,980	0.87	10,423	87%
PSTR	39,706	28,686	0.87	24,957	63%
SS	124,551	147,323	0.74	109,019	88%
Total	180,302	192,033	N/A	147,986	82%

Table 2-26. PY 2010 Gas Net Program Realization Rate - Washington

Program	*Ex-Ante* Gross Program Reported Savings	*Ex-Post* Gross Program Evaluated Savings	Net-to-Gross	*Ex-Post* Net Program Evaluated Savings	Realization Rate

APP	9	9	0.87	8	87%
ESG	17,782	12,873	0.90	11,586	65%
PCW	1,018	1,018	0.87	886	87%
PDCV	1,016	1,016	0.87	884	87%
PFS	17,164	17,135	0.87	14,907	87%
PRW	12,542	6,936	0.87	6,034	48%
PSTR	4,192	1,926	0.87	1,676	40%
SS	557,958	659,971	0.74	488,378	88%
Total	611,681	700,883	N/A	524,358	88%

2.3.7 Achievements Compared to Goals

During the program planning process, Avista outlined goals for various programs to save a total of 1,172,269 therms, as shown in Table 2-27.

Table 2-27. PY 2010 Gas Program Achievements Compared to Goals

State	*Ex-Ante* Program Gross Goals	*Ex-Post* Gross Program Evaluated Savings	Gross Realization Rate	*Ex-Post* Net Program Evaluated Savings	Net Realization Rate
Idaho	347,812	192,033	55%	147,986	43%
Washington	824,457	700,883	85%	524,358	64%
Total	1,172,269	892,916	76%	672,344	57%

The overall portfolio evaluated *ex post* gross savings achieved 76 percent of goals. The NTG impact reduced *ex post* net savings to 57 percent of the original portfolio goal.

2.3.8 HVAC / Lighting Interactive Impacts

The portfolio results did not account for gas heating penalties due to increased lighting efficiency. Lighting systems convert a large portion of their input energy to useful light output, but a substantial fraction is converted to heat. Any reduction in lighting input energy also reduces waste heat. This waste heat reduction lowers the site's required cooling load but increases its heating load.

Cadmus noted that Avista tracked these HVAC interactive effects for many projects and reported those impacts for determining program cost-effectiveness. Most interactive effects involved prescriptive or site specific lighting projects, although some therm penalties were reported for the Energy Smart Grocer and Site Specific HVAC program projects.

Cadmus typically applies interactive factors based on values supplied by the RTF of the Northwest Power and Conservation Council. Those values rely on the fixture savings, building type, and HVAC system; however, that information was not available for most affected projects. Avista noted their methodology for calculating interactive effects was not as robust as that for their energy savings methodology.

In addition, Avista did not factor interactive effects into their portfolio energy savings goals, which would have reduced goals.

2.4 Conclusions

The Cadmus team evaluated 104 of 453 measures installed through the program, representing 65 percent of reported *ex ante* savings.

In general, Cadmus determined that Avista implemented the programs well. Gross *ex post* evaluated savings achieved 76 percent of reported program savings goals. The overall portfolio achieved a 113 percent realization rate comparing gross *ex post* evaluated savings to gross *ex ante* reported savings. However, the NTG impact reduced the savings realization rate to 57 percent of the goals.

Cadmus developed a number of additional conclusions throughout the evaluation process:

- Cadmus could have streamlined the sampling process with the addition of site addresses and contact information. Measure-level data for each project, such as specific measure type and quantity, would have improved the range and depth of our evaluation activities.
- Certain measures (demand controlled ventilation, refrigerated warehouse, and steam trap replacements) are less conducive to deemed savings estimates due to complex HVAC/lighting interactions and significant variation of site conditions.
- Interactive effects between HVAC and lighting represent a significant impact on gas demand. Cadmus is unable to reliably estimate interactive savings impacts through the data available in Avista's current database extracts.

2.5 Recommendations

Cadmus recommends that Avista continue to offer incentives for measure installation through the evaluated programs. We have the following recommendations for potentially improving program energy savings impacts and evaluability:

- Avista may want to consider a method to provide more robust tracking database extracts to improve evaluation activities. The database extract should include site addresses, site contact information, and measure-level details.
- Avista may want to consider providing incentives for demand controlled ventilation, refrigerated warehouses, and steam trap replacements through the Site Specific program.
- Avista should consider revising their methodology for calculating and tracking HVAC/lighting interactive effects.

3 2010 Low-Income Gas Impact Report

Executive Summary

Program Overview

Avista's Low-Income Weatherization Program in Washington and Idaho is aimed at lowering customers' energy consumption and utility bills. The program provides, at no cost to income-qualified customers, a complete home energy audit and installation of energy-efficient measures.

Evaluation Approach

For this impact evaluation, we assessed gas energy impacts associated with measure installations in homes in Avista's Washington and Idaho service territories. The major tasks we performed for the evaluation are described in more detail below.

Data Collection

The data required for this evaluation and their sources are listed in Table 3-1.

Table 3-1. Data Sources

Data	Source
Program participant and measure data	Avista
Expected savings by measure installation	Avista / CAP agencies
Participant billing histories	Avista
Weather data	NOAA

Evaluation of Program Energy Savings

Cadmus reviewed Avista's estimated savings and calculated the average achieved household and total savings as described below:

- **Expected Savings:** Were based on expected measure-level gas savings estimates provided by Avista from their program participant database.
- **Actual Savings:** Were calculated using a pre-post conditional savings analysis (CSA) fixed effects regression model to estimate weather-normalized, program-induced energy savings based on participant billing data. In addition, we leveraged work from Avista's Residential evaluation to determine savings achieved for those participants receiving an electric to high-efficiency gas furnace conversion.

Gas Impact Findings and Conclusions

Billing Analysis Gas Savings

Model savings were applied to the 186 gas-saving participants, summarized in Table 3-2. An additional 42 participants received electric to gas fuel-conversion measures; savings for these installations are discussed below.

Table 3-2. Billing Analysis Gas Savings by State

State	Total Participants	Model Savings Per Participant (Therms)	Total Savings (Therms)
Idaho	72	123	8,886
Washington	114	104	11,862
Overall	186	112	20,749

From the billing analysis, gross savings for program participants averaged 123 therms in Idaho, 104 in Washington, and 112 across both states. This is approximately 15 percent energy savings for participants in both Washington and Idaho relative to their pre-participation annual consumption.

We calculated realization rates of 60 percent in Idaho, 30 in Washington, and 38 overall. Cadmus determined that the average expected savings provided by Avista appeared particularly high for Washington participants, which may account for the lower realization rate. Several other factors may have contributed to the low results:

- High saturation of alternative heating sources (e.g., wood, fuel oil, portable electric heaters) not accounted for when developing expected savings estimates.
- Different approaches in developing expected savings estimates, maybe not always accounting for pre-weatherization annual consumption, square footage, or measure interaction.

Fuel-Conversion Savings

In addition to the 186 participants modeled in the billing analysis, 42 received fuel conversions for electric heating and/or water heating equipment. Conversion installations occurred only in Washington. Of the 42 conversion participants, only 36 received high-efficiency furnace installations, for which estimated savings of 61 therms was adapted from the billing analysis for residential single-family furnace replacements.[13] For these participants, we estimated an additional 2,188 therms.

Overall Gas Savings

Table 3-3 below compares the reported gas savings for PY2010 against the evaluated savings from our analysis. Overall, the program is achieving a 37 percent realization rate compared against the expected therms savings totals from the 228 participants. These results include both model savings applied to the 186 gas-saving participants and the furnace savings applied to the 36 participants receiving furnace conversions.

Table 3-3. Overall Gas Savings Comparison

State	Total Customers	Reported Savings (Therms)	Evaluated Gas Savings (Therms)	Program Realization Rates

[13] The program participant database did not indicate water heater conversions were replaced with efficient units; therefore, no additional gas savings were applied.

Idaho	72	15,286	8,886	58%
Washington	156	45,990	14,049	31%
Overall	228	61,276	22,937	37%

Recommendations

Our impact evaluation revealed several areas where program performance and savings accuracy could be improved:

- Standardize expected savings calculations.
- Account for additional factors in savings calculations, such as historical consumption, interaction effects, square footage, and primary heating source.
- Track alternative heating sources in homes.
- Include high-use customers in program targeting.

3.1 Introduction

Cadmus conducted a statistical billing analysis to determine the adjusted gross savings and realization rates for the energy-efficient measures installed through the Low-Income Weatherization Program in PY 2010. We performed the analysis and provided results at the household- or participant-level, rather than at the measure-level. In this report, we describe our approach and findings for the PY 2010 gas savings.

To estimate the energy savings due to the program, Cadmus used a pre- and post-installation combined CSA and Princeton Score Keeping Method (PRISM) approach using monthly billing data. We analyzed savings estimates for Idaho and Washington, in addition to running a series of diagnostics, such as a review of savings by pre-consumption usage quartile and outlier analysis. Below we include a detailed discussion of the regression model we used for this billing analysis and the resulting savings.

In the 2010 program year, 228 out of 556 total program participants received gas-saving measures, 186 of which we included in the billing analysis.[14] These 186 participants received a mix of energy-efficiency measures, encompassing insulation, infiltration controls, doors, windows, and efficient furnace and water heater replacements. Both Avista and the community action program agencies (CAPs) which implement the program, contributed to developing expected measure-level savings estimates for each participant home.[15]

3.1.1 Program Description

Five programs comprise the Low-Income Weatherization Program, listed in Table 3-4. All of the low-income programs are implemented by local CAPs within Avista’s Idaho and Washington service territories. CAPs holistically evaluate homes for energy-efficiency measure applicability,

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[14] The analysis excluded 42 customers who also received electric to gas conversion measures.

[15] CAPs in Idaho developed expected savings and provided these estimates to Avista. In Washington, the CAPs did not report expected savings and Avista developed their own savings estimates.

combining funding from different programs to apply appropriate measures to a home based on the results of a home energy audit.

While both states operate very similar weatherization programs, it is important to note that each state has individual programs, with different sovereign statewide administers, implementation agencies, and weatherization protocols. Table 3-4 provides a description of the measures installed under each program component, along with the count of gas measures installed in PY 2010 and included in our gas impact analysis (we will include our findings of the evaluated electric measures in a subsequent report).

Table 3-4. 2010 Gas Efficiency Installations by Program Component

Low-Income Program Component	Measure Description	Measure Installations
Shell / Weatherization	Insulation (ceiling, floor, wall, duct), window/door installation, air infiltration	612
ENERGY STAR® Appliance	High-efficiency refrigerator replacement	N/A
Fuel Conversion*	Electric furnace and water heater replacement with gas units	N/A
Hot Water Efficiency	High-efficiency water heater replacement	8
HVAC Efficiency	High-efficiency gas furnace replacement	42

3.1.2 Data Collection

Cadmus obtained impact evaluation data from a number of different sources, including:

- ***Program participant database***: Avista provided information regarding the program participants and installed measures for each state. Specifically, these data included the list of measures installed per home and the expected savings from each completed installation; however, these data did not include the quantity of measures installed (such as the number of square feet of installed insulation) or the per unit savings estimates.
- ***Billing records***: Avista provided participant meter records from January 2008 through April 2011.
- ***Weather data***: Cadmus collected Idaho and Washington weather data from 10 representative stations for the corresponding time period from the National Oceanic and Atmospheric Administration (NOAA).

Cadmus first matched participant accounts from program data with billing data. We then matched daily heating degree days (HDD) to each of the respective monthly read date periods in the billing data for use in the weather-adjusted savings model. Finally, we paired pre- and post-consumption periods in order to compare consistent time frames.

3.2 Methodology

3.2.1 Sampling

We used a census of program participants in the billing analysis (186 gas accounts, not including any of the gas customers who received conversion measures).

3.2.2 Data Collection Activities

3.2.2.1 Documentation Review/Database Review

Cadmus used the 2010 Idaho and Washington Program participant database provided by Avista to develop a complete population for use in both our billing analysis and for developing the telephone survey sample. The participant data also included customer information, account numbers, type of measure installed, rebate amounts, measure installation costs, measure installation dates, and expected savings per measure. Upon reviewing these data, Cadmus identified the few impact-related issues discussed below. We will include a detailed discussion of our process-oriented findings in the 2010 Process Report.

3.2.2.2 Surveys

Cadmus performed a telephone survey of 123 program participants to collect information about measure installations, energy education, non-energy benefits, and satisfaction with the program. This information contributed only slightly to our impact analysis and most findings will be reported in the 2010 Process Report.

3.2.2.3 Billing Analysis

Avista provided monthly billing data for all the Low-Income Weatherization Program participants from January 2008 through April 2011. Avista also provided the program participant database with participation and measure data, including all the gas and electric measures installed per home by the different CAPs. Cadmus summarized the data in the database for each participant by unique customer account and matched these data to the gas billing data for analysis.

We obtained daily average temperature weather data from 2008 to 2011 for the 10 NOAA weather stations that represent all the zip codes in Avista's Washington and Idaho service territories. From the daily temperatures, we determined base 65-degree HDD for each station. We obtained the nearest weather station for each territory using a zip code map of all the U.S. weather stations. We then matched the billing data periods with the HDDs from the station closest to each participant.

In order to prevent bias in assigning the pre- and post-periods from the different reading cycles (i.e., billing cycles that do not align exactly with the days per month, and different billing cycles for individual customers), and to simplify the analysis, we allocated the therm billing usage and the associated matched HDDs to calendar months.

Since the latest available billing data were for April 2011 and the measures were installed in 2010, we defined the analysis *PRE* period as 2009, before all participation installations occurred. We defined the *POST* period as the months following the installation.

Due to post-period data limitations, most participants had fewer than the desired 12 months of pre- or post-installation billing data. For this reason, we paired the pre- and post-months used in the billing analysis. For example, if a customer had measures installed in August 2010, we defined the post period as September 2010 through April 2011, and defined the pre-period as the corresponding months—from September 2009 through April 2010. This ensured that we used the same calendar months in both the pre and post periods, preventing bias from using mismatching months.

3.2.3 Data Screening

Once we had a subset of participant billing data with only the gas participants that did not receive conversion measures, Cadmus conducted a series of steps to screen participant usage data. These screens ensured that the analysis was conducted with a clean, reliable dataset.

3.2.3.1 General Screens

We performed the following screens to remove accounts that could possibly skew the savings estimation:

- Customers that indicated unit numbers in the address. These could potentially indicate weatherization installations that occurred in apartments.
- Accounts with fewer than three paired months (90 days) of billing data in either the pre- or post- period.

3.2.3.2 PRISM Modeling Screens

The second step in our screening process was to run PRISM models for the pre- and post- billing data. We used these models to obtain weather-normalized pre and post annual usage for each account, and to provide an alternate check of the weatherization savings obtained from the CSA model.

For each participant home, we estimated a heating model in both the pre and post periods to weather-normalize raw billing data.

The PRISM model specification we used was:

$$ADC_{it} = \alpha_i + \beta_1 AVGHDD_{it} + \varepsilon_{it}$$

Where for each customer ‘i’ and calendar month ‘t’:

ADC_{it}	=	the average daily therms consumption in the post program period
α_i	=	the participant intercept; represents the average daily therms base load
β_1	=	the model space heating slope
$AVGHDD_{it}$	=	the base 65 average daily HDDs for the specific location
ε_{it}	=	the error term

From the model above, we computed the weather-normalized annual consumption (NAC) as follows:

$$NAC_i = \alpha_i * 365 + \beta_1 LRHDD_i + \varepsilon_i$$

Where, for each customer ‘i’:

NAC_i	=	the normalized annual therms consumption
α_i	=	the intercept that is the average daily or base load for each participant; represents the average daily base load from the model

$\alpha_i * 365$ = the annual base load therms usage (non-weather sensitive)

β_1 = the heating slope; in effect, this is the usage per heating degree from the model above

$LRHDD_i$ = the annual, long-term HDDs of a typical month year (TMY2) in the 1971-2000 series from NOAA, based on home location[16]

$\beta_1 * LRHDD_i$ = the weather-normalized annual weather sensitive (heating) usage, also known as HEATNAC

ε_i = the error term

Once we ran the models, we applied the following first set of screens on the PRISM model output to remove participants from the billing analysis:

- **Accounts with a PRISM model r-squared of less than 0.75.** These indicate a bad fit of the monthly gas usage and the actual HDDs, which is unexpected when gas appliances are used in both the pre and post periods.
- **Accounts with a HEATNAC of less than 100 therms in either the pre or post period**. If the annual heating usage is that low, the heating system was likely not used at all, and gas was probably only used for backup secondary heating. This screen also removed accounts with negative heating slopes from the analysis, since it is unlikely that the usage would have decreased in the heating months.
- **Accounts where the change between the pre weather-normalized usage (PRENAC) and the post weather-normalized usage (POSTNAC) was more than 80 percent of PRENAC.** Such large changes could indicate property vacancies when adding or removing "other" gas equipment, such as pools or spas, that are unrelated or outside of program activities.
- **Accounts where the pre-period base load was 0 and the post-period base load was greater than 0.** Since the base load indicates the usage that occurs in non-winter and shoulder months, those months outside of the heating season, this outcome suggests that a gas water heater, gas dryer, or gas range was added to the participant home. In this situation, the additional base load usage in the post period should not correspond to the weatherization measures installed through the program.
- **Accounts with negative intercepts, and hence negative base load**, were included in the analysis but were truncated to 0. These negative intercepts typically occur in homes with gas space heating and without gas water heating. The base load for these homes is expected to be 0, thus we set the base load to 0.

[16] In billing analysis we typically use 30 year normal heating degree averages to weather normalize the usage. The latest 30 year series available for this analysis was the TMY2 (1971-2000) series from NOAA/NCDC. We also ran the billing analysis using the 15 year TMY3 (1991-2005) heating degree days and the overall savings were not very different (7% lower).

- **Multifamily accounts.** We removed these accounts to avoid any issues associated with multifamily metering, as well as to avoid the interactive effects of heating usage across units.
- **Outliers.** Finally, model outlier diagnostic testing revealed four outliers that had a large influence on the participant HDD savings coefficient, and hence we removed these from the final model.

After applying these screens, there were 111 participants remaining that we used in the CSA model outlined below to determine average per home gas savings.

Table 3-5 summarizes the account attrition from the various screens listed above.

Table 3-5. Weatherization Account Attrition

Screen	Participants Remaining	Percent Remaining	Number Dropped	Percent Dropped
Original Gas Accounts	228	100%	0	0%
Gas-Only Accounts (No Conversion Measures)	186	82%	42	18%
Insufficient Pre- and Post-Period Months	178	78%	8	4%
Low R-Squared, Low Heating Usage	143	63%	35	15%
Changed Usage from the Pre to Post (> 80%)	142	62%	1	0%
Added Base Load	132	58%	10	4%
Multifamily (Unit Number Present)	115	50%	17	7%
Outliers	111	49%	4	2%
Final Analysis Group	111	49%	117	51%

3.2.4 CSA Modeling Approach

To estimate energy savings from this program, we used a pre-post CSA fixed-effects modeling method that uses pooled monthly time-series (panel) billing data. The fixed-effects modeling approach corrects for differences between the pre- and post-installation weather conditions, as well as for differences in usage consumption between participants with the inclusion of a separate intercept for each participant. Our modeling approach ensures that model savings estimates will not be skewed by any unusually high usage or low usage participants. Monthly consumption is also paired between the pre and post months to maintain the same timeframe for evaluating unique participants. We used the following model specification to determine the state-level savings:

$$ADC_{it} = \alpha_i + \beta_1 AVGHDD_{it} + \beta_2 POST\_ID_i * AVGHDD_{it} + \beta_3 POST\_WA_i * AVGHDD_{it} + \beta_{4..14} M_t + \varepsilon_{it}$$

Where, for participant ‘i’ and monthly billing period ‘t’:

ADC_{it} = the average daily therm consumption during the pre- or post-program period

α_i = the average daily therm base load intercept for each participant (this is part of the fixed effects specification)

$AVGHDD_{it}$ = the average daily base 65 HDD based on home location

β_2 = the therm savings per HDD for the efficient measures in Idaho

$POST\_ID_i$ = an indicator variable that is 1 in the post-period (after the weatherization installations) for Idaho participants, and 0 in the pre-weatherization period

$POST\_ID_i * AVGHDD_{it}$ = an interaction between the Idaho post indicator ($POST\_ID_i$) and the HDDs ($AVGHDD_{it}$)

β_3 = the therm savings per HDD for the efficient measures in Washington

$POST\_WA_i$ = an indicator variable that is 1 in the post-period (after the weatherization installations) for Washington participants, and 0 in the pre-weatherization period

$POST\_WA_i * AVGHDD_{it}$ = an interaction between the Washington post indicator ($POST\_WA_i$) and the HDDs ($AVGHDD_{it}$).

M_t = an array of bill month dummy variables (Feb, Mar, …, Dec), 0 otherwise.[17]

ε_{it} = the modeling estimation error

The above model estimates the savings per heating degree for Idaho and Washington respectively with β_2 and β_3. In order to obtain the actual annual savings under normal weather conditions, we applied the 1971-2000 TMY2 normal HDDs from NOAA.

The per-HDD modeling approach resolves much of the potential bias from customers where predominantly winter month data was available. Since furnaces and shell measure impacts reflect seasonality in gas consumption, a per heating degree savings allows for allocating savings across all the calendar months, as well as being based on the HDDs. Using just a post-period indicator would have had a predominance of the winter months, resulting in savings being biased upwards.

3.3 Results and Findings

3.3.1 Billing Analysis Results

Table 3-6 summarizes the model savings results of the weatherization measure installations for the group of 111 participants. The model savings are an average of 123 therms in Idaho, 104 in Washington, and 112 overall.[18] The precision level indicates that the percent of error in the savings estimates is very low: at 12 percent in the combined model.

17 We excluded one of the dummy variables from the independent variables, otherwise the 12 monthly indicators would form perfect co-linearity with the intercepts. We excluded January, thus the intercepts include the seasonality from January.

18 Similar savings were reported in Ecotope's 2008 evaluation of Avista's Low-Income Weatherization Program, where they cited an average of 113 therm savings per gas participant.

Table 3-6. Low-Income Weatherization Program Savings Summary

Group	n	PRENAC	Model Savings Per HDD	Normal HDDs	Model Savings (Therms)	Precision 90%	Savings Lower 90% (Therms)	Savings Upper 90% (Therms)
Idaho	43	850	-0.01735	7,113	123	17%	102	144
Washington	68	753	-0.01572	6,619	104	16%	88	121
Overall	111	791	-0.01638	6,810	112	12%	98	125

Table 3-7 compares the evaluated to expected deemed savings, along with the realization rates. The percent savings are similar by state, at roughly 15 percent of the weather-normalized pre-period usage. By comparison, the expected savings estimates per home relative to pre-period usage represents 24 percent in Idaho, and are nearly doubled in Washington at 46 percent .[19]

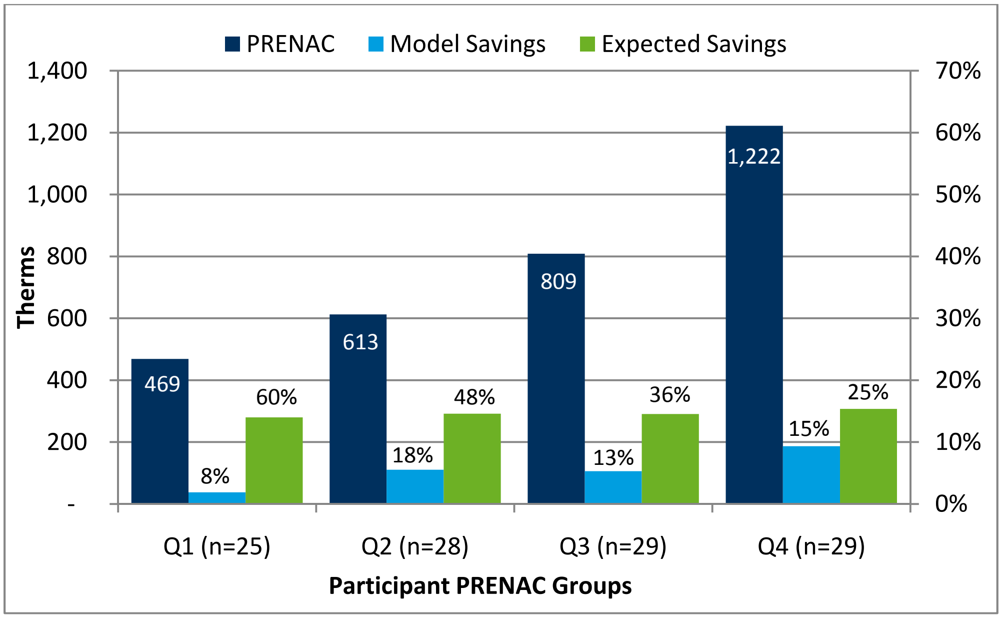
Table 3-7. Realization Rate Summary

Group	n	PRENAC	Model Savings (Therms)	Expected Savings (Therms)	Realization Rate	Model Savings as Percent of Pre-Usage	Expected Savings as Percent of Pre-Usage
Idaho	43	850	123	207	60%	15%	24%
Washington	68	753	104	347	30%	14%	46%
Overall	111	791	112	293	38%	14%	37%

To further illustrate the irregularity with expected savings, Figure 3-1 compares PRENAC to model savings and to expected savings estimates. We made these comparisons across categories of customers grouped by PRENAC usage quartiles (i.e., distribution of participants into four equal groups based on usage), which reflect different groups of customers that vary by their energy use.

[19] By comparison, the 2008 Ecotope evaluation reported a total expected savings of 110,665 therms for the 222 participants, resulting in an average expected savings of 498 therms, which is nearly 200 therms higher than the average expected savings in 2010. Assuming a comparable PRENAC of approximately 800 therms on average, the 2008 expected savings would reflect over 60% savings relative to the average pre-weatherization usage.

Figure 3-1. Savings Comparison by Customer Usage Category



Note: Each PRENAC column represents therm totals, while model savings and expected savings include the percentage of therm savings relative to PRENAC.

Intuitively, PRENAC increases through each quartile (across the different customer usage categories), and the model savings estimates reflect this as an increasing trend. In other words, customers that use more energy have a higher potential for energy savings. In contrast, the expected savings estimates are relatively flat across each customer usage category, with the percent of PRENAC being relatively higher for lower use customers.

Given the fairly similar distribution of installed measures between quartiles 1 and 4, it is surprising that the expected savings do not reflect the pre-period consumption trends.

We compared the average expected measure savings and noticed some discrepancies between the two states. Table 3-8 provides the average expected savings for each installed gas measure by state.

Table 3-8. Average Expected Savings by Measure and by State

	Expected Therms Savings		Number of Installations	
Measure	ID	WA	ID	WA
Ceiling/attic insulation	58.5	183.5	30	81
Wall insulation	74.6	155.4	11	35
Floor insulation	88.0	130.7	32	51
Duct insulation	41.8	67.8	23	18
Air infiltration controls	45.9	83.1	65	84
ENERGY STAR door replacement	23.4	23.6	23	64
ENERGY STAR window replacement	131.9	54.0	41	54
High-efficiency furnace replacement	n/a	150.0	0	42
High-efficiency water heater replacement	n/a	11.0	0	8

Note: Frequencies reflect all gas savings measures from the participant database

For most shell measures (aside from window and door replacements), expected therm savings in Washington are significantly higher than in Idaho. This distinction is clearly driving the difference in expected savings between the two states. The largest discrepancies in savings are with insulation and infiltration measures, which are the most frequently installed measures in participant homes in both states.

To better understand the model results and trends indicative of these expected savings, we assessed two other factors: 1) the average home square footage (primarily available for Washington homes)[20] and 2) HDDs per state. Washington participant homes average approximately 1,250 square feet, which helps to explain why the pre-usage numbers are so low, at 731 therms.

Secondly (and as shown in Table 3-6), Idaho has higher average HDDs (7,113) than Washington (6,619). This indicates that Idaho residents should average higher heating usage due to weather conditions (holding all other factors constant). While higher Idaho HDDs appear to be reflected in the PRENAC values for each state, it is surprising that Washington exhibits such a high expected savings estimate for heating and shell measures. Even assuming that homes in Washington have a higher average square footage than homes in Idaho is not significant enough to account for the differences in expected savings (e.g., average savings for Washington ceiling and wall insulation are twice the savings reported in Idaho for these measures).

3.3.2 Overall Program Results

In applying the state-level savings estimates from the billing analysis to the gas participant program population, a total therms savings of 20,749 is achieved. Table 3-9 provides more detail on the overall savings calculation by state.

Table 3-9. Overall Gas Savings by State

State	Total Participants	Model Savings Per Participant (Therms)	Total Savings (Therms)
Idaho	72	123	8,886
Washington	114	104	11,862
Overall	186	112	20,749

A remaining 42 participants in Washington received electric to gas conversion measures, including high-efficiency gas furnaces and water heaters. For these customers, there is a net increase in therms usage; however, in this report, we calculated therm savings generated from installations of high-efficiency gas equipment compared to standard gas equipment.[21] Table 3-10 provides a distribution of all Avista-funded measure installations for these 42 conversion participants.

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20 Source: Zillow square footage information applied to participant addresses for Washington (www.zillow.com).

21 Electric savings associated with conversion measure installations will be accounted for in the 2010-2011 Avista Electric Impact Report, along with the increase in therms associated with installation of standard efficiency gas equipment to replace the electric equipment (considered by Avista to be a secondary impact under their electric program).

Table 3-10. Measure Installations for Conversion Participants

Description	Freq
Electric ENERGY STAR Refrigerator	7
Electric to Gas High Efficiency Furnace Conversion	36
Electric to Gas Hot Water Heater Conversion	38
Gas Air Infiltration Reduction	2
Gas ENERGY STAR Door Replacements	2
G ENERGY STAR Window Replacements	3
Gas High Efficiency Furnace	36
Gas Insulation - Ceiling/Attic	3
Gas Insulation – Floor	3
Gas Insulation – Wall	3
Health and Human Safety	1

The majority of these participants received both water heater and high-efficiency furnace conversion (n = 32), while 4 received only high-efficiency furnace conversions and 6 received only water heater conversions.

To account for the gas savings experienced through high-efficiency furnace replacement, we used the savings calculated through for Avista's residential furnace replacement program (84 therms for Washington participants) and scaled this value to reflect low-income participant home square footage.[22] The 36 conversion participants receiving a high-efficiency furnace conversion instead of a standard-efficiency gas furnace will generate a total of 2,188 therms.

Table 3-11 provides the overall savings gas savings by state, including only the savings generated from fuel conversion participants receiving high-efficiency equipment instead of standard-efficiency equipment.

Table 3-11. Overall Gas Savings by State

State	Total Model Savings (Therms)	Conversion Participant Savings (Therms)	Total Savings (Therms)
Idaho	8,886	n/a	8,886
Washington	11,862	2,188	14,049
Overall	20,749	2,188	22,937

[22] For Washington, low-income participants averaged 1,250 square feet per home, while single-family participants averaged 1,728 square feet per home.

3.3.3 Goals Comparison

We compared the evaluated savings for the 228 gas participants against the estimated therms savings for these participants listed in Avista's program participant database. Table 3-12 provides a summary of overall evaluated savings, expected savings goals, and the realization rates overall and by state. Overall, the low-income weatherization program is reaching approximately 37 percent of their gas savings goals.

Table 3-12. IRP Program Goals Comparison

State	Total Customers	Reported Savings (Therms)	Evaluated Gas Savings (Therms)	Program Realization Rates
Idaho	72	15,286	8,886	58%
Washington	156	45,990	14,049	31%
Overall	228	61,276	22,937	37%

3.4 Conclusions

Model savings as a percent of pre-period weather-normalized usage (15 percent) may be the best reference point for assessing the program impacts relative to other programs. In a 2005 national evaluation of the Weatherization Assistance Program, Oak Ridge National Laboratory found that the average gas savings compared to pre-weatherization consumption is approximately 23 percent.[23] Similarly, in a 2006 weatherization evaluation for the state of Ohio, Quantec, LLC (now Cadmus) determined that gas participants save 25 percent of their pre-period normalized annual consumption.[24] However, it is important to take into account the age of these comparison reports and the recent economic factors and changing energy rates that may affect customer behavior. While the ORNL national study did not provide data with enough detail to use in comparison, we were able to use some of the details from our Ohio study to help understand Avista's impacts:

1. Average square footage was slightly higher (1,384 in Ohio compared to 1,250 in Washington).
2. Ohio participant PRENAC averaged 1,290 therms, while Avista participant PRENAC was 791 therms.

Using a savings distribution by PRENAC category from the Ohio study, we can scale the percent savings reported for Ohio using the Avista distribution. Table 3-13 provides details of this comparison, which result in an average percent savings of approximately 14 percent, nearly identical to the percentage found in the Avista study. This finding reinforces the conclusion that lower savings were experienced in the Avista program due to average lower pre-treatment consumption, as a higher percent savings should be realized by weatherizing larger homes with higher pre-treatment consumption.

23 ORNL, 2005. *Estimating the National Effects of the U.S. Department of Energy's Weatherization Assistance Program With State-Level Data: A Metaevaluation Using Studies from 1993 to 2005*. http://weatherization.ornl.gov/pdfs/ORNL_CON-493.pdf

24 http://www.development.ohio.gov/cms/uploadedfiles/Development.ohio.gov/Divisional_Content/Community/Office_of_Community_Services/HWAPImpactEvaluation.pdf

Table 3-13. OH HWAP Savings Comparison

Pre-Treatment Usage	Avista Study			Ohio HWAP % Savings	Weighted Average % Savings Using Avista Participant Distribution
	Participant Count	% Participant Distribution	Average PRENAC		
High Use (>1,800)	1	1%	2,688	26%	
Mid Use (1,000-1,800)	21	19%	1,240	21%	
Low Use (<1,000)	89	80%	663	13%	
Overall	111	100%	791		14%

Additionally, several factors may be contributing to lower realization rates:

- First, low-income programs often experience different types of take-back effects. In some cases, additional family members may move into the newly weatherized home because of the increased comfort provided by the installations, thus increasing usage in the post period. Alternatively, perceived energy savings with respect to new insulation or a new furnace may result in behavior changes where customers turn up the heat, thereby using more energy. Participants who were formerly heating only part of their home may also be able to heat their entire home because of the savings provided by weatherization.
- Second, the use of different types of heating equipment (such as using wood or portable electric heaters instead of an electric or gas furnace) can result in lower savings than expected. A survey of 123 program participants revealed that approximately 10 percent use neither electricity nor natural gas for primary heating, but are instead using wood, propane, or fuel oil.[25] Additionally, nearly one-third of respondents (n=40) indicated using a supplemental heat source, such as a space heater or wood. These results indicate the program may have inaccurate expected savings estimates by assuming primarily gas heating in the home.
- Third, different approaches in deriving expected savings may results in different savings estimates for the same measure. With Avista's program, expected savings for Idaho come directly from the agencies, while the expected savings for Washington are calculated by Avista using a deemed measure-level savings approach that does not appear to account for square footage or historical energy consumption. Deemed savings estimates in low-income programs tend to over-estimate actual savings by not accounting for nuances such as behavior, weather, and alternative fuels.

3.5 Recommendations

The following subsections outline our suggestions of program enhancements that could help to improve program impact results.

[25] Of the 10 percent of respondents who reported using alternative fuel as their primary source of heat, 7 respondents indicated using wood or wood stoves and 4 respondents indicated using fuel oil.

Standardize Expected Savings Calculations

Standardizing expected savings calculations across both states will help avoid wide discrepancies in realization rates.

Account for Additional Factors in Savings Calculations

Accounting for pre-period annual consumption, square footage, and interaction effects will help create a more robust savings estimate and avoid over-estimates that may occur through a prescriptive application of deemed estimates.

Track Alternative Heating Sources

As inexpensive alternatives to gas heat, gas customers may turn to electric room heaters and wood stoves, thereby reducing the impact of the weather-sensitive measures installed through weatherization (e.g., insulation). Collecting information on a customer's primary heating usage at the time of weatherization will allow for more reasonable estimates in cases where, despite being a gas customer, gas is used as a secondary heating source.

Include High-Use Customers in Program Targeting

While prioritization guidelines for targeting low-income weatherization participants are set at the federal level, some utilities actively track customer usage and provide agencies with lists of customers that have particularly high energy consumption for targeting purposes. In these cases, along with other targeting criteria (e.g., families with children, senior citizens), agencies are equipped to incorporate energy consumption characteristics into their program participant prioritization. Not only would weatherizing high use customers likely result in higher energy savings, it is possible that some customers are overly burdened with energy bills due to their housing characteristics, and the program could provide relief.

There are methods for identifying high usage customers while also controlling for factors that contribute to consumption (e.g., square footage, income, number of people per household). Using such an approach would allow Avista to identify their high-use customers.

Appendix A: Residential Furnace Billing Model Outputs

The following tables summarize the model result outputs[26] from our billing analysis of PY 2010 participants.

Table A1. Furnace Savings Regression Model (State-Level Savings)

	Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	1,728	350,619	202.90468	305.95	<.0001
Error	25,794	17,107	0.6632		
Corrected Total	27,522	367,726			
Root MSE	0.81437		R-Square	0.9535	
Dependent Mean	2.35167		Adj R-Square	0.9504	
Coeff Variable	34.62944				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	1714	0.84145	0.2158976	4.16	<.0001
AVGHDD	1	0.11299	0.00239	47.34	<.0001
POST_ID * AVGHDD	1	-0.01458	0.0005853	-24.92	<.0001
POST_WA * AVGHDD	1	-0.01566	0.0004522	-34.62	<.0001
Feb	1	-0.15754	0.02125	-7.41	<.0001
Mar	1	-0.38654	0.02745	-14.08	<.0001
Apr	1	-0.6308	0.04133	-15.26	<.0001
May	1	-0.71512	0.06195	-11.54	<.0001
Jun	1	-0.59065	0.07668	-7.7	<.0001
Jul	1	-0.42269	0.08506	-4.97	<.0001
Aug	1	-0.45796	0.08448	-5.42	<.0001
Sep	1	-0.6534	0.07399	-8.83	<.0001
Oct	1	-0.7657	0.04867	-15.73	<.0001
Nov	1	-0.42187	0.02634	-16.01	<.0001
Dec	1	-0.07407	0.02066	-3.58	3E-04

26 We ran all of the models with a fixed effects specification, which is a separate intercept for each participant. Due to the large amount of output from showing the model coefficients for each of the intercepts, we only present the average of all the separate intercepts in the output.

Table A2. Furnace Savings Regression Model (Overall Savings)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
	Analysis of Variance				
Model	1,727	350,618	203.02126	306.11	<.0001
Error	25,795	17,108	0.66323		
Corrected Total	27,522	367,726			
Root MSE	0.81439		R-Square	0.9535	
Dependent Mean	2.35167		Adj R-Square	0.9504	
Coeff Variable	34.63034				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	1714	0.83624	0.21584	4.13	<.0001
AVGHDD	1	0.11312	0.00238	47.44	<.0001
POST * AVGHDD	1	-0.01527	0.00037601	-40.61	<.0001
Feb	1	-0.15712	0.02125	-7.39	<.0001
Mar	1	-0.38533	0.02744	-14.04	<.0001
Apr	1	-0.62855	0.0413	-15.22	<.0001
May	1	-0.71172	0.06191	-11.5	<.0001
Jun	1	-0.58645	0.07664	-7.65	<.0001
Jul	1	-0.41807	0.08501	-4.92	<.0001
Aug	1	-0.4534	0.08443	-5.37	<.0001
Sep	1	-0.64931	0.07394	-8.78	<.0001
Oct	1	-0.76302	0.04864	-15.69	<.0001
Nov	1	-0.42086	0.02634	-15.98	<.0001
Dec	1	-0.07408	0.02066	-3.59	0.0003

Table A3. Furnace Savings Regression Model (Quartile 1: 207-735 therms)

Source	Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	442	34,242	77.47122	501.12	<.0001
Error	7,230	1,117.73374	0.1546		
Corrected Total	7,672	35,360			
Root MSE	0.39319		R-Square	0.9684	
Dependent Mean	1.38872		Adj R-Square	0.9665	
Coeff Variable	28.31295				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	429	0.51271	0.11794	4.56	<.0001
AVGHDD	1	0.07084	0.00214	33.03	<.0001
POST * AVGHDD	1	-0.0056	0.00035135	-15.94	<.0001
Feb	1	-0.08354	0.02074	-4.03	<.0001
Mar	1	-0.25164	0.02598	-9.69	<.0001
Apr	1	-0.43941	0.03834	-11.46	<.0001
May	1	-0.5412	0.05586	-9.69	<.0001
Jun	1	-0.44099	0.06926	-6.37	<.0001
Jul	1	-0.31625	0.07699	-4.11	<.0001
Aug	1	-0.33503	0.0765	-4.38	<.0001
Sep	1	-0.48238	0.06692	-7.21	<.0001
Oct	1	-0.55694	0.04416	-12.61	<.0001
Nov	1	-0.29982	0.0244	-12.29	<.0001
Dec	1	-0.03962	0.01964	-2.02	0.0436

Table A4. Furnace Savings Regression Model (Quartile 2: 736-939 therms)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
	Analysis of Variance				
Model	441	59,377	134.64169	651.35	<.0001
Error	6,461	1,335.56723	0.20671		
Corrected Total	6,902	60,713			
Root MSE	0.45466		R-Square	0.978	
Dependent Mean	2.04783		Adj R-Square	0.9765	
Coeff Variable	22.20182				

Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
	Parameter Estimates				
Average Intercept	428	0.51987	0.14719	3.77	<.0001
AVGHDD	1	0.10243	0.00266	38.5	<.0001
POST * AVGHDD	1	-0.01277	0.00041839	-30.52	<.0001
Feb	1	-0.11737	0.0236	-4.97	<.0001
Mar	1	-0.27638	0.0307	-9	<.0001
Apr	1	-0.43793	0.0459	-9.54	<.0001
May	1	-0.54731	0.06944	-7.88	<.0001
Jun	1	-0.44015	0.08589	-5.12	<.0001
Jul	1	-0.28605	0.09521	-3	0.0027
Aug	1	-0.30825	0.09452	-3.26	0.0011
Sep	1	-0.50876	0.08276	-6.15	<.0001
Oct	1	-0.64131	0.05454	-11.76	<.0001
Nov	1	-0.33758	0.02956	-11.42	<.0001
Dec	1	-0.07396	0.02303	-3.21	0.0013

Table A5. Furnace Savings Regression Model (Quartile 3: 940-1210 therms)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	440	91,198	207.26707	757.29	<.0001
Error	6,410	1,754.39792	0.2737		
Corrected Total	6,850	92,952			
Root MSE	0.523216		R-Square	0.9811	
Dependent Mean	2.56575		Adj R-Square	0.9798	
Coeff Variable	20.39014				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	427	0.419695972	0.170254848	2.8270726	0.03
AVGHDD	1	0.1325	0.00309	42.83	<.0001
POST * AVGHDD	1	-0.01697	0.00048389	-35.08	<.0001
Feb	1	-0.10991	0.02734	-4.02	<.0001
Mar	1	-0.27635	0.03526	-7.84	<.0001
Apr	1	-0.47098	0.05312	-8.87	<.0001
May	1	-0.58867	0.08019	-7.34	<.0001
Jun	1	-0.42928	0.09913	-4.33	<.0001
Jul	1	-0.2029	0.10998	-1.84	0.0651
Aug	1	-0.25344	0.10922	-2.32	0.0203
Sep	1	-0.49487	0.09561	-5.18	<.0001
Oct	1	-0.59265	0.06265	-9.46	<.0001
Nov	1	-0.31833	0.03374	-9.44	<.0001
Dec	1	-0.04687	0.02642	-1.77	0.0761

Table A6. Furnace Savings Regression Model (Quartile 4: Over 1211 therms)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
	Analysis of Variance				
Model	443	173,443	391.51809	421.01	<.0001
Error	5,655	5,258.87108	0.92995		
Corrected Total	6,098	178,701			
Root MSE	0.96434		R-Square	0.9706	
Dependent Mean	3.77279		Adj R-Square	0.9683	
Coeff Variable	25.56037				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	430	0.065836349	0.342176605	0.428930233	0.67
AVGHDD	1	0.19838	0.00611	32.48	<.0001
POST * AVGHDD	1	-0.0254	0.00092502	-27.46	<.0001
Feb	1	-0.1792	0.05009	-3.58	0.0004
Mar	1	-0.33048	0.06684	-4.94	<.0001
Apr	1	-0.52291	0.10334	-5.06	<.0001
May	1	-0.49647	0.15775	-3.15	0.0017
Jun	1	-0.23818	0.19484	-1.22	0.2216
Jul	1	0.0394	0.21533	0.18	0.8548
Aug	1	0.02262	0.21386	0.11	0.9158
Sep	1	-0.26928	0.18798	-1.43	0.1521
Oct	1	-0.61218	0.12365	-4.95	<.0001
Nov	1	-0.42436	0.06559	-6.47	<.0001
Dec	1	-0.09208	0.05022	-1.83	0.0668

Table A7. Furnace Savings Regression Model Without Heat Pumps (State-Level Savings)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
	Analysis of Variance				
Model	1,555	322,211	207.20972	322.74	<.0001
Error	23,253	14,929	0.64203		
Corrected Total	24,808	337,140			
Root MSE	0.80127		R-Square	0.9557	
Dependent Mean	2.36585		Adj R-Square	0.9528	
Coeff Variable	33.8681				

Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
	Parameter Estimates				
Average Intercept	1,541	0.80182	0.21433	3.99	<.0001
AVGHDD	1	0.11383	0.00246	46.24	<.0001
POST_ID * AVGHDD	1	-0.0113	0.00061049	-18.5	<.0001
POST_WA * AVGHDD	1	-0.0125	0.00046939	-26.62	<.0001
Feb	1	-0.152	0.02206	-6.89	<.0001
Mar	1	-0.36082	0.02843	-12.69	<.0001
Apr	1	-0.59322	0.04278	-13.87	<.0001
May	1	-0.6728	0.06379	-10.55	<.0001
Jun	1	-0.53892	0.07903	-6.82	<.0001
Jul	1	-0.37086	0.08769	-4.23	<.0001
Aug	1	-0.41219	0.0871	-4.73	<.0001
Sep	1	-0.61516	0.07631	-8.06	<.0001
Oct	1	-0.72472	0.05026	-14.42	<.0001
Nov	1	-0.4033	0.02732	-14.76	<.0001
Dec	1	-0.07937	0.02151	-3.69	0.0002

Table A8. Furnace Savings Regression Model Without Heat Pumps (Overall Savings)

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
	Analysis of Variance				
Model	1,554	322,209	207.34194	322.92	1,554
Error	23,254	14,931	0.64208		23,254
Corrected Total	24,808	337,140			24,808
Root MSE	0.8013		R-Square	0.9557	
Dependent Mean	2.36585		Adj R-Square	0.9528	
Coeff Variable	33.86929				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	1,541	0.79603	0.21428	3.96	<.0001
AVGHDD	1	0.11399	0.00246	46.33	<.0001
POST * AVGHDD	1	-0.01207	0.00039101	-30.87	<.0001
Feb	1	-0.15153	0.02205	-6.87	<.0001
Mar	1	-0.35948	0.02842	-12.65	<.0001
Apr	1	-0.59071	0.04276	-13.82	<.0001
May	1	-0.66902	0.06375	-10.49	<.0001
Jun	1	-0.53428	0.07898	-6.76	<.0001
Jul	1	-0.36574	0.08763	-4.17	<.0001
Aug	1	-0.40705	0.08705	-4.68	<.0001
Sep	1	-0.61056	0.07626	-8.01	<.0001
Oct	1	-0.72172	0.05023	-14.37	<.0001
Nov	1	-0.40217	0.02731	-14.72	<.0001
Dec	1	-0.07936	0.02151	-3.69	0.0002

Table A9. Furnace Savings Regression Model With Heat Pumps (State-Level Savings)

	Analysis of Variance				
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	187	28,882	154.44973	229.1	<.0001
Error	2,527	1,703.57301	0.67415		
Corrected Total	2,714	30,586			
Root MSE	0.82107		R-Square	0.9443	
Dependent Mean	2.21626		Adj R-Square	0.9402	
Coeff Variable	37.04731				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	173	0.865818439	0.357330058	2.446589595	0.0148
AVGHDD	1	0.11406	0.00809	14.1	<.0001
POST_ID * AVGHDD	1	-0.04051	0.00178	-22.76	<.0001
POST_WA * AVGHDD	1	-0.04341	0.00143	-30.3	<.0001
Feb	1	-0.17295	0.06735	-2.57	0.0103
Mar	1	-0.54103	0.08936	-6.05	<.0001
Apr	1	-0.82699	0.1351	-6.12	<.0001
May	1	-0.87454	0.21595	-4.05	<.0001
Jun	1	-0.74537	0.26326	-2.83	0.0047
Jul	1	-0.52422	0.29097	-1.8	0.0717
Aug	1	-0.52633	0.28809	-1.83	0.0678
Sep	1	-0.74051	0.25125	-2.95	0.0032
Oct	1	-0.96829	0.16315	-5.93	<.0001
Nov	1	-0.52143	0.08465	-6.16	<.0001
Dec	1	-0.03305	0.0638	-0.52	0.6045

Table A10. Furnace Savings Regression Model With Heat Pumps (Overall Savings)

Source	Analysis of Variance				
	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	186	28,881	155.2736	230.25	<.0001
Error	2,528	1,704.78295	0.67436		
Corrected Total	2,714	30,586			
Root MSE	0.82119		R-Square	0.9443	
Dependent Mean	2.21626		Adj R-Square	0.9402	
Coeff Variable	37.05313				
	Parameter Estimates				
Source	DF	Parameter Estimates	Standard Error	t value	Prob. t
Average Intercept	173	0.85206	0.35705	2.41	0.016
AVGHDD	1	0.11442	0.00809	14.15	<.0001
POST * AVGHDD	1	-0.0423	0.00117	-36.09	<.0001
Feb	1	-0.17191	0.06736	-2.55	0.0108
Mar	1	-0.53795	0.08935	-6.02	<.0001
Apr	1	-0.82128	0.13506	-6.08	<.0001
May	1	-0.86546	0.21588	-4.01	<.0001
Jun	1	-0.73354	0.26316	-2.79	0.0054
Jul	1	-0.51162	0.29086	-1.76	0.0787
Aug	1	-0.516	0.28804	-1.79	0.0733
Sep	1	-0.73068	0.25118	-2.91	0.0037
Oct	1	-0.96158	0.1631	-5.9	<.0001
Nov	1	-0.5189	0.08465	-6.13	<.0001
Dec	1	-0.03349	0.06381	-0.52	0.5997

Appendix B: Residential ENERGY STAR Home Model Inputs

The following table summarizes the standard building codes in Washington and Idaho, along with the standards for new ENERGY STAR homes.

Table B1. ENERGY STAR, Washington, and Idaho Construction Standards for New Homes

Measure	Type	ENERGY STAR® Home	WA Code - Climate Zone II, R-3	ID Code - IECC 2006 Zone 5
Insulation	Ceiling	R-38	R-38	R-38
	Wall	R-19	R-19 + R-5	R-19
	Floors Over Unconditioned Space	R-30	R-30	R-30
	Slab Floors	R-10	R-10	R-10
Windows & Doors	Windows	0.35	0.35	0.35
	Max Glazing Area	0.21	Unlimited	Set to ENERGY STAR standards
	Doors	R-5	0.2 U-factor	Set to ENERGY STAR standards
Ducts	Insulation	R-8	R-10	R-8
	Sealing	Mastic only	Tapes allowed	Tapes allowed
	Max Leakage	<0.06 CFM/sqft or 75 CFM total @50Pa	Set to ENERGY STAR standards	Set to ENERGY STAR standards
Ventilation & Air Sealing	Ventilation System	Exhaust ventilation	Exhaust ventilation	Exhaust ventilation
	Envelope Tightness	0.35 normal ACH	0.35 normal ACH	0.35 normal ACH
Heating & Cooling Equipment	Gas Furnace	90 AFUE	78 AFUE	80 AFUE
	Air Conditioner	SEER 13	SEER 13	SEER 13

Appendix C: Non-Residential Impact Analysis

Overview

For this analysis, we evaluated four non-residential projects. These sites differed substantially; therefore, we evaluated them on a case-by-case basis. The four sites we evaluated are outlined in Table C1.

Table C1. Site Descriptions

Site Number	Business Type	Location	Claimed Savings (therms/year)
19652963	Church	Spokane, WA	4,192
1500385	Wastewater Treatment	Sandpoint, ID	21,883
17739130	Concrete Pre-Mix Facility	Spokane, WA	75,000
18524903	Linen Supply Company	Lewiston, ID	39,706

Billing Analysis Methodology

Our pre–post modeling approach allows for directly developing retrofit savings estimates for each site. The modeling approach accounts for differences in HDDs and, where applicable, production. It also allows for determining savings for normalized weather conditions, since the actual weather conditions may be milder or more extreme than the 15 year (1991-2005) normal weather averages from the NCDC.

Cadmus obtained daily weather data from NCDC for each weather station associated with the participants. From the daily weather data, we calculated the base 65 reference temperature HDDs. We then matched the participant billing data to the nearest weather station by zip code, and matched each monthly billing period to the associated base 65 HDDs.

All models follow a modified PRISM approach. We normalized all dependent and independent variables for the days in each billing period; therefore, model coefficients can be interpreted as average daily values. We did this to account for differences in the length of billing periods. For each model, we took the average daily consumption in therms as a function of some combination of average standing baseload, HDD, and (where appropriate) daily consumption.

For each site, we estimated two demand models: one for the pre period and one for the post period. We chose this methodology over a single standard treatment effects model to account for structural changes in demand that might occur due to retrofits. For instances, we eliminated the standing load for one site as a results of the retrofit program. Using our pre-post modeling approach, we estimated an intercept model for the pre period and a no-intercept model for the post period to reflect this change.

After estimating model coefficients for each site, we calculated three scenarios. First, we estimated a reference load for the past 12 billing cycles using the pre period model. This scenario extrapolates the counterfactual consumption; that is, what the consumption would have been in the absence of the program. The difference between this scenario and the actual consumption represents actual savings.

We then estimated two normalized scenarios—one using the pre model and one using the post model—using 15 year TMY3 data as the annual HDD and mean annual values for the production data. The difference between these two scenarios represents the long-term expected annual savings.

Summary of Estimated Savings

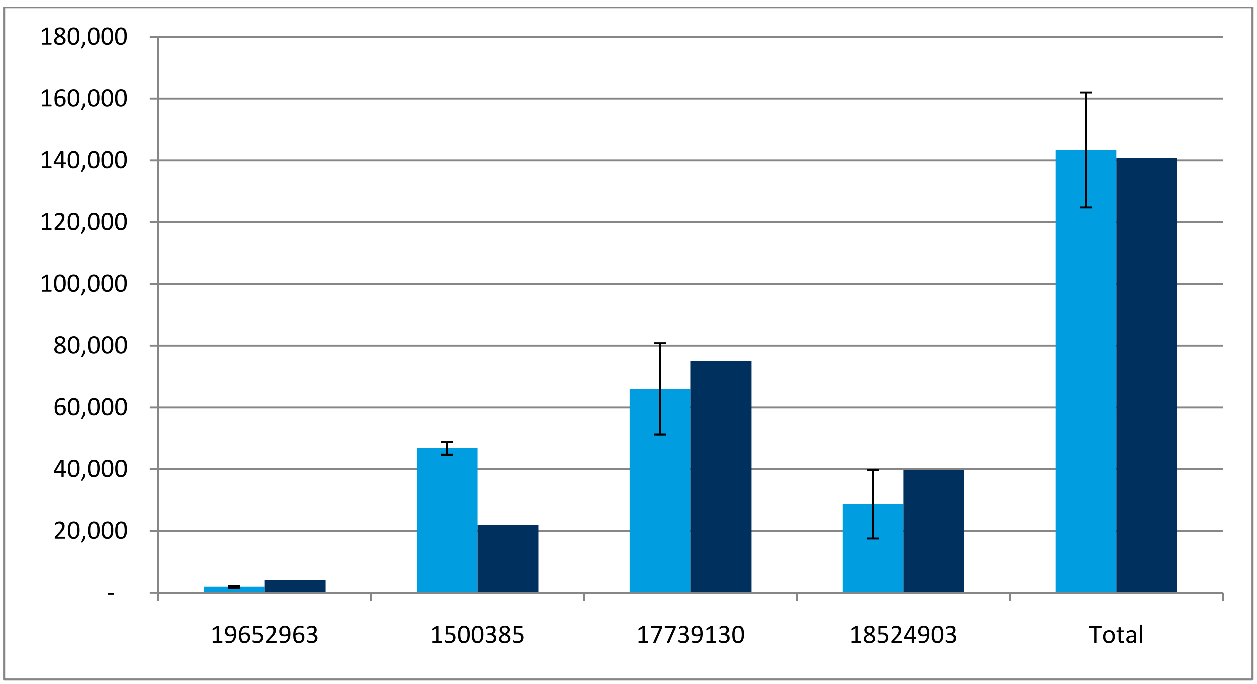
As a result of our site reviews and billing analysis, we found that savings differ substantially from what was claimed in many cases. For all but one of the projects, claimed savings appeared to overstate actual achieved savings.

Table C2. Claimed and Evaluated Savings by Project

Site	Claimed Savings	Evaluated Savings	Relative Precision
19652963	4,192	1,926	14%
1500385	21,883	46,769	4%
17739130	75,000	66,015	22%
18524903	39,706	28,686	39%
Total	140,781	143,396	13%

Despite consistently high claimed savings for the other programs, the offset from low claimed savings for site #1500385 caused the total evaluated savings for the program to closely match claimed savings at the 95 percent confidence level (as shown in Figure C1).

Figure C1. Claimed and Evaluated Savings (with 95% Confidence Intervals)



Case Study - Site # 19652963

Site #19652963 is a church with a congregation of approximately 60 members located in Spokane, Washington.

Site Review

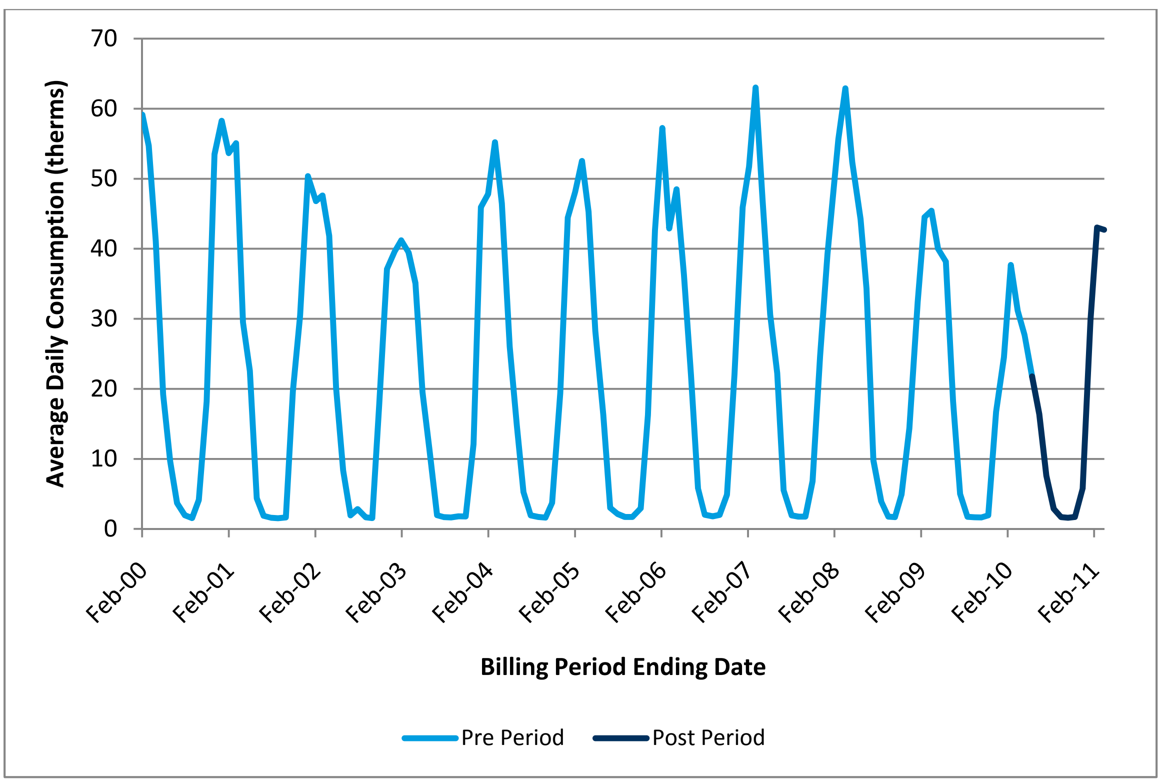
The church has four stories of brick construction with a commercial kitchen, multiple offices, a meeting room, and classrooms. The sanctuary is on the first floor and the rest of the rooms are on the upper levels.

The main church boiler is 76 to 80 percent efficient and 500,000 BtuH in size. The system has a low-pressure steam of 6 psig and a condensate return. The steam distribution lines are mostly 4-inches in diameter; 12-inches where insulated. Most of the radiators have 1/2-inch steam traps installed. The steam traps are thermostatic type.

The congregation stopped heating the two upper floors of the building in the last few years, and only heats the sanctuary and the first floor. Gas heat is used only on Sundays, while electric space heaters are used the remainder of the week.

The site has three water heaters. The primary unit, which is gas-fired, has a tank capacity of 75 gallons and is always on. A 50-gallon gas-fired unit operates on pilot only. The third water heater is electric, is for the commercial kitchen, and is primarily for dishwasher use.

Figure C2. Site #19652963 Average Daily Consumption for the Past 11 Years



Billing Analysis

We obtained Spokane weather data from WBAN #24157, located at the Spokane airport. There were 6,821 HDD in the 12 billing cycles beginning March 29, 2010 and ending March 29, 2011. There are 6,712 TMY3 HDD for this weather station, implying that this past winter season was slightly colder than average.

Given that the gas load is virtually entirely weather sensitive, we did not use intercept models for the pre and post periods. We tested intercept models and found—in all cases—that they did not differ significantly from zero. We estimated models as identical univariate regressions with the following specification:

$$therms_t = \beta_1 HDD_t + e_t$$

Where:

$therms_t$ = average daily therms for billing period 't'

HDD_t = average HDD for billing period 't'

Findings

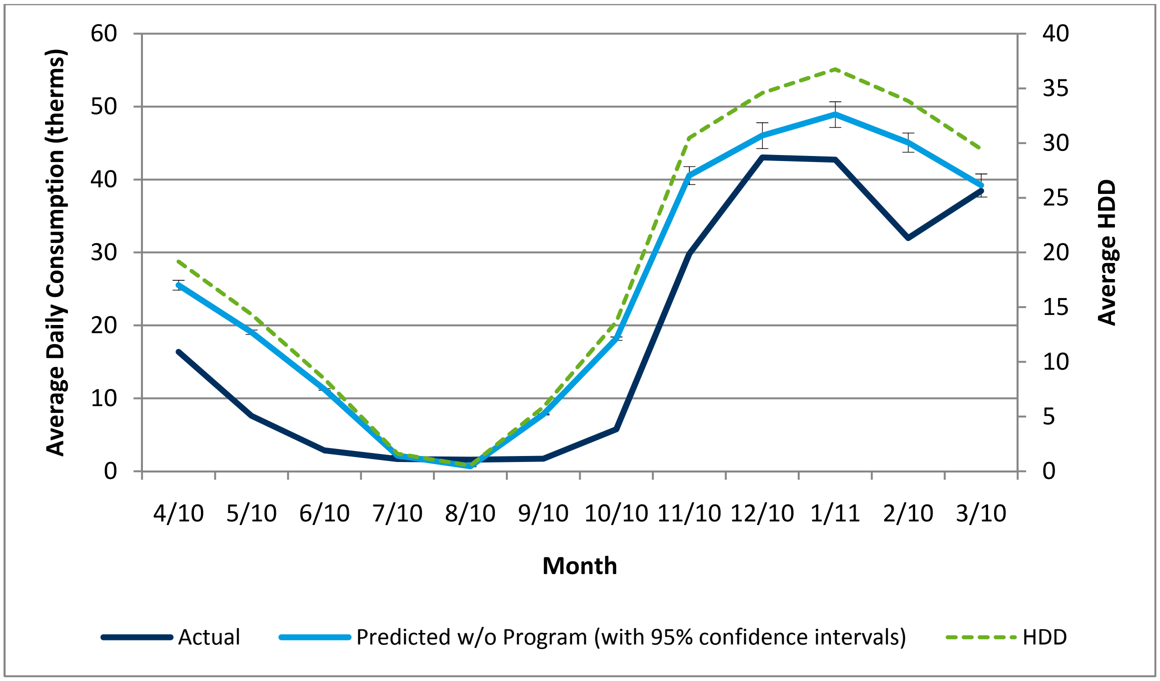
The estimated coefficients from the models support the hypothesis that consumption was decreased as a result of the retrofits. Table C3 shows the coefficients we estimated for each model and their respective fit indices.

Table C3. Site #19652963 Model Fit and Parameters

Model	n	R^2	Coefficients			
			Variable	Parameter	Standard Error	p-value
Pre	123	0.97	HDD	1.331	0.021	<.0001
Post	15	0.96	HDD	1.044	0.065	<.0001

These model coefficients indicate that there was a net decrease of 0.29 therms per HDD on average because of the program. Given that there were 6,821 HDD in the past 12 billing cycles, the model estimates that consumption would have been 9,081 therms; when in fact it was 6,636 therms. We therefore estimate gross savings for the past 12 billing periods at 2,445 therms. The relationship between the actual consumption, estimated consumption, and HDD can be seen in Figure C3.

Figure C3. Site #19652963 Reference vs. Actual Load for Past 12 Billing Cycles



Based on the results of our billing analysis, we conclude that the retrofits did result in savings, albeit lower than those originally claimed. Using TMY3 HDD, we estimate that this project will result in an average annual gross savings of 1,926 therms.

Table C4. Site #19652963 Normalized Annual Gross Savings

Consumption Type	Units	Pre-Retrofit Estimate	Post-Retrofit Estimate	Difference	Normalized Units/Day	Daily Savings	Annual Savings
Weather Sensitive	HDD	1.33	1.04	-0.29	18.4	5.3	1,926
Total						5.3	1,926

Case Study - Site # 1500385

Site #1500385 is a municipal wastewater plant in Sandpoint, Idaho. We installed two measures at this site before January 21, 2009.

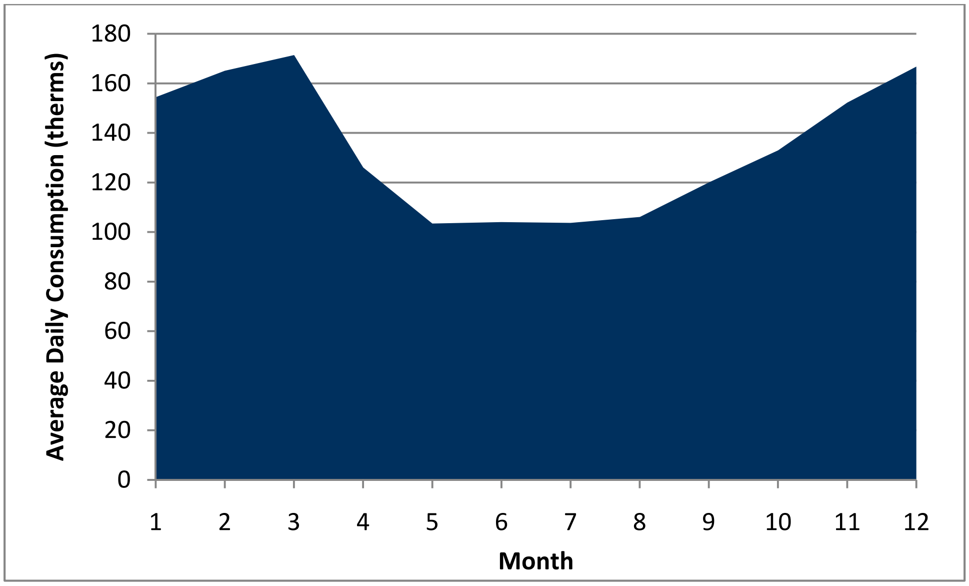
For application #23037, clean digester gas was set up to heat the facility. This involves replacing natural gas with methane gas to feed the main boiler. The boiler subsequently keeps the heat at 98°F for the digester. This project had an anticipated savings of 20,604 therms per year.

For application #23040, installers replaced the gravity thickener with a rotary screen. This reduces the quantity of water going to the digester, where it has to be removed. This project had an anticipated savings of 1,279 therms per year.

Site Review

The throughput for wastewater treatment is normally in the high two million gallons/day (MGD). In past four years, it has been closer to the low two MGD. In the spring, throughput can often climb to ten MGD for two to three weeks. This pattern appears to take place in March, as can be seen in Figure C4. The typical heating season is from October to the end of May, when the unit heaters are being used and consuming gas.

Figure C4. Site #1500385 Average Daily Consumption by Month



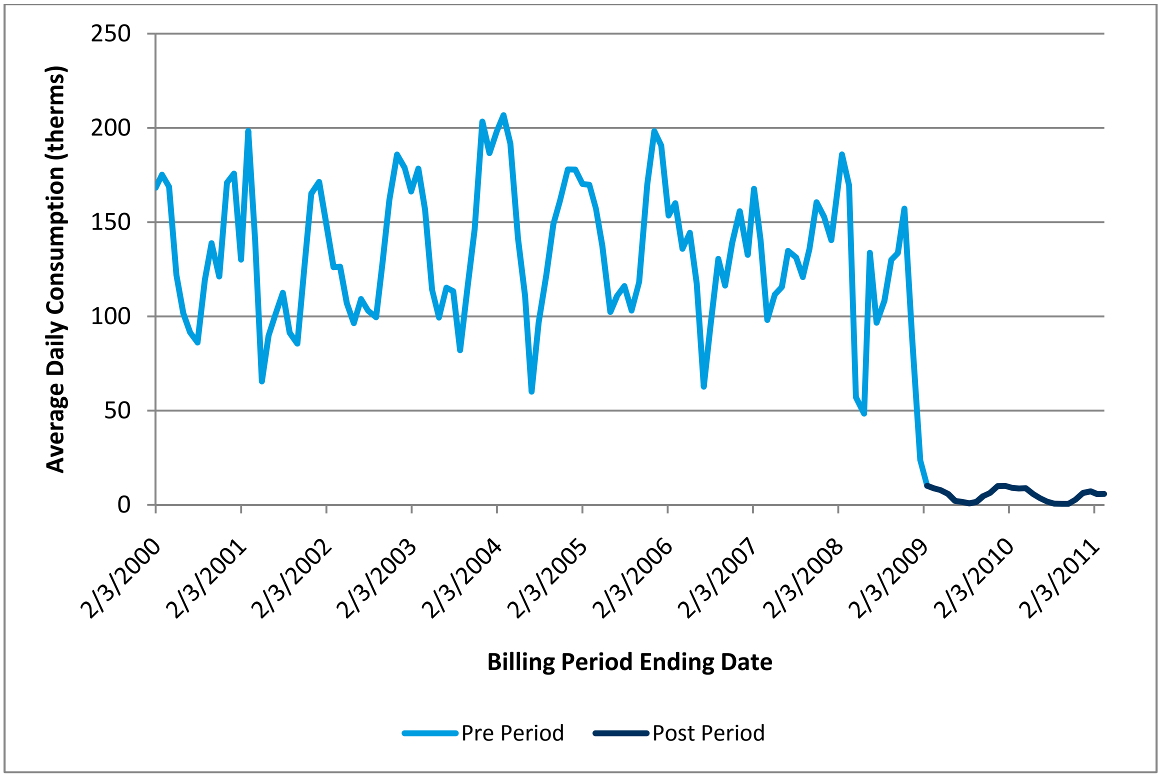
The application #23037 project provides a waste stream of gas to one of the boilers that provides heat for the digester. The digester must remain around 98°F all year to function properly. Because of the low pressure on the methane waste gas being used, only one of two boilers has been converted to use this gas. The second boiler is still on natural gas, and is now used as a backup.

The application #23040 project reduced the amount of water going to the digester. This reduced the amount of heat needed from the boiler to eliminate extra water in the digester. This project therefore reduced the demand for natural gas. The installation of the gravity thickener has improved process control. This project also included the installation of new primary pumps to the digester to improve the process control.

Other minor process improvements are ongoing, such as the installation of an electronic spark ignition at the flare to keep it going (as methane gas is not available).

This site has shown a very large drop in the use of natural gas since the projects were completed. Hourly meter data show a drop from an average of approximately 133 therms/day to 5 therms/day on average (see Figure C5).

Figure C5. Site #1500385 Average Daily Consumption for the Past 11 years



Billing Analysis

The nearest major weather station to Sandpoint is WBAN #24157, located at the Spokane airport. There were 6,808 HDD in the 12 billing cycles beginning March 17, 2010 and ending March 17, 2011. There are 6,712 TMY3 HDD for this weather station, implying that this past winter season was slightly colder than average.

Since wastewater treatment involves both weather-sensitive demand and a certain standing production demand, we used intercept models for the billing analysis of this site. We estimated two separate models for the pre and post periods. The pre period model was as follows:

$$therms_t = \beta_0 + \beta_1 HDD_t + \beta_2 March_t + e_t$$

Where:

$therms_t$ = average daily therms for billing period '*t*'

HDD_t = average HDD for billing period '*t*'

$March_t$ = a dummy variable that equals 1 if '*t*' is during the March peak period and equals 0 otherwise

The model for the post period was nearly identical, with the exception that we excluded the March dummy variable. We chose to exclude this variable for two reasons: 1) we should not expect a spike in consumption now that the boiler is being run on methane, and 2) the coefficient was not found to differ significantly from zero. The final post period model was as follows:

$$therms_t = \beta_0 + \beta_1 HDD_t + e_t$$

Where:

$therms_t$ = average daily therms for billing period 't'

HDD_t = average HDD for billing period 't'

Findings

The estimated coefficients from the models support the hypothesis that consumption decreased substantially as a result of the retrofits. Table C5 shows the estimated coefficients for each model and their respective fit indices.

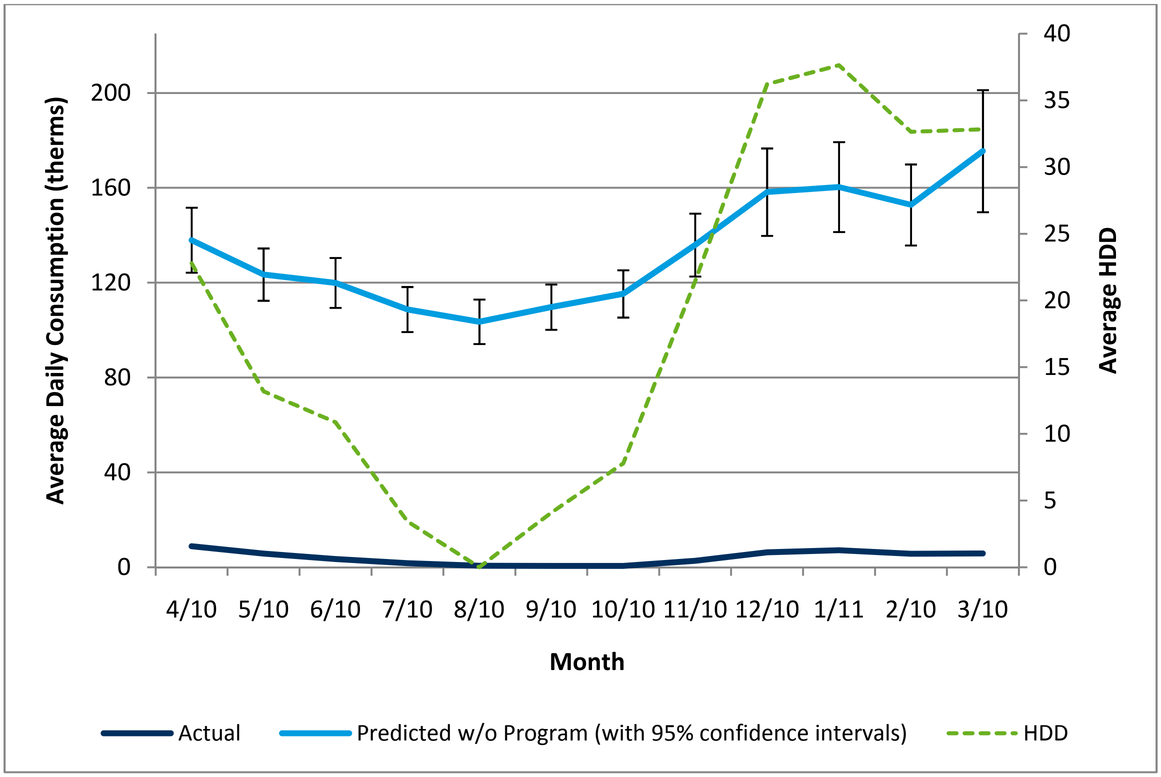
Table C5. Site #1500385 Model Fit and Parameters

Model	n	R^2	Coefficients			
			Variable	Parameter	Standard Error	p-value
Pre	108	0.39	Intercept	103.54	4.79	<.0001
			HDD	1.51	0.22	<.0001
			March Dummy	22.40	9.77	0.0239
Post	26	0.75	Intercept	1.10	0.59	0.07
			HDD	0.22	0.03	<.0001

These model coefficients indicate that there was a net decrease of 1.3 therms per HDD on average because of the program, as well as an average daily decrease to the standing load of 101.9 therms. In addition, the March spike in production does not appear to be significant, resulting in a 22.4 therms per day during the March billing period.

Given that there were 6,808 HDD in the past 12 billing cycles, the model estimates that weather sensitive consumption would have been 10,277 therms. There would have been a standing baseload of 37,792 therms and 672 therms for the March production spike. Actual total consumption over this period was 1,507 therms. We therefore estimate gross savings for the past 12 billing periods at 47,234 therms. The relationship between the actual consumption, estimated consumption, and HDD can be seen in Figure C6.

Figure C6. Site #1500385 Reference vs. Actual Load for Past 12 Billing Cycles



Given the results of our billing analysis, we conclude that the retrofits resulted in substantial savings. Using TMY3 HDD, we estimate that this project will result in an average annual gross savings of 46,769 therms.

Table C6. Site #1500385 Normalized Annual Gross Savings

Estimate	Units	Pre-Retrofit	Post-Retrofit	Difference	Normalized Units/Day	Daily Savings	Annual Savings
Standing Production	Day	103.5	1.1	-102.4	1.0	102.4	37,415
March Production Spike	Day	22.4	0.0	-22.4	1.0	1.8*	672
Weather Sensitive	HDD	1.5	0.2	-1.3	18.4	23.8	8,682
Total						128.0	46,769

*Since this savings only takes place during the month of March, we adjusted the annual average daily savings for this factor by the proportion of March billing period days in the total year: 30/365 = 0.082.

Case Study - Site # 17739130

Site #17739130 is a concrete pre-mix facility in Spokane, Washington. Two projects were completed for this site.

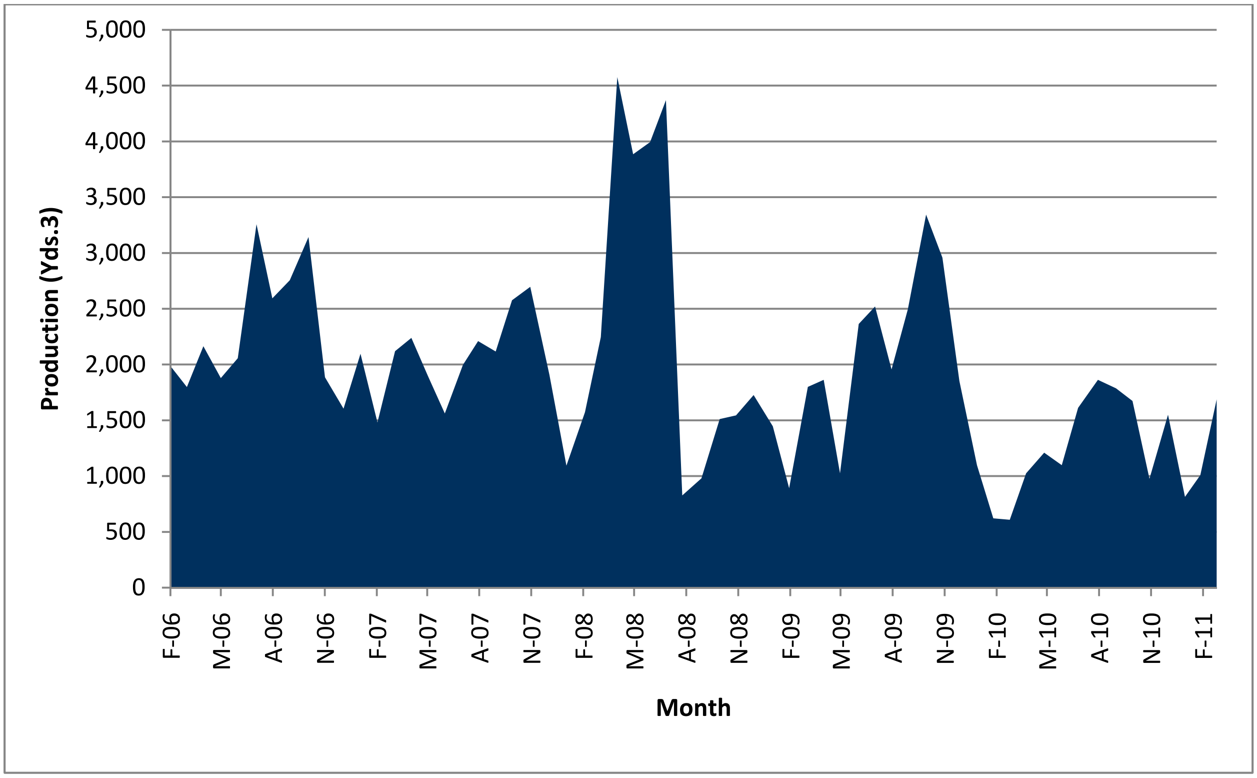
Application #27543 involved the replacement and insulation of outdoor steam lines used in curing beds. We completed a final inspection of measure installation for this project on June 18, 2009. The claimed savings for this project was 63,500 therms per year.

The second project, application #27545, was for the installation of condensing economizers for the site's two gas-fired boilers. We completed the final inspection of measure installation for this project on June 22, 2010. The claimed savings for this project was 11,500 therms per year.

Site Review

Concrete production at this site has only recently started to increase after a notable decline in concrete demand due to the 2007-08 recession. The variation in production has a large effect on the overall gas consumption. Figure C7 shows the variation in monthly production over the past five years.

Figure C7. Site #17739130 Concrete Production for the Past Five Years



We observed three main pipelines that feed the steam mains for the curing beds. The mains and beds are all located outside. Thermocouples are imbedded into the concrete to control the steam valves to maintain roughly 98ºF in the beds for approximately 12 to 24 hours, depending on the product being manufactured.

The pipelines are 6-inches in diameter with 1-1/2-inches of foam glass insulation and an aluminum jacket for lines that are outside. We measured the steam pressure at 12 to 14 psig. The steam line is only a few feet above ground, then goes into the ground at a depth of approximately 3 to 4-feet. After the new steam mains were installed, about 30 traps that were blowing through had to be replaced.

The entering city water temperature was 80ºF, as measured at the water meter located inside the boiler room. When examining the water line discharge from the stack heat exchanger, we observed discharge at 135ºF for one line and at 165 ºF for another line.

Figure C8 is based on monthly billing data. In addition to these billing data, we received hourly data for the past five months. These data (shown in Figure C9 for one week in December 2010 and in Figure C10 for one week in January 2011) reinforce the hypothesis that the majority of gas usage is associated with production. Consumption is much less on weekends, with a standing base load of only around 10 therms per hour.

Figure C8. Site #17739130 Average Daily Consumption for Past 11 Years

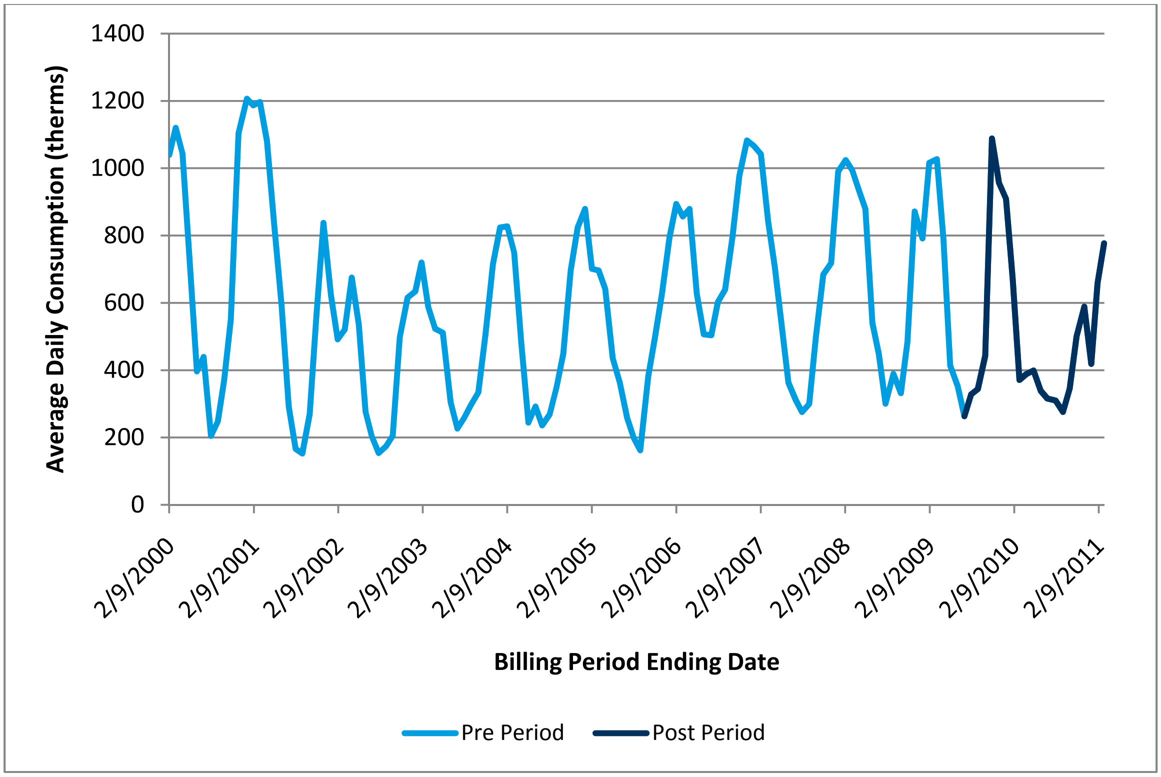


Figure C9. Site #17739130 Hourly Consumption (12/21/10 - 12/28/10)

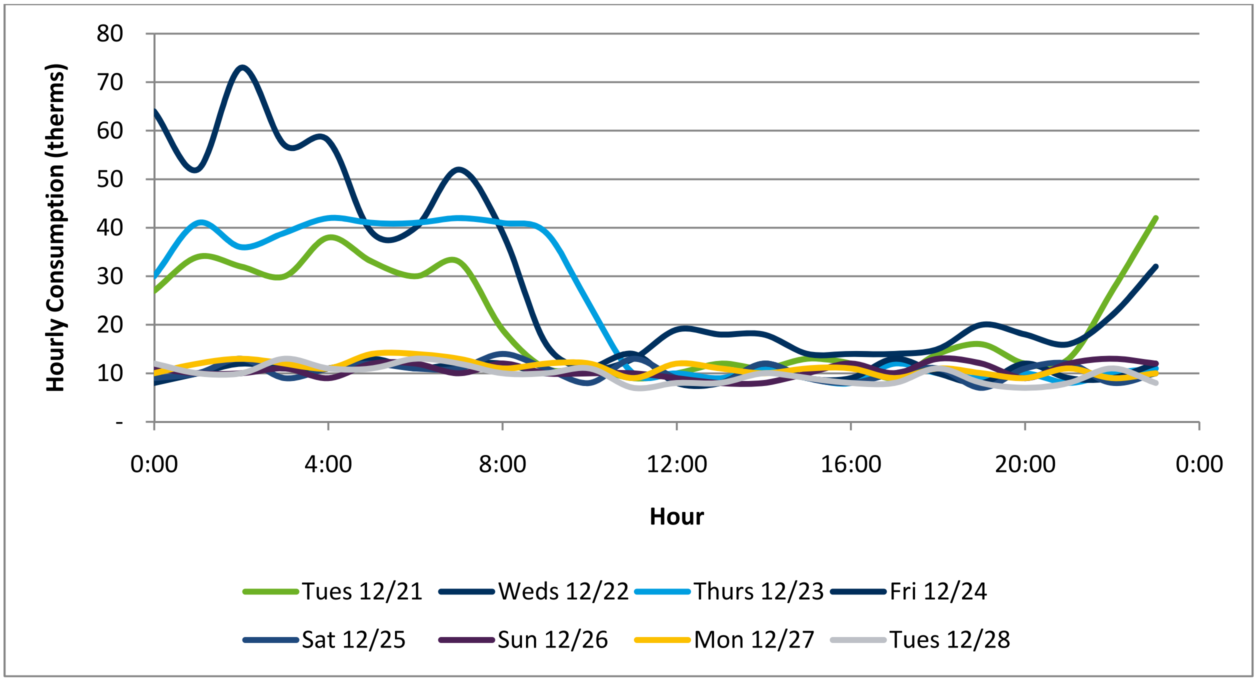
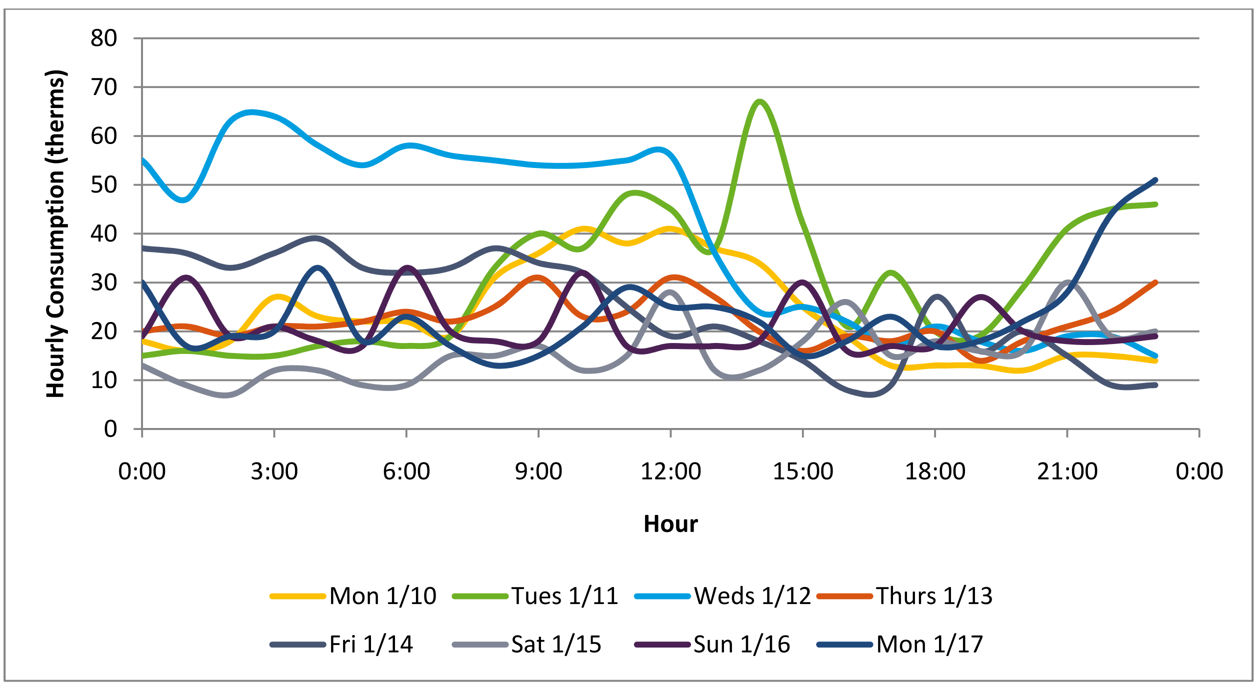


Figure C10. Site #17739130 Hourly Consumption (1/10/11 – 1/17/11)



Our independent calculation for the steam pipeline losses is noted below. We used the NAIMA 3E Plus 4.0 program to independently determine the amount of heat lost in the steam pipe to the beds. The NAIMA computer run showed bare pipe loss of 1,279 BTU/Hr/ft (with 1/2-inch of insulation, 134 BtuH/ft for pipe, and a jacket). The NAIMA run gave the heat loss parameters shown in Table C7.

Table C7. Site #17739130 NAIMA 3EPlus Parameters

Input	
Parameter	Value
Average Temp (F)	47.6
Wind Speed (MpH)	9.75
Pipe	4"
Process Temp (F)	250
Outer Jacket	0.9 Aluminum Service
Hours	8,760
Given Load (BtuH)	860,000 (389 per ft.)

Given these values, we ran calculations using the linear feet of piping we measured during the site visits. Our initial calculations estimate a savings value within a range near the claimed savings of 63,500 therms.

Table C8. Site #17739130 Initial Engineering Estimates

Insulation	Heat Loss, (BTU/hr/ft)	Length of Steam Pipe Line (ft.)	Hours/yr	BthH/ft	BtuH Required	Saved BtuH	Saved Therms
Bare	389	2,212	8,760	860,000	7,533,600,000	-	-
0.5	134	1,060	8,760	141,934	1,243,341,840	6,290,258,160	62,903
1	75	1,060	8,760	79,903	699,948,528	6,833,651,472	68,337

Billing Analysis

We obtained Spokane weather data from WBAN #24157, located at the Spokane airport. There were 6,819 HDDs in the 12 billing cycles beginning March 3, 2010 and ending March 4, 2011. There are 6,712 TMY3 HDDs for this weather station, implying that this past winter season was slightly colder than average.

Due to the complexity of the relationship between weather and production for this site, along with the fact that measures were installed in two stages a year apart, we estimated one model for this site. By using a single model, we were able to include greater variation in production and model different aspects of each retrofit stage. We estimated the model as follows:

$$therms_t = \beta_0 + \beta_1 HDD_t + \beta_2 production_t + \beta_3 post1_t + \beta_4 post2HDD_t + e_t$$

Where:

$therms_t$	=	average daily therms for billing period 't'
HDD_t	=	average HDDs for billing period 't'
$production_t$	=	average daily production in cubic yards of concrete for billing period 't'

post1$_t$ = a dummy variable that equals 1 if '*t*' is after replacement and insulation of outdoor steam lines, and equals 0 otherwise

post2HDD$_t$ = a variable which equals HDD if '*t*' is after installation of condensing economizers and equals 0 otherwise

Findings

The estimated coefficients from the model supports the hypothesis that consumption decreased substantially as a result of the retrofits. Table C9 shows the estimated coefficients for the model and their respective fit indices.

Table C9. Site #17739130 Model Fit and Parameters

n	R^2	Coefficients			
		Variable	Estimate	Standard Error	p-value
62	0.78	Intercept	161.192	60.442	0.010
		HDD	17.801	1.354	<.0001
		Production	2.700	0.612	<.0001
		Dummy: Steam Pipes	-74.838	40.736	0.071
		Interaction: HDD Economizers	-5.763	2.195	0.011

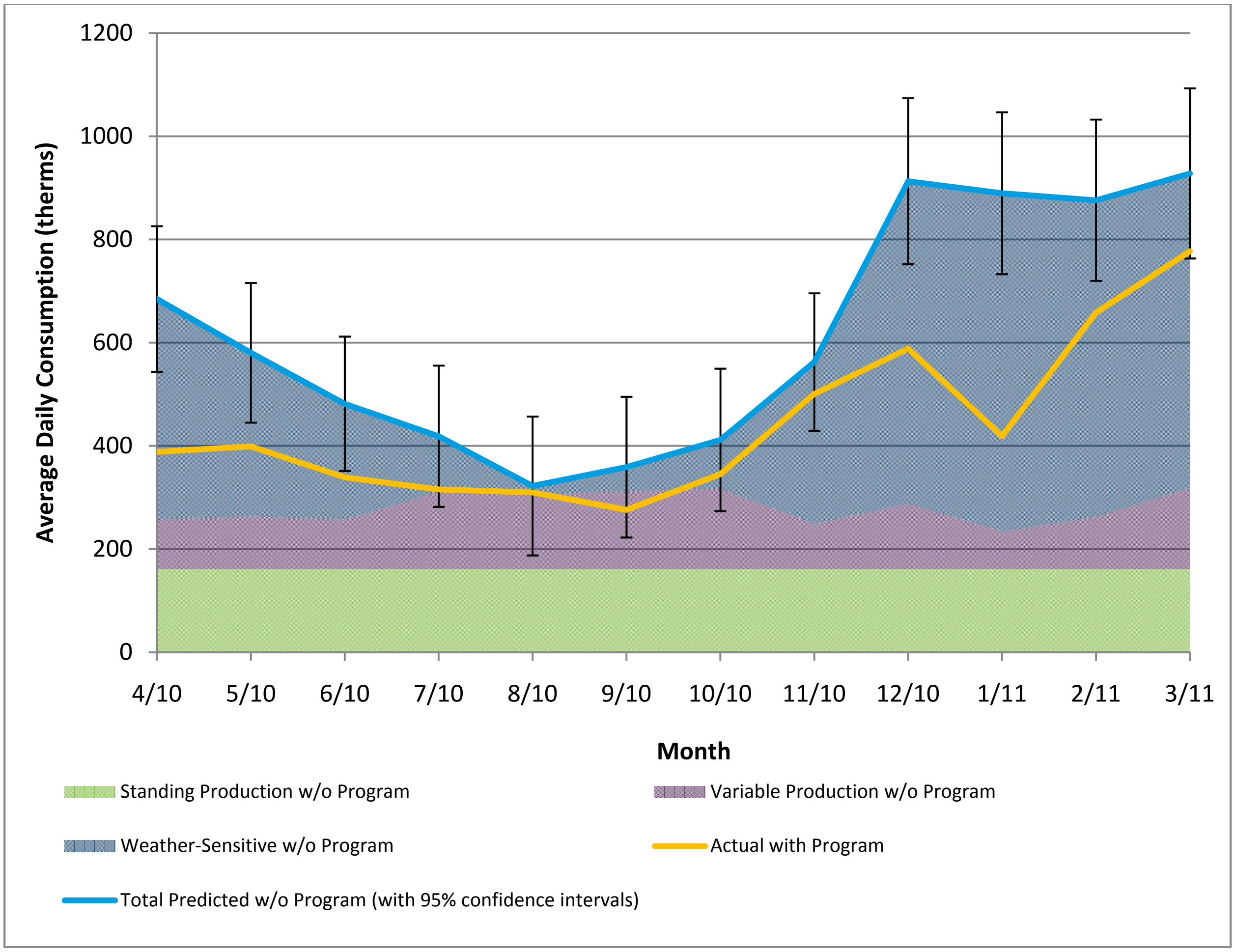
These model coefficients indicate that there was a net decrease of 78.8 therms per day on average following the installation of the new steam pipes, insulation, and control valves. In addition, the installation of the condensing economizers resulted in a decrease of 5.8 therms per HDD on average. Table C10 shows the calculations for the counterfactual load for the past 12 billing cycles, broken out by each consumption type.

Table C10. Site #17739130 Predicted Load by Consumption Type for Past 12 Billing Cycles

Billing Period End Date	Days	Standing Load	Production	Variable Production Load	HDD	Weather Sensitive	Total Predicted Load
4/1/2010	29	4,675	1,026	2,770	697	12,407	19,852
5/3/2010	32	5,158	1,210	3,266	570	10,147	18,571
6/3/2010	31	4,997	1,099	2,967	391	6,960	14,924
7/2/2010	29	4,675	1,612	4,352	175	3,115	12,141
8/6/2010	35	5,642	1,864	5,032	34	605	11,279
9/7/2010	32	5,158	1,788	4,827	84	1,495	11,480
10/6/2010	29	4,675	1,674	4,519	154	2,741	11,935
11/5/2010	30	4,836	977	2,637	528	9,399	16,872
12/8/2010	33	5,319	1,551	4,187	1,158	20,613	30,120
1/7/2011	30	4,836	814	2,197	1,104	19,652	26,685
2/3/2011	27	4,352	1,009	2,724	931	16,573	23,649
3/4/2011	29	4,675	1,689	4,560	993	17,676	26,910
Total	366	58,998	16,313	44,038	6,819	121,383	224,418

As shown in Table C10, the model estimates that weather sensitive consumption would have been 121,383 therms. There would have been a standing production load of 58,998 therms. In addition, this site produced 16,313 cubic yards in the past year, which was responsible for approximately 44,038 therms of consumption. This would lead to a total consumption of 224,418 therms. Actual total consumption over this period was 160,679 therms. We therefore estimate gross savings for the past 12 billing periods at 63,739 therms. The relationship between the actual consumption, estimated consumption, and HDD is shown in Figure C11.

Figure C11. Site #17739130 Reference vs. Actual Load for Past 12 Billing Cycles



In sum, given the results of our billing analysis, we conclude that the retrofits resulted in substantial savings. Using TMY3 HDDs, we estimate that this project will result in an average annual gross savings of 66,015 therms. This value comes from using TMY3 HDDs and the five-year average production of 23,708 cubic yards per year.

Table C11. Site #17739130 Normalized Annual Gross Savings

Estimate	Units	Pre-Retrofit	Post-Retrofit	Difference	Normalized Units/Day	Daily Savings	Normalized Units/Year	Annual Savings
Standing Production	Days	161.2	86.4	-74.8	1.0	74.8	365.25	27,334
Weather Sensitive	HDD	17.8	12.0	-5.8	18.4	105.9	6,712	38,681
Variable Production	Yds.³/ day	2.7	2.7	0.0	64.9	0.0	23,708	-
Total						180.7		66,015

Case Study - Site # 18524903

Site #18524903 is a linen supply company located in Lewiston, Idaho. The project (application #33831) involved installing steam traps in the facility. Installation was completed by May 2010. The claimed savings for this project were 39,706 therms/year.

Site Review

The facility is quite large (between 28,000 and 33,000 sq.ft.), with 102 employees working on site and 12 delivery drivers. Production has varied substantially over the last few years, though by what amount is unclear, as production data was only provided for 15 of the months that we have billing data for.

A 150 HP boiler at 90 to 125 psig was recently repaired after losing a couple of tubes. Condensate is returned to the boiler at roughly 190°F, and we measured exhaust from the boiler at between 345 and 365°F.

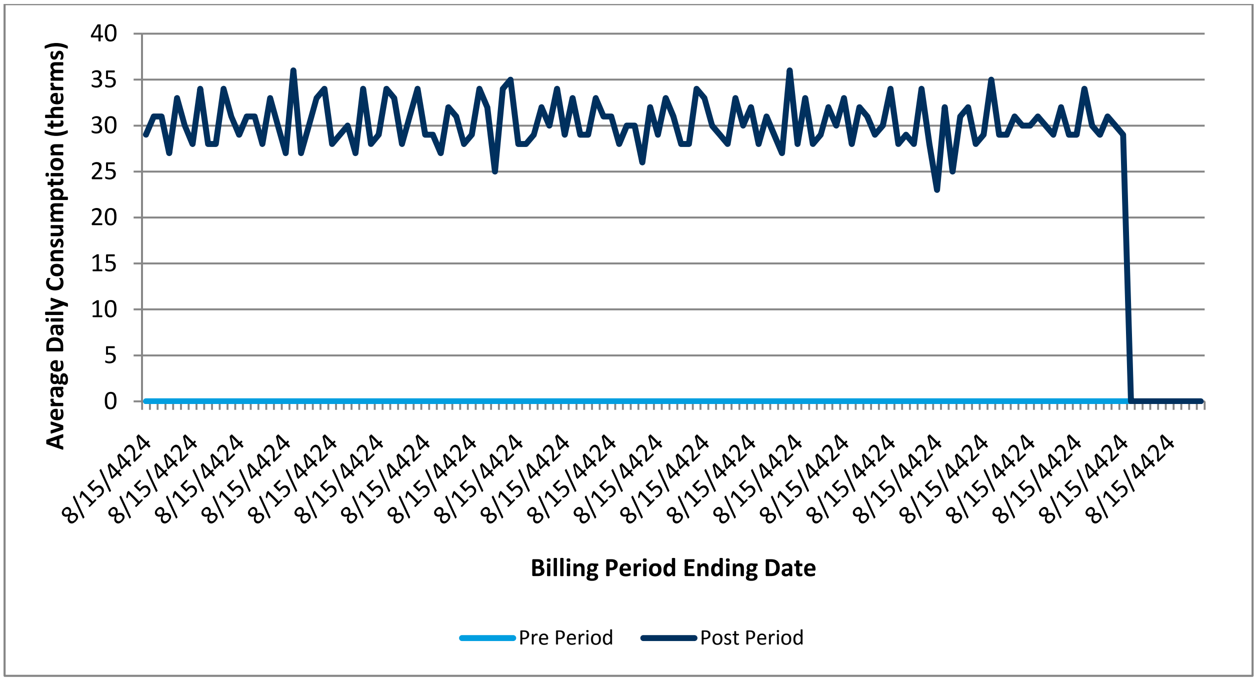
Insulation is falling off in many places throughout the plant. Staff we interviewed mentioned that they plan to reinsulate the building. They also plan to insulate the hot water storage tank. Hot water is maintained at 160°F. Both boiler and wash water are softened.

Steam is only used for production to heat water to 152°F when the gas fired water heater is down and to provide dry steam to production machines. The staff will now clean out the installed steam traps integral strainers on an annual basis. Some of the drip legs could benefit from being a bit longer. The plant turns the boiler on and purges the steam lines with low-pressure steam at 5:00 a.m., and is ready for production at 5:45 a.m. The steam lines are 2-inches in diameter, and most takeoffs are 1-1/4-inches from the machines.

The staff on site noted that the ironing machines have been easier to use since the installation of the steam traps. Much of that is related to a substantial decrease in the amount of moisture in many areas of the plant, and a decrease in water hammer. Pressures have also been reduced by the regulators.

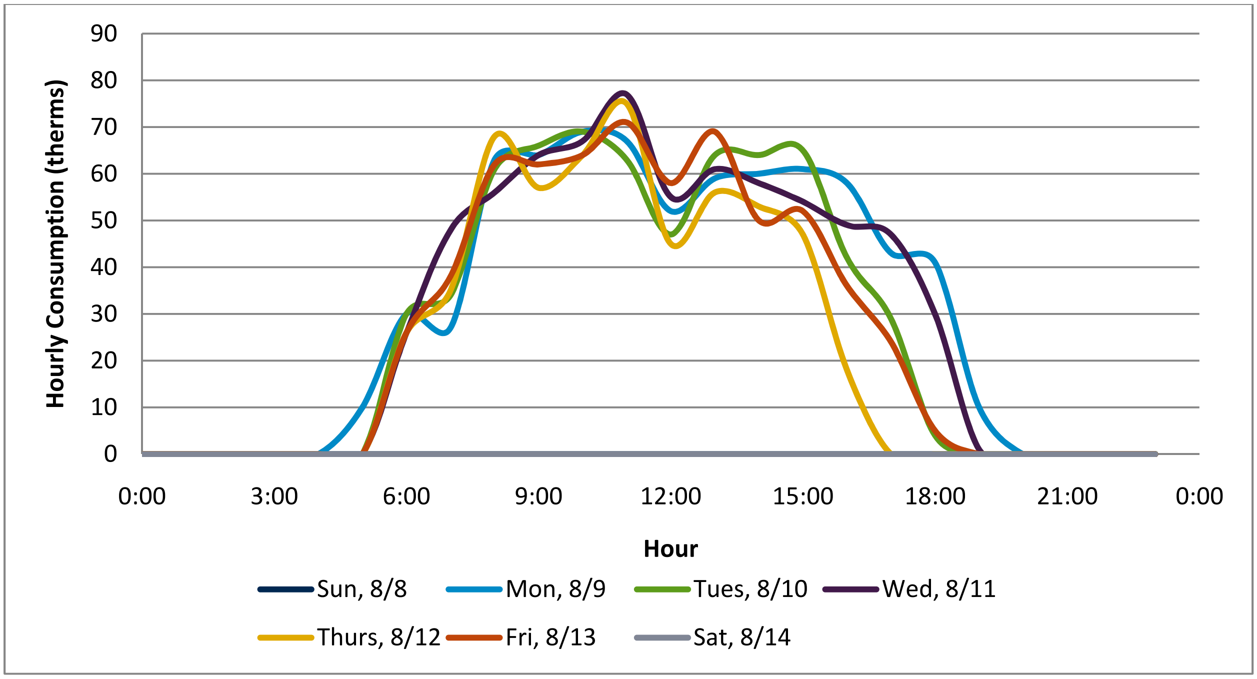
Production has been quite variable over the last few years. This is evident from the gas consumption at the site over the past 11 years (as shown in Figure C12). Per staff we interviewed on site, production is picking up. In 2007, the company was producing 5.0 million pounds in linen; in 2010 it produced 5.6 million pounds. Dry loads increased by 15 percent this year due to a hospital being added in January 2011.

Figure C12. Site #18524903 Average Daily Consumption for Past 11 Years



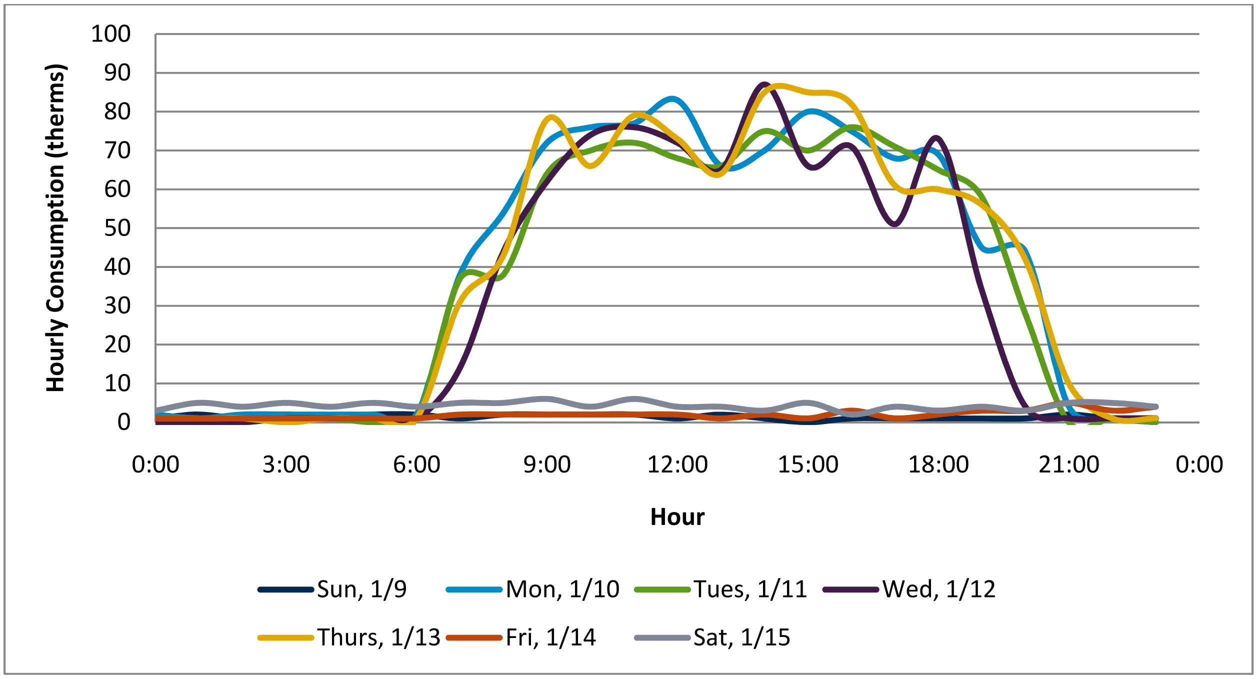
We were also provided with hourly consumption data from the past year. These data confirmed that little space or water heating takes place outside of production hours. Figure C13 and Figure C14 show this pattern for two sample weeks, one in the summer and one in the winter.

Figure C13. Site #18524903 Hourly Consumption (8/8/10 – 8/14/10)



Note that there appears to be a very low level of heating in the winter months. This most likely reflects water heating, as the consumption is not nearly large enough to be reflecting space heaters.

Figure C14. Site #18524903 Hourly Consumption (1/9/11 – 1/15/11)



Billing Analysis

We obtained Lewiston weather data from WBAN #24149, located at the Nez Perce County airport. There were 5,242 HDDs in the 12 billing cycle beginning March 3, 2010 and ending March 4, 2011. There are 5,515 TMY3 HDDs for this weather station, implying that this past winter season was slightly warmer than average.

Given that production data were only available for the previous 15 months (only five of which were pre-period), we were unable to model consumption as a function of both production and weather. However, as previously shown in Figure C12, changes in production clearly have a significant impact on consumption. As production is on the rise, failing to account for the related increase in consumption could create a significant negative bias in savings estimates. This is evident when modeling consumption merely as a function of the retrofit and HDDs, where the model estimates negative savings as a result of the program retrofits.

We attempted several strategies to mitigate this issue. We estimated models using a variety of instrumental variables to account for the unobserved production in the pre-period. We included explanatory variables for HDDs and treatment dummy variables in all the models. We also tested interactions between HDDs and treatment to determine if there is an interactive effect from heat spillage, but found that the effect did not differ significantly from zero in any of the model iterations we ran.

To account for production, we estimated the following models:

- As a function of individual dummy variables controlling for each year and month to account for both year-on-year business cycles and seasonal variations in production;
- As a function of statewide macroeconomic indicators;
- As a function of a polynomial time-trend; and
- Various hybrid models combining the explanatory variables outlined above.

In the end, we decided that the most appropriate model was one that used a simple polynomial time trend. We opted for this model for several reasons. First, this model makes no presuppositions about the drivers of production over time, which is important for determining the change in demand given previous trends. Second, this model was the most parsimonious and well fitting. That is, we achieved the desired significance and expected signs for model coefficients while optimizing both the total and adjusted r-squares.

Models that included a complex dummy structure approximated the time trend model, but lacked the parsimony and ease of interpreting the time trend models. We found macroeconomic models to have only weak signals; largely because most data were only available at the annual and statewide levels. Despite our preference for our final model, savings from comparable models did not differ dramatically from our final estimates. We estimated the model as follows:

$$therms_t = \beta_0 + \beta_1 HDD_t + \beta_2 time_t + \beta_3 time_t^2 + \beta_4 time_t^3 + \beta_5 post_t + e_t$$

Where:

$therms_t$	=	average daily therms for billing period 't'
HDD_t	=	average HDDs for billing period 't'
$time_t$	=	a variable which equals 1 in the first billing period of the sample and increases by 1 in each subsequent period
$post_t$	=	a dummy variable which equals 1 if 't' is after replacement and insulation of outdoor steam lines and equals 0 otherwise

Findings

The estimated coefficients from the model supports the hypothesis that consumption decreased substantially as a result of the retrofits. Table C12 shows the estimated coefficients for the model and its respective fit indices.

Table C12. Site #18524903 Model Fit and Parameters

n	R^2	Coefficients			
		Variable	Estimate	Standard Error	p-value
137	0.77	Intercept	537.31	12.607	<.0001
		HDD	2.18	0.259	<.0001
		Dummy: Steam Traps	-78.54	18.850	<.0001
		Time	-2.20	0.813	0.008
		Time2	-0.023	0.015	0.114
		Time3	0.0003	0.0001	<.0001

These model coefficients indicate that there was a net decrease of 78.5 therms per day on average following installation of the steam traps, holding the past consumption trends constant. Though this model controls for these trends, it is unclear under what conditions this trend analysis will remain stable in the future. For this reason, we present these daily savings as a best estimate, as more production data is necessary to better understand the interaction between production and heating consumption.

Table C13. Site #18524903 Annual Gross Savings

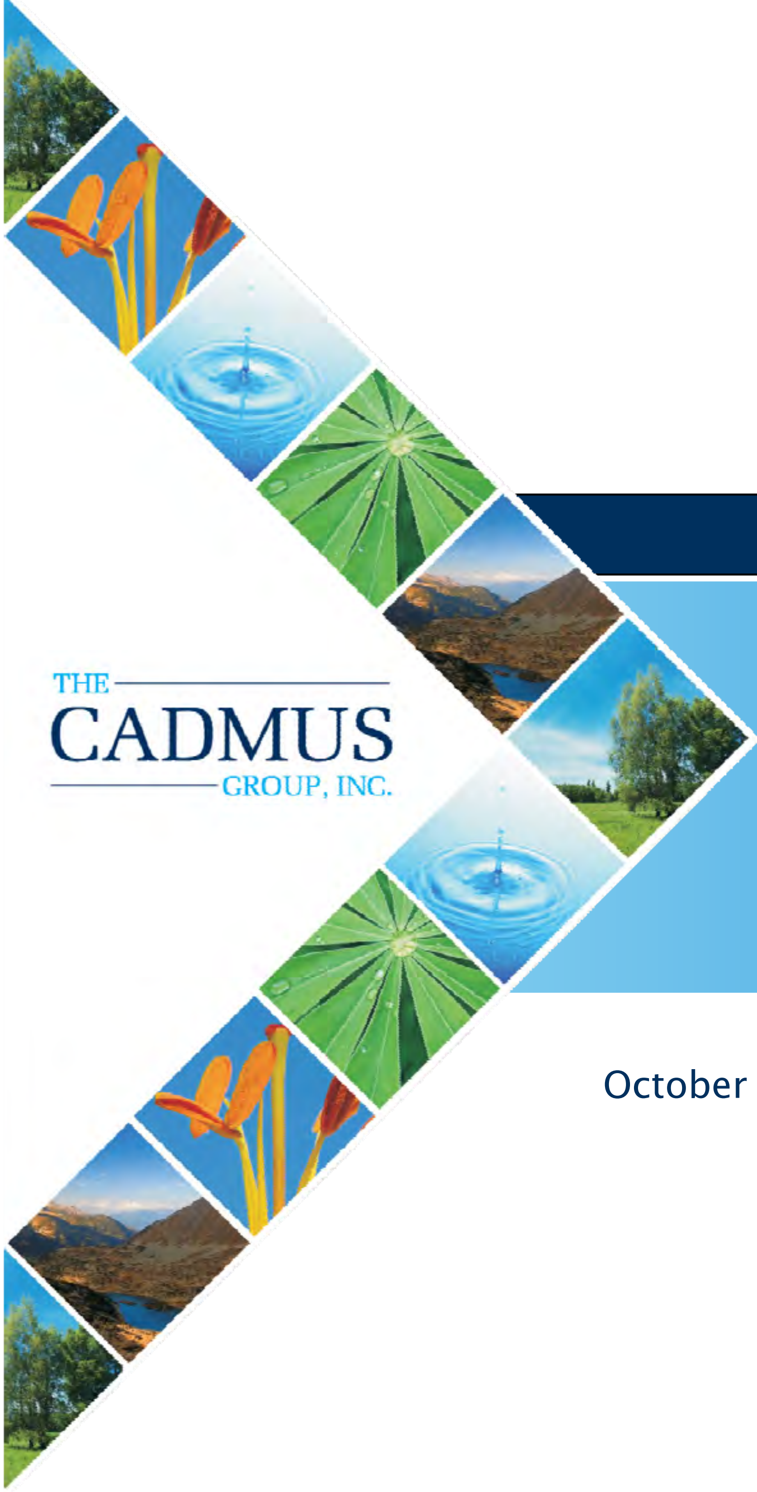
Daily Savings	Annual Savings
78.5	28,686

Appendix 3

Avista 2010 Multi-Sector Process Evaluation Report

October 12, 2011

The Cadmus Group, Inc.



Avista 2010 Multi-Sector Process Evaluation Report

October 12, 2011

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Table of Contents

Portfolio Executive Summary

Avista Corporation contracted with The Cadmus Group, Inc., to perform a portfolio-wide evaluation for the 2010 demand-side management programs. The evaluation entailed process and impact components. Process evaluation examines program delivery, while impact evaluation produces estimates of program achievements. This report presents the process evaluation findings.

Evaluation Activities

Table ES-1 summarizes the process evaluation activities.

Table ES-1. Process Evaluation Activities

Activity	Residential	Nonresidential	Low-Income
Avista Staff Interviews	✓	✓	✓
Participant Surveys	✓	✓	✓
Non-Participant Surveys	✓	✓	
Contractor Interviews	✓	✓	
Implementer/Agency Interviews	✓	✓	✓
Assessment of Tracking Databases	✓	✓	✓
Review of Program Documentation	✓	✓	✓
Review of Marketing Materials	✓	✓	
Examination of Stakeholder Reports	✓	✓	✓

Portfolio Level Considerations

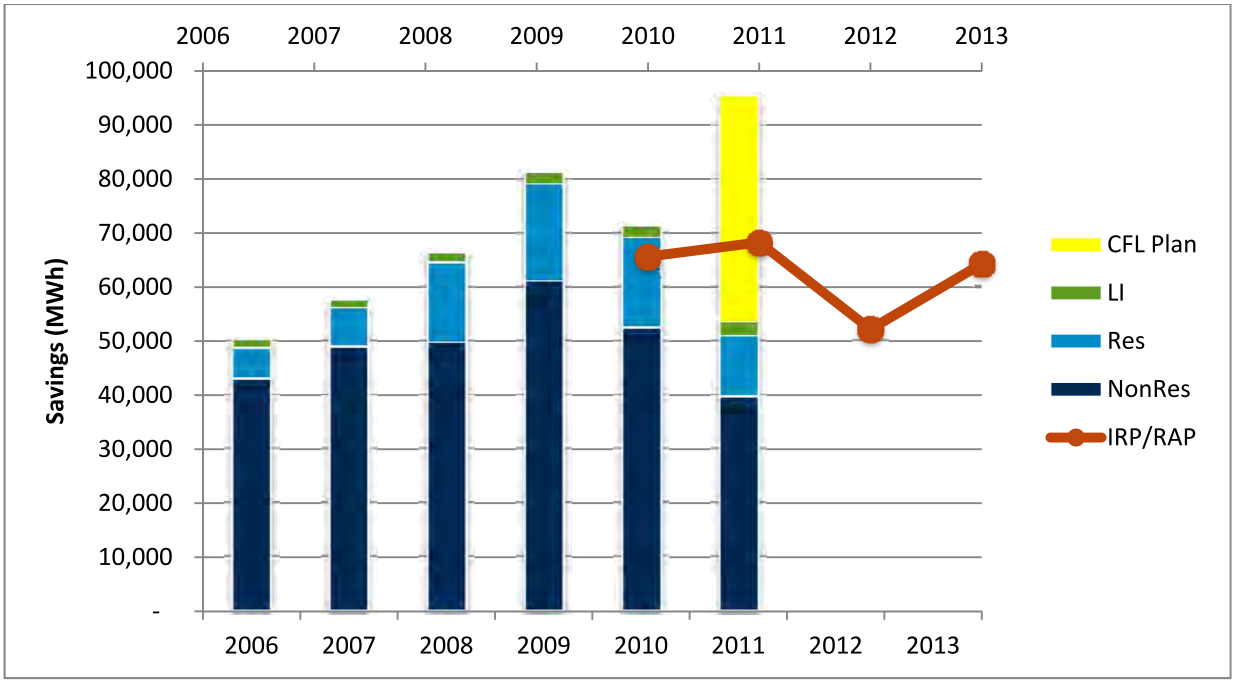
Portfolio Goals and Unverified Savings

Figure ES-1 below shows the unverified reported electric savings trends for each of the sectors between 2006 and 2010, and estimated for 2011. The demonstrated large drop in savings from 2010 to 2011 is due in part to the end of Stimulus funds.

The 2011 portfolio is still underway and, as such, the figure uses our projections based on the first 8 months of the program year. In addition, the 2011 portfolio savings will depend to a significant degree on the savings associated with the just-launched compact fluorescent light (CFL) contingency campaign. Avista is in the process of mailing 350,000 packages containing eight CFLs. The potential savings of this program is expected to be between 42,000 and 89,600 MWh. The figure below assumes the low end of the estimate to be conservative. The orange line illustrates overall portfolio-level goals for years 2010 through 2013. 2010 and 2011 goals are based on IRP filings, whereas 2012 and 2013 are the realistic achievable potential (RAP), which represent the lower limit of the range of savings goals from Avista’s conservation potential assessment (CPA).

The 2010 portfolio’s unverified reported savings surpassed the IRP goal by around 5,000 MWh. The impact evaluation will determine the final savings that Avista can claim. Without the contingency plan, meeting the 2011 goals would have been unlikely, and Cadmus expects that meeting future goals will be challenging, since this kind of contingency plan can only be used once. Furthermore, the CFL Contingency Plan is likely to have an effect on the Simple Steps upstream CFL program performance in the coming years.

Figure ES-1. Unverified kWh Savings by Sector and Portfolio Goals



Program Implementation

Utilities often use a mix of in-house and third-party program implementation. Table ES-2 below shows the programs that are implemented by third parties for Avista for each sector. All other programs are administered directly by Avista.

Table ES-2. Third Party Implementation

Sector	Program	Implementer
Low-Income	All programs	CAP Agencies
Nonresidential	EnergySmart Grocer	PECI
Nonresidential	Green Motors Rewind	Green Motors Practices Group
Residential	Appliance Recycling	JACO
Residential	Simple Steps	Fluid Marketing Strategies

There are advantages and disadvantages to utilizing third party implementers. It is our opinion that Avista has thus far selected the appropriate programs to contract to implementation firms. In general utilities maintain direct implementation of programs that require intimate knowledge of unique customers (e.g., large commercial and industrial customers). Programs that can benefit from a uniform approach that has been tried successfully elsewhere, involve national accounts, or require certain market expertise available from a third-party firm can benefit from being contracted out.

As savings goals increase and the "low hanging fruit" of energy-efficiency measures are exhausted, it may be advantageous for utilities to consider increasing the utilization of third party implementers for certain programs. Avista may wish to consider the following questions as they plan programs in the coming years:

- Does the program's success depend heavily on the utility's relationship with the customer or institutional knowledge?
- Do third-party implementers bring specialized knowledge or skill sets that exceed that of Avista?
- Do third-party implementers have established relationships with upstream distribution channels, trade allies, or customers that could increase program success?
- Does the third party have greater flexibility than the utility for things such as delivery capacity or market intervention strategies?
- Are the implementers willing to take on some of the risk of not meeting goals?

As mentioned above, Cadmus feels the current split of delivery mechanisms is appropriate. We have found no strong evidence indicating the need for sweeping changes. That said, we believe that two programs ought to be considered in the coming two years for potential outsourcing: the residential ENERGY STAR Products program and components of the Heating and Cooling Efficiency program. We believe that Avista could benefit from concentrating on the delivery of programs involving larger customers.

Sector Conclusions and Recommendations

The section below lists the key conclusions and recommendations for each of the sectors, broken out by major evaluation topic area for each sector.

Residential Conclusions and Recommendations

Program Participation

Conclusions

- Residential portfolio reported strong achievement of savings and participation goals in 2010.
- Expected decline in 2011 participation may affect ability to reach savings targets in future program years.
- High ENERGY STAR market share for dishwashers signifies that high freeridership is likely for this measure and further market transformation through rebate is unlikely.
- Perception of difficulty of participation may be a barrier.

Recommendations

- Research market saturation and participation to track achievement of potential. Using the *Avista Electric Conservation Potential Assessment Study* completed in August 2011, along with available data sources such as ENERGY STAR and additional primary research, Avista should track the residential portfolio's progress toward capturing projected realistic achievable potential. This effort will inform program planning and design decisions to allow for the long-term success of the residential portfolio.

- Discontinue rebate for ENERGY STAR dishwashers. ENERGY STAR data show that 78 percent of dishwashers sold nationally are ENERGY STAR models. Therefore, this measure is likely to suffer from high freeridership, and the Avista rebate is unlikely to affect market transformation.
- In order to address the nonparticipant perception that program participation may be difficult, Avista should emphasize the ease of participating in residential marketing.

Program Design

Conclusions

- Organization of programs may be unnecessarily complex.
- Two third-party implementers (JACO and FMS) provide advantages.
- Trade allies favor contractor rebates over customer rebates.

Recommendations

- Simplify and document program organization structure. Cadmus recommends grouping programs in logical clusters, in order to reduce complexity of documentation and tracking. While streamlining program organization, Avista should also document institutional knowledge of programs to avoid loss of continuity.
- Assess viability of redesigning some programs to include contractor rebates. Avista should consider the suggestion from HVAC trade allies to provide rebates direct to contractors. Other utilities have seen success with this model, which reduces the administrative burden on customers, allows for batch processing of rebates by Avista, and ensures close communication with trade allies. Anti-fraud provisions (such as requiring customer information and signature on rebate forms, or conducting site visits to verify installation) may be included in any such program adaptation.

Data Tracking

Conclusions

- Program data are tracked adequately for internal purposes, but improvements could enhance evaluability.
- Areas for improvement in tracking include consistency and detailed tracking of audit participation and follow-through

Recommendations

- Consider enhancing uniformity of program tracking by standardizing data formats. Wherever possible, Avista should develop tracking methods that support consistent analysis across programs. For example, a standardized format for customer address data across separate databases would ease database combination or integration.
- Track follow-through on audit recommendations. In planning for future Audit program implementation, Avista should consider additional tracking of customer follow-through on recommendations, both through other Avista rebate programs, and independently without rebates.

Marketing and Outreach

Conclusions

- Residential marketing is strong, contributing to high program awareness even among nonparticipants.
- Participants learn of programs through variety of channels, with Avista representative and contractor outreach being key methods.
- Opportunities exist for expansion of marketing efforts to counteract declining participation.

Recommendations

- Continue pursuing diverse marketing and outreach strategies. Avista should maintain its multi-faceted approach to reaching a broad range of customers, while targeting difficult-to-reach customers where appropriate.
- Continue enhancing social media marketing. Since Avista reported that younger customers can be more difficult to reach, the marketing team should continue to enhance its social media marketing efforts.
- Ensure contractors have adequate information to disseminate. Since trade allies were one of the commonly reported ways that participants learned about the program, Avista must focus on providing trade allies with adequate and accurate information. This can be achieved by distributing updated materials regularly, holding trainings for contractors, or formalizing the trade ally network to ensure frequent communication. For example, Avista should consider providing printable online information sheets that trade allies can print and disseminate to their customers.

Participant Experience and Satisfaction

Conclusions

- Participants are highly satisfied with all programs and rebates.

Recommendation

- Continue emphasizing good customer service and offering customer-friendly programs. These areas should be maintained as priorities in future program planning and implementation.

Effectiveness of Implementers

Conclusion

- High participation levels in the Simple Steps, Smart Savings program indicate potential for program expansion.
- Future evaluation activities may require retailer cooperation.

Recommendations

- Consider expanding offerings of Simple Steps program. Avista should consider the benefits of adding measures to the Simple Steps program. Additional measure offerings may increase potential participation and savings.

- Require FMS to ensure evaluators have access to retailers. Upstream program evaluation often requires access to retail locations, for shelf-stocking studies and in-store intercepts, for example. In order to ensure future evaluability of the Simple Steps program, FMS should require participating retailers to grant such access to evaluators when necessary.

Trade Ally Participation and Satisfaction

Conclusion

- HVAC contractors value program, contribute significantly to program outreach, are willing to engage more directly with Avista, and would appreciate additional marketing support

Recommendation

- Enhance and formalize trade ally network. Avista should offer additional training and informational materials to contractors who serve the HVAC program, to ensure high-quality program information reaches customers, and to encourage program promotion through contractors.

Residential Portfolio

Conclusion

- As programs mature, opportunities for program expansion or modification will arise due to factors such as market transformation and new regulations.

Recommendation

- Consider various opportunities for expansion. Avista should regularly assess the viability of expanded program and measure offerings. Avista may consider various possible expansions including behavioral programs and energy education programs.

Nonresidential Conclusions and Recommendations

Overall, the nonresidential programs are working well and operating as designed. Many of the programs are meeting or exceeding energy reduction targets. Highly qualified, dedicated, and long-term staff ensures quality control and efficient operations of the many prescriptive and site-specific programs. Commercial and industrial (C&I) customers and trade allies report strong satisfaction with the programs.

Program Documentation

Conclusion

- Although program overview, goals, and implementation plans are located in the 2011 DSM Business Plan, documented operational procedures were not easily accessible. Therefore, it is difficult to link the EM&V policies found in the high level planning documents to the program's operational management.

Recommendation

- Developing a program manual, with implementation plans, operational procedures, marketing strategies, and verification protocols aggregated into a single program handbook, could help to establish this link.

Customer Feedback

Conclusions

- Overall, customers proved very satisfied with all program elements. The majority of survey respondents did not encounter program participation challenges.
- However, customers felt there was a lack of information about program offerings.

Recommendations

- Enhance outreach and communication efforts for participants, nonparticipants, and partial participants.
- Develop additional printed program materials to educate customers about program opportunities.
- Consider regularly scheduled online Webinars to assist customers with questions about program incentives, eligibility, and application processing.

Trade Ally Feedback

Conclusions

- Avista's informal network of trade allies works well, through updates to the mailing list, word of mouth, and strong communications between contractors and Avista's customers, program staff, and account representatives.
- Although trade allies expressed strong satisfaction with program components, they also requested additional program guidance and greater opportunities for direct communication with Avista.
- Although the mailing list serves as an informal network for nonresidential programs, limited information has been documented about trade allies, the markets they serve, and their areas of specialization and qualifications.

Recommendations

- Provide regular trade ally communications through targeted outreach efforts, such as a Website, monthly e-mails, or a newsletter. A Website dedicated for trade allies could enable registration, thereby providing a method for compiling (and updating) trade ally profiles and contact information.
- Consider providing additional promotional materials that would highlight various program technologies available to customers. This would not require that Avista endorse any one contractor.
- Explore ways to leverage strong working relationships forged between customers and contractors within the community by sponsoring additional program working sessions, luncheons, or Webinars that provide guidance for trade ally outreach efforts.

Application Processing and Data Tracking

Conclusions

- Overall, application forms and program databases work well for tracking nonresidential participants and projects.

- Some customers and trade allies expressed confusion about prescriptive program requirements listed on the forms, and requested more help in filling out the site-specific forms and worksheets.

Recommendations

- Offer site-specific application forms online. Although it would be ideal to enable submission of forms online, simply making the forms downloadable and mail-in would provide a good first step. In addition, consider including guidelines for completing site-specific forms.
- Gather additional feedback from customers and trade allies about how site-specific form enrollment and processing could be streamlined.
- Gathering more detail about program and project measures in the participant database would enable a better understanding of the kinds of projects done in the past (by different types of customers and end-uses). Additional information could be used to market specific types of projects to other customers who have the same end-use equipment.

Marketing and Outreach

Conclusions

- Although a marketing budget had not been allocated before 2011, Avista's nonresidential marketing and outreach strategy has worked well, and includes the Website, customer E- newsletter, and outreach efforts of the key account managers. However, lack of knowledge about the effectiveness of nonresidential marketing approaches could result in reduced understanding of target markets for meeting future program goal requirements.

Recommendations

- Ensure allocation in future marketing budgets dedicated for nonresidential program marketing and outreach efforts.
- Develop additional marketing materials targeted specifically for trade ally outreach to customers. These materials would enable Avista staff to leverage existing trade ally relationships in the community. Make them available at a trade ally website for printing.
- Conduct marketing surveys, and targeted marketing research that would gather additional information about customer facilities and technology end-uses.
- Conducting targeted marketing research of largest 100 customers with hourly demand data. Use such data to analyze demand patterns, identify opportunities, and provide account executives with needed intelligence to market energy efficiency measures.

Quality Assurance and Verification

Conclusions

- Procedures for QA of data tracking, savings estimation, project approval, and inspection have been well-documented for site-specific projects.
- Although Avista uses a risk-based approach to pre- and post-inspections for prescriptive programs, guidelines or standardized procedures for this approach have not been documented.

Recommendations

- Consider developing a verification protocol to document pre- and post-inspection procedures for prescriptive programs, and ensure data tracking for project installation. In addition, protocols should highlight any differences in verification procedures used for prescriptive and site-specific programs.

Low-Income Conclusions and Recommendations

Program Delivery

Conclusions

- Avista's low-income weatherization program has been successfully implemented, without significant delivery barriers.
- Avista homes weatherized by agencies without Avista funding may represent opportunities to claim "non-programmatic" savings.
- Periodic review of agency funding disbursements may allow for midstream reallocations.

Recommendation

- Work with agencies to track non-programmatic savings.

Communication

Conclusion

- Opportunities exist for Avista to increase its involvement in the program by accompanying CAP agency staff and state administrators in ridealongs and monitoring.

Recommendation

- Continue to coordinate with state and agency staff to participate in ridealongs and monitoring.

Program Tracking

Conclusions

- Current participant and measure data are not being used consistently or effectively to calculate robust expected savings estimates.
- Agencies are willing to provide additional building and measure details for Avista to incorporate into an improved expected savings calculation.
- Two key criteria that with implications on estimated savings are currently not being collected: 1) primary heating source reported by the homeowner, and 2) whether equipment is non-functioning upon replacement.
- While agencies reported no major problems in complying with reporting requirements, removing preapproval requirements and electronic reporting procedures may help streamline the program.

Recommendations

- Ensure consistency and accuracy of data collected for expected savings calculations.

- Work with CAPs for more detailed data collection.
- Eliminate preapproval requirements for refrigerators, natural gas furnaces, and water heater replacements.
- Continue to communicate with agencies regarding opportunities for automating reporting.

Cost-Effectiveness Considerations

Conclusions

- While state resource portfolio requirements remain unclear in regard to holding low-income weatherization to the same cost-effectiveness standards as other DSM programs, a ruling on this issue will allow Avista to consider options for changing the design and delivery of their low-income weatherization program.

Recommendations

- Work with stakeholders to get clarity on whether low-income weatherization is held to the same cost-effectiveness requirements as other DSM program offerings

Quality Assurance and Control

Conclusions

- QA/QC protocols, implemented by both state monitors and agency staff, appear sufficient for guaranteeing completion of all work identified by the agency auditor and for confirming quality installation of the work completed.
- Reviewing inspection reports from state monitors will give Avista a better understanding of reoccurring issues or areas for concern with regard to agency implementation and quality installation of weatherization measures.

Recommendations

- Consider leveraging state resources for additional oversight.
- Request inspection reports from state monitors for Avista customer homes.

Participant Findings

Conclusions

- As about 12 percent of participants use non-electric or gas sources as their primary means of heating, Avista's expected savings estimates may not be accurate if assuming electric or gas heating systems in its savings calculations. This especially applies to shell measure savings calculations.
- As 28 percent of participants reported changing how they heat their homes following weatherization work, estimated savings for these participants may not be accurate, given Avista's deemed savings estimates.
- Low reported take-back levels indicated increases in consumption did not likely occur due to increased occupants moving into a home, increase occupancy of rooms within a home, or changes to thermostat set-points.

Participant Energy Education

Conclusions

- The program's energy-saving educational component appears to lack standardization across agencies; however, it appears to operate successfully, based on participant responses, high rates of reviewing materials, and reported energy-saving behavior changes.
- The energy education curriculum and delivery could focus more on actions saving the most energy.

Recommendations

- Focus energy education on actions resulting in high energy savings (e.g., reducing heating setpoints and how water use).

Non-Energy Benefits

Conclusions

- Participants reported additional benefits (e.g., increased comfort, improved health, reduced forced mobility) beyond cost-savings associated with reductions in energy consumption.
- An opportunity exists for Avista to quantify more non-energy benefits associated with this program.

Recommendation

- Consider funding additional research of non-energy benefits, in particular those benefits that can be added to the Total Resource Cost (TRC).

Participant Satisfaction

Conclusions

- Participants reported high satisfaction levels with Avista's low-income weatherization program overall.
- Participants also expressed satisfaction with measure installations, with the majority indicating either "excellent" or "good" ratings for each measure type.

Recommendations for Future Research

This process evaluation identified multiple areas worthy of future research for the 2011 and future evaluations, including:

Residential

- Analysis of multiple rebates, including the heat pump and gas furnace combination. Since over 25% of 2010 participants received more than one rebate, Avista should study the patterns of multiple-measure participation. This could provide insight into marketing possibilities, and inform impact analysis and future program planning.
- Market research on program penetration. Avista's residential programs may affect the market for high-efficiency equipment in its service territory, and these effects should be documented. Studies could include quantifying nonparticipant spillover, examining market saturation of

rebated equipment, and using the 2011 Conservation Potential Assessment Study to assess participation trends and program plans.

- Assessment of implementation costs. Examination of program costs, either through cost-effectiveness analysis or through process evaluation, can provide insight into the relative efficiency of implementation practices.

Nonresidential

- Conducting targeted marketing research of largest 100 customers with hourly demand data. Use such data to analyze demand patterns, identify opportunities, and provide account executives with needed intelligence to market energy efficiency measures.
- Examining historical trends for nonresidential program technology end-uses in comparison with future savings targets and technology potential.
- Analyzing market penetration by rate class, commercial and industrial sector, and technology types.
- Examining individual program processes (selected and prioritized by Avista's program managers) for potential improvements to efficiency and cost effectiveness.
- Conducting more in-depth research about nonparticipant spillover resulting from installation of energy-efficiency equipment outside of the program.
- Investigating potential improvements to TRC valuation resulting from nonresidential program non-energy benefits.

Low-Income

- Revise the participant survey to collect more detailed information in particular areas of interest. Three such areas may include: 1) additional non-energy benefits from the participant perspective; 2) specific changes to customer heating and cooling behaviors occurring after weatherization; and 3) non-functioning equipment prior to replacement.
- Consider identifying non-programmatic savings resulting from low-income weatherization performed on Avista customer homes using other funding sources.
- Assist with Washington Utilities and Transportation Commission hearings and data requests regarding cost-effectiveness requirements for low-income programs.
- Work to determine non-energy benefits and to prioritize benefits to be pursued with further research.
- Consider funding a market assessment to identify: the geographic breakout of eligible participant populations; historical participation; whether any target markets have been historically underserved; and additional targeting opportunities (e.g., energy burdens).

1 2010 Residential Process Report

1.1 Executive Summary

The residential process evaluation focuses on 11 Avista residential programs during the 2010 program year (PY 2010). Cadmus prioritized these programs, shown in Table 1-1, conducting additional, in-depth research on those achieving the greatest savings (in bold).

Table 1-1. PY 2010 Residential Programs

Residential Gas and Electric Saving Programs
ENERGY STAR Appliance Rebate
ENERGY STAR Homes
Heating and Cooling Efficiency
Weatherization and Shell Measures
Water Heater Efficiency
Home Energy Audit Pilot
Residential Electric-Only Programs
Geographic Saturation Events
Shade Tree
Second Refrigerator and Freezer Recycling
Space and Water Conversions
Simple Steps, Smart Savings (CFLs)

1.1.1 Evaluation Activities and Objectives

The evaluation sought to assess the following research areas for each program:

- Customer participation;
- Trade ally participation;
- Effectiveness of program design and delivery; and
- Opportunities for improvements.

In assessing these topics, Cadmus relied on three main data collection efforts: a document review; in-depth interviews; and telephone surveys of participants and nonparticipants.

The document review included the following information sources, provided to Cadmus by Avista:

- Tracking databases;
- Business plans;
- Marketing materials; and
- Cost-effectiveness analysis spreadsheets.

In-depth interviews with program and implementation staff provided detailed insights into design and delivery processes, and allowed clarification of gathered information. In staff interviews, as well as in selecting implementer and trade ally interviewees, Cadmus focused on the high-savings programs such as HVAC and Simple Steps, Smart Savings.

Table 1-2. PY 2010 Residential Interviews

Role	Number of Completed Interviews
Avista Program Staff	15
Simple Steps Implementers	2
HVAC Contractors	10

Cadmus designed and analyzed participant and nonparticipant telephone surveys, which were implemented by Discovery Research Group. The participant survey sampling plan was based on multiple factors, including feasibility of reaching customers, program participant population, and research topics of interest. Cadmus did not conduct participant surveys with Simple Steps, Smart Savings customers, because this—as an upstream program—did not track participant contact information. Similarly, for ENERGY STAR New Homes, Cadmus did not survey residential customers purchasing rebated homes, because rebates were paid to the builders, not end-use customers. For Refrigerator Recycling, a larger sample was surveyed to provide sufficient precision and confidence for the estimation of net-to-gross ratios, which will be reported in the forthcoming 2010 Electric Impact Evaluation. Table 1-3 shows achieved sample sizes and absolute precision at the 90 percent confidence level for the participant survey.[1]

Table 1-3. Participant Survey Sample Sizes and Precision Estimates by Program

Program	Total Program Participants	Survey Respondents	Absolute Precision at 90% Confidence
ENERGY STAR Appliance Rebate	17,397	73	±9.7%
Heating and Cooling Efficiency	7,681	72	±9.7%
Weatherization and Shell Measures	7,775	70	±9.9%
Water Heater Efficiency	1,362	20	±19.1%
Home Energy Audit Pilot	268	64	±8.0%
Second Refrigerator and Freezer Recycling	1,729	133	±6.6%
Space and Water Conversions	250	43	±10.7%
Overall	36,462	475	±3.7%

The study selected nonparticipants by using screening questions to identify customers purchasing items or taking actions that could have been eligible for rebates, but not participating in the rebate programs. These included customers purchasing standard-efficiency versions of rebated measures. Nonparticipant surveys results have been reported in aggregate to reflect behaviors and attitudes of all Avista nonparticipant residential customers. The achieved sample size of 70 sufficiently produces significance at the 90 percent level, within no more than a ±10 percent confidence interval for the nonparticipant population.

[1] Precision values in Table 1-3 represent the least favorable possible precision given the sample sizes, and were calculated by assuming a reported proportion of 50 percent. Precision for most reported results is better than values shown in the table.

1.1.2 Conclusions and Recommendations

The conclusions and recommendations summarized below are described in greater detail in the final section of this report (1.4 Conclusions, Recommendations, and Future Research Areas).

Program Participation

Conclusions

- Residential portfolio reported strong achievement of savings and participation goals in 2010
- Expected decline in 2011 participation may affect ability to reach savings targets in future program years
- High ENERGY STAR market share for dishwashers signifies that high freeridership is likely for this measure and further market transformation through rebate is unlikely
- Perception of difficulty of participation may be a barrier

Recommendations

- **Research market saturation and participation to track achievement of potential.** Using the *Avista Electric Conservation Potential Assessment Study* completed in August 2011, along with available data sources such as ENERGY STAR and additional primary research, Avista should track the residential portfolio's progress toward capturing projected realistic achievable potential. This effort will inform program planning and design decisions to allow for the long-term success of the residential portfolio.
- **Discontinue rebate for ENERGY STAR dishwashers.** ENERGY STAR data shows that 78 percent of dishwashers sold nationally are ENERGY STAR models. Therefore, this measure is likely to suffer from high freeridership, and the Avista rebate is unlikely to affect market transformation.
- **Emphasize ease of participation in marketing**. In order to address the nonparticipant perception that program participation may be difficult, Avista should emphasize the ease of participating in residential marketing.

Program Design

Conclusions

- Organization of programs may be unnecessarily complex
- Two third-party implementers (JACO and FMS) provide advantages
- Trade allies favor contractor rebates over customer rebates

Recommendations

- **Simplify and document program organization structure.** Cadmus recommends grouping programs in logical clusters, in order to reduce complexity of documentation and tracking. While streamlining program organization, Avista should also document institutional knowledge of programs to avoid loss of continuity.
- **Assess viability of redesigning some programs to include contractor rebates.** Avista should consider the suggestion from HVAC trade allies to provide rebates direct to

contractors. Other utilities have seen success with this model, which reduces the administrative burden on customers, allows for batch processing of rebates by Avista, and ensures close communication with trade allies. Anti-fraud provisions (such as requiring customer information and signature on rebate forms, or conducting site visits to verify installation) must be included in any such program adaptation.

Data Tracking

Conclusions

- Program data are tracked adequately for internal purposes, but improvements could enhance evaluability.
- Areas for improvement in tracking include consistency and detailed tracking of audit participation and follow-through

Recommendations

- **Consider enhancing uniformity of program tracking by standardizing data formats.** Wherever possible, Avista should develop tracking methods that support consistent analysis across programs. For example, a standardized format for customer address data across separate databases would ease database combination or integration.
- **Track follow-through on audit recommendations.** In planning for future Audit program implementation, Avista should consider additional tracking of customer follow-through on recommendations, both through other Avista rebate programs, and independently without rebates.

Marketing and Outreach

Conclusions

- Residential marketing is strong, contributing to high program awareness even among nonparticipants
- Participants learn of programs through variety of channels, with Avista representative outreach and contractor outreach being key methods
- Opportunities exist for expansion of marketing efforts to counteract declining participation

Recommendations

- **Continue pursuing diverse marketing and outreach strategies.** Avista should maintain its multi-faceted approach to reaching a broad range of customers, while targeting difficult-to-reach customers where appropriate.
- **Continue enhancing social media marketing.** Since Avista reported that younger customers can be more difficult to reach, the marketing team should continue to enhance its social media marketing efforts.
- **Ensure contractors have adequate information to disseminate.** Since trade allies were one of the commonly reported ways that participants learned about the program, Avista must focus on providing trade allies with adequate and accurate information. This can be achieved by distributing updated materials regularly, holding trainings for contractors, or formalizing

the trade ally network to ensure frequent communication. For example, Avista should consider providing printable online information sheets that trade allies can print and disseminate to their customers.

Participant Experience and Satisfaction

Conclusions

- Participants are highly satisfied with all programs and rebates

Recommendation

- **Continue emphasizing good customer service and offering customer-friendly programs.** These areas should be maintained as priorities in future program planning and implementation.

Effectiveness of Implementers

Conclusion

- High participation levels in the Simple Steps, Smart Savings program indicate potential for program expansion
- Future evaluation activities may require retailer cooperation

Recommendations

- **Consider expanding offerings of Simple Steps program.** Avista should consider the benefits of adding measures to the Simple Steps program. Additional measure offerings may increase potential participation and savings.
- **Require FMS to ensure evaluators have access to retailers.** Upstream program evaluation often requires access to retail locations, for shelf-stocking studies and in-store intercepts, for example. In order to ensure future evaluability of the Simple Steps program, FMS should require participating retailers to grant such access to evaluators when necessary.

Trade Ally Participation and Satisfaction

Conclusion

- HVAC contractors value program, contribute significantly to program outreach, are willing to engage more directly with Avista, and would appreciate additional marketing support

Recommendation

- **Enhance and formalize trade ally network**. Avista should offer additional training and informational materials to contractors who serve the HVAC program, to ensure high-quality program information reaches customers, and to encourage program promotion through contractors.

Residential Portfolio

Conclusion

- As programs mature, opportunities for program expansion or modification will arise due to factors such as market transformation and new regulations.

Recommendation

- **Consider various opportunities for expansion**. Avista should regularly assess the viability of expanded program and measure offerings. Avista may consider various possible expansions including behavioral programs and energy education programs.

1.2 Introduction

1.2.1 Program Overview

The residential process evaluation focuses on 11 programs Avista offered to residential gas and electric customers during the 2010 program year (PY 2010). Cadmus prioritized these programs, shown in Table 1-4, conducting additional, in-depth research on those achieving the greatest savings (the table shows these high-priority programs in bold).

Table 1-4. PY 2010 Residential Programs

Residential Gas and Electric Saving Programs
ENERGY STAR Appliance Rebate
ENERGY STAR Homes
Heating and Cooling Efficiency
Weatherization and Shell Measures
Water Heater Efficiency
Home Energy Audit Pilot
Residential Electric-Only Programs
Geographic Saturation Events
Shade Tree
Second Refrigerator and Freezer Recycling
Space and Water Conversions
Simple Steps, Smart Savings (CFLs)

This report's following sections briefly describe each program examined through this process evaluation.

ENERGY STAR Appliance Rebate

This program offers direct financial incentives to motivate customers to use more energy-efficient appliances. The program indirectly encourages market transformation by increasing demand for ENERGY STAR products.

ENERGY STAR New Homes

This program offers builders incentives to construct single-family or multifamily homes complying with ENERGY STAR Homes criteria.
One incentive targets Avista electric or Avista electric and natural gas for space heat and water heat, and a lower incentive targets homes using only Avista natural gas (for both hot water and space heating).

Heating and Cooling Efficiency

This program offers four incentive categories for electric and gas customers seeking to purchase:

- High-efficiency natural gas furnaces or natural gas boilers;
- High-efficiency air-source central heat pumps;
- Ductless heat pumps; and

- Primary heating systems incorporating a variable speed motor.

Weatherization and Shell Measures

This program incents three measure categories, available to residential electric and gas customers with homes heated by an Avista fuel:

- Ceiling and attic insulation (both fitted/batt type and blown-in);
- Floor and wall insulation (both fitted/batt type and blown-in); and
- Upgrades of windows with low u-factors (available only through April 1, 2011).

Water Heater Efficiency

Through this program, Avista offers incentives to gas and electric customers installing a qualifying, high-efficiency water heater. To qualify, water heaters must meet specified efficiency standards.

Home Energy Audit Pilot

This pilot program, launched in May 2010, seeks to determine home energy audits' cost-effectiveness for capturing electric and gas savings. Eligible Avista customers must reside in single-family homes, duplexes, and manufactured homes located in the Spokane area. The program offers energy audits, conducted by Building Performance Institute-certified auditors, at reduced costs to eligible customers. An Energy-Efficiency Community Block Grant, under the American Recovery and Reinvestment Act (ARRA), partially funded this program.

Geographic Saturation Events

Targeting Washington and Idaho electric and gas customers, this program promotes energy-efficiency measures in homes by providing energy-efficiency education, distributing measures (such as compact fluorescent lamps [CFLs] and weatherization products), and promoting options and rebates available through Avista and state programs.

Shade Tree

This program seeks to reduce energy consumption required for cooling by strategically planting large-growing deciduous trees that shade homes from the sun. With a partnership between Avista and Spokane County Conservation District, the program is available to Avista electric customers owning eligible homes in approved geographic areas within Spokane County.

Second Refrigerator and Freezer Recycling

This program, applying to Washington and Idaho electric and electric/gas customers, provides financial incentives to customers recycling refrigerators and freezers. The program seeks to reduce energy consumption by recycling up to two inefficient secondary refrigerators or freezers per home. JACO Environmental, Inc., is the implementation contractor responsible for scheduling, pickup, recycling, rebate payment, and data tracking.

Space and Water Conversions

This program offers incentives for two types of fuel conversion:

- Replacement of electric straight resistance as a primary heat (either electric forced air furnaces or electric baseboard heat), with central, natural gas heating systems or central heat pumps; and
- Replacement of electric water heaters with new, natural gas water heaters.

Simple Steps, Smart Savings Program (CFLs)

Avista sponsors an upstream, buy-down CFL program, administered by the Bonneville Power Authority and implemented by Fluid Market Strategies (FMS). The program, available to electric customers in Washington and Idaho, offers discounted twist and specialty CFLs at most big-box stores.

1.2.2 Process Evaluation Objectives

The residential process evaluation sought to assess the following research areas for each program evaluated:

- Customer participation;
- Trade ally participation;
- Effectiveness of program design and delivery; and
- Opportunities for improvements.

1.2.3 Evaluation Methodology and Information Sources

Cadmus' approach to this portfolio-wide process evaluation relied on three, primary data collection efforts: a document review; in-depth interviews; and telephone surveys of participants and nonparticipants.

Document Review

Cadmus first conducted a document review, consisting of reviewing existing program documentation to develop an understanding of program design, status, and delivery processes. Additionally, this review allowed Cadmus to identify topics of interest for greater focus during the in-depth interviews.

The document review included the following information sources, provided to Cadmus by Avista:

- DSM Business Plans (2010 and 2011).
- EM&V Framework and EM&V Plan (2010 and 2011).
- 2010 DSM Annual Process Report and other key reports (such as PPA Ecotope summary).
- Organization charts.
- Marketing materials
  - Sample newsletters, brochures, information sheets, and other advertising
  - DSM tracking survey results

- 2010 cost-effectiveness analysis spreadsheets.

Program Staff, Implementer, and Trade Ally Interviews

In-depth interviews with program and implementation staff provided detailed insights into design and delivery processes, and allowed clarification of gathered information. In staff interviews, as well as in selecting implementer and trade ally interviewees, Cadmus focused on the high-savings programs such as HVAC and Simple Steps, Smart Savings.

Table 1-5. PY 2010 Residential Interviews

Role	Number of Planned Interviews	Number of Completed Interviews
Avista Program Staff	Approximately 10	15
Simple Steps Implementers	1	2
HVAC Contractors	10	10

Cadmus interviewed 15 members of Avista's program staff, including:

- Demand-side management (DSM) program managers and engineers;
- Planning, Policy and Analysis team members; and
- Marketing team members.

Cadmus conducted these interviews in person and by phone, using a structured interview guide. Where necessary, Cadmus requested clarifying information via phone or e-mail. Topics covered through staff interviews included the following:

- Goals;
- Program design;
- Implementation:
    - Marketing
    - Target markets
- Tracking; and
- QA/QC.

Cadmus also interviewed two implementation staffers at Fluid Market Strategies, the company implementing Simple Steps, Smart Savings. Conducted by phone, these interviews also followed a structured interview guide. Main topics included:

- Goals;
- Implementation processes; and
- Tracking.

To gather information from trade allies, Cadmus conducted a series of telephone interviews with residential HVAC contractors that installed rebated equipment during PY 2010. Over a period of two weeks, Cadmus contacted a total of nineteen contractors and vendors from Avista's trade ally mailing list. Of these, one refused an interview, and eight were unavailable at the time of the call. Cadmus interviewed 10 contractors, using a structured interview guide. Contractor interview data, while not statistically representative of all participating contractors, provided broad anecdotal insights into contractors' experiences by asking questions of multiple contractors. Contractor interviews sought to procure data addressing the following topics:

- Program awareness:
  - Contractor awareness
  - Customer awareness
- Effect of rebates on sales;
- Contractor marketing/outreach; and
- Satisfaction.

Telephone Surveys

Cadmus contracted with market-research firm Discovery Research Group (DRG) to conduct surveys with participants and nonparticipants. To minimize response bias, DRG called customers during various hours of days and evenings (including weekends), and made multiple attempts to contact individual participants. After six unsuccessful calls, contacts were removed from the sample. Cadmus monitored survey phone calls to ensure accuracy, professionalism, and objectivity.

Participant Surveys

Participant telephone surveys offered important insights into program experiences for seven residential programs, exploring the following topics:

- Sources of awareness;
- Satisfaction;
- Awareness of energy efficiency;
- Participation barriers;
- Freeridership and spillover; and
- Customer characteristics.
- Within each program sample, measure distribution proportionally reflected the 2010 program's participant population.[2] Table 1-6 provides details on residential participant survey calls.

[2] For participants installing more than one measure, Cadmus designated one, randomly-selected measure, upon which survey questions focused.

Table 1-6. Residential Participant Details and Survey Sample

	Number of Participants
Total Participants	36,462
ENERGY STAR Appliance Rebate	17,397
Heating and Cooling Efficiency	7,681
Weatherization and Shell Measures	7,775
Water Heater Efficiency	1,362
Home Energy Audit Pilot	268
Second Refrigerator and Freezer Recycling	1,729
Space and Water Conversions	250
Eligible Participants in Call List	16,453
Screened out due to change in occupancy or bad phone number	58
Screened out due to unreachable primary decision maker	273
Completed Surveys	475
Number of Calls Required to Achieve Sample	3,485
Response Rate*	14%
Cooperation Rate**	30%
Sample Size for Analysis	475

* Response rate: the number of customers completing a survey, divided by the number of calls made.

** Cooperation rate: the number of customers completing a survey, divided by the number of customers reached by phone.

Cadmus designed participant survey sample sizes to yield significance at the 90 percent confidence and ±10 percent precision levels in most cases, for program-level survey results. The participant survey sampling plan was based on multiple factors, including feasibility of reaching customers, program participant population, and research topics of interest. Cadmus did not conduct participant surveys with Simple Steps, Smart Savings customers, as this is an upstream program and therefore does not track participant contact information. Similarly, for ENERGY STAR New Homes, Cadmus did not survey residential customers purchasing rebated homes, because the rebates were paid to the builders, not the end-use customers. In the case of Refrigerator Recycling, a larger sample was surveyed to provide sufficient precision and confidence for the estimation of net-to-gross ratios, which will be reported in the forthcoming 2010 Electric Impact Evaluation. As the Water Heater Efficiency Program accounted for a relatively small amount of savings, Cadmus surveyed a smaller sample of its participants, planning for a ±20 percent precision at the 90 percent level.

Table 1-7 shows the number of surveys achieved, and the resulting absolute precision for each program. The precision values listed in these tables were calculated assuming that the reported proportion was 50 percent, so the results reported in this evaluation have at least this level of confidence and precision.

Table 1-7. Participant Survey Sample Sizes and Precision Estimates by Program

Program	Total Program Participants	Survey Respondents	Absolute Precision at 90% Confidence
ENERGY STAR Appliance Rebate	17,397	73	±9.7%
Heating and Cooling Efficiency	7,681	72	±9.7%
Weatherization and Shell Measures	7,775	70	±9.9%
Water Heater Efficiency	1,362	20	±19.1%
Home Energy Audit Pilot	268	64	±8.0%
Second Refrigerator and Freezer Recycling	1,729	133	±6.6%
Space and Water Conversions	250	43	±10.7%
Overall	36,462	475	±3.7%

Cadmus combined residential survey data files from each program to produce overall results for the portfolio of residential programs with surveys conducted. As each sample represented program populations of different sizes, we developed a weighting scheme, resulting in the combined residential data file representing the portfolio as a whole.

Established design weights for each program accounted for under- or overrepresentation by weighting respondents up or down, based on their program; so the combined residential data file represented each program proportionately to its representation in the overall participant population. Table 1-8 shows the weighting scheme, applied only when reporting combined results (not when reporting program-level results).

Table 1-8. Participant Survey Sample Design Weights by Program

Program	Proportion of Total Participant Population	Proportion of Total Survey Respondents	Program Weight
ENERGY STAR Appliance Rebate	48%	15%	3.10
Heating and Cooling Efficiency	21%	15%	1.39
Weatherization and Shell Measures	21%	15%	1.45
Water Heater Efficiency	4%	4%	0.89
Home Energy Audit Pilot	1%	13%	0.05
Second Refrigerator and Freezer Recycling	5%	28%	0.17
Space and Water Conversions	1%	9%	0.08

Nonparticipant Surveys

Cadmus conducted telephone surveys with Avista residential customers not participating in the programs with the nonparticipant survey call list including randomly selected gas and electric customers not participating in programs during 2010 or 2011. Nonparticipant surveys collected the following information:

- Program awareness;
- Participation barriers;
- Awareness of energy efficiency; and
- Customer characteristics.

- The study selected nonparticipants by using screening questions that identified customers purchasing items or taking action that could have been eligible for rebates without applying for one. This included customers purchasing standard-efficiency versions of rebated measures. Table 1-9 details residential nonparticipant survey results.

Table 1-9. Residential Nonparticipant Details and Survey Sample

	Quantity
Eligible Participants in Call List	2,256
Screened due to changes in occupancy or bad phone numbers	71
Completed Surveys	70
Number of Calls Required to Achieve Sample	1,748
Response Rate*	4%
Cooperation Rate**	8%
Sample Size for Analysis	70

* Response rate: the number of customers completing a survey, divided by the number calls made.

** Cooperation rate: the number of customers completing a survey, divided by the number of customers reached by phone.

Nonparticipant surveys results have been reported in aggregate to reflect behaviors and attitudes of all Avista nonparticipant residential customers.

1.2.4 Organization of Key Findings

The Key Findings section is organized into the following major topic groups:

- Program Participation (Section 1.3.1)
- Program Design (Section 1.3.2)
- Data Tracking (Section 1.3.3)
- Marketing and Outreach (Section 1.3.4)
- Participant Experience and Satisfaction (Section 1.3.5)
- Effectiveness of Implementers (Section 1.3.6)
- Trade Ally Participation and Satisfaction (Section 1.3.7)

The Key Findings discussions report objectively on research findings, while a separate final section summarizes Cadmus' conclusions and recommendations.

1.3 Key Findings

The following sections present key 2010 residential process evaluation findings. Each section focuses on a particular topic, and draws from multiple data sources, as noted in the text.

1.3.1 Program Participation

For this part of the analysis, Cadmus used several of the data sources listed above. Specifically, Cadmus used Avista's *2010 DSM Business Plan* to define each program's goals, and a summary of 2010 results,[3] comparing actual participation to those goals. Additional information about participants and nonparticipants derived from customer surveys.

Savings and Incentives

Table 1-10 provides unverified savings reported for each program, comparing those savings to Business Plan targets. This does not include the Home Audit program, as savings from that program have been included in other programs' totals.[4]

Table 1-10. Reported Savings and Comparison to Business Plan Goals

	2010 Reported Results (Annual Report Summary)		Reported Results / Business Plan		
Residential Program*	Savings kWh	Savings Therms	Savings kWh	Savings Therms	Incentive
Simple Steps / CAL	8,010,982		167%		191%
Weatherization (Shell)	6,359,099	553,783	126%	116%	111%
HVAC Efficiency	6,157,826	483,975	77%	135%	115%
Fuel Conversion	1,802,454		84%		125%
Energy Star Appliances	1,785,477	44,400	168%	166%	172%
Refrigerator Recycling	1,140,936		56%		53%
Geographic Saturation	433,240		135%		104%
Energy Star Home	406,011	32,822	110%	198%	159%
Water Heating	175,812	12,010	148%	167%	173%
Total	26,271,837	1,126,990	110%	167%	122%

* Note: This does not show the Shade Tree program (planning estimate of 100 trees at approximately 2,088 kWh in savings). Results were not included in the Annual Report. The participant database showed 77 trees plantings achieved.

As shown on the "Total" line, according to program-reported results, the residential programs exceeded Business Plan goals for kWh and Therm savings. Most energy benefits accrued from just a few programs. For example, of total kWh savings, the Simple Steps, Weatherization, and HVAC Efficiency programs delivered 78 percent. Similarly, the HVAC and Weatherization programs resulted in 92 percent of Therm savings.

As savings and incentives closely correlate for residential programs, it was not surprising most programs had higher incentive costs than planned. For kWh savings, a few exceptions stood out, such as the HVAC Efficiency program and the Fuel Conversion program, with incentive payments over 100 percent and kWh savings below 100 percent.

For the HVAC program, original per-unit kWh savings estimates for some heat pump measures were reduced significantly. Consequently, average savings per measure over the entire HVAC program dropped by 33 percent (from 2,435 kWh to 1,642 kW per HVAC measure). Similarly, Avista reduced per-unit kWh savings for conversion from an electric to a gas furnace by more

[3] Avista provided the summary spreadsheet: *2010 annual report 8_31_11 version 1.xls*

[4] Because savings are unverified, drawn from Avista's annual cost-effectiveness reporting, this analysis serves only to examine relative scale and general performance issues, rather than definitively to assess achievement of goals.

than 50 percent. Savings and incentives also did not move in tandem for the lighting programs—Geographic Saturation and Simple Steps. Although Cadmus did not have the measure detail required to analyze these results, we did not consider this as an issue in evaluating the program processes at this point. The 2010 electric impact evaluation will perform further analysis of these programs.

Three programs—Refrigerator Recycling, Home Audit, and Shade Trees—which did not achieve their savings or measure quantity goals are discussed in the review of measure participation, below.

Measure Quantities

Table 1-11 provides measure quantities reported for each program, and compares them to Business Plan targets. Similarly to results for savings and incentives, most residential programs exceeded Business Plan goals.

Table 1-11. Reported Measure Quantities and Comparison to Business Plan Goals

Residential Program	Reported Measure Quantity	Reported Results / Business Plan
Energy Star Appliances	17,398	172%
Energy Star Home	203	166%
HVAC Efficiency	7,684	124%
Weatherization (Shell)	7,770	125%
Water Heating	1,362	145%
Fuel Conversion	250	150%
Geographic Saturation	18,150	182%
Simple Steps / CAL	358,151	239%
Shade Trees	77	77%
Refrigerator Recycling	1,843	53%
Home Audit (E)	268	13%

In the case of the HVAC efficiency program, two measures—variable speed motors and high-efficiency gas furnaces—exceeded original targets by 398 units (or 21 percent) and 1,010 units (or 35 percent), respectively. These two measures comprise nearly all of the 1,500 units by which the program exceeded its 2010 objective.

JACO Refrigerator Recycling, Home Audit, and Shade Trees did not reach plan participation targets. Of these, only the JACO program was expected to deliver significant savings in 2010; so its performance raised concerns, from both process and impact perspectives. Avista identified these 2010 performance issues, and worked with JACO to set an achievable target for 2011. They also developed plans for additional marketing activities, designed to increase participation.

In 2010, the Home Audit program was a pilot. The program's substantial *2010 Business Plan* targets included: 2,000 participants; 3.9 million kWhs; 94,000 Therms; and a $450,000 incentive budget. Avista described these as placeholder values, not intended to be actual objectives. Cadmus also identified some issues with tracking audit program results, discussed in Section 1.3.3.

Given its small size, no further evaluation effort has been directed toward the Shade Tree program, a local partnership.

Multiple Rebates

Besides looking at total measure quantities, we analyzed the participant database to determine how many Avista customers applied for and received multiple rebates. Table 1-12 shows the results, which exclude participants in the lighting and Refrigerator Recycling programs. Analysis indicates 25 percent of participants received two or more rebates.

High-efficiency furnaces and variable-speed motors were the measures most frequently combined (1,133 instances). The next most common combinations were refrigerators and dishwashers (415 instances), and high-efficiency furnaces and heat pumps (387 instances). The latter measure combination proved to be of special interest, as gas and electric savings resulting from these measures installed *together* may differ from savings resulting from the measures installed on their own. Understanding common measure combinations may also allow for more effective marketing and training of trade allies.

Table 1-12. Number of Measures Installed

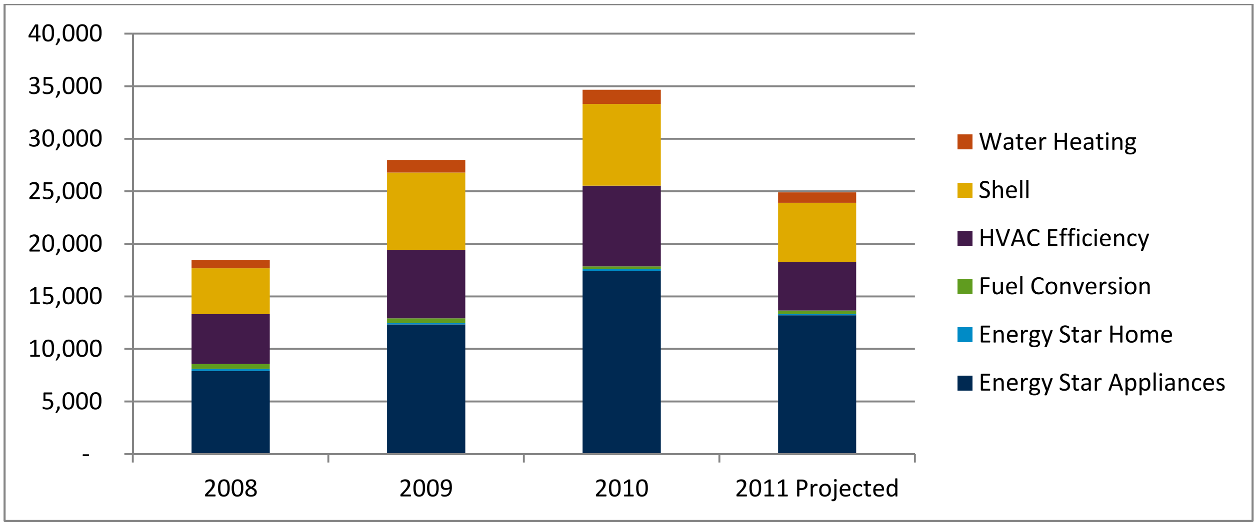
Total Number of Measures	Participants
1	19,076
2	4,415
3	1,304
4 or more	504
Total Participants	25,299

Participation Trends

At the program level, Cadmus combined historical participation data from 2008 through the first eight months of 2011.[5] These data, shown in Figure 1-1, clearly indicate increased participation from 2008 to 2010, with somewhat lower projected participation levels in 2011.

[5] Cadmus projected full-year participation for 2011 by assuming a linear participation trend for the remaining four months of the year.

Figure 1-1. Reported Number of Rebates by Program: 2008—2011



While several explanations may account for the 2011 participation decline, Avista staff reported a major driver of the change was the expiration of Federal and State tax credits for energy-efficiency renovations and high-efficiency appliances offered under the American Recovery and Reinvestment Act of 2009. Staff members reported these tax credits prompted increased participation in 2010, and 2011 participation slowed without that influence. This effect appeared particularly noticeable in the ENERGY STAR Appliance rebate program, HVAC program, and weatherization measures.[6] Cadmus collected survey data on the factors motivating participants to purchase their rebated equipment, and less than 1 percent of respondents reported tax credits as a primary motivator in 2010. While this finding does not indicate tax credits had a primary influence on participation, participants may have been influenced by multiple factors, including availability of tax credits.

Cadmus collected additional data to examine the natural turnover rate in certain appliances, as presented in Table 1-13. Though these data were insufficient to characterize the appliance market with any precision, they provided a rough approximation of how much potential remained for these three appliance rebate programs in 2010. Cadmus estimated the potential annual turnover of each appliance type assuming that each of Avista's 317,443 residential customer households owned each of these appliances. By dividing number of households by measure life, and assuming that all appliances are replaced on burnout with a new appliance, Cadmus arrived at the estimated turnover. Using number of 2010 participants divided by potential annual turnover, Cadmus estimated a participation rate.

[6] This trend has also been reported in other jurisdictions in the United States.

Table 1-13. Potential Annual Appliance Turnover and 2010 Participation*

Appliance	Measure Life*	Potential Annual Turnover**	Number of 2010 Rebates	Participation Rate	ENERGY STAR Market Share***
Clothes Washer	14	22,675	7,533	34%	30%
Dishwasher	12.3	25,808	4,466	18%	78%
Refrigerator	20	15,872	4,919	31%	34%

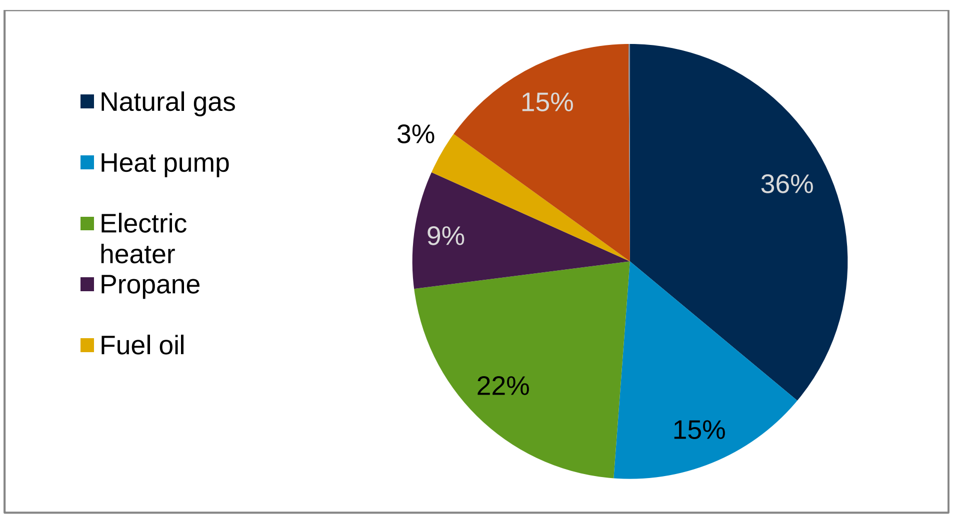
*Measure lives from Regional Technical Forum.
**Potential Annual Turnover based on 317,443 Avista residential customers in Washington and Idaho.
***ENERGY STAR annual market share from www.energystar.gov

ENERGY STAR dishwashers showed very different market characteristics compared to the other two measures. The high market share of ENERGY STAR dishwashers, combined with the relatively low 18 percent participation among customers who presumably replaced a dishwasher in 2010, indicated only a small portion of customers bought non-ENERGY-STAR dishwashers. This is consistent with national market trends, given that very few non-ENERGY-STAR dishwashers are available. This finding implies that freeridership for this measure is likely to be very high. It also shows that Avista's rebate is unlikely to affect market transformation for this measure.

Participant Characteristics

Weighted overall participant survey responses indicated 88 percent of program participants lived in single-family homes, while 11 percent lived in mobile or manufactured homes, and less than 1 percent lived in apartments or condominiums. Ninety-three percent owned their properties. When asked to describe the areas where they lived, 50 percent of participants said rural, 29 percent said suburban, and 21 percent said urban.

Figure 1-2. Participant Primary Heating Type (n=462)

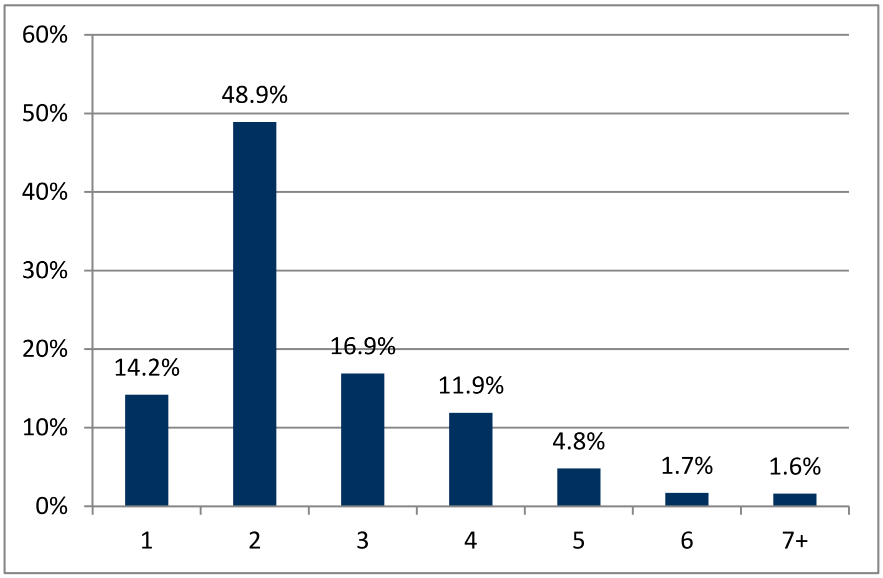


As shown in Figure 1-2, 36 percent of participants primarily heated their homes with natural gas, 22 percent with electric heaters, 15 percent with heat pumps, and 15 percent with wood. Forty five percent said they did not use additional heating. Of those using additional heating, 39 percent used electric heaters, 20 percent used wood, 14 percent used propane, 13 percent used natural gas, and 8 percent used heat pumps.

Participants asked how they cooled their homes most commonly cited central air conditioning (37 percent), followed by opening windows in the mornings and evenings (22 percent).

The survey asked respondents how many people lived in their households, with nearly half of participant survey respondents (49 percent) reporting two-person households. As shown in Figure 1-3, the other most common responses included: three people (17 percent), and one person (14 percent).

Figure 1-3. Participant Household Size (n=450)



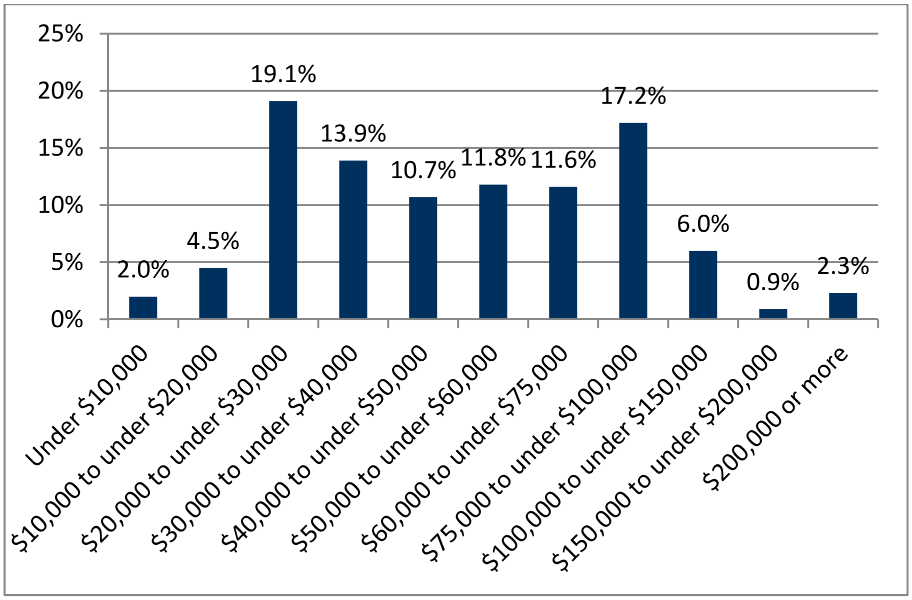
As shown in Table 1-14, respondents described the ages of the people living in their households, with 65 percent having at least one person between the ages of 19 and 60, and 47 percent having at least one person over 60. Fewer households had children or teenagers, with 20 percent having one or more persons between six and 18, and 14 percent having at least one child under six years old.

Table 1-14. Participant Household Composition by Age Category (n=319)

Age Category	Percent of Respondents with at Least One Member
Under 6	14.4
Between 6 and 18	19.6
Between 19 and 60	65.2
Over 60	47.4

For 2010, 49 percent reported their 2010 pre-tax household income at less than $50,000, while 51 percent reported their pre-tax income at $50,000 or above. Figure 1-4 shows a more specific range of respondents' incomes.

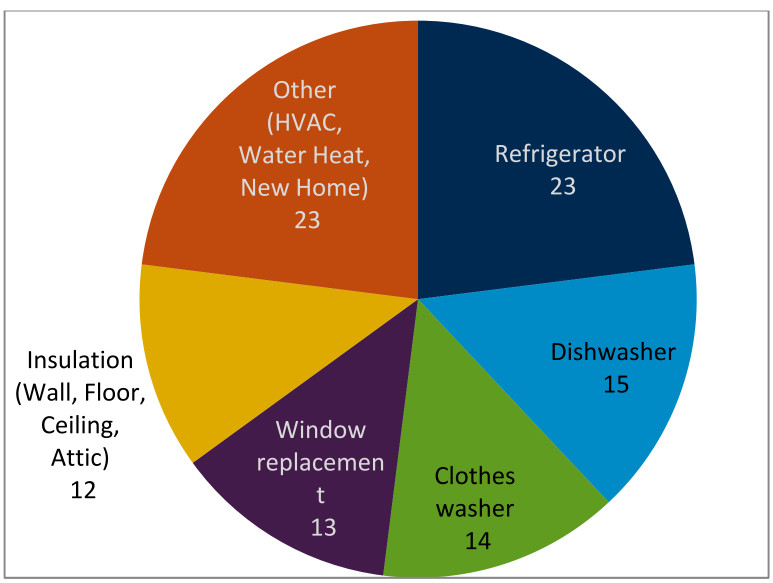
Figure 1-4. Participant Household Income (n=384)



Nonparticipant Characteristics

Figure 1-5 shows distributions of measures among surveyed nonparticipants, resulting from randomly dialing Avista residential customers, and reflecting the rate at which such purchases occurred without intervention from Avista. Appliances made up approximately half the measures installed, aligning with high participation in the ENERGY STAR appliance rebate program. Following appliances, weatherization and HVAC measures were the measures most commonly installed.

Figure 1-5. Measures Installed by Nonparticipants (n=70, multiple responses allowed)



Nonparticipant survey data indicated 67 percent of nonparticipants were aware Avista offered rebates for purchasing and installing energy-saving equipment. When asked why they did not apply for energy-efficiency rebates, respondents listed not knowing how to apply as the number one reason (27 percent, n=18), followed by not purchasing any energy-efficient equipment (18 percent, n=12), and not being aware of the rebate (17 percent, n=11). Figure 1-6 shows these results.

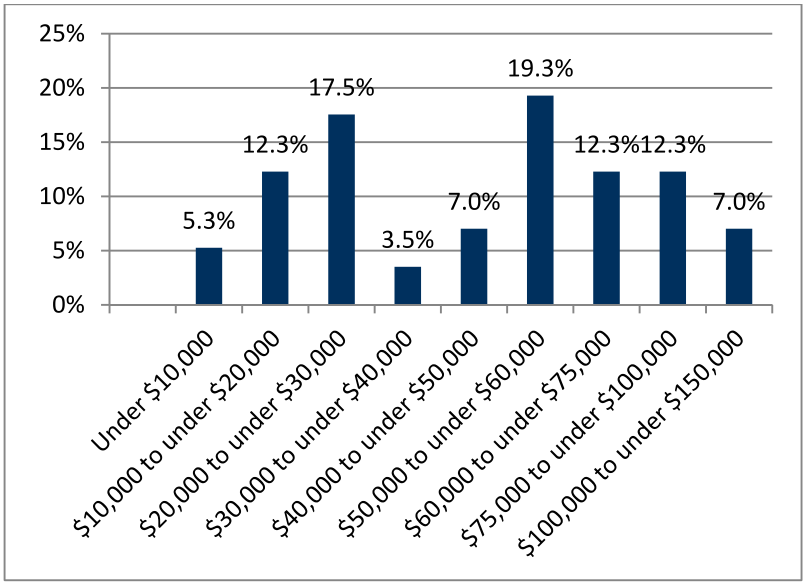
Figure 1-6. Reasons for Nonparticipation (n=66)

Fourteen respondents gave other reasons for not participating in the rebate program. These included: being too late to apply for a rebate (n=2); not thinking what they bought qualified for a rebate (n=2); having all appliances included when they bought a new house (n=2); and being the owner of their house (n=2).

Seventeen percent (n=12) of nonparticipant respondents said they had received Avista rebates previously, and 54 percent (n=38) thought they would apply for energy-efficiency rebates in the near future. The 27 respondents who said they did not think they would apply for energy-efficiency rebates in the near future listed several reasons, though mainly that they did not need or had no plans to buy new appliances (n=16), and that they could not afford new appliances (n=3).

Demographic data about nonparticipant household size and age composition yielded similar results for the participant population. Data collection on income, however, showed a slightly different pattern, as shown in Figure 1-7. Compared to participants, a smaller percentage of nonparticipants earned between $30,000 and $50,000. Likewise, a smaller percentage of nonparticipants earned more than $75,000.

Figure 1-7. Nonparticipant Household Income (n=54)



Program Participation Findings Summary

- Participation, in terms of reported savings and measure quantities, exceeded 2010 Business Plan goals for the overall residential program group. Three programs—Simple Steps, Shell, and HVAC Efficiency—delivered 78 percent of kWh savings, and two—HVAC and Shell—were responsible for 92 percent of Therm savings.
- The HVAC Efficiency and Conversion programs exceeded their measure quantity goals, but fell short of their kWh savings goals due to significant reductions in expected savings per unit for some measures during the program year. According to Avista's reported savings, the HVAC program exceeded its Therm savings goals.
- Participation in the JACO Refrigerator Recycling program fell significantly below Business Plan objectives. Avista has reviewed this with JACO, and has taken actions to increase future participation, including an increase in marketing activity.
- Twenty-five percent of program participants installed multiple measures. Combinations most frequently occurring included: gas furnace/variable speed motor; refrigerator/ dishwasher; and gas furnace/heat pump.
- Overall annual residential participation increased steadily from 2007 to 2010, but 2011 participation is projected to be lower than 2010.
- Sixty-seven percent of nonparticipants knew of Avista's energy-efficiency rebate programs.

1.3.2 Program Design

Overview

This section discusses our observations regarding design of the Avista residential programs.[7] These observations focused on the definition and organization of programs, the logic model, and the implementation approach.

Overall, we found the residential programs' design worked well. As evaluators, we could quickly and easily understand each individual program and the aggregate portfolio. Avista clearly documented the residential programs in the 2010 Business Plan, reporting results in the participant database and cost-effectiveness files. Avista program staff, EM&V staff, and trade allies also could discuss each program with us. As noted in the review of Avista's reported participation, above, most programs significantly exceeded 2010 goals. In all these areas, the programs operated smoothly, with few major issues.

One program design issue became apparent as we worked on this evaluation: the definition of programs composing the residential portfolio. As various Cadmus staff worked to understand the portfolio, the portfolio varied, depending on perspectives or purposes of documentation. Table 1-15 shows several examples of such variations. Though not a major problem, this required some effort to understand and reconcile the various descriptions.

Table 1-15. Alternative Descriptions of Residential Programs

Document / Context	Description
Business Plan	11 General Programs, 2 Multifamily, 1 Distributed Generation, 1 Schools
Avista management	3 Managers, 5 Program Groupings
Marketing	5 Programs: Home Improvement, New Homes, JACO, Simple Steps, Audit
Internal tracking	6 Programs / 36 Measures X 2 States (CONV, ESH, ESP, HVAC, WH, WZN)
2010 Residential Electric CE	19 Programs (9 Programs X 2 States) + HEA
2010 Residential Natural Gas CE	10 Programs (5 Programs X 2 States)

Logic Model and Process Flow

Cadmus developed two logic models to describe the residential programs, presented in Figure 1-8 and Figure 1-9.

[7] Other topics studied for this evaluation also provide insight into program design, as discussed elsewhere in the report. For example, participation and customer satisfaction reflect the effectiveness of program design, but the report includes these findings in standalone sections.

Figure 1-8. Residential Electric-Only Program Cluster Logic Model

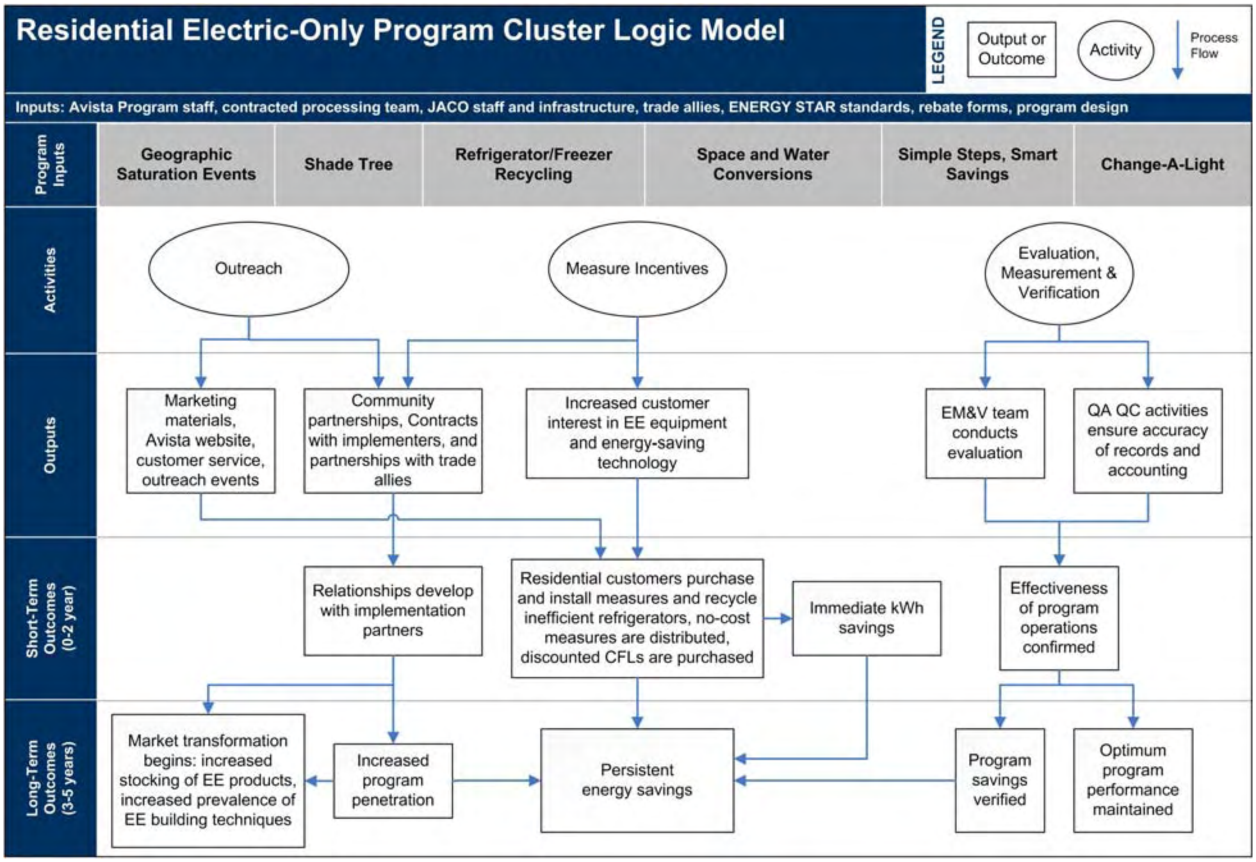
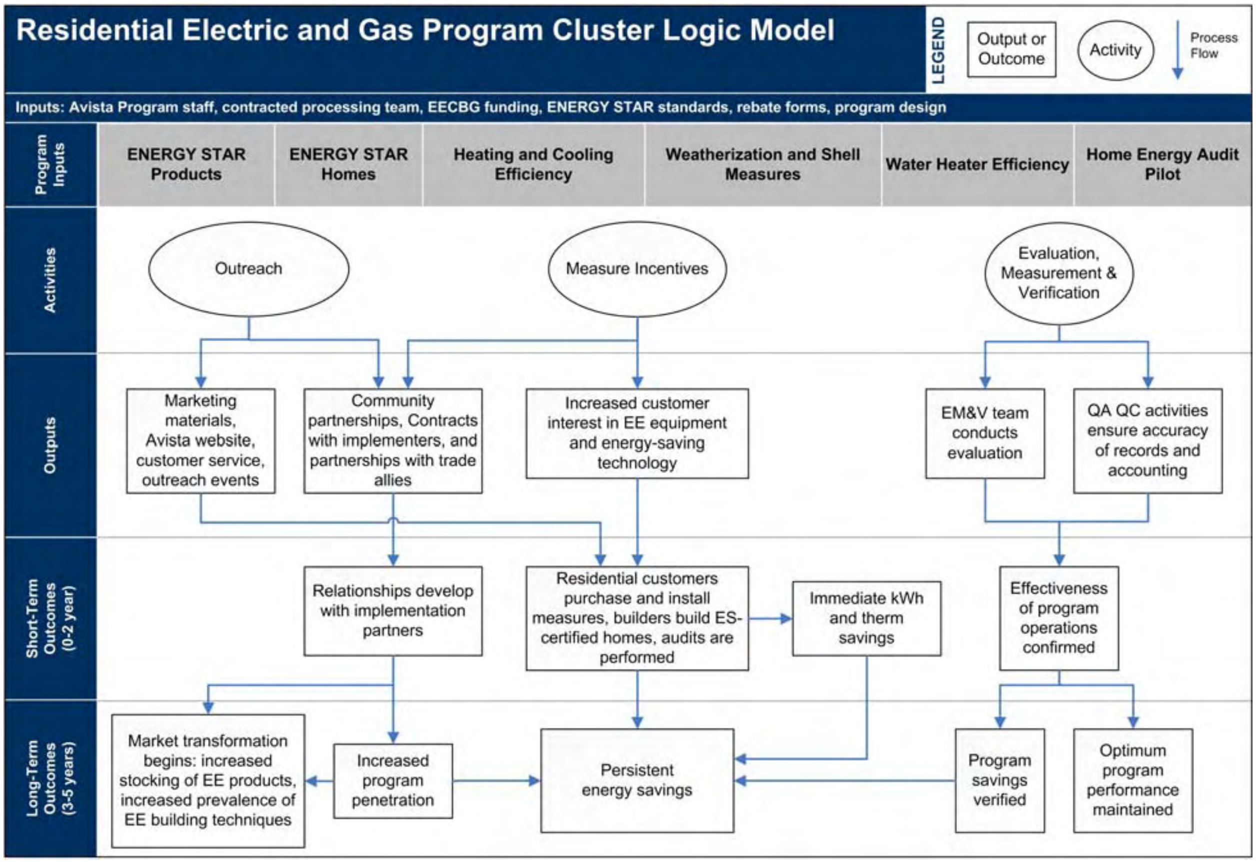
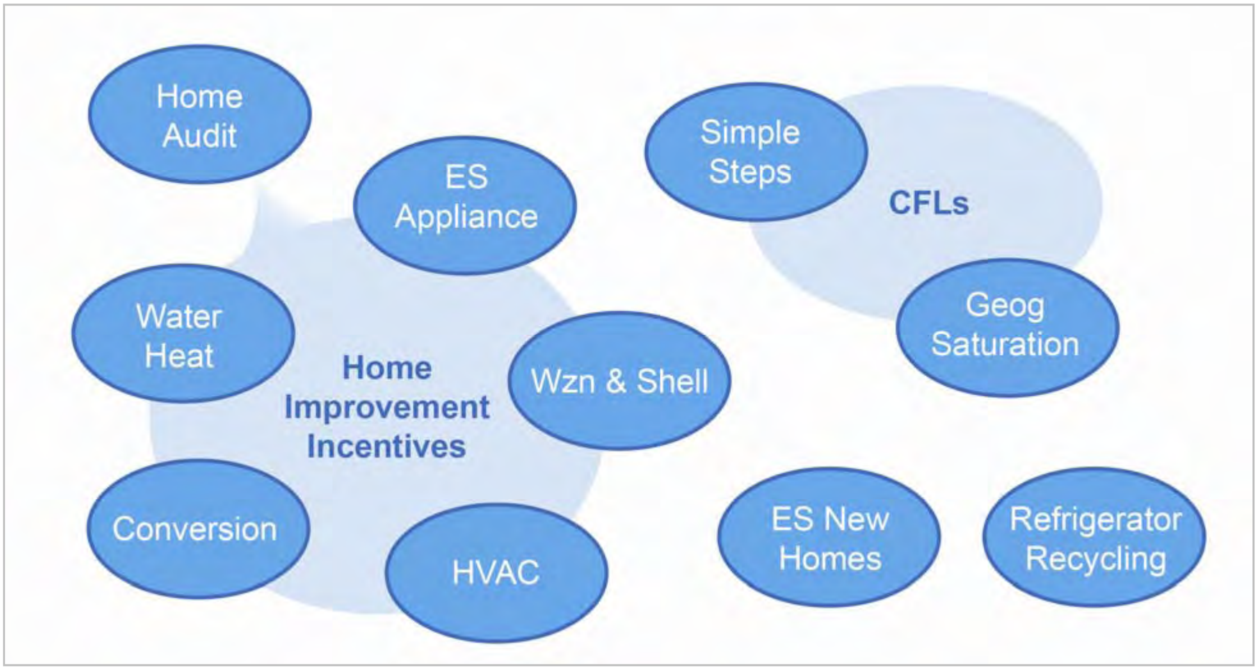


Figure 1-9. Residential Gas and Electric Program Cluster Logic Model



While the logic models show programs grouped by primary fuels saved (natural gas or electricity), Cadmus identified an alternative method for grouping programs, which may prove useful for future evaluations or reorganizations of residential programs. As shown in Figure 1-10, these groupings have been based on each program's delivery strategy and type of service provided to customers.

Figure 1-10. Functional Program Groupings



The first main grouping includes the Home Improvement Incentives (including heating and cooling, weatherization, water heat, and conversion measures) and the ENERGY STAR Appliance Rebates. These programs, while tracked individually, provide similar services to customers, offering rebates for purchases of efficient equipment for residential homes. The Audit program relates to this grouping, since it refers customers to Home Improvement Incentives.

The second grouping includes the two major CFL programs: Simple Steps, Smart Savings; and Geographic Saturation Events. These programs employ different delivery mechanisms (upstream buy-down vs. direct giveaway), but both endeavor to transform the residential lighting market by encouraging customers to use CFLs rather than incandescent light bulbs.

The two programs functioning externally to these groupings—Refrigerator Recycling and ENERGY STAR New Homes—have distinctly different delivery mechanisms and goals, setting them apart from the rest of the residential portfolio. (The Refrigerator Recycling program provides customers with a used appliance pick-up service, and the New Homes program targets homes builders, rather than residential customers.) For those reasons, they can be regarded as independent programs, rather than programs functioning as part of a group.

The Shade Tree program has been excluded from this portrayal because Avista plans to discontinue the program.

Implementation Approaches

The evaluation also examined Avista's implementation approach. The residential portfolio includes programs Avista administers, programs third-party firms administer, and programs operated as partnerships. This section summarizes our observations regarding Avista's implementation decisions for each residential program.

Avista administers most of the residential programs, including five in the Home Improvement group, the ENERGY STAR Homes program, Geographic Saturation, and Home Audit. Avista values its direct control over these programs, most of which, as noted, exceeded business objectives in 2010. As Cadmus did not study Avista's costs in administering these programs, this report does not address their relative efficiency. Though the programs could be outsourced, no compelling reason has emerged for Avista to consider making such changes at this time.

Avista does outsource two programs: the Simple Steps upstream CFL program and the Refrigerator Recycling program. The CFL program is outsourced to FMS, a firm engaged by the Bonneville Power Administration (BPA) to manage this program for regional utilities choosing to participate. BPA independently evaluates this program, and Avista should have access to its reports in this regard. Avista is able to leverage the regional coordination that FMS and BPA provide, offering a stronger negotiating position with lighting manufacturers than that achieved by a single utility. Administration costs also should be lower, as FMS/BPA can spread expenses over several utilities.

Avista outsources the Refrigerator Recycling program to JACO, a vendor implementing this program for many utilities throughout the U.S. and Canada (including PacifiCorp, in areas adjacent to Avista's service territory). Many evaluations (including some by Cadmus) of JACO-implemented programs for other utilities, have found they have unique expertise and effectively market and administer these appliance recycling programs.

Avista does much of the work necessary to support the Home Audit program, the larger of two community partnerships—funded in part by an Energy Efficiency Community Block Grant (EECBG), and operated with Spokane County and the City of Spokane Valley. Although this program requires significant staff resources, Avista has gained valuable experience through its administration. The smaller community partnership, Shade Trees, operates as a partnership with the City of Spokane. Due to its modest size, this evaluation does not address it in detail.

Program Design Findings Summary

- Overall program design works well to deliver a range of end-use measures to residential gas and electric customers.
- The number and description of programs in the Avista residential portfolio varies, depending on the documentation's perspective or purpose.
- From a functional perspective, programs can be organized into five distinct groups: Home Improvement, Lighting, Community Partnerships, Refrigerator Recycling, and New Homes.
- Avista's reported program results supported implementation decisions. Most programs administered by Avista exceeded 2010 participation goals. Simple Steps and Refrigerator Recycling, outsourced to firms with specialized expertise, realized some economies of scale.

1.3.3 Data Tracking

Avista provided Cadmus with tracking data for each residential program evaluated. These data derived from four separate mechanisms:

- Internal, multiprogram tracking database;
- Home Energy Audit tracking spreadsheet;

- JACO Refrigerator Recycling database; and
- Simple Steps, Smart Savings reporting.

Cadmus examined each database to determine data tracked, and to assess the data-tracking processes' effectiveness. The assessment also sought to identify potential evaluability barriers presented by contemporary tracking processes.

Data Tracking Summary

The internal, multiprogram tracking database included participant, measure-level data for the following programs:

- Space and Water Conversions
- ENERGY STAR New Homes
- ENERGY STAR Products
- HVAC
- Water Heat
- Weatherization and Shell

The extract examined contained 26 variables, containing the following five kinds of information:

- Measure and program designation (*code*, *measure*, *fuel*, *program*).
- Payment and savings (*rebate*, *kWh*, *Therms*, *cost*).
- Customer information (*account*, *customer*, *dir*, *house#*, *street*, *st sfx*, *unit*, *rural*, *city*, *state*, *zip*).
- Process date-stamps (*entry date*, *pmt date*).
- Customer phone numbers (day area code, day phone ext, day phone#, home area code, home phone).

The internal, multiprogram database serves as the electronic repository for customer data collected from program application forms, including data for programs Avista implements internally (excepting the Home Energy Audit Pilot Program, which is tracked in a separate database).

The Home Energy Audit Pilot Program tracking spreadsheet contained the following variables, providing limited information on participating customers:

- *AuditPrefix*
- *Audit #*
- *Customer Name*
- *Address*
- *Zip*

- *Phone*
- *Account #*
- *Audit Date*
- *E-mail Address*

The Home Energy Audit database format differs from the internal, multiprogram database. For example, in the Home Energy Audit database, the address field contains participant home addresses, but the address formatting does not appear standardized. This limits the data's usefulness, as nonstandardized addresses can be difficult to match to standardized addresses (such as those tracked in the multiprogram database). The Home Energy Audit data provided did not contain tracking of testing performed, recommendations, direct installation measures, or follow-through installations.

JACO, the implementer of the Refrigerator Recycling Program, also collected data on participating customers, their pickup orders, and refrigerators and freezers recycled through the program. These data are provided in three separate, integrated spreadsheets, allowing comprehensive tracking of customers' and units' movements through the program. Avista provided Cadmus with unit and customer data. The customer data contained addresses in a nonstandard format, similar to that of the Home Energy Audit database.

Finally, Cadmus received data on the Simple Steps, Smart Savings program. This program tracks monthly reporting from FMS. Both Avista and FMS noted monthly reporting for this program often involved delays and adjustments, caused by difficulties in obtaining sales data from retailers in a timely manner. FMS monthly invoices contained detailed data at the measure level, reporting adjustments to previous months, and current monthly sales at each participating retailer by Stock Keeping Unit code (SKU). Each monthly invoice included two spreadsheets, Sales Data Adjustments and Sales Data, containing the following, multiple data fields:

- *Store*
- *Address*
- *Manufacturer*
- *SKU*
- *PTR Code*
- *Allocation*
- *Sales Month*
- *Sales Adjustment*
- *Prior Month Unreported Sales*
- *kWh Savings*
- *Incentive Amt*
- *Admin Fee*

- *Total*

Aggregated into a final annual report, these data showed adjustment totals, made after the program year's close. Neither Avista nor FMS provided an aggregated year-end database of measure-level data.

Data Tracking Findings Summary

- Avista and its implementers tracked 2010 program data for all 11 programs Cadmus evaluated.
- Cadmus identified inconsistencies in formatting (e.g., customer addresses formatted differently) and detail levels between the four main tracking mechanisms.
- The 2010 Home Energy Audit Pilot Program database did not include data on measure installation.
- Simple Steps, Smart Savings data tracking and reporting involved multiple revisions, and year-end reporting did not contain aggregated, measure-level data.

1.3.4 Marketing and Outreach

Avista marketed its residential programs through multiple channels during the 2010 program year. Cadmus' examination of marketing materials included reviewing information available online as well as examples Avista provided of print and other media pieces. Further, Cadmus interviewed marketing team members to understand processes, approaches, areas of achievement, and possibilities for improvements.

Marketing Approaches and Processes

Avista pursued the following marketing channels to promote residential programs in 2010:

- Direct mail
- Bill inserts
- Newspaper advertisements and articles
- Television and radio advertisements
- Billboards
- Online advertisements
- Website
- Brochures
- Newsletters
- Events
- Social media outreach

The Every Little Bit campaign, launched in the fourth quarter of 2007, is a broad-based marketing and outreach campaign, raising customer awareness of energy-efficiency and the availability of rebates. The campaign was launched after Avista conducted a residential baseline survey to identify barriers to purchasing efficient equipment. Marketing efforts included program-specific messages as well as more general messages about energy conservation.

In addition to these efforts, Avista engages in various community and public relations outreach activities, including:

- News segments: "Test Your Energy IQ";
- Movie theater advertising;
- Energy education program in elementary schools;
- College outreach;
- Every Little Bit video competition in high schools; and
- Energy education for seniors through community programs.

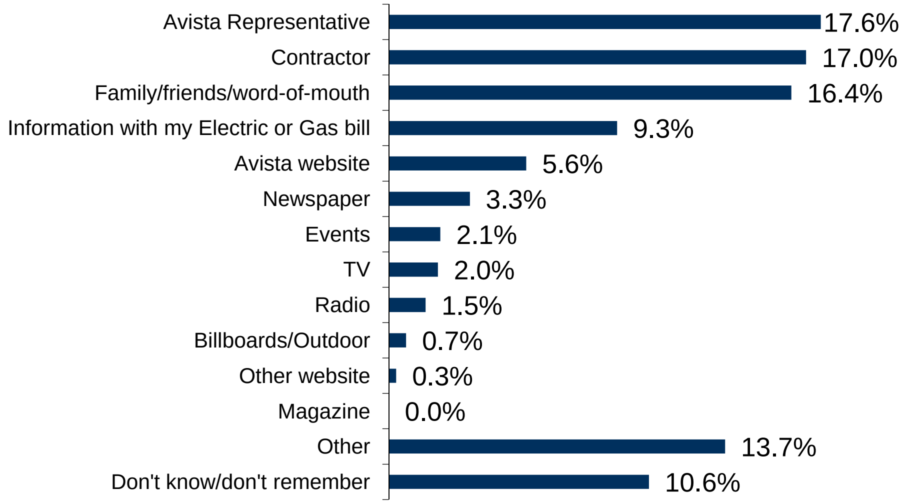
The approach targets broad marketing and outreach, covering many different types of customers. Marketing team members reported that, while awareness increased over time, some age groups proved easier to reach than others. Awareness among customers aged 45 to 55 ran high, while reaching younger customers proved more challenging.

The marketing team reported working closely with program managers and senior management, including presenting new marketing pieces and soliciting feedback from program managers. The team also reported working very closely with DSM engineers to ensure all numbers cited in marketing materials were correct.

Sources of Participant Awareness

The participant survey asked respondents how they first learned of the Avista program in which they participated. The results, summarized in Figure 1-11, show most participants reported learning about the programs through direct communication with Avista representatives, contractors, or friends and family.

Figure 1-11. How Respondents First Heard of Program



Within individual programs, information provided with electric or gas bills proved an especially important source for the Refrigerator Recycling Program (26 percent, n=35) and Audit program participants (20 percent, n=13), though less important for the other programs. The Refrigerator Recycling and Audit programs also achieved high response rates through the Avista Website and through newspapers. The 72 HVAC primary program participants most frequently (33 percent, n=22) learned of the program through contractors, and retailers served as a major source for the 73 ENERGY STAR Appliance participants (16 percent, n=12). Respondents indicated word-of-mouth, contractors, and Avista representatives across categories.

After weighting the responses, 35 percent of respondents felt "very knowledgeable" regarding energy efficiency and saving energy in the home, and 59 percent felt "somewhat knowledgeable Eighty-one percent expressed familiarity with the ENERGY STAR standard for appliances and other products, and 84 percent looked for the ENERGY STAR label when buying new products.

The survey asked 171 respondents to recall messages or themes of advertisements they saw. After weighting these responses, 41 percent said they did not recall, with the other top responses being generic, such as: rebate program (24 percent); energy conservation (16 percent); and flyers in statements or bills (11 percent). Two percent of participants cited the "Heat" television spot; one respondent cited the "Nickel Buyback" program; and another participant cited "Every Little Bit."

Fifty-one percent of respondents knew of Avista's other energy-efficiency rebates, though not at a consistent rate across all programs. HVAC, ENERGY STAR Appliance, and Refrigerator Recycling participants' awareness rates all ran about 50 percent; for the Audit, Conversion, Water Heater and Weatherization programs, at least 60 percent of participants knew of other rebates.

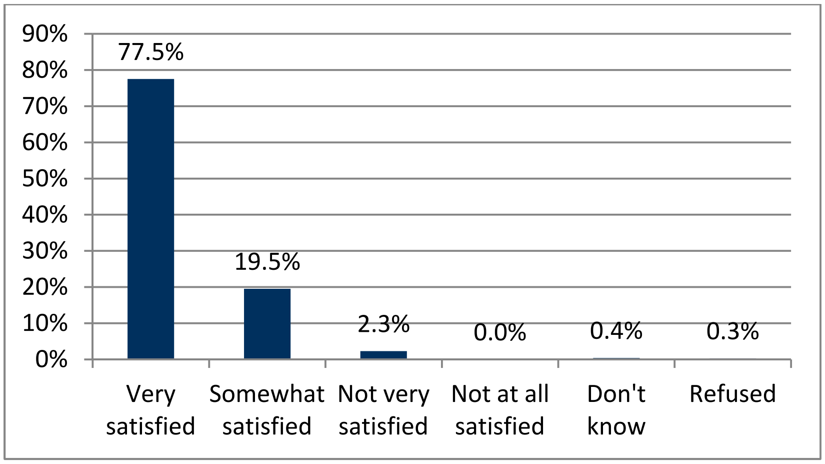
Marketing and Outreach Findings Summary

- High awareness among nonparticipants indicates that the overall marketing approach has been effective in awareness-building, but the messaging has not overcome participation barriers.
- Since 2007, Avista has promoted residential rebate programs through the Every Little Bit campaign, and the 2010 residential marketing approach included varied marketing and outreach channels, seeking to reach a broad range of customers.
- Survey results showed Avista representatives served as the most common source for participants learning about the rebate program.
- Contractors were the second most frequently reported source of program information for participants, indicating that trade allies play a key role in program marketing.
- Participant awareness of Avista's other rebate programs was higher among Audit, Conversion, Water Heater, and Weatherization programs.

1.3.5 Participant Experience and Satisfaction

Cadmus asked surveyed participants to rate their overall satisfaction with the program as well as their satisfaction with various program aspects. As shown in Figure 1-12, overall satisfaction with the residential programs ran high, with 97 percent of participants surveyed describing themselves as very or somewhat satisfied with the program in which they participated.[8] Satisfied respondents cited reasons such as rebate amounts they received and few difficulties in obtaining rebates.

Figure 1-12. Weighted Average Participant Satisfaction for All Programs



Four of the nine individuals saying they were not very satisfied had been denied rebates or were uncertain if they would receive one, and two expressed unhappiness with the rebate's amount, while another expressed unhappiness that some previously available rebates had been canceled.

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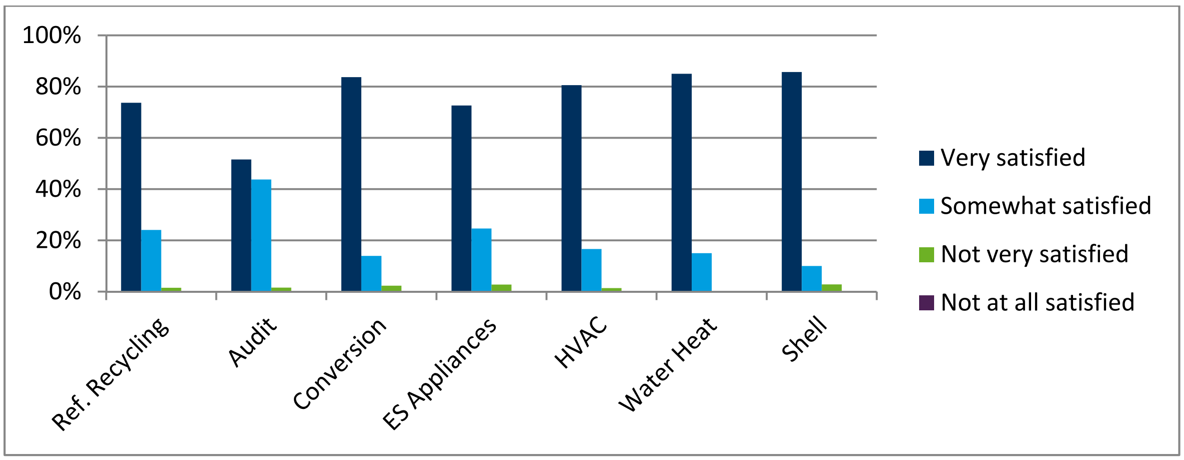
8 Overall participant survey data have been reported as weighted averages, accounting for variations in sample sizes and program participation among programs studied.

These results compare favorably to another multimeasure, residential rebate program in the Pacific Northwest: 95 percent of participants in the comparison program reported being very or somewhat satisfied. However, only 56 percent of that program's participants were very satisfied, compared to satisfaction rates for nearly 78 percent of Avista's residential program participants.

Program-level results, displayed in Figure 1-13, showed that satisfaction was high across all programs. Results for the Audit program showed that a comparatively lower percentage (52 percent) of Audit participants reported being very satisfied. This difference, as well as other programs' detailed results, are reported in greater detail in Appendix A.

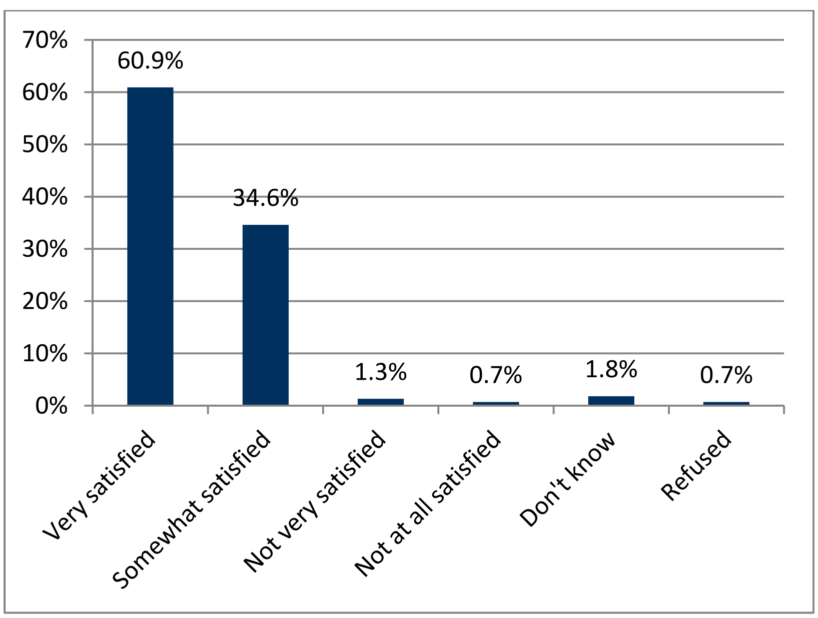
Figure 1-13. Participant Satisfaction by Program



Rebate Amount and Promptness Satisfaction

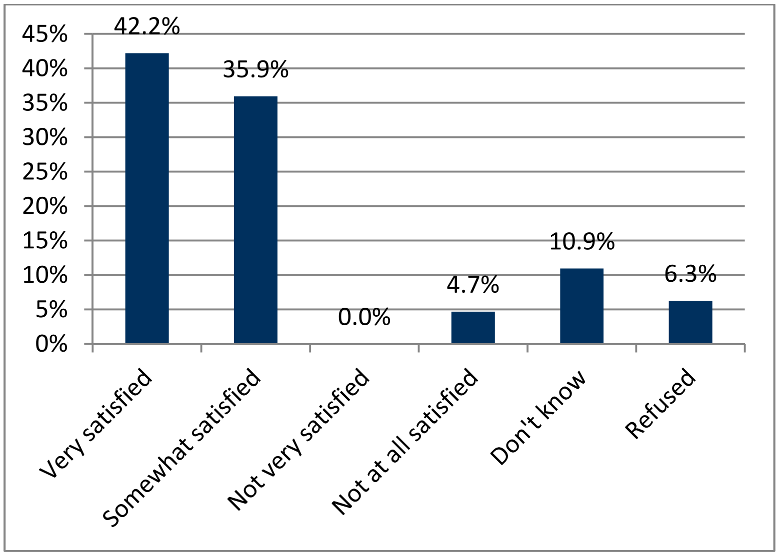
As shown in Figure 1-14, survey respondents reported slightly lower satisfaction levels with rebate amounts than with the overall program.

Figure 1-14. Weighted Average Rebate Amount Satisfaction for All Programs (n=475)



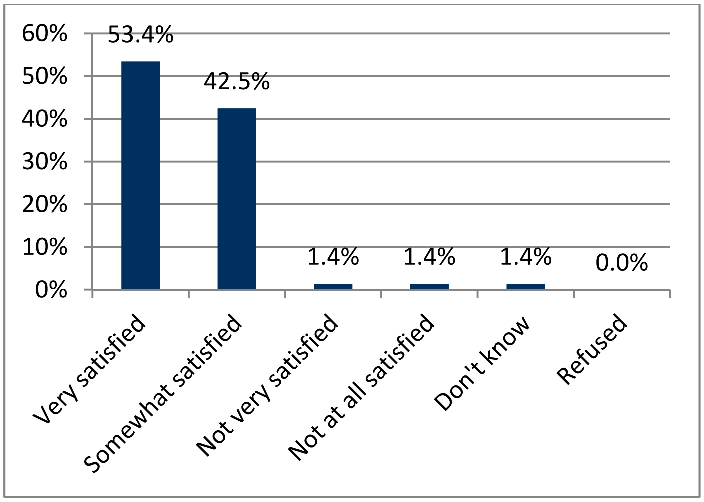
A shown in Figure 1-15, the Audit program's rebate satisfaction level had a lower number of very satisfied respondents than other programs, at 42 percent (n=27), and a higher percentage of respondents somewhat satisfied (36 percent, n=23) and not at all satisfied (5 percent, n=3). Those not at all satisfied reported rebates as so small they did not impact decision making, and they received neither rebates nor information that they would receive rebates for improvements. Most somewhat satisfied respondents wished for larger rebates. Verbatim comments indicated audit participants expressed their opinions about all Avista rebates in some cases, rather than on the audit's discounted cost.

Figure 1-15. Audit Rebate Level Satisfaction (n=64)



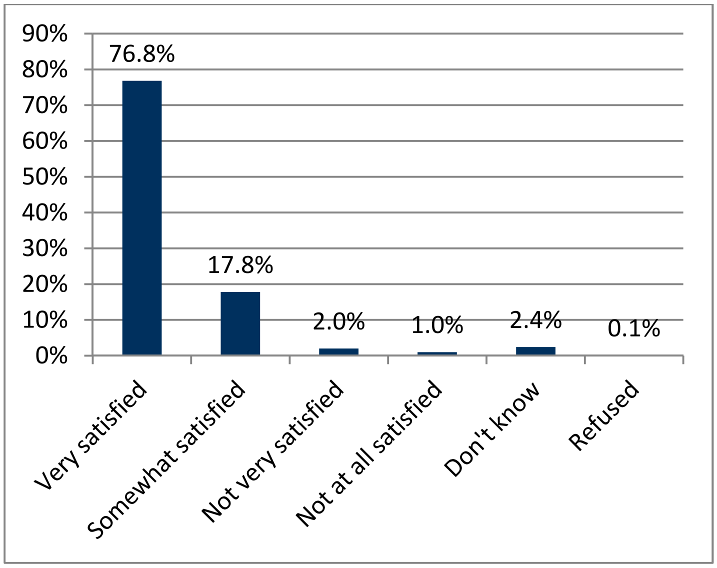
As shown in Figure 1-16, the Appliance Program also received lower very satisfied response rates regarding rebate amounts: 53 percent (n=39) reporting being very satisfied; and 43 percent (n=31) reporting being somewhat satisfied. Several people describing themselves as very satisfied did not even realize rebates were available; so receiving one came as a pleasant surprise. Somewhat satisfied respondents' feedback mainly consisted of wishing for a larger rebate, especially relative to the appliance price.

Figure 1-16. ENERGY STAR Appliance Rebate Amount Satisfaction (n=73)



The survey also asked respondents to rate their satisfaction with how quickly they received rebate checks.

Figure 1-17. Weighted Average Rebate Promptness Satisfaction for All Programs (n=475)



For the most part, respondents expressed satisfaction with how quickly they received their rebates, with 77 percent of participants saying they were very satisfied, and only 3 percent describing themselves as not very satisfied or not at all satisfied. Comments from less satisfied respondents included: waiting a long time to receive the rebate (sometimes 10 weeks to a year); not receiving a rebate; and not receiving the rebate for which the individual believed they were entitled. Although differences occurred, ratings did not vary greatly by program. Audits had the lowest percentage of participants reporting as very satisfied (63 percent, n=40), and the highest number reporting as not at all satisfied (3 percent; n=2).

Measure Satisfaction

The survey asked respondents participating in appliance, HVAC, water heater, or weatherization programs how they rated rebated products. Overall, 61 percent rated products as excellent, and 31 percent rated them as good. Three individuals rating measures as poor cited reasons such as: workmanship; appliances not cleaning dishes well; and appliances costing more to operate than previous units.

Table 1-16. Measure Satisfaction Rating by Program*

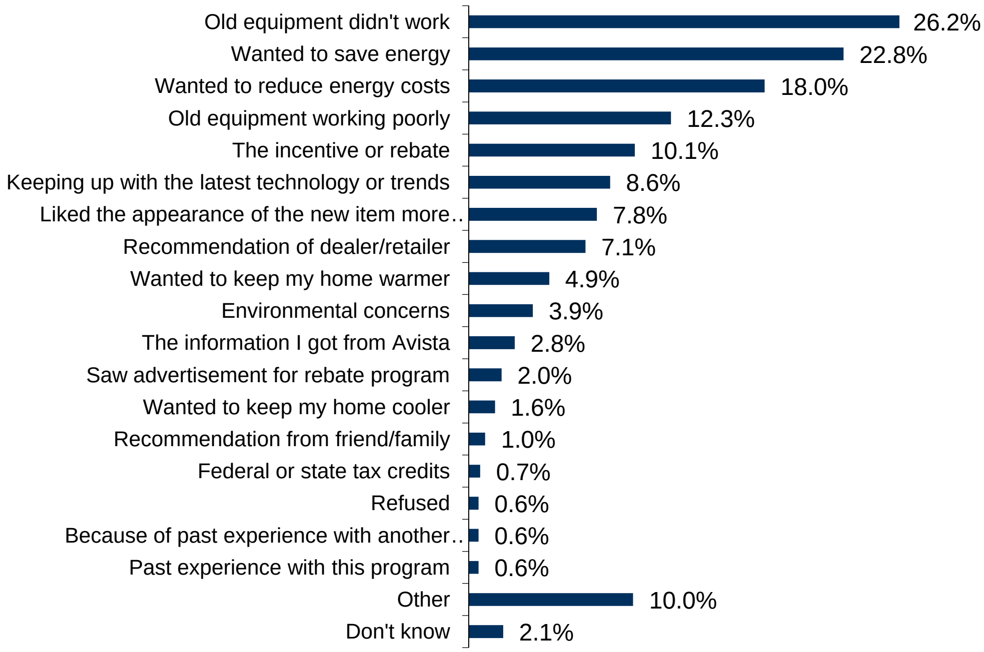
Rating	Percentage of Program Respondents				
	Conversion	ES Appliances	HVAC	Water Heater	Weatherization
Excellent	58.1	58.3	63.2	70.0	65.2
Good	25.6	33.3	30.9	30.0	27.5
Fair	4.7	2.8	1.5	0.0	1.4
Poor	0.0	1.4	1.5	0.0	1.4

*Program columns do not add to 100% due to respondents not knowing what rating to give, refusing to answer the question, or not installing the measure in question.

Motivation for Measure Purchases

Twenty-six percent of participants listed old, nonworking equipment as a primary factor motivating their purchases; 23 percent cited wanting to save energy; 12 percent cited old equipment working poorly, and 10 percent cited the rebate or incentive (respondents could offer multiple answers for this question). Only 1 percent of participants cited federal or state tax credits as a motivating factor. Several “other” responses noted the product’s price and value.

Figure 1-18. Weighted Average Motivation for Purchasing Measure



Forty-eight respondents offered mostly positive additional comments, with many complimenting the program and asking that it continue. Some people thought advertising should be increased to inform more of the program, and one would prefer submitting rebate applications online rather than by mail.

Participant Experience and Satisfaction Findings Summary

- Participants in all programs expressed high levels of satisfaction with the program overall, as well as with the rebate amount, and the promptness of payments.
- Participants in the Audit program were slightly less satisfied than participants in other programs, though still showing high satisfaction. Rebate amounts were slightly less satisfactory to Audit and Appliance participants, compared to other programs' participants.
- Ninety-two percent of participants rated their installed measure as either good or excellent.
- The most common motivations for purchasing the rebated measures were that the old equipment did not work or worked poorly, and that customers wanted to save energy or reduce energy costs. Ten percent of participants mentioned the rebate as a motivator.

1.3.6 Effectiveness of Implementers

The evaluation's research into program processes included implementers'[9] performance, with two firms identified for the residential portfolio:

- JACO, implementer of the refrigerator recycling program.
- FMS, implementer of the Simple Steps upstream lighting program.

Section 1.3.2 discussed reasons behind using these implementation firms. As noted in Section 1.3.1, performance in 2010 for the refrigerator recycling program fell below original business plan targets. Avista's program manager described 2011 plans as follows:

> The goal is to remove and incentivize 2,500 units, with 1,447,500 kWh savings, for 2011. We have never met this goal, but have increased marketing promotion to encourage Avista residential electric customers to participate. There are no plans to change program design. The majority of the marketing is done through a JACO subcontractor. JACO markets through use of their Website, newspaper, contests (TV collaborative) and value-pack coupons. Avista has provided marketing through Avista Websites, bill inserts, connections articles, contests, and at events.

As Avista has taken these steps to address performance issues, more in-depth evaluation of the program processes was not necessary.

FMS Implementer Profile

According to FMS Website: "Fluid is a mission-driven consulting firm that provides management, marketing and education services to our clients, including energy services with an emphasis on efficiency and renewable technology programs, sustainability consulting and carbon management services."

Based in Portland, Oregon (although acquired by CLEAResult of Austin, Texas, in August 2011), FMS implements Simple Steps, Smart Savings, an upstream lighting program sponsored by the BPA. For a number of years, Avista has participated in BPA-sponsored lighting programs.

Cadmus met with the FMS program manager and program associate to learn more about program functions and work conducted for Avista. While Cadmus did not collect data directly from retailers in this evaluation, retailer research, including on-site data collection, may be necessary for future evaluations.

Program Design

FMS works with lighting and showerhead manufacturers to allow these energy-efficient products to be offered at reduced prices at area retail stores. Lighting products offered include: general purpose "twist" and specialty CFLs from at least five manufacturers (Earthtronics, Feit, G.E., Maxlite, and TCP). FMS signs a Memorandum of Understanding with each manufacturer, specifying products, incentive amounts, and retail price ranges for each product. FMS field representatives visit stores monthly to verify that retail prices are in the specified range for each

9 Cadmus defines implementers as subcontractors providing significant operational support to one or more utility programs.

product. Though Avista can set funding limits to manage total spending on the program, it did not set a specific limit in 2010, and the program sold over 358,000 CFLs, or 239 percent of the 2010 goal to sell 150,000 lamps.

FMS consolidates monthly reports from all program retailers, dividing product sales between participating utilities, based on retailer locations. This process results in a monthly report to Avista, allowing program unit sales and savings to be tracked.

Though FMS can also implement direct mail and direct-install programs to deliver/install CFLs, showerheads, and faucet aerators to residential customers, these direct programs generally form a small component of the overall Simple Steps program.

Marketing and Outreach

FMS reaches out to potential program retailers, and markets the products to end-use customers. Field sales representatives support both of these activities. Field staff work with electric and plumbing department managers to ensure appropriate display of point-of-purchase (POP) materials in stores.

For most utilities, FMS completes 100 percent of in-store marketing. More than any other utility, Avista stays involved in this area, with the Avista program manager providing quality assurance on POP materials through frequent in-store checks and by directly contacting nonparticipant retailers. FMS described the program manager as "a kind of a third field rep" and "very active in stores." After the project manager identified stores missing POP material several times, FMS provided the project manager with a supply, solving the problem on the spot. FMS reported Avista's activity directly resulted in its field representatives checking area stores more frequently.

Communication and Coordination with Avista

FMS and Avista generally communicate in two ways: formal reporting and informal coordination.

FMS formally communicates with Avista through monthly sales reports. After the program's 2010 launch, FMS experienced issues with reports expected from participating retailers, partly due to requiring generation of monthly reports shortly after each month ends. These issues have been addressed, and a very robust audit process now supports reporting.

Regarding informal communications, FMS program staff acknowledged communications with Avista could be challenging during 2010, given marketing expectations initially not being well-defined. FMS reported these issues have been resolved, and now communicates with Avista through an effective, open dialogue. The FMS manager suggested occasional face-to-face meetings could further improve coordination.

Market Barriers and Possible Solutions

When asked about obstacles limiting sales or use of program products, FMS identified knowledge of CFLs as a primary obstacle. They felt more education about ranges and performance of current offerings might overcome consumers' confusion and misperceptions about CFLs.

FMS also suggested stronger marketing could improve the program, particularly in terms of retail POP placement and refreshing. They suggested their program should try to avoid requiring a utility staffer working in the field.

The current product list, consisting entirely of general purpose and specialty CFLs, also presents a barrier to greater program success. To address this, FMS suggested considering the following products:

- Energy-efficient showerheads. This product can most easily be added to Avista's program, as the overall Simple Steps program already includes it. FMS believes this provides an especially good fit, as Avista could recognize gas and electric savings through showerhead sales.
- LED downlights. These products, replacing conventional recessed lighting, have been offered through the program in Oregon. FMS is considering making this product more widely available.
- Smartstrips. These powerstrips offer new functions, not generally associated with power strips, including remote computer control and time-of-day programming. Major manufacturers already offer products through energy-efficiency programs in Wisconsin and New York.

Effectiveness of Implementers Findings Summary

- As Avista has worked with JACO to address gaps between 2010 goals and results, minimal evaluation was required. No known process issues exist at this time.
- The Simple Steps program design works to make CFLs available to Avista customers at reduced costs and greatly exceeded participation goals.
- Simple Steps program marketing has been well-supported in Avista's territory, where the program manager has provided an effective quality assurance function.
- Communication between Avista and FMS consists of monthly sales reports, and informal, as-needed communication between FMS program staff and the Avista manager.
- FMS has identified energy-efficient showerheads as the best opportunity for expanding the program in the immediate future, with LED lighting and smartstrips as additional products for future consideration.

1.3.7 Trade Ally Participation and Satisfaction

The evaluation's research into program processes included trade allies'[10] roles, specifically with two ally groups:

- Home Audit field auditors
- HVAC contractors

[10] Cadmus defines trade allies as organizations playing key roles in program operations, but not paid directly by program's sponsoring utility.

For the Home Audit program, Avista supplies auditors with: leads (potential audit customers); financial help; and information about Avista programs reducing homeowners' costs. As Home Audit was a pilot program in 2010, and Avista staff worked very closely with approximately four auditors, we did not interview auditors for this report, relying on Avista's program manager for information about auditors as trade allies. Research did not identify significant issues.

For the Heating and Cooling Efficiency Program, contractors played a crucial role, as nearly all homeowners used contractors to install measures such as furnaces or heat pumps. Consequently, these contractors influenced customers' equipment choices (program participation) and their training on and usage of the equipment (program satisfaction).

Avista maintains mailing lists of contractors and vendors involved with Avista's programs. Over two weeks, Cadmus contacted 19 contractors and vendors drawn from this list, assessing satisfaction, communication, and areas for improvements. Reaching interview target numbers proved challenging, as most contacts were busy and requested multiple callbacks. In total, 10 HVAC contractors completed interviews, as summarized in this section.

HVAC Contractor Profile

A fairly consistent profile emerged for contractors interviewed. All installed a range of HVAC equipment, including nearly all program measures. Most had annual volumes between 50 and 200 residential projects. Contractors generally reported 40 to 60 percent of these projects included Avista program rebates.

All trade allies felt Avista rebates played very important roles in a customer's decision-making process when considering energy-efficient technologies. In fact, they said, without the rebates, customers might have made different decisions concerning their equipment purchases. Most trade allies (eight of 10) said they always recommended program-qualifying equipment.

Program Participation

Interviews collected data about contractors' involvement with Avista's programs.

Awareness

Of eight respondents remembering where they first learned of Avista's rebate programs, sources cited included: Avista's outreach efforts (four of eight); or involvement in the HVAC industry (four of eight). Avista's outreach efforts included: contacts by Avista representatives, receipt of marketing materials, or Avista's Website. Those familiar with Avista programs through industry involvement reported previous relationships with Avista as well as contacts with professional organizations and equipment manufacturers.

Program Benefits

As shown in Table 1-17, all respondents believed their companies received value from Avista's programs.

Table 1-17. HVAC Trade Ally Responses

What value do Avista's programs bring to your company?	Respondents
Increase product/service sales	8
Use of program as a marketing tool	4
Help customers save on electric bills	2
Program helps get more business	2
Development of good customer relations	1

Program Satisfaction

All trade allies working with Avista's customers expressed being very satisfied with the residential rebate programs as well as with Avista's program staff and account representatives. When asked if program aspects could be improved, only two respondents offered comments:

- After installation of efficient equipment, one customer did not qualify for a rebate, as they had recently moved into a new house, and had not lived there long enough. Avista could have clarified qualifying parameters, or could have made arrangements with the customer.
- Trade allies recommended higher rebates to encourage greater participation.

Avista Outreach to Trade Allies

When we asked how contractors obtained information about the program, they cited multiple channels:

- Checked Avista's Website (four);
- Contacted an Avista representative for program questions or concerns (two);
- Checked with equipment manufacturers (one); and
- Compared equipment AHRI information with Avista's eligible equipment parameters (one).

Generally, most respondents (nine of 10) found Avista's trade ally outreach adequate. One respondent thought Avista could increase contractors' involvement more, as they had little contact with Avista. Another trade ally echoed this, suggesting Avista send more e-mails to better inform contractors of program offerings and changes.

Surveys asked trade allies about types of materials provided to contractors and satisfaction with these materials. More than half of respondents (six of 10) said they received some kind of program materials, including program updates (five of six) or rebate forms (four of six). Those receiving program materials reported being very satisfied or somewhat satisfied with the materials. Two respondents suggested regular program updates—including specific details about changes—would be helpful in keeping trade allies informed, while another thought brochures for customers would be helpful.

Trade Ally Outreach to Customers

All contractors actively promoted the Avista programs to their customers, using the methods shown in Table 1-18. Two respondents promoted Avista's rebate programs (through online and newspaper advertising) to inform customers of available rebates and to increase business.

Table 1-18. "How does your company promote the Avista rebate program?" (n=10, Multiple Responses Allowed)

Promotion of Avista Rebate Program	Respondents
Include Incentives in Customer Cost Proposal	7
Word of Mouth	6
Provide Rebate Forms	4
Customer Education	1
Help Customers Fill Out Paperwork	1

Trade ally surveys included questions about customer awareness and types of information typically requested. Trade allies found most customers (eight of 10) very or somewhat aware that Avista offered rebate programs, though some (four of eight) noted customers did not know of rebate details or how they could be accessed. Two respondents said customers were somewhat or very unaware of Avista rebates, and one recommended Avista send informative mailers to customers. Typical information most requested by customers addressed incentive levels (four), technology (two), and participation requirements (one).

Application Process

Trade allies typically participated in the application process. Most (nine of 10) completed application paperwork, leaving customers to complete personal information and to submit applications to Avista. When asked whether they encountered difficulties in completing forms, two respondents reported the new rebate forms asked for more information about customers' homes (i.e., square footage, year of home construction, secondary heating sources, and water heat), meaning they expended greater effort, involving customers more in the application process.

Market Barriers and Possible Solutions

Contractors identified equipment costs as the primary obstacle to customer installation of energy-efficient equipment. This applied more to general HVAC equipment costs, as three respondents noted rebates almost covered entire cost differences between efficient and non-efficient equipment. The issue next most frequently cited was compatibility of equipment with existing homes.

When asked how Avista could help customers overcome these obstacles, contractors recommended the following:

- Raise rebates; if rebates covered all upgrade costs, decisions would be simple. (three)
- Provide utility-sponsored financing, allowing customers to make payments through their monthly bills. (three)
- Direct rebates to contractors, reducing customers' upfront costs. (two)

When asked to recommend technologies to be added to Avista's rebate programs, contractors suggested ground source-heat pumps and tankless water heaters. These measures are already offered through Avista's programs, indicating some of the contractors may not be well-informed about program offerings.

Trade Ally Findings Summary

- HVAC contractors reported 40 to 60 percent of their residential projects included Avista program rebates. Most contractors always recommended program-qualifying equipment. They also thought rebates influenced customers' selection of energy-efficient equipment.
- HVAC contractors generally learned about rebate programs through Avista outreach efforts, or from industry sources, such as professional organizations and equipment manufacturers.
- Most contractors reported the program increased product sales, and about half used the program as a marketing tool.
- Contractors expressed strong satisfaction with the program and Avista's communications. They suggested more e-mail communication and regular program updates would help contractors stay better informed about program offerings and changes. They also suggested brochures for distribution to customers would be helpful.
- Suggested improvements included: utility-supported financing; direct rebates to contractors; and additional products.
- Some contractors may have been unaware that Avista offers rebates on ground-source heat pumps and tankless water heaters.

1.4 Conclusions, Recommendations, and Future Research Areas

1.4.1 Program Participation

Conclusions

Cadmus found, through reviewing program documentation, that the residential portfolio as a whole reported strong achievement of savings and participation goals in 2010. Although this assessment is based on Avista's reported, unverified 2010 results, it is clear that most programs performed well in terms of participation.

Trends over time show that program participation increased from 2008 through 2010, but year-to-date numbers for 2011 indicate that a decline in participation is expected. This may be due in part to the discontinuation of Federal and State tax credits for energy-efficiency retrofits. The expected participation decline in the 2011 program year may affect Avista's ability to reach load reduction targets mandated by Washington State Initiative 937.[11]

Assessing participation data in light of ENERGY STAR market saturation showed that the ENERGY STAR Appliance program may have had a market transformation effect, though further research is necessary to confirm. Furthermore, with a large market share of ENERGY

[11] http://www.sos.wa.gov/elections/initiatives/text/i937.pdf

STAR dishwashers and relatively low participation, it is likely that this measure suffers from high freeridership.

Program awareness among nonparticipants is good. However, some nonparticipating customers perceive that participating is difficult. This perception may be a barrier to participation.

Recommendations

- **Research market saturation and participation to track achievement of potential.** Using the *Avista Electric Conservation Potential Assessment Study* completed in August 2011, along with available data sources such as ENERGY STAR and additional primary research, Avista should track the residential portfolio's progress toward capturing projected realistic achievable potential. This effort will inform program planning and design decisions to allow for the long-term success of the residential portfolio.
- **Discontinue rebate for ENERGY STAR dishwashers.** ENERGY STAR data shows that 78 percent of dishwashers sold nationally are ENERGY STAR models. Therefore, this measure is likely to suffer from high freeridership, and the Avista rebate is unlikely to affect market transformation.
- **Emphasize ease of participation in marketing**. In order to address the nonparticipant perception that program participation may be difficult, Avista should emphasize the ease of participating in residential marketing.

1.4.2 Program Design

Conclusions

2010 residential programs achieved strong participation, indicating that program design adequately served customer needs. Organizationally, however, Avista's designation, management, tracking, and documentation of programs contain a high level of complexity. Avista groups programs together in multiple ways for different purposes, which can cause confusion for evaluators or other external parties.

Avista's programs made use of two third-party implementers, both of which were selected for the specific advantages they confer: JACO Environmental provides expertise and infrastructure for appliance recycling, while the Simple Steps, Smart Savings implementer, Fluid Market Strategies (FMS), allows for a regional approach, which is appropriate to an upstream program.

Trade allies in the HVAC program noted, though they are satisfied with the current program design, they may favor contractor rebates over customer rebates. Since the program relies on trade allies for proper installation of equipment, as well as some outreach to customers, the relationship with trade allies is a key factor in the program's success.

Recommendations

- **Simplify and document program organization structure.** Cadmus recommends grouping programs in logical clusters, in order to reduce complexity of documentation and tracking. While streamlining program organization, Avista should also document institutional knowledge of programs to avoid loss of continuity.

- **Assess viability of redesigning some programs to include contractor rebates.** Avista should consider the suggestion from HVAC trade allies to provide rebates direct to contractors. Other utilities have seen success with this model, which reduces the administrative burden on customers, allows for batch processing of rebates by Avista, and ensures close communication with trade allies.[12] Anti-fraud provisions (such as requiring customer information and signature on rebate forms, or conducting site visits to verify installation) must be included in any such program adaptation.

1.4.3 Data Tracking

Conclusions

Cadmus' review of Avista's residential data tracking showed that program data are adequately for internal purposes, but improvements could enhance evaluability. Two areas for improvement were identified:

- Inconsistencies in format and level of detail between separately tracked programs make portfolio-level analysis challenging.
- The lack of tracking of follow-through for audit participants prevents thorough assessment of spillover and detailed assessment of efficacy of audits.

Recommendations

- **Consider enhancing uniformity of program tracking by standardizing data formats.** Wherever possible, Avista should develop tracking methods that support consistent analysis across programs. For example, a standardized format for customer address data across separate databases would ease database combination or integration.
- **Track follow-through on audit recommendations.** In planning for future Audit program implementation, Avista should consider additional tracking of customer follow-through on recommendations, both through other Avista rebate programs, and independently without rebates.

1.4.4 Marketing and Outreach

Conclusions

Residential marketing for 2010 was strong, informing customers about programs through multiple media and outreach channels and contributing to high program awareness even among nonparticipants. Customers reported outreach by Avista representatives as the most common method for learning about programs, followed by outreach by contractors. Given the declining participation foreseen for 2011, opportunities may exist to expand current efforts in order to bolster program awareness and encourage additional participation.

[12] One such utility also showed increased program participation in years where contractor rebates were offered, as compared to years in which only customer rebates were offered.

Recommendations

- **Continue pursuing diverse marketing and outreach strategies.** Avista should maintain its multi-faceted approach to reaching a broad range of customers, while targeting difficult-to-reach customers where appropriate.
- **Continue enhancing social media marketing.** Since Avista reported that younger customers can be more difficult to reach, the marketing team should continue to enhance its social media marketing efforts.
- **Ensure contractors have adequate information to disseminate.** Since trade allies were one of the commonly reported ways that participants learned about the program, Avista must focus on providing trade allies with adequate and accurate information. This can be achieved by distributing updated materials regularly, holding trainings for contractors, or formalizing the trade ally network to ensure frequent communication. For example, Avista should consider providing printable online information sheets that trade allies can print and disseminate to their customers.

1.4.5 Participant Experience and Satisfaction

Conclusions

Participants reported high levels of satisfaction with all programs, and with rebate amounts and timeliness. This indicates that Avista's residential portfolio served its customers well in 2010, providing good customer service (such as quick rebate processing), and customer-friendly program offerings (such as convenient appliance recycling).

Recommendation

- **Continue emphasizing good customer service and offering customer-friendly programs.** These areas should be maintained as priorities in future program planning and implementation.

1.4.6 Effectiveness of Implementers

Conclusion

The Simple Steps program, implemented by FMS, greatly exceeded participation goals in 2010. Given the healthy rate of participation, FMS has identified energy-efficient showerheads as the best opportunity for expanding the program in the immediate future, with LED lighting and smartstrips as additional products for future consideration.

Recommendations

- **Consider expanding offerings of Simple Steps program.** Avista should consider the benefits of adding measures to the Simple Steps program. Additional measure offerings may increase potential participation and savings.
- **Require FMS to ensure evaluators have access to retailers.** Upstream program evaluation often requires access to retail locations, for shelf-stocking studies and in-store intercepts, for example. In order to ensure future evaluability of the Simple Steps program, FMS should require participating retailers to grant such access to evaluators when necessary.

1.4.7 Trade Ally Participation and Satisfaction

Conclusion

HVAC contractors reported that they value Avista's rebate program for its support of their businesses. Most contractors reported promoting the program and encouraging customers to install high-efficiency equipment. The participant survey results corroborated these reports, showing that contractors were a common source of information about the program. HVAC contractors also reported a willingness to engage more directly with Avista and with the program.

Recommendation

- **Enhance and formalize trade ally network**. Avista should offer additional training and informational materials to contractors who serve the HVAC program, to ensure high-quality program information reaches customers, and to encourage program promotion through contractors.

1.4.8 Residential Portfolio

Conclusion

As Avista continues to offer residential programs, the needs of this customer segment will change. Factors such as market transformation and program maturation can affect participation levels and program cost-effectiveness, and opportunities for program expansion or modification will arise.

Recommendation

- **Consider various opportunities for expansion**. Avista should regularly assess the viability of expanded program and measure offerings. Avista may consider various possible expansions including:
    - Adding showerheads to Simple Steps
    - Additional cost-effective measures in HVAC program
    - Behavioral programs, energy education programs

1.4.9 Future Research Areas

During this process evaluation, Cadmus identified multiple areas worthy of future research, including:

- **Analysis of multiple rebates**, including the heat pump and gas furnace combination. Since over 25% of 2010 participants received more than one rebate, Avista should study the patterns of multiple-measure participation. This could provide insight into marketing possibilities, and inform impact analysis and future program planning.
- **Market research on program penetration.** Avista's residential programs may affect the market for high-efficiency equipment in its service territory, and these effects should be documented. Studies could include quantifying nonparticipant spillover, examining market

saturation of rebated equipment, and using the 2011 Conservation Potential Assessment Study to assess participation trends and program plans.

- **Assessment of implementation costs.** Examination of program costs, either through cost-effectiveness analysis or through process evaluation, can provide insight into the relative efficiency of implementation practices.

2 2010 Nonresidential Process Report

2.1 Executive Summary

Avista's nonresidential programs have operated for a number of years, encouraging energy-efficiency retrofits for commercial and industrial customers throughout Idaho, Washington, and Oregon. In 2010, the nonresidential incentive programs provided energy-efficiency incentives for replacing existing electrical and gas equipment with an ambitious list of high-efficiency options and eligible measures for customer buildings and facilities. Prescriptive measures have included: lighting, HVAC, demand control technologies, efficient motors, building shell, plug loads, and grocery refrigeration. Incentives for prescriptive measures vary by incremental unit of savings.

Participants qualifying for the site-specific program may receive incentives of up to 50 percent of incremental project costs for custom energy-efficient retrofits. Site-specific programs are comprised of electric and gas measures including appliances, compressed air, HVAC, industrial process, motors, shell, and custom lighting projects that do not qualify for the prescriptive lighting program. Site-specific programs must demonstrate kWh or therm savings based on project-specific information, and provide the largest portion of energy savings to the overall energy efficiency portfolio.

As part of a larger, energy-efficiency program evaluation in progress, Avista commissioned The Cadmus Group, Inc. (Cadmus) to conduct a process evaluation of its commercial and industrial energy-efficiency programs in Idaho and Washington. The primary process evaluation goals include informing Avista about how well individual programs operate, and helping Avista better plan, integrate, implement, and evaluate its entire portfolio of commercial and industrial (C&I) energy-efficiency programs.

This assessment of the nonresidential program has been based on: interviews with program staff; reviews of program materials; and surveys with program participants, nonparticipants, and trade allies. As part of the process evaluation, Avista also requested Cadmus provide recommendations based on industry best practices for energy-efficiency programs. Where possible, Cadmus has drawn upon internal knowledge of best practice research to provide these recommendations.

2.1.1 Conclusions and Recommendations

Overall, the nonresidential programs are working well and operating as designed. Many of the programs are meeting or exceeding energy reduction targets. Highly qualified, dedicated, and long-term staff ensures quality control and efficient operations of the many prescriptive and site-specific programs. Commercial and industrial (C&I) customers and trade allies report strong satisfaction with the programs.

Cadmus identified the following conclusions as a result of 2010 process evaluation activities:

Program Documentation

Although program overview, goals, and implementation plans are located in the 2011 DSM Business Plan, documented operational procedures were not easily accessible. Therefore, it is difficult to link the EM&V policies found in the high level planning documents to the program's operational management. Developing a program manual, with implementation plans, operational procedures, marketing strategies, and verification protocols aggregated into a single program handbook, could help to establish this link.

Customer Feedback

Overall, customers proved very satisfied with all program elements. The majority of survey respondents did not encounter program participation challenges. However, customers felt there was a lack of information about program offerings.

For improvements to program delivery consider the following recommendations:

- Enhance outreach and communication efforts for participants, nonparticipants, and partial participants.
- Develop additional printed program materials to educate customers about program opportunities.
- Consider regularly scheduled online Webinars to assist customers with questions about program incentives, eligibility, and application processing.

Trade Ally Feedback

Avista's informal network of trade allies works well, through updates to the mailing list, word of mouth, and strong communications between contractors and Avista's customers, program staff, and account representatives. Although trade allies expressed strong satisfaction with program components, they also requested additional program guidance and greater opportunities for direct communication with Avista. Although the mailing list serves as an informal network for nonresidential programs, limited information has been documented about trade allies, the markets they serve, and their areas of specialization and qualifications.

Cadmus recommends a more formalized network that would incorporate the following elements:

- Provide regular trade ally communications through targeted outreach efforts, such as a Website, monthly e-mails, or a newsletter. A Website dedicated for trade allies could enable registration, thereby providing a method for compiling (and updating) trade ally profiles and contact information.
- Consider providing additional promotional materials that would highlight various program technologies available to customers. This would not require that Avista endorse any one contractor.
- Explore ways to leverage strong working relationships forged between customers and contractors within the community by sponsoring additional program working sessions, luncheons, or Webinars that provide guidance for trade ally outreach efforts.

Application Processing and Data Tracking

Overall, application forms and program databases work well for tracking nonresidential participants and projects. Some customers and trade allies expressed confusion about prescriptive program requirements listed on the forms, and requested more help in filling out the site-specific forms and worksheets.

Consider the following improvements to application forms and data tracking:

- Offer site-specific application forms online. Although it would be ideal to enable submission of forms online, simply making the forms downloadable and mail-in would provide a good first step. In addition, consider including guidelines for completing site-specific forms.
- Gather additional feedback from customers and trade allies about how site-specific form enrollment and processing could be streamlined.
- Gathering more detail about program and project measures in the participant database would enable a better understanding of the kinds of projects done in the past (by different types of customers and end-uses). Additional information could be used to market specific types of projects to other customers who have the same end-use equipment.

Marketing and Outreach

Although a marketing budget had not been allocated before 2011, Avista's nonresidential marketing and outreach strategy has worked well, and includes the Website, customer E- newsletter, and outreach efforts of the key account managers. However, lack of knowledge about the effectiveness of nonresidential marketing approaches could result in reduced understanding of target markets for meeting future program goal requirements.

Consider the following improvements to future marketing strategies:

- Ensure allocation in future marketing budgets dedicated for nonresidential program marketing and outreach efforts.
- Develop additional marketing materials targeted specifically for trade ally outreach to customers. These materials would enable Avista staff to leverage existing trade ally relationships in the community. Make them available at TA website for printing
- Conduct marketing surveys, and targeted marketing research that would gather additional information about customer facilities and technology end-uses.

Quality Assurance and Verification

Procedures for QA of data tracking, savings estimation, project approval, and inspection have been well-documented for site-specific projects. Although Avista uses a risk-based approach to pre- and post-inspections for prescriptive programs, guidelines or standardized procedures for this approach have not been documented.

Consider developing a verification protocol to document pre- and post-inspection procedures for prescriptive programs, and ensure data tracking for project installation. In addition, protocols should highlight any differences in verification procedures used for prescriptive and site-specific programs.

2.2 Introduction

2.2.1 Program Overview

This report provides findings and recommendations drawn from a process evaluation of Avista's nonresidential energy-efficiency programs. These programs encourage commercial and industrial customers to install more energy-efficient equipment in their facilities. To accomplish this, Avista offers cash incentives for installation of qualifying energy-efficient equipment. Incentives are organized by energy-efficiency measures, grouped into approximately 15 individual programs. A program may be a single measure type or a group of measures. Eligibility of prescriptive programs is based on installation of qualifying equipment. Energy-efficiency measures falling outside of prescriptive applications are considered under the site-specific program, based on their project-specific information. With the exceptions of the EnergySmart Grocer program and Green Motors program, which are implemented by third-party contractors, Avista implements all of its rebate programs.

2.2.2 Process Evaluation Objectives

This process evaluation primarily seeks to: (1) document and analyze how the program works in practice; and (2) ascertain important influences on its operation and achievements. Evaluation objectives include:

- Documenting and assessing program components and processes;
- Gathering opinions and program experience responses from customers and program partners;
- Reviewing primary data, reviewing secondary program information, and reporting on findings;
- Comparing program information to best practices; and
- Providing conclusions and actionable recommendations.

2.2.3 Evaluation Methodology and Information Sources

This process evaluation analyzes both primary and secondary program data. Primary data have been gathered through interviews with: program staff involved in daily operations; program participants and nonparticipants; and market actors involved in promoting and implementing the programs. Secondary data have included program materials used to enroll participants and guide operations, marketing materials, reports for external stakeholders, and information about best practices.

2.2.4 Report Organization

This report contains the following sections:

- Introduction (Section 2.2)
- Key Findings (Section 2.3)
    - Program Planning and Design (Section 2.3.1)
    - Program Documentation (Section 2.3.2)
    - Customer and Trade Ally Feedback (Section 2.3.3)

  - Application Processing and Data Tracking (Section 2.3.4)
  - Marketing and Outreach (Section 2.3.5)
  - Program QA/QC and Verification (Section 2.3.6)
- Conclusions and Recommendations (Section 2.4)
  - Future Research

2.3 Key Findings

2.3.1 Program Planning and Design

Program Logic Models and Process Flows

Avista's nonresidential energy-efficiency programs can be grouped into three main clusters, based on their delivery mechanisms. These program cluster groups have been designed and implemented with similar operational procedures, from enrollment to project eligibility and verification. The site-specific or custom program makes up the first cluster group. Avista's prescriptive program, the second cluster-level group, is composed of individual prescriptive measures or groups of measures. The third cluster group, EnergySmart Grocer, operates through an external implementer, Portland Energy Conservation, Inc. (PECI).

EnergySmart Grocer program is Avista's only commercial and industrial (C&I) program delivered by a third party implementer. PECI, the implementer, has designed and delivered identical programs successfully throughout the Northwest. Typically the largest C&I programs are handled internally, as utilities prefer to maintain control over relationships with largest customers.

In the initial stages of evaluation planning, Cadmus developed preliminary logic models for each program cluster, helping to guide evaluation research and discussions with program staff and implementers. Program logic models offer a comprehensive means to identify and measure progress toward program goals. In planning stages, logic models can be used to identify program activities leading to expected outputs required to accomplish program goals and anticipated short and long term outcomes. While outputs are under the control of the program sponsor, outcomes are not. The logic model can be used to clarify program design elements, ensuring all operate properly for achieving a program's ultimate goals and anticipated outcomes.

Setting the groundwork for the nonresidential program process evaluation, this section describes each program cluster, and presents a logic model for each to help identify program inputs, anticipated outputs, and outcomes. Based on results from the process evaluation, feedback from staff, and reviews of program documents, Cadmus revised and finalized logic models to better reflect program operations in practice. At the end of each cluster description, we discuss program process flows as a preliminary step towards developing process flowcharts that can be used to map operational steps.

Site-Specific Program

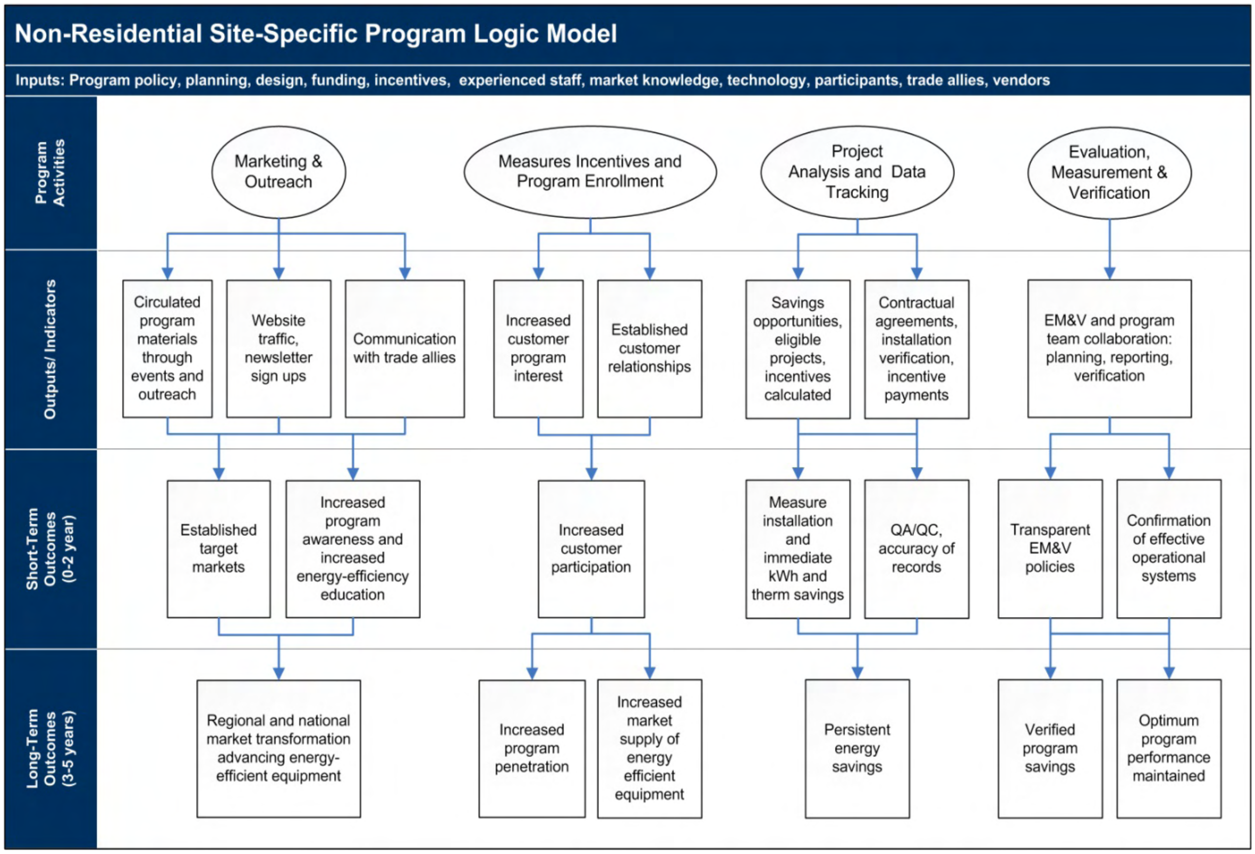
The site-specific program is offered to all commercial, industrial, or pumping customers receiving electric or natural gas service from Avista, and choosing to undertake cost-effective, energy-efficiency improvements to their businesses. Based on their project-specific information, site-specific measures generally do not lend themselves to prescriptive applications. For measures to be considered, it must have demonstrable kWh or therm savings.

The site-specific measures currently consist of electric and gas-saving measure technologies, including:

- Appliances
- Compressed air
- HVAC
- LEED
- Industrial process
- Motors (HVAC Variable Frequency Drive Program)
- Shell
- Multifamily
- Custom lighting projects

The site-specific program logic model shown in Figure 2-1 demonstrates the four key program activities required to produce desired outputs and anticipated outcomes. Due to the customized nature of site-specific programs, extensive project analysis and contractual arrangements are required to determine project eligibility and ensure persistent energy savings.

Figure 2-1. Site-Specific Program Logic Model



Site-Specific Program Operational Work Flow

The steps involved in administering and implementing the site-specific program differ from Avista's prescriptive programs by: size of project, incentive amounts, complexity of project-specific information and energy savings calculations, amount of paper work required for enrollment, and eligibility requirements.

The following steps describe program operational flows, from marketing and outreach to rebate payments:

- Marketing and outreach:
  - Account executives communicating opportunities to customers through e-mails, phone calls, and on-site visits.
  - Marketing flyers distributed at events.
  - Customers offered access to business Websites, including Efficiency Avenue.
  - Customer signing up to receive Energy Solutions bimonthly E-newsletter.
- Preapproval or preinspection requirements for most projects:
  - All large or site-specific projects go through account executives.

    - All site-specific projects require preapproval.
    - Engineer reviews projects to determine the extent of preinspection.
- Project submittal:
    - Calculation forms sent in with customer contract.
    - Account executives enter information into participant and project tracking databases (Sales Logix and Tracker).
- Application processing:
    - Engineers work up an inspection report and bid, which is sent to the customer.
    - Account executives check application requirements and obtain additional information from customer, as needed.
    - Calculating total project costs (materials and labor) and recording these in application forms.
    - Account executives provide contracts and evaluation reports to customers.
- Installation verification:
    - Site-specific projects receive post-inspection (with some exceptions).
    - Account executives and engineers take responsibility for determining high-risk projects for post-installation.
- Rebate processing:
    - Program coordinators check analysis details between customer agreements and database, and update information, as needed.
    - Program managers check documents for signatures, invoices, measurements, and post-verification reports.
    - Upon completion, document information is uploaded and payments processed.
    - Account executives deliver payments.

Prescriptive Programs

Prescriptive programs considered for the 2010 process evaluation have been grouped by: electric-only, and gas or both gas and electric.

Electric only measures include:

- Green Motors Rewind Program
- Prescriptive LED Traffic Signal Program
- Prescriptive Lighting Program
- Prescriptive Premium Efficiency Motors Program
- Prescriptive Power Management for PC Networks
- Prescriptive Side-Stream Filtration Program

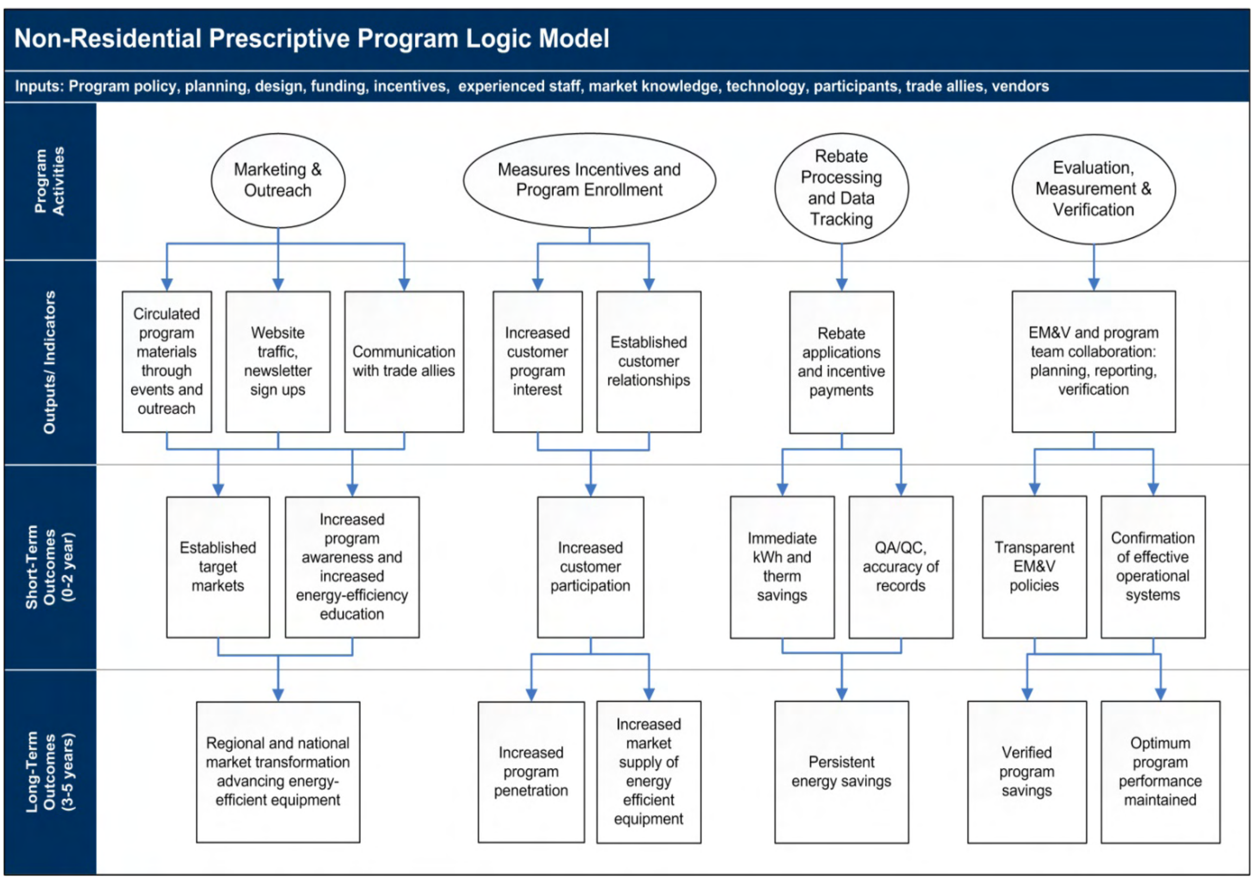
- HVAC Rooftop Maintenance Pilot Program

Gas-only or both gas and electric measures include:

- ENERGY STAR Residential Products
- Prescriptive Commercial Clothes Washer Program
- Prescriptive Demand-Controlled Ventilation (DCV)
- Prescriptive Food Service Equipment Program
- Prescriptive Refrigerated Warehouse Program
- Prescriptive Steam Trap Replacement Program

The prescriptive program logic model, shown in Figure 2-2, demonstrates the relationships between the four key program activities, outputs, and intended outcomes. Compared to the site-specific program, the prescriptive programs require fewer rebate processing activities. For example, customers apply for rebates based on application requirements without lengthy project analysis and contractual arrangements.

Figure 2-2. Prescriptive Program Logic Model



Prescriptive Program Operational Work Flow

The prescriptive programs take the following operational work flow, from marketing and outreach to rebate payments:

- Marketing and outreach:
    - Access to Avista's business Website (including Efficiency Avenue).
    - Bi-monthly E-newsletter (Energy Solutions).
    - Marketing flyers distributed by account executives at events.
    - Indirect outreach through contractors and vendors.
- Preapproval/Preinspection:
    - Required only for select programs (for example, Steam Trap and Side-Stream Filtration, and Demand Control Ventilation[13]).
    - Information and requirements provided on rebate forms.
    - Equipment must be purchased and installed before payments can be authorized.
- Enrollment and application processing:
    - The majority of projects (about 60 percent) are submitted through contractor bids.
    - Following application submittal, program managers check forms and invoices to verify requirements have been met, and collect additional information from the customer, as needed.
    - Program managers calculate project costs, and enter customer data into a database (Sales Logix).
- Rebate processing:
    - Agreement scanned, payback calculated, additional information input into database (Sales Logix).
    - Program managers verify rebates, prints vouchers, and obtains signatures.
    - Small checks are sent to customers; account executives deliver large rebate checks.
- Installation verification:
    - Inspection requirements based on random sampling and risk levels.
    - Program managers determine risk.
    - Program managers check forms, requirements, and calculations match customer claims.

Prescriptive Electric Programs

This section provides short descriptions of each electric-only, gas-only, or combined gas and electric prescriptive program, examined through the 2010 process evaluation.

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[13] These programs will be discontinued as prescriptive for 2011 and moved to site-specific program.

Green Motors Rewind

Operated in partnership with the Green Motors Practices group, this program provides education to foster organization and promotion of member motor service centers to commit to energy-saving shop rewind practices for motors ranging from 15 to 500 HP. Through promotion of continuous energy improvement and motor-driven system efficiency, this program seeks to achieve kWh savings.

Prescriptive LED Traffic Signal

This program targets nonresidential electric customers (primarily municipalities) that own traffic signals, offering them incentives to replace incandescent with high-efficiency LED signals, designed for use in pedestrian signals, red-yellow-and-green traffic signals, and traffic arrows. As market saturation has nearly been reached, this program closes at the end of 2011.

Prescriptive Lighting

As significant opportunities exist for lighting improvements in commercial facilities, this program offers direct financial incentives to customers increasing the efficiency of their lighting equipment. The program offers rebates to existing commercial or industrial facilities, with electric service provided by Avista and rate schedules 11 or above. Predetermined incentive amounts can be paid for a total of 38 individual measures, including:

- T12 to T8 fluorescents.
- High-bay, high-intensity discharge lighting, T5 or T8 fluorescents.
- High-bay, high-intensity discharge lighting to induction fluorescents.
- Incandescents to compact fluorescents or cold cathode fluorescents.
- Incandescents to LEDs.
- Incandescent exit signs to LED exit signs.

Prescriptive Premium Efficiency Motors

This program provides an incentive for nonresidential electric customers purchasing premium-efficiency motors over standard motors. The incentive pays approximately 50 percent of incremental costs of buying premium-efficiency motors—specifically upon purchase. To qualify for incentives, motors must meet the listed premium efficiency National Electrical Manufacturers Association (NEMA) standards.

Prescriptive Power Management for PC Networks

Computers remaining in a full-power state when idle can waste significant energy for customers operating numerous PCs. This program, available to nonresidential electric customers, provides incentives to install a network-based power management software solution for simplifying the process of implementing power management in large numbers of networked PCs.

The program offers a $10 incentive per controlled PC meeting the following criteria (in addition to making a commitment that the software will remain in operation for a minimum of three years):

- Able to provide regular energy-use reports.

- Able to control every available level of power management offered by the PC.
- Able to reset user override capabilities.
- Provides a minimum average savings of 120 kWh annually per PC.
- Able to provide usage data before control installation (a baseline setting)

Prescriptive Side-Stream Filtration

This program provides incentives to nonresidential electric customers installing permanent side-stream filtration systems on their new or existing open-loop evaporative cooling tower/chiller systems. With program incentives paid at $18 per ton—or 50 percent of the installed cost, whichever is less—these systems help the equipment operate more efficiently between normal cleanings and inspections.

HVAC Rooftop Maintenance Pilot

This pilot program is the latest in a series of Avista programs encouraging nonresidential electric customers to perform maintenance regularly on their rooftop HVAC units. As the most recent program was flagged for savings reevaluation, this pilot program was designed to determine whether the program should be reinstated or terminated.

To accurately determine energy savings of regularly maintained HVAC units, the program compares energy use of like rooftop units (one maintained and one not) on one rooftop. The decision to implement this program will be made after all data are analyzed; so the program has no associated savings goals at this time.

Prescriptive Gas or Combined Gas and Electric

ENERGY STAR Residential Products

This program is available to nonresidential customers using residential-grade appliances in a small business application.

Prescriptive Commercial Clothes Washer

To encourage customers to select high-efficiency clothes washers, this program targets nonresidential electric and natural gas customers in multifamily or commercial Laundromat facilities. The program's streamlined prescriptive approach has been designed to reach customers quickly and effectively in promoting ENERGY STAR or CEE-listed units.

Prescriptive Demand-Controlled Ventilation

Under this program, nonresidential electric and natural gas customers receive direct incentives to install demand-controlled ventilation (DCV) in existing buildings. This ventilation measures the approximate number of people occupying a space—based on carbon dioxide levels—and resets outdoor air intake rates for occupant ventilation in accordance with this measurement. To qualify for the program, temperatures of conditioned spaces must remain between 65 and 75 degrees during operating hours. Controlled conditioned space must also have a minimum of 2,000 square feet.

Incentives pay 25¢ per square foot, with a cap of 2,500 square foot per sensor. If the space has portable walls, each room must be controlled separately, and the controlled space must meet a minimum of ASHREA 62 standards.

Prescriptive Food Service Equipment

Applicable to nonresidential electric and gas customers with commercial kitchens, this program provides direct incentives to customers choosing high-efficiency kitchen equipment. The equipment must meet ENERGY STAR or CEE Tier levels (depending on the unit) to qualify for incentives. Measures available for rebates include:

- Fryers
- Steam cookers
- Hot food holding cabinets
- Refrigerators and freezers
- Vent hood controls
- Ovens
- Griddles
- Char-broilers
- Hot water heaters
- Dishwashers
- Ice machines

Prescriptive Refrigerated Warehouse

This program offers nonresidential electric customers a direct incentive for efficiency improvements in refrigerated warehouses. Although this program has a limited customer base, significant opportunities exist for energy savings from the program's measures. Qualifying measures include:

- Fast-acting doors
- Dock seals
- Variable frequency drives (VFDs)
- Fan motors
- Bi-level lighting

Prescriptive Steam Trap Replacement

This program offers rebates to nonresidential gas customers repairing or replacing failed steam traps on steam distribution lines of boiler heating systems. Key criteria for the steam trap replacement program include: 1) the replacement must be a new working steam trap of the same duty; 2) each repair or replacement is eligible for rebate once every five years; and 3) repaired or replaced traps must include a strainer. A minimum of 95 percent of steam generation must be provided by Avista retail natural gas.

Rebates amounts include:

- $120 for 1/2-inch pipe
- $140 for 3/4-inch pipe
- $165 for 1-inch pipe
- $200 for 1-1/4-inch pipe
- $270 for 1-1/2-inch pipe
- $350 for 2-inch pipe

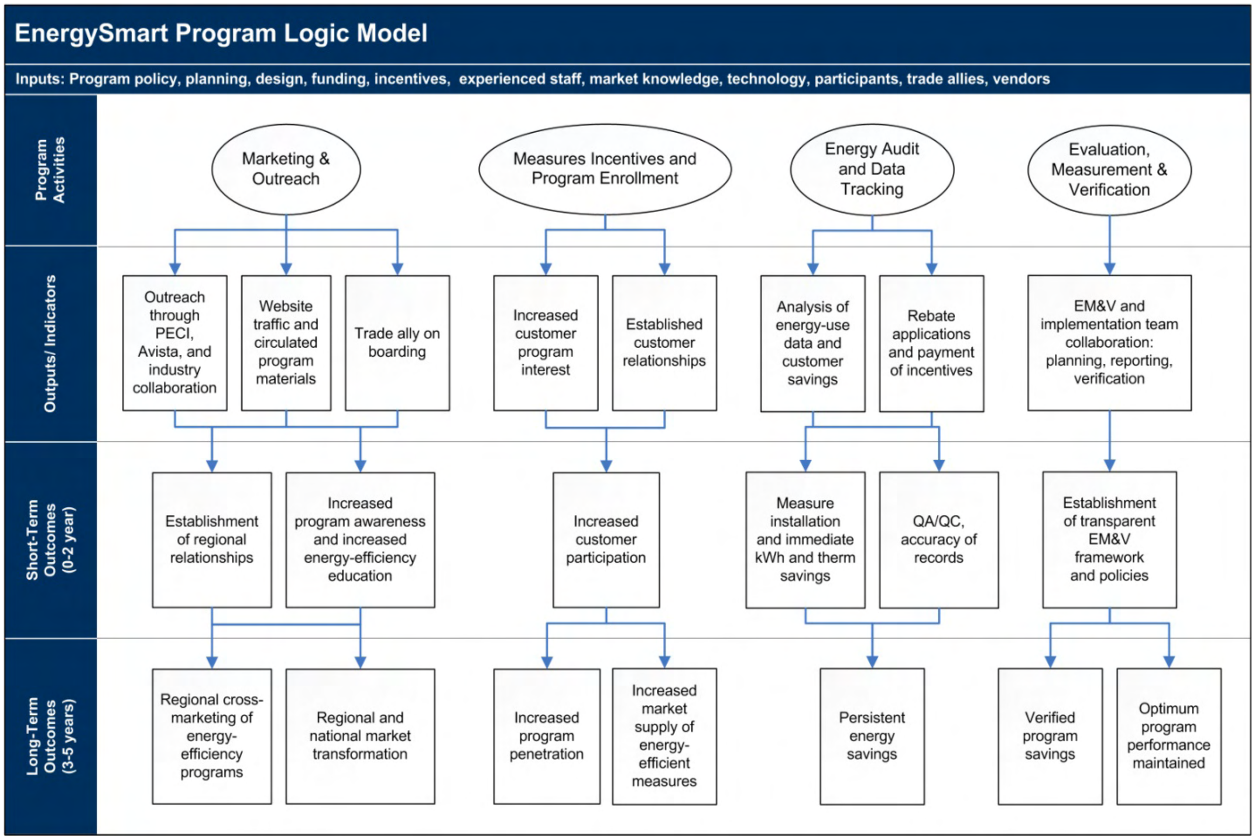
EnergySmart Grocer Program

The EnergySmart Grocer program offers a variety of energy-savings grocery and refrigeration equipment for nonresidential electric and gas customers, particularly grocery stores. The program assists customers with technical aspects of their refrigeration systems, while providing a clear view of achievable savings. A field energy analyst provides customers with technical assistance, produces a detailed energy savings report regarding potential savings for their facility, and guides customers from enrollment to incentive payments for the following qualifying equipment:

- Auto closers, gaskets, and strip curtains
- Cases
- Case lighting
- Compressors and condensers
- Controls
- Motors
- Night covers
- Suction line insulation
- Vending machine controllers
- Automatic flue dampers
- Domestic hot water (DHW) tank insulation
- DHW heat reclaim

Activities and resulting outputs for the EnergySmart Grocer program logic model, shown in Figure 2-3, differ slightly from Avista's other programs. PECI implements the program to participating utilities throughout the region. An industry-wide goal of the program is market transformation. Therefore, activities and key outputs focus on collaborative outreach and training efforts, trade ally enrollment, and customer education through energy auditing.

Figure 2-3. EnergySmart Grocer Program Logic Model



EnergySmart Grocer Program Operational Work Flows

Key operational work flows for the EnergySmart Grocer include collaborative industry outreach activities, free energy audits, and trade ally networking. The following steps describe program operational flows, from marketing and outreach to rebate payments:

- Marketing and outreach:
  - PECI conducting outreach through industry networking.
  - PECI and account executives referring customers and distributing flyers at events.
  - PECI offering customers Website access to Avista's business Website, and EnergySmart Grocer Program Website.
- Preapproval or audit requirements for most projects:
  - All interested customers receive a free energy audit.
  - PECI field energy analyst performs walk through facility audit and discusses energy-efficiency opportunities with customers.
  - Energy analyst reviews contractor bid to verify that it meets incentive criteria.
- Project submittal:

  - If agreed, customer submits audit report and required documentation to PECI field analyst who works with registered trade allies to establish a bid.[14]
  - Contractors provide bids to customer and PECI field analyst.
- Application processing:
  - Customer submits rebate application to PECI.
  - PECI checks application requirements and obtains additional information from customer, as needed.
- Installation verification:
  - PECI conducts post-inspection on a sample of completed projects.
  - PECI coordinates inspection with Avista's program managers with focus on large projects.
- Rebate processing and data tracking:
  - PECI provides Avista with a monthly report and tracking data summarizing program activity.
  - PECI submits monthly rebate processing and payment requests to Avista.
  - Avista program manager checks reports, documentation, and enters rebate processing information into participant database.
  - Avista sends payments to PECI who then sends rebate checks to customers.

2.3.2 Program Documentation

To evaluate operational procedures of Avista's nonresidential programs from a process perspective, Cadmus reviewed available program documents, and interviewed staff involved in the programs on a daily basis. This section discusses results derived from review of the documented operational procedures.

Research Objectives

Research objectives for the review of the nonresidential energy efficiency program's operational procedures sought to obtain a comprehensive understanding of the programs, enabling Cadmus to document and assess the following key program components:

1. Program theory, design, and goals.
2. Marketing plan.
3. Trade ally program.
4. Enrollment and rebate processing.
5. Quality control and verification procedures.

[14] PECI works with contractors to help them become trade allies.

The materials review sought to help evaluators identify management and operational procedures used to guide staff in implementing nonresidential programs. Interviews with Avista program staff helped the evaluation team attain a complete picture of program operations, from marketing to rebate payments. Through the interviews, Cadmus gathered feedback on overall program delivery and solicited recommendations for program improvements and other opportunities. The interviews also helped to refine the content and presentation of the program logic models, and to solidify key researchable issues examined through other data collection activities.

Methods

For the program documentation materials review, Cadmus requested program manuals, operational guidelines, process flowcharts, enrollment procedures, marketing plans, and staff and trade ally training materials. Initial materials provided included several high-level documents, such as a business plan, an EM&V framework, and various internal process reports. In addition to the initial sets of materials provided by Avista staff, operational documents sent to Cadmus included:

- DSM Business Plans (2010 and 2011).
- EM&V Framework and EM&V Plan (2010 and 2011).
- 2010 DSM Annual Process Report and other key reports (such as PPA Ecotope summary).
- A trade ally training presentation and workshop attendance list.
- Organization charts.
- Program data collection procedures for prescriptive lighting and site-specific programs.
- A sample monthly report for prescriptive lighting.

Avista staff were interviewed in person and over the phone throughout the evaluation's course. We spoke with program and policy managers, support staff, engineers, account managers, and the marketing team, in interviews lasting 30 to 60 minutes. These interviews were primarily conducted in group settings, in-person interviews, or one-on-one interviews over the phone.

Research Results

Avista provided several comprehensive, high-level policy and planning documents, describing the EM&V framework and plan, and DSM portfolio methodologies, tariff requirements, and strategies for energy resource acquisitions. Avista's 2011 DSM Business Plan contains numerous appendices documenting strategies, tariffs, and schedules. Appendix G contains individual program plans, with overviews, target markets, goals, budgets, and implementation plans, using a couple pages per program.

Although reviewing these policy and planning documents enabled evaluators to eventually piece together an understanding of the programs, this proved to be challenging given the number, and to some extent the complexity, of the nonresidential programs. Operational procedures and guidelines were not clearly identified in the policy and planning documents. To fill in the missing elements of the program procedures, it was necessary for the evaluation team to consult with Avista's program staff, engineers, and account executives on several occasions, through follow up emails and phone calls.

2.3.3 Customer Feedback

One process evaluation key task was to conduct primary research using surveys of Avista's program participants and nonparticipants. These groups included:

- Customers receiving rebates through the nonresidential energy-efficiency programs; and
- Customers choosing not to participate in the programs.

This section discusses research objectives, methods, and results of surveys and interviews conducted for the 2010 process evaluation.

Participant and nonparticipant surveys enabled the evaluation team to gain insight into different customer perspectives, while gathering feedback about program areas working well and areas for improvements. Information gathered can also be compared across customer groups in areas of enrollment and outreach, awareness, satisfaction, potential participation barriers, and decision-making patterns.

Nonparticipant surveys included two customer groups:

- *Nonparticipants without program association:* A random selection of Avista nonresidential customers having no association with the energy-efficiency programs. (Survey questions for this group focused on understanding how Avista might better identify and target this untapped nonparticipant market, determine market segments not being reached, and identify potential missed opportunities for program savings.)
- *Partial participants:* Nonresidential customers expressing interest in the program after being approached by an Avista account executive. (For the 2010 process evaluation, this group can be considered partial participants, which may have dropped out of the program during the application process, or chose not to apply for rebates during initial contact stages. Survey questions focused on understanding why this group declined to follow through with program participation.)

Research Objectives

Participants

Cadmus designed the participant survey to inform evaluation objectives discussed and agreed to during planning and kickoff meetings with Avista staff. Research questions (and areas of interest) emerged from interviews with Avista's implementation team, engineering staff, account executives, and policy and planning team members. Primary research objectives for participant surveys included:

- Compiling profile information about Avista's commercial and industrial target markets.
- Identifying participants' perceptions of market barriers, incentive levels, and program delivery.
- Determining participant satisfaction with key program components.

- Identifying potential areas for program improvements and future offerings.
- Understanding participant equipment decision-making processes.

Nonparticipants and Partial Participants

Surveys with program nonparticipants (those without program association) and partial participants (those expressing initial interest in the program) provided information about participation barriers, and levels of awareness among surveyed respondents. Understanding interests and motivations for these customer groups (who were sampled to be representative of the overall nonparticipating customer population) could provide a means to reach untapped markets for energy-efficiency resources. Further, the surveys collected information enabling comparisons between target markets for participants, nonparticipants, and partial participants.

Primary research objectives for nonparticipants and partial participants included:

- Determining characteristics and levels of program awareness.
- Identify nonparticipation reasons (for those aware of the program).
- Identify nonparticipants' perceptions of program participation barriers.
- Understand commercial and industrial customers' equipment decision-making processes.
- Identify perceptions regarding market barriers, incentive levels, and program delivery.

Survey Methods

Discovery Research Group (DRG)—a survey firm regularly working with Cadmus on similar evaluation projects—conducted the participant, nonparticipant, and partial participant surveys. To reduce respondents' time requirements, surveys, designed to last 10 to 15 minutes, were conducted by the phone.

To streamline survey delivery, most questions utilized standardized, closed-ended responses. However, to capture subtle nuances and differences in decision-making patterns, the surveys included open-ended "other" response options.

Participant Survey Instrument

To meet the impact evaluation report's expedited timeline (be delivered several months in advance of the process evaluation), nonresidential participant surveys were conducted in two waves: first for gas and dual-fuel customers, and second for electric customers. Process evaluation survey questions did not depend on customer fuel types. However, to coordinate with data collection efforts for the overall evaluation, some questions were included to assist with the impact evaluation's program measure verification.[15]

To ensure surveying respondents from programs with low participation levels, the survey team prioritized and contacted strata with low numbers of unique contacts first. Each participant was contacted once per day, until a final disposition (e.g., complete, refusal, ineligible) could be achieved. Each contact received up to eight attempts before termination of the survey effort, approximately after two weeks of calling for gas and electric participant surveys.

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15 The Cadmus Group. August 2, 2011. *Avista 2010 Multi-Sector Gas Impact Evaluation.*

Although the administration of Avista's commercial incentive programs makes prescriptive and site-specific distinctions internally, these differences proved insufficiently significant from participants' perspectives to warrant separate surveys for each program type. Therefore, the process evaluation team used a single participant survey instrument, including a few specific questions designed to capture unique aspects from customers participating in site-specific, prescriptive lighting, Green Motors, and EnergySmart Grocer programs.

Program participant questions addressed the following topics:

- Participant characteristics (heating fuel type, number of employees, leasing versus ownership, and square footage of heated and cooled space).
- Primary sources of program awareness.
- Satisfaction with program elements (or reasons for dissatisfaction).
- Decision-making influences.
- Program benefits experienced in addition to energy efficiency.
- Market and program participation barriers (pre-participation and post-participation).
- New program offerings desired.

Participant Survey Sampling

For the survey sample, Avista provided a customer participant list, drawn from the program tracking database. Cadmus designed both gas and electric participant survey samples to represent reported savings by program and measure type. Survey targets were adjusted to account for numbers of survey respondents available.[16]

Table 2-1 shows numbers of completed surveys and original targets. Numbers of unique contacts in the cluster sample may differ due to multiple participation within programs.

Table 2-1. Participant Survey Summary of Details

Program – Fuel Type	Total Number of Participants*	Total Number of Projects	Survey Targets	Survey Completes
Prescriptive Electric	747	1,204	80	140
Prescriptive Gas & Dual Fuel	19	41	14	7
Site Specific Electric	196	298	80	43
Site Specific Gas & Dual Fuel	168	398	104	76
EnergySmart Grocer Electric	66	309	44	20
Total	1,196	2,250	322	286

*For customers participating in multiple programs, the customer was categorized by the measure yielding the highest savings.

16 Taking into consideration recent Net-to-Gross surveys (conducted at the end of 2010), and other evaluation efforts requiring site visits and surveys with large commercial customers, Avista requested that some participants be removed from the sample set to prevent potential survey fatigue.

Across the program clusters, 286 participant surveys were completed, (89 percent of target sample size). Despite the apparent differences in the achieved versus targeted samples, statistical tests conducted post sampling revealed sufficient representation.[17]

Nonparticipant and Partial Participant Survey Instrument Design

Nonparticipant and partial participant surveys sought to inform key research topics and help Avista identify potential untapped markets for additional energy-efficiency resources. To compare nonparticipant and partial participant customer groups, the same topic areas and similar questions were used, when applicable.

The survey included questions to assess the following:

- Program awareness and how respondents heard about the program.
- For customers aware of the program:
    - Reason for not participating.
    - Satisfaction with various program components or reasons for dissatisfaction.
- Installation of energy-efficiency measures outside of the program.
- Influences on decision-making regarding energy-efficiency equipment.
- Participation barriers.

Nonparticipant Sample Selection

To represent customer interests and decision making for small and large energy users, Avista selected a stratified random sample by rate schedules and geographical regions (by state). Table 2-2 shows samples and targets for each stratum.

[17] Cadmus performed a chi-squared goodness-of-fit test to check for representativeness of the sample to the population of participants. Representativeness was tested by location and measure type using a chi-squared test.

Table 2-2. Nonparticipant Survey Summary*

State and Rate Schedule	Electric/Gas	Number of Contacts in Sample	Survey Targets	Surveys Completed
ID_011	Electric	996	5	8
WA_011	Electric	1,294	5	7
ID_021	Electric	299	16	23
WA_021	Electric	623	16	31
ID_031	Electric	167	2	2
WA_031	Electric	247	2	2
ID_032	Electric	8	1	1
WA_032	Electric	20	1	1
WA_025	Electric	11	1	0
ID_111	Gas	13	5	1
WA_111	Gas	30	6	4
WA_121	Gas	6	0	0
	Total	3,714	60	80

* The following Websites provide Avista nonresidential customer rate class definitions, by state: WA: http://www.avistautilities.com/services/energypricing/wa/elect/Pages/default.aspx; http://www.avistautilities.com/services/energypricing/wa/gas/Pages/default.aspx; ID: http://www.avistautilities.com/services/energypricing/id/elect/Pages/default.aspx

Partial Participant Sample Selection

Avista provided a list of about 200 customers initially contacted by account representatives, but declined to participate in the program. SalesLogix tracked these customer leads by contact information and program interest. Table 2-3 shows the sample and number of surveys completed for each program.

Table 2-3. Partial Participant Survey Summary

Program	Number of Contacts in Sample	Surveys Completed
Appliances	6	
Compressed Air	3	2
Energy Smart-Audit	2	
HVAC Combined	27	6
HVAC Cooling	5	3
HVAC Heating	15	4
Industrial Process	3	1
LEED Certification	1	
Lighting Exterior	11	1
Lighting Interior	21	3
Motor Controls HVAC	2	
Motor Controls Industrial	1	
Motors	1	
Multifamily	1	
Prescriptive Food Service	1	
Prescriptive Lighting Exterior	1	
Prescriptive Lighting Interior	8	2
Prescriptive PC Network Controls	1	
Shell	35	4
Total	145	26

The pool of participants shrank from 200 to 145 unique contacts. This was due to duplicate entries (with some individual customers tracked by measure), and some of the customers identified as past participants in the 2010 database. An additional nine respondents were identified as participants during survey screening. This small sample size made it difficult to reach the targeted number of 60 completes.

Research Results

This section groups participant, nonparticipant, and partial participant survey results, providing results for similar topic areas. For similar results from identical questions (for example, customer profiles), results are shown side-by-side for all survey groups. Where questions and topics differed (for example, nonparticipant awareness or reasons for nonparticipation), results are distinguished by customer type within each topic area.

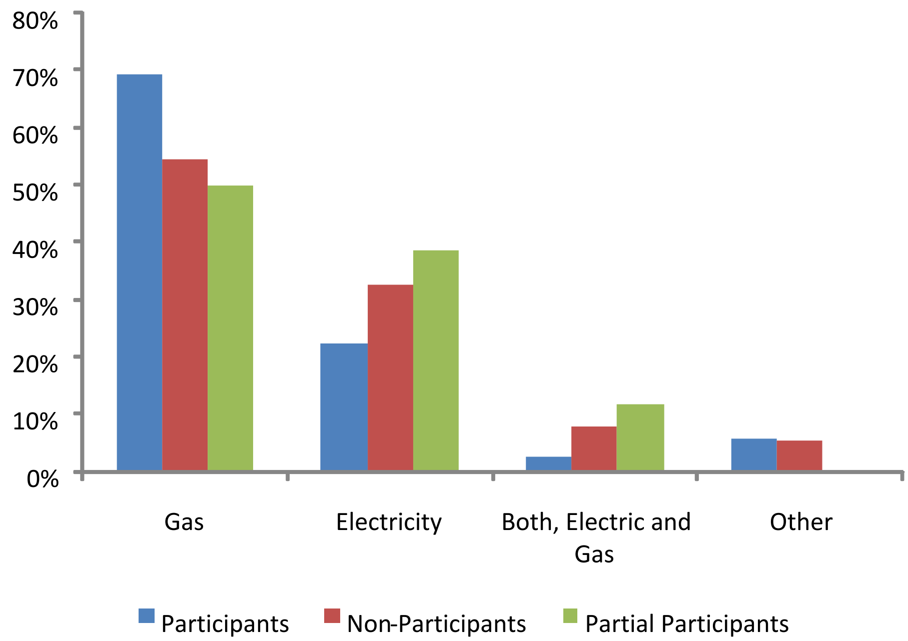
Where respondents answered "don't know," "not applicable," or refused to answer, responses were removed from the total, unless a high number of respondents resulted in this category (for example, above 10 to 15 percent). In such cases, "don't know" and "refused" responses have been included as meaningful indicators for the question. Individual sections discuss instances where uncertainty represented a high percentage of the overall response. Tables providing more detailed survey results are located in Appendix B.

Customer Profile

Several questions across participant, nonparticipant, and partial participant surveys sought to identify typical facility characteristics, including: square footage of heated and cooled spaces; fuel types used to heat spaces; numbers of full-time employees; and ownership status. Profile (or firmographic) questions added to the surveys helped identify differences in customer groups, indicating how these characteristics may have affected program participation.

The following short summary demonstrates similarities in facilities of the three customer groups examined. Many had facilities 5,000 square feet or less,[18] predominately owned their own facilities, and used gas to heat facilities. Figure 2-4 illustrates fuel use by customer survey group.

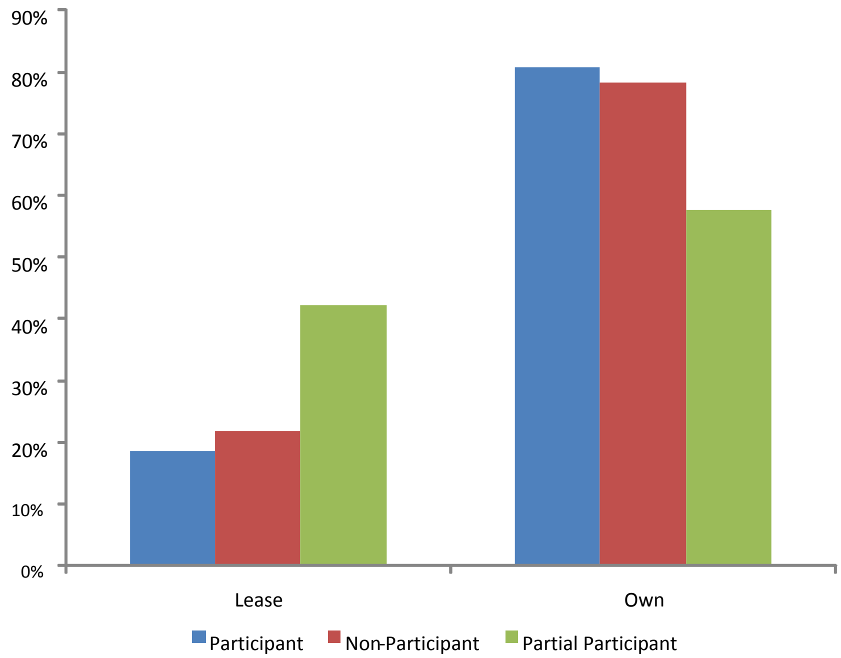
Figure 2-4. Fuel Use by Customer Group



Participants had the highest percentage of owned spaces. Figure 2-5 shows percentage ownership distributions between survey groups.

[18] Survey respondents with less than 5,000 square feet of facility space included 53 percent of participants, 44 percent of nonparticipants, and 24 percent of partial participants.

Figure 2-5. Percentage Ownership by Customer Facility



Understanding differences in customer profiles may help Avista develop more targeted marketing efforts, and could lead to additional energy-efficiency opportunities for nonresidential programs.

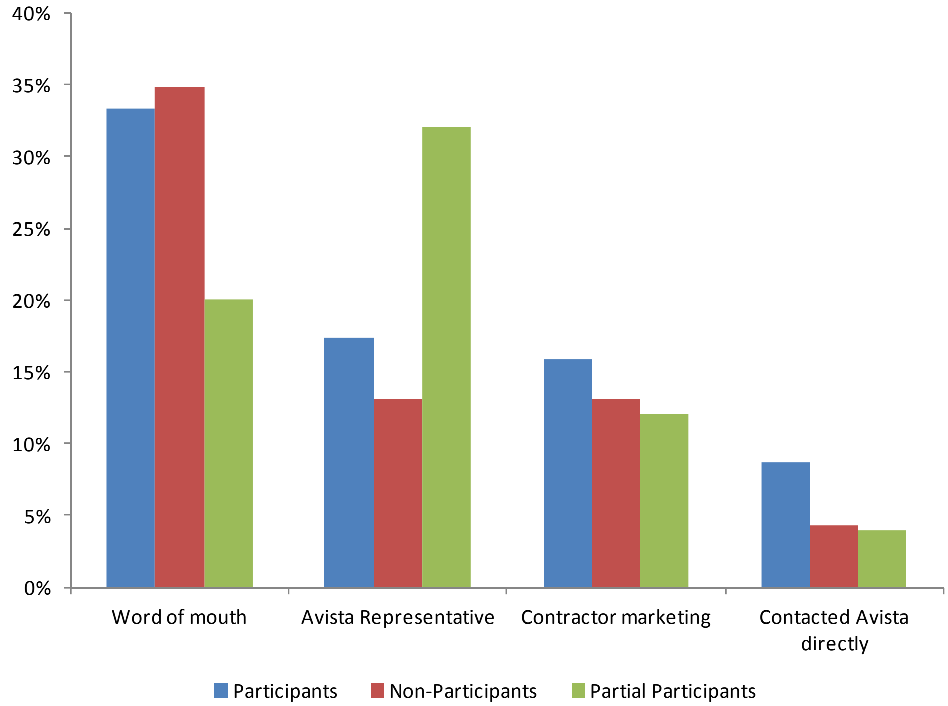
Program Awareness

Participant, nonparticipant, and partial participant surveys included questions identifying levels of customer awareness about Avista's energy-efficiency rebates, asking participants and partial participants how they learned of the programs. Nonparticipant questions included: 1) whether respondents had heard about the program; and 2) how they learned of the program. This section discusses results by customer type.

How Participants, Nonparticipants, and Partial Participants Learned of Programs

Participants and nonparticipants most frequently learned of the programs through: word-of-mouth, account executives, and contractors or vendors. However, there were slight variations between the customer groups. Results, by percentage of each customer group, are shown in Figure 2-6.

Figure 2-6. How Respondents Learned of the Programs



While participants and nonparticipants learned of the program primarily through word of mouth,[19] partial participants learned more frequently from Avista representatives. This is not surprising given that, according to account representatives, many partial participants resulted from customer leads.

Nonparticipant Awareness

Nonparticipant surveys revealed that the majority (66 percent) did not know of the program. The nonresidential customer's rate class helps distinguish customers by size, business type, and energy usage. As Avista assigns account executives to large customers, one might expect larger customers to be more aware of the program. To investigate this theory, the evaluation team analyzed the awareness percentage within each rate class, comparing the small nonresidential general service customers (rate class 11) to the largest general service customers (rate class 21). Figure 2-7 indicates that there is no difference in awareness by customer size.

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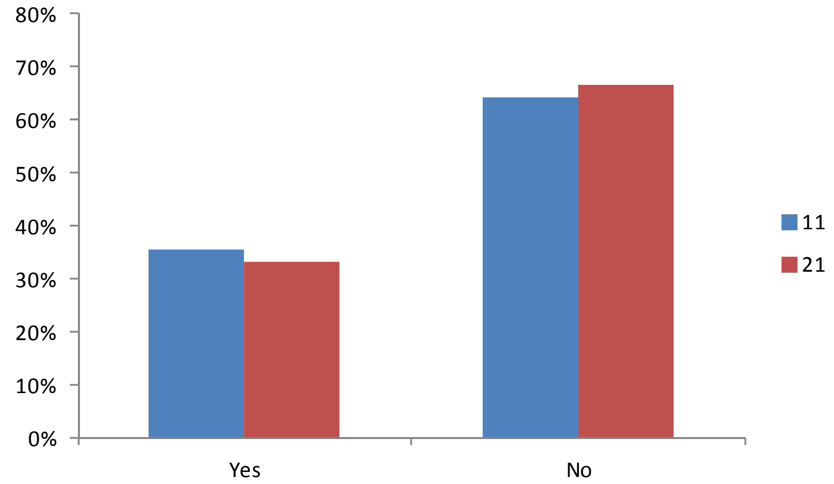
19 In the survey, word of mouth is differentiated to respondents as hearing from a business colleague, family, friend, or neighbor.

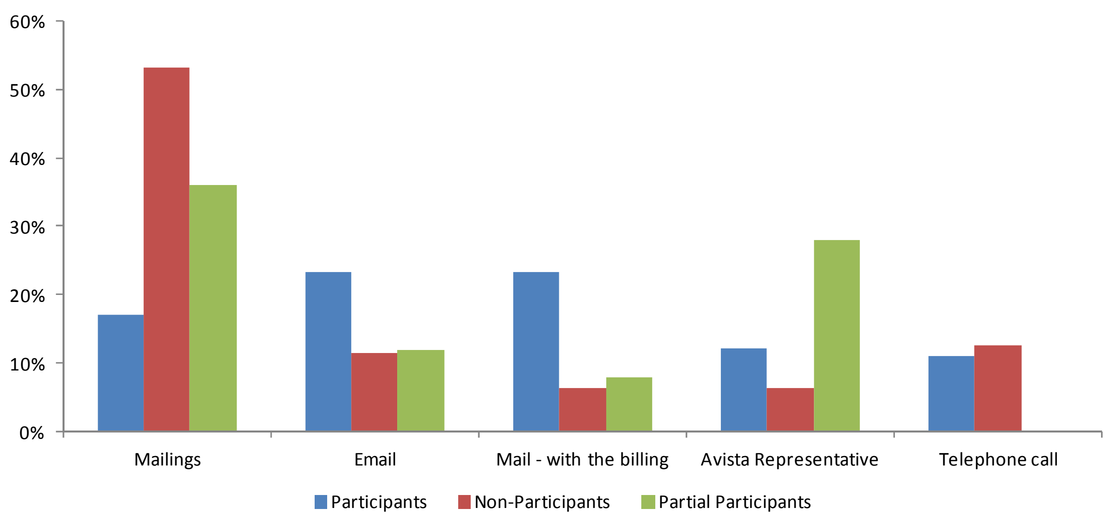
Figure 2-7. Nonparticipant Program Awareness, Comparing Schedule 11 and 21



Most Effective Ways to Inform Participants, Nonparticipants, Partial Participants of Program Opportunities

Surveys asked respondents how they wished to be informed of program opportunities. While participants reported the most effective way to reach them as e-mail, over half of nonparticipants (53 percent) and one-third of partial participants (36 percent) preferred through direct mail. Figure 2-8 illustrates respondents' preferred channel for learning about the program.

Figure 2-8. Most Effective Way to Reach Customers



Purchase Patterns and Decision Making

Surveys included questions to identify Avista customers' major influences and motivations for energy-efficiency equipment decision making and purchases. Purchase patterns and decision-making questions included:

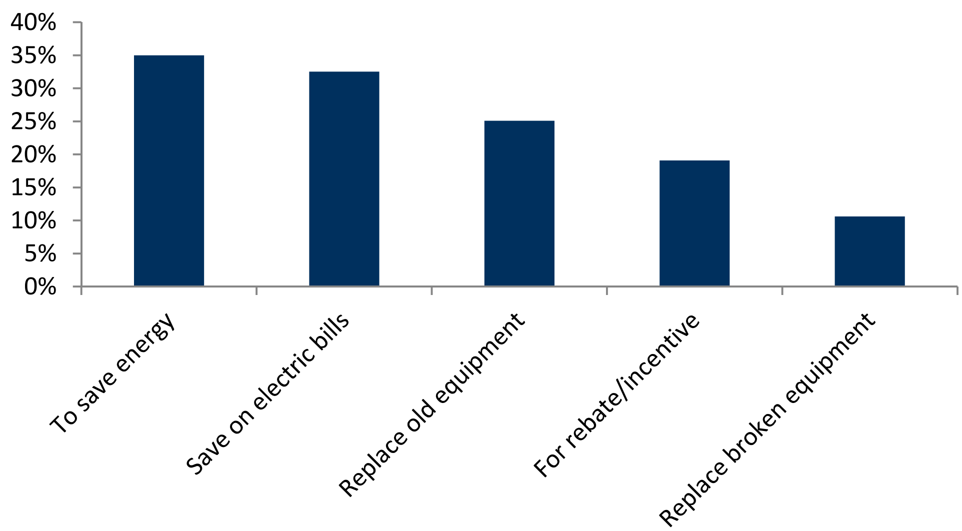
- Factors influencing installation of efficient equipment for participants;
- Reasons nonparticipants or partial participants chose not to apply for Avista's energy-efficiency rebates; and
- Whether nonparticipants or partial participants installed equipment outside of the program.

The following sections briefly summarize results for these questions.

Factors Influencing Participants' Installation of Efficient Equipment

Participants were asked what factors influenced them to install energy-efficient equipment. Figure 2-9 illustrates the top five most influential factors.

Figure 2-9. Most Influential Factors for Equipment Installation



Nonparticipant and Partial Participant Energy-Efficiency Equipment Installation Outside the Program

We asked respondents whether they installed equipment outside of the program. The majority of nonparticipants (80 percent) had not. For the 15 nonparticipants who had installed outside of the program, only eight were aware of program offerings. Half installed lighting measures.

Alternatively, more than half of partial participants (56 percent) had installed energy-efficiency equipment. For the 14 who had installed outside of the program, five installed lighting.

Respondents were asked why they had installed equipment. None attributed the installation directly to Avista's programs. Top reasons for installing energy-efficiency equipment included:

1) saving money; 2) having better quality products (or problems with previous products); and 3) replacing broken or malfunctioning units.

Reason for Nonparticipation

The survey asked nonparticipants aware of Avista's nonresidential rebate programs (26 of 80 total respondents) why they did not participate in the rebate program. Though the questions resulted in open-ended, varied responses, the majority (88 percent) listed reasons outside of Avista's control such as:

- They were not eligible.
- They leased and did not have authority to change equipment.
- They did not need new equipment.
- Their facility was reasonably efficient.
- They had just moved into the facility.

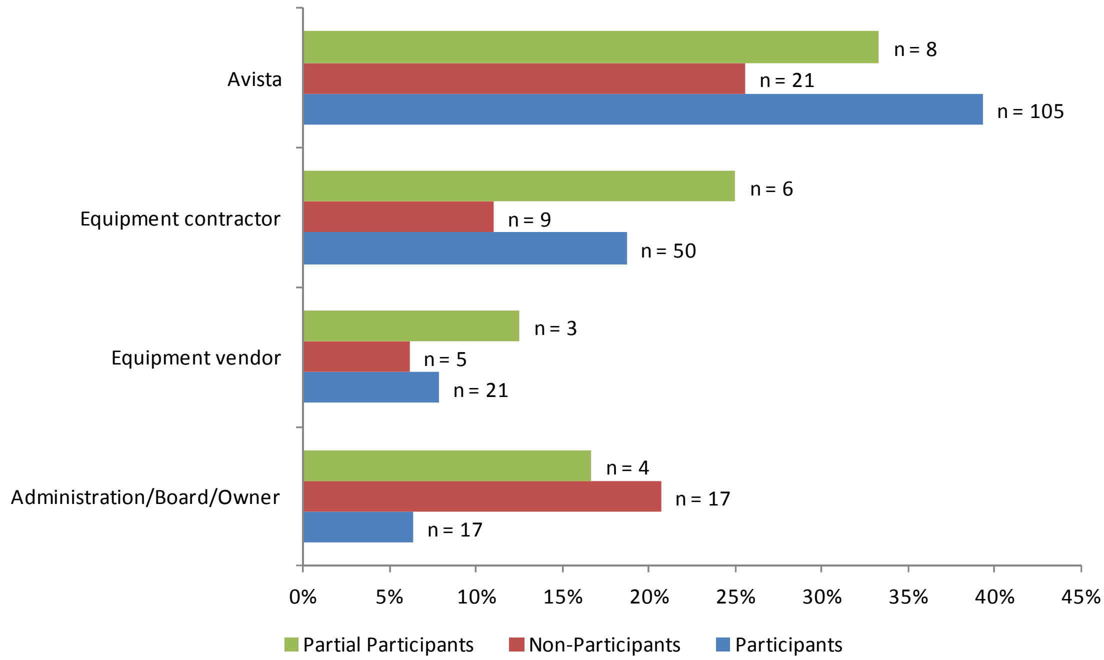
The remaining (3 respondents) said that they did not have sufficient information about the programs.

Forty percent (8 of 20 respondents) of partial participants reported installing measures through the rebate program in the past and still considering installation. Over one-third of partial participants (7 of 20 respondents) reported funding challenges, ranging from budget cuts, project costs, and the economy. One respondent said the rebate was not worth the time to fill out the paperwork. Remaining respondents did not cite reasons for nonparticipation. Future research will investigate potential spillover benefits from nonparticipant and partial participant customers.

Who Customers Talk to About Energy Efficiency

To better understand where customers learn about improving energy efficiency, the survey asked participants, nonparticipants, and partial participants who they would talk to about improving energy efficiency at their facilities. Ten percent of participants and thirteen percent of non-participants did not know. Figure 2-10 demonstrates sources mentioned most frequently. All respondents listed Avista as their first source. While participants and partial participants list equipment contractor as their second source of information, nonparticipants cite administration.

Figure 2-10. Who Customers Talk to Most About Energy Efficiency

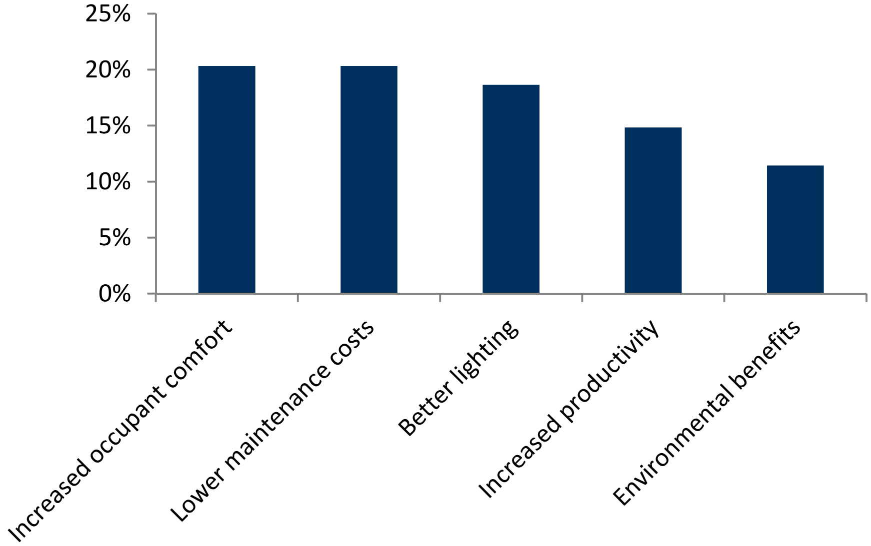


Program Barriers and Benefits

Participant Benefits

To better understand motivating factors in addition to energy savings, the survey asked program participants whether the rebated energy project provided benefits beyond energy savings. Seven percent did not know, and of the remaining 264 respondents 75 percent believed participation offered key benefits in addition to energy savings. Top non-energy benefits cited in Figure 2-11 include: increased occupant comfort, lower maintenance costs, better lighting, and increased productivity. Given the high incidence of non-energy benefits, Cadmus believes it is important to try to quantify these benefits in future TRC values.

Figure 2-11. Benefits Beyond Energy Savings

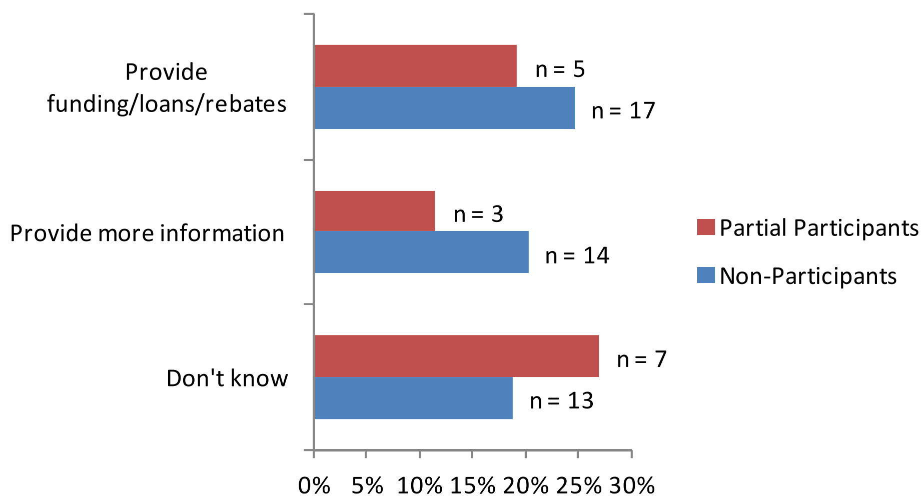


Participation Barriers

Surveys asked all customer groups what they saw as the most significant obstacles to installing energy-efficiency equipment for their company. The overwhelming majority (68 percent for participants and 69 percent for nonparticipants and partial participants) replied high first-costs as the most significant obstacle. Many did not know the most significant obstacle (10 percent of participants, and 19 percent of nonparticipants).

Surveys also asked nonparticipants and partial participants what Avista could do to help their companies overcome these obstacles. Top results are shown in Figure 2-12.

Figure 2-12. Barriers to Installing Energy Efficient Equipment



Participant Sources of Outside Funding

The participant survey included several questions about the influence of outside funding sources on their decisions to participate in the program. When asked whether their company utilized other sources of outside funding, a majority of non-lighting program participants (88 percent) reported they did not. For the 16 respondents who did use outside funding, all but one indicated outside funding sources proved very important, or somewhat important in their decisions to install measures through the program.

Questions on the survey also included specifically asking lighting participants whether their company applied for tax rebates for lighting installed, in addition to rebates received through Avista's lighting program.

Of 157 lighting respondents, surveys revealed:

- 22 percent utilized the tax rebate.
- 54 percent did not utilize a tax rebate.
- 24 percent did not know.

Of lighting participants applying for tax rebates, 91 percent indicated the tax rebate influenced their decision to install measures through the program. Of the total lighting participants, however, only about 20 percent said tax rebates were important indicating that when gone, they are likely to have little effect on the program.

Program Satisfaction

To provide insights about satisfaction with various program components, surveys asked participants (and nonparticipants or partial participants who had heard of the program) to rate the program in several areas.

For participants, topic areas included: 1) marketing materials and the Website; 2) rebate amounts and measure offerings; 3) communication; 4) contractors and vendors; 5) application and rebate processing; and 6) Avista staff. If participants had experience with external implementers, energy audits, or pre- and post-verification, they were asked to rate satisfaction with these program elements.

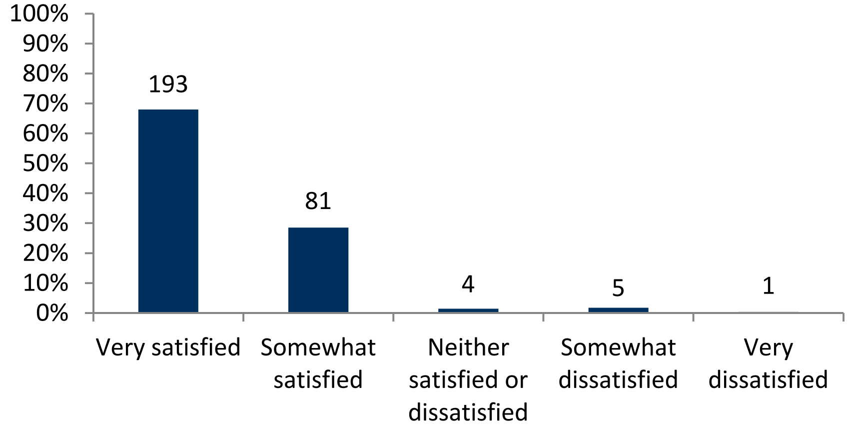
Surveys asked nonparticipant and partial participants aware of the programs to rate a smaller list of program components, focusing on impressions with marketing and outreach, program measures, contractor experiences, the application process, and Avista staff.

Survey respondents rated their satisfaction on a five-point scale, ranging from very satisfied to very dissatisfied, with a midpoint of neither satisfied or dissatisfied. If respondents responded somewhat or very dissatisfied, they were asked why they gave that rating, and what Avista could have done to improve their experience. Not applicable response types were excluded from the analysis.

Participant Program Satisfaction

Overall, participants proved very satisfied with the program and its various components. Almost all (97 percent) answered somewhat satisfied or very satisfied with the program overall. Figure 2-13 shows the number of respondents, and how they rated satisfaction with the program.

Figure 2-13. Participant Satisfaction with the Program



Program areas conveying strongest participant satisfaction were:

- Avista staff and account executives (82 percent);
- Measure installed (78 percent); and
- Speed in which rebate was received (73 percent).

Nineteen of the 20 EnergySmart Grocer program participants reported being either very or somewhat satisfied with the program. Sixteen of these respondents also reported being satisfied with implementer, PECI, while the remaining four respondents did not have enough contact with PECI to respond.

Program areas that participants reported being dissatisfied with most often included the program materials, the speed with which the rebate was received, and Avista's program offerings.

Sixteen of the 226 participants who were familiar with the program materials reported being dissatisfied with them. Common reasons for dissatisfaction with program materials included:

- Program materials seemed confusing.
- They had not received printed program materials.
- They were not sure about the different program opportunities.

Ten of 105 participants were dissatisfied with either the speed in which the rebate was process or the amount of rebate.

A very small percentage of participants (ranging from one to five percent) were dissatisfied with other program elements. These include:

- Avista's program offerings.
- Speed the rebate was received.
- Energy savings realized.
- Application forms.

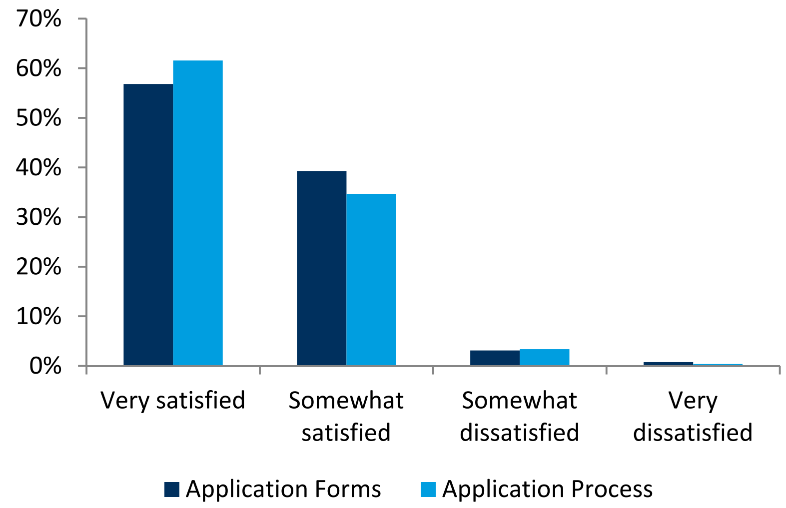
- Application process.

Participant Satisfaction with the Application Process

Overall, participants, nonparticipants, and partial participants proved very satisfied or somewhat satisfied with application forms and the application process.

Figure 2-14 shows participant satisfaction with the application process.

Figure 2-14. Participant Satisfaction with Application Process



Participant Satisfaction with Contractor or Vendor

The survey asked participants to rate their satisfaction with contractors and vendors (for those who had experienced working with them). If the customer indicated dissatisfaction, they were asked to provide reasons.

Of participants responding to this question, the majority used a contractor (171 of 215). Nearly 80 percent reported being very satisfied with the contractor service, while 15 percent reported being somewhat satisfied. Only 5 percent were somewhat dissatisfied or very dissatisfied. Three respondents expressed dissatisfaction due to poor engineering and installation.

Nonparticipant Satisfaction

Nonparticipants aware of the program and partial participants also expressed strong satisfaction with program elements they experienced. The nonparticipants and partial participants were asked to rate their satisfaction with the Website, rebate amounts offered, Avista's program offerings, program materials, application forms, application process, and program staff or account executive at Avista. As many respondents did not have experience with different program elements, surveys recorded a high number of "not applicable" responses, which were removed from analysis.

Although nonparticipants reported satisfaction, their satisfaction levels ran slightly lower for most program elements than those of participants. Nonparticipants highly ranked their satisfaction with Avista's program staff and account executives, with 83 percent of nonparticipants surveyed very satisfied or somewhat satisfied with Avista staff. A few nonparticipants and partial participants were somewhat or very dissatisfied with program elements including rebate amount offered, program materials, and the application process.

2.3.4 Trade Ally Feedback

Over several years Avista has accumulated and maintained a mailing list of contractors and vendors providing services to Avista's residential and nonresidential energy-efficiency program customers. Avista uses this mailing list to inform trade allies of energy-efficiency program opportunities, changes, or upcoming events.

As such, the trade ally program serves as an informal network of participating contractors and vendors, who anticipate learning about Avista's energy-efficiency program incentives, benefit from the business opportunities provided by the program, and interact with Avista's energy-efficiency program participants.

Avista also sponsors periodic technical training sessions (about once a year) for lighting contractors through the Northwest Trade Ally Network (NW TAN), informing contractors and vendors of new program offerings.

Research Objectives

The trade ally research sought to gather opinions and feedback from a representative sample of trade allies, both active or inactive, for Avista's nonresidential energy-efficiency programs. Process evaluation objectives for the trade ally research included:

1. Gathering information about the contractor and vendor target market.
2. Assessing awareness, experiences, and satisfaction with program design, enrollment processes, outreach, and communication.
3. Identifying whether the program evidenced challenges, barriers, or possible improvements.

Methods

In assessing Avista's trade ally program, Cadmus:

- Reviewed promotional and training materials;
- Discussed the trade ally program's structure with Avista staff; and
- Conducted interviews with participating trade allies.

Program materials reviewed for evaluation included:

- Trade ally mailing list.
- Technical training presentations.
- Sample handout about program updates.
- Record of NW TAN training attendance.

Promotional and training materials specifically targeting Avista's trade allies contained information regarding program updates, and sought to provide technical information about new program measures.

Drawing from a mailing list of contractors and vendors dealing with Avista's prescriptive and site-specific programs, we contacted Avista's program managers by phone, seeking to highlight the key commercial program contractors and lighting vendors on the list.

The evaluation plan targeted 30 to 40 interviews over a two-year period (2010 and 2011). Due to the trade ally program's informal structure, nonparticipating trade allies could not be identified for the 2010 evaluation. Therefore, the evaluation targeted 20 interviews with participating trade allies.

Over a two week period, Cadmus contacted 64 contractors and vendors from Avista's nonresidential trade ally mailing list. Of the trade allies who were called, nine had limited to no involvement with the rebate programs, two refused interviews, and one number had been disconnected. The remaining contacts were busy, requested more than one call back, and consequently could not be reached. Ultimately, 20 trade allies were interviewed. These contractors or vendors either sold or installed equipment to business customers receiving rebates through Avista nonresidential energy-efficiency programs.

The interview guide included 35 questions, with topics ranging from program awareness, satisfaction, marketing and outreach, market barriers, and recommendations for improvements.

Research Results

Participating trade allies provided insights into many program components, highlighting strengths and weaknesses from their direct experience with the nonresidential programs. This section summarizes trade ally interviews results. The observations do not distinguish PECI and the Green Motors Practices Group, which implement Avista's EnergySmart and Green Motors programs, respectively, as external agents from the utility.

Trade Ally Profile

Trade allies provided services to a mix of customers, serving a variety of project sizes and types. More than half the respondents completed 10 or fewer projects incentivized through Avista's nonresidential programs. Only lighting market companies had greater than 20 projects incentivized by Avista in 2010.

Cadmus' effort to contact trade allies in varying fields sought to capture an overall picture of Avista's trade ally network. Table 2-4 identifies trade allies interviewed, as a portion of the commercial energy savings by program type, demonstrating that the respondents are representative of the program.

Table 2-4. Trade Ally Respondent Comparison

Trade Ally Program Type	Number of Respondents	Portion of Interview Respondents*	Portion of 2010 Portfolio Savings Represented**
Lighting	7	39%	35%
HVAC	5	28%	25%
Industrial	1	6%	6%
Motors	1	6%	3%
Shell	1	6%	10%
Rebate Coordinators	2	N/A	N/A
Energy Smart Grocer	2	11%	14%
Green Motors	1	6%	0%
Total	20	100%	93%

* Rebate Coordinators are not included as a percent of the total respondents because they promote various measure types.

**Trade allies were not contacted for the measure categories that account for the remaining 7% of the savings. Therm savings were converted to kWh for this comparison.

Awareness

Of 15 respondents remembering where they first learned of Avista's rebate programs, a majority (9 of 15) attributed their knowledge to Avista's outreach efforts. These efforts included contacts by Avista representatives or receipt of program or marketing materials. The remaining individuals (6 of 15) learned of Avista's programs through industry contacts or trade associations.

Most respondents (15 of 18) found Avista's trade ally outreach adequate. Two responded that Avista could provide better outreach to trade allies and provided these recommendations:

- Reach out to specific businesses rather than leave materials for contractors to pick up at electrical supply houses.
- Expand the range of equipment eligible for prescriptive rebates to encourage additional participation.

Program Benefits

Almost all trade allies (18 of 20) believed the programs brought value to their companies. As shown in Table 2-5, most trade allies provided multiple responses about the type of value.

Table 2-5. Value Avista's Programs Provide

Statement	Number of Responses
Increase product/service sales	14
Program helps get more business and enhances company value to customers	14
Use of program as a marketing tool	5
Helps customers save on electric bills	5
To receive portion of incentive	3
There is a market for products that save businesses energy and money	2
Development of good customer relations	2
To offer higher quality products/service	2
Total	47

This question provided insights outside the anticipated responses. In addition to increased business, one contractor suggested Avista's programs may spur additional hiring in the region by expanding anticipated project opportunities. Another contractor suggested Avista's programs may help to level the playing fields between large and small businesses, providing additional resources and Return on Investment opportunities for smaller, independent customers.

Program Satisfaction

As shown in Table 2-6, the majority of trade allies (15 of 20) working with Avista's customers expressed strong satisfaction with the nonresidential rebate programs. A few respondents (3 of 20) were somewhat satisfied, and one respondent was somewhat dissatisfied.

Table 2-6. Satisfaction with Avista's Rebate Programs

Program Satisfaction	Respondents
Very Satisfied	15
Somewhat Satisfied	3
Somewhat Dissatisfied	1
Don't Know (DK)	1
Total	20

The majority of trade allies were very satisfied with Avista's program staff and account representatives. One respondent was somewhat dissatisfied with the program and staff, citing lack of program promotion and follow-through with applications.

More than half of trade allies (13 of 20) had some experience with other utilities' similar programs. Trade allies offered the following pros and cons regarding Avista's nonresidential programs:

Pros:

- Quick turnaround times.
- Easy to work with, limited amount of paperwork, user-friendly programs.
- Less restrictive programs.

Cons:

- Limited quantity or choice of efficient technologies through the prescriptive program (for example LEDs and digital HID).
- Project approval processes can be slow.

Avista Communications with Trade Allies

Trade allies learned of the program through a variety of approaches. Particularly for site-specific projects, trade allies felt they received information directly from their Avista representatives, and, as such, maintained good working relationships with key account managers. Nineteen respondents used the following communication methods to learn about eligibility, program changes, or new measures:

- Twelve reported they contacted Avista representatives for questions or concerns about project eligibility.
- Four checked the Website before calling Avista representatives.
- The three remaining respondents expected customers to do additional research beyond that available on the customer Website or handouts.

In addition to direct contact with Avista representatives, trade allies suggested e-mail as the most effective way to notify them of program opportunities and updates. Table 2-7 lists preferred modes of contact.

Table 2-7. Most Effective Way to Notify Trade Allies of Program Offerings and Changes

Method of Contact	Number of Responses
Email	13
Mailing	5
Website	5
Seminar	1
Total	24

Generally, most respondents felt Avista conducted adequate outreach for trade allies. Many characterized outreach as "great," "user friendly," and "Avista is always available to help." However, a few respondents provided the following observations:

- Though outreach to contractors is adequate, trade allies noted sometimes not being sure who to talk about rebate opportunities. This type of information could be included in bill inserts.
- It is not enough to simply leave materials at electric supply houses and hope the information will spread.
- Avista does not promote the program as much as they should; they could do more.

When asked how communications or interactions with Avista might be improved, just over half of respondents (11 of 20) stated current communications worked fine. However, recommendations for improvements to overall communications between Avista and trade allies included the following:

- Meet personally with trade allies (for example lunch meetings) to review program materials.
- Increase program promotion to trade allies.
- Regularly send out program materials and information about types of incentives.
- Send out monthly e-mails, summarizing the rebate programs, including changes or updates.
- Work more with trade allies to help them better understand the program and assist with promotion to customers.
- Provide a specific Website targeted for trade allies.
- Streamline the lighting program: for example, break the prescriptive program into indoor and outdoor programs.
- Site-specific programs sometimes took up to six weeks, which could “kill” a project.

When asked, trade allies expressed satisfaction about materials received from Avista. However, although more than half of respondents (12 of 20) received some program materials most could not recall what they received. Three respondents suggested regular program updates would be helpful to keep trade allies informed. For those receiving program materials, all were very satisfied or somewhat satisfied with the materials.

Trade Ally Communications with Customers

A majority of trade allies (18 of 20) promoted Avista programs to customers, with most (16 of 20) actively promoting materials often or always. Two respondents only promoted rebates occasionally, depending on customer project types. Two contractors did not promote Avista programs, as one left EnergySmart outreach efforts to PECI field staff and the other reasoned Avista responded slowly to applications.

Trade allies promoted the program through the following means:

- Over half (11 of 20) promoted the program through word of mouth.
- Nearly one-third (6 of 20) promoted the program by including Avista’s program incentives in customer cost proposals.
- One trade ally reached out directly to commercial customers that could potentially qualify for Avista rebates.

When asked what types of energy-efficiency program benefits trade allies promoted to customers, respondents offered the following, top three responses:

- More than half (13 of 20) cited reduced energy costs.
- Nearly half (9 of 20) promoted the incentives and ROI.
- Almost one-third (6 of 20) promoted reduced energy use.

Trade allies answered questions about perceived customer awareness and types of information typically requested. Per trade allies, most customers (18 of 20) were very aware or somewhat aware that Avista offered rebate programs, though some trade allies (4 of 20) noted customers were unaware of rebate details or how to access them. One respondent commented that smaller businesses particularly did not know about Avista programs. Typical of information most requested by customers addressed incentive levels, technology, and participation requirements. Appendix C includes survey response details about customer awareness and typical types of information customers requested.

Barriers to Program Participation

When asked to identify perceived obstacles Avista customers face when installing energy-efficiency equipment, trade allies most often cited the availability of capital (13 of 20). Appendix C includes detailed responses about types of market barriers trade allies experienced.

When asked how Avista could assist trade allies and customers in overcoming obstacles to financing energy-efficiency projects, trade allies recommended:

- Raising rebates;
- Expanding prescriptive program to include certain commonly accepted site-specific technologies;
- Offering up-front incentives to decrease initial project costs;
- Providing a newsletter to customers; and
- Providing incentives to contractors promoting the program more and having more contact with customers.

Most trade allies (15 of 20) felt, although significant market barriers exist, Avista rebates proved a very important element in customers' decision-making processes when considering energy-efficient technologies. Over one-third (8 of 20) asserted most of their projects would not have been completed without Avista's nonresidential program incentives. Appendix C provides detailed responses about the importance of Avista rebates.

When asked if they had recommendations for technologies to be included in Avista's rebate programs, nearly half of trade ally respondents provided recommendations. Table 2-8 lists some additional technologies that trade allies would like Avista to consider.

Table 2-8. Energy Efficiency Equipment Avista Should Consider Offering Rebates for

Energy Efficient Equipment	Number of Responses
Digital HID	2
LEDs	4
Green Pump Repairs	1
Air Conditioning	1
Tankless Water Heaters	1
Total	9

2.3.5 Application Processing and Data Tracking

To enroll in nonresidential programs, customers must fill out application forms or contractual agreements to apply for prescriptive and site-specific rebates. The number and type of required application forms and documents vary, depending on the program type, eligibility requirements, and types of measure installed. This section describes forms used for enrollment and tracking procedures.

Prescriptive Forms

For projects eligible for a prescriptive rebate, customers complete and submit one application for each measure type, following the project's completion. Avista provides measure-specific rebate forms on its Website (downloadable as PDFs), each providing instructions and specifying eligibility requirements, payment amounts, payment procedures, and terms and conditions. Some prescriptive measures requiring extra verification outline the supplementary materials.

Typically, except for prescriptive projects requiring additional verification, enrollment forms provide Avista customers with the information needed to successfully complete a program-qualifying project. Upon project completion, customers submit rebate applications with necessary materials, outlined in the forms.

Site-Specific Forms

In contrast to prescriptive program requirements, customers receive site-specific forms once contact has occurred between an account executive and a customer to determine eligibility for program rebates before project completion. Site-specific projects are usually more complex and require supplemental forms, such as calculation worksheets and customer contracts. Avista's business home Website provides basic, site-specific program information to customers, including incentives and eligibility requirements. Customers must contact an account executive before engaging in program-related procedures.

Avista determines site-specific project eligibility after a customer submits a preliminary site-specific form. Once the customer submits the form, Avista uses measure-corresponding incentive calculators to determine eligibility, energy savings, and rebate amounts. If both parties agree to move forward, Avista signs contracts with the customer, delineating rebate agreements. After project completion, a customer submits a completed site-specific form with proof of installation. This documentation varies by project.

Participant Tracking Databases

Avista maintains two primary databases for tracking participants and projects: Sales Logix tracks program participant activity; and Tracker follows site-specific projects through the pipeline, from eligibility, installation, and inspection. Program staff use Sales Logix to enter customer participant information, following engagement in the enrollment process.

Both account executives and program engineers use Tracker to follow site-specific projects through its various installation stages, from prequalification to post-installation inspection. As a site-specific projects move through the pipeline, Tracker facilitates communication between account executives and engineers.

Research Objectives

During initial kick-off meetings and follow-up interviews, Avista's implementation team and account managers indicated they wished to learn more about the ease of enrollment processes from the program participant perspective. Therefore, the application form and database review sought to achieve the following objectives:

- Assess the ease of use of program enrollment forms and data processing;
- Assess completeness, accuracy, and consistency of forms and the data tracking database; and
- Assess the ability to provide useful information for tracking and evaluation.

Methods

Methods used to assess the application processing and data tracking components for the nonresidential energy-efficiency programs included: review of application forms and data tracking systems; and collection of feedback from staff interviews, participant and nonparticipant surveys, and interviews with trade allies.

To better understand and assess the enrollment forms and data tracking procedures, the evaluation team reviewed the following materials:

- Prescriptive rebate applications;
- Site-specific contracts and worksheets;
- Database participant extracts;
- Screenshots of databases and terminology; and
- Samples of monthly payment records.

Research Results

Staff Interviews

During interviews with Avista staff, program managers and account executives requested examinations into applications and enrollment processes, to identify whether customers or contractors experienced challenges with the forms. Several staff believed, based on customer feedback, the site-specific forms, in particular, could be streamlined. For the 2010 evaluation, Cadmus included satisfaction question options to identify specific issues with the forms. Results indicated some participants and trade allies did experience challenges that are discussed below.

Participant Surveys

Participants did experience a few challenges with the application form and application process. These include:

- The information was hard to find online, or difficult to access.
- The application process seemed confusing and difficult to understand.
- The forms were too long.
- The application process was not easy and could be simplified.
- It was hard to access the forms and difficult to understand.

Trade Ally Interviews

Trade allies reported they typically helped customers fill out applications. Most (16 of 20) completed the application paperwork, leaving customers to complete personal information and submit applications to Avista. When asked whether they encountered difficulty with completing forms, three respondents reported some difficulty with site-specific related paperwork. In these instances, however, Avista representatives provided assistance, solving outstanding issues efficiently.

One trade ally in particular reported dissatisfaction with Avista's application process, after experiencing a great deal of difficulty in submitting an application for LED lighting. He said Avista lost the paperwork on multiple occasions and was nonresponsive to the trade ally's concerns.

Trade allies did not report customer complaints or challenges with the application process, though, when asked for recommendations to enhance the application process, three interviewees provided the following observations:

- How the prescriptive lighting worksheet requested information about fixtures replaced proved to be confusing. The trade ally suggested accounting for total wattages replaced rather than numbers of fixtures and bulbs replaced, as fixtures have varying numbers of bulbs. Prescriptive rebate forms did not always clearly designate documentation needed. Avista could provide standards or samples of material requested.
- As some commonly installed measures had to undergo the site-specific process, filling out the site-specific paperwork could be cumbersome, as had to be done by hand. Providing forms that could be submitted online could expedite the application process.
- Some difficulty emerged in providing information necessary through the site-specific program. Open-ended information was often requested, making it difficult to determine necessary materials. Additional instructions could help clarify documentation needed for the application process.

Database and Evaluability Assessment Checklist

Cadmus has developed a simple approach to determine how well participant datasets can be evaluated based on information that is available and can be collected. Based on a review of evaluation assessments (from our internal database), we have identified criteria for data tracking and evaluation. To document the evaluability of Avista's application processing and data tracking, Cadmus determined how customer and project information was collected, stored, and communicated through Avista's various databases.

The review sought to ensure necessary information existed in the forms and databases to: enable accurate tracking of participant projects; enable quality control; and ensure necessary information has been collected from program participants and projects. We compared data fields in prescriptive and site-specific rebate forms with data found in Sales Logix screen shots and Avista data extracts.

The table below was used as a checklist to identify information found in program rebate and application forms, Sales Logix screen shots, and database extracts. The first column lists kinds of data typically needed to enable a comprehensive evaluation. The second, third, and fourth columns indicate whether the data field was requested in the application forms, and whether data appeared to be consistently collected in the database extracts received throughout the evaluation. Inconsistencies are found in data tracking when the first and second columns do not match.

Table 2-9. Prescriptive and Site-Specific Data Tracking

<table>
<tr><th colspan="2">Data for Tracking and Evaluation</th><th>Sales Logix</th><th>Field in Extract Database</th><th>Collected in Prescriptive Forms</th><th>Collected in Site Specific Forms</th></tr>
<tr><td colspan="2">Customer Acct Number</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">App Number</td><td>Yes</td><td>Yes</td><td>No</td><td>Yes</td></tr>
<tr><td colspan="2">Tracker Number</td><td>Yes</td><td>No</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="2">Business Name</td><td>Yes</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Business Mailing Address</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Project Site Address</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Contact Name (first, last)</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Phone</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Email Address (Fax on some)</td><td>No</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td colspan="2">Fuel Type</td><td>Yes</td><td>Yes</td><td>Yes</td><td>When applicable</td></tr>
<tr><td colspan="2">Program Type</td><td>Yes</td><td>Yes</td><td rowspan="4">Rebate Forms are specific for each measure</td><td rowspan="4">Rebate Forms are specific for measures, Asks for description</td></tr>
<tr><td colspan="2">Project Type</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Measure Type</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Measure Description</td><td>Yes</td><td>No</td></tr>
<tr><td colspan="2">Measures Quantity Installed</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Equipment Details (Manufacturer, model…)</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Type of Facility</td><td>No</td><td>No</td><td>When applicable</td><td>When applicable</td></tr>
<tr><td colspan="2">Total square feet affected by measure</td><td>No</td><td>No</td><td>When applicable</td><td>When applicable</td></tr>
<tr><td colspan="2">Occupancy</td><td>No</td><td>No</td><td>When applicable</td><td>When applicable</td></tr>
<tr><td colspan="2">Site verified/inspected</td><td>Yes</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td colspan="2">Account Executive</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td></tr>
<tr><td colspan="2">Tech Lead</td><td>Yes</td><td>Yes</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="2">kWh/Therm</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td></tr>
<tr><td colspan="2">Incentive Electric/Gas</td><td>Yes</td><td>Yes</td><td>No</td><td>No</td></tr>
<tr><td colspan="2">Measure Cost</td><td>No</td><td>Yes</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Incentive Cost</td><td>Yes</td><td>Yes</td><td>Yes</td><td>No</td></tr>
<tr><td colspan="2">CE Cost</td><td>Yes</td><td>Yes</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="2">Phase</td><td>Yes</td><td>Yes</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="2">Measure Life</td><td>Yes</td><td>Yes</td><td>N/A</td><td>N/A</td></tr>
<tr><td colspan="2">Program Participation Year</td><td>No</td><td>No</td><td>No</td><td>No</td></tr>
<tr><td colspan="2">Customer Signature</td><td>No</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td colspan="2">Installation/Completion Date</td><td>Yes</td><td>No</td><td>Yes</td><td>Yes</td></tr>
<tr><td rowspan="7">Site-Specific Information only</td><td>Rate Schedule</td><td>No</td><td>Yes</td><td rowspan="7"></td><td>Yes</td></tr>
<tr><td>Tier</td><td>No</td><td>No</td><td>Yes</td></tr>
<tr><td>Existing Equip Details</td><td>No</td><td>No</td><td>Yes</td></tr>
<tr><td>Contractor Name</td><td>No</td><td>No</td><td>Yes</td></tr>
<tr><td>Contractor Contact</td><td>No</td><td>No</td><td>Yes</td></tr>
<tr><td>Taxpayer ID No.</td><td>No</td><td>No</td><td>Yes</td></tr>
<tr><td>Contract No.</td><td>Yes</td><td>No</td><td>Yes</td></tr>
</table>

From the review of application forms and databases, interviews with staff, and survey results, the evaluation team observed the following areas for improvements:

- The evaluability checklist highlights a few missing fields. These included business address, program type, measure descriptions, and measure quantity. Inability to identify specificity of program and measure detail created challenges in identifying unique participants for survey sampling.

- Participant and tracking databases exhibit a lack of integration. Though Avista is moving toward integrating these databases over the next few years, program staff currently use different databases to track participant and project information. Use of separate databases may result in increased chance of error during data transfer and reporting.
- Some inconsistencies were found in the participant data tracking sheets including merged cells and duplicate entries.

2.3.6 Marketing and Outreach

In 2010, Avista's marketing and outreach efforts for nonresidential customers focused on program promotion through Avista's business Website,[20] account executives, marketing flyers, and a bimonthly E-newsletter, e-mailed to customers who sign up online. In addition, the Every Little Bit residential program campaign provided a platform to promote the Efficiency Avenue Website,[21] a virtual business park, highlighting energy-efficiency rebate opportunities for business customers, and organized by commercial and industrial sectors.

Research Objectives

Research objectives for the marketing and outreach component included gathering information about how programs are promoted to nonresidential customers. Research included the following objectives:

- Identifying marketing strategies.
- Identifying how accessible customers and trade allies found the program.
- Identifying marketing and outreach efforts for leveraging the existing supply chain.
- Determining marketing strategy's ability to target commercial and industrial audiences.
- Gaining insights into marketing efforts contributed to removing participation barriers and facilitating customer communication.

Methods

For the evaluation, we reviewed marketing materials, Websites, the E-newsletter, and other outreach communications. The evaluation team conducted interviews with program staff, account executives, and the marketing team. In addition, we gathered feedback through interviews with trade allies, and surveys with program participants and nonparticipants.

Reviewed marketing and media materials included:

- Program marketing handouts.
- Business customer Websites.
- Efficiency Avenue Website.

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[20] Avista's business home Website: http://www.avistautilities.com/business/pages/default.aspx;
[21] Efficiency Avenue: http://www.everylittlebit.com/EfficiencyAvenue.aspx

- Energy Solutions newsletter.
- Questline Electronic Business Services Control Console (screen shot).

Research Results

Marketing Strategy and Research

Though nonresidential programs had no dedicated marketing budget in 2010, Avista dedicated a marketing budget and resources in 2011. As a result, Avista's marketing team, in collaboration with nonresidential program managers and account executives, are developing a broad-reaching nonresidential marketing campaign, which will profile a series of customers through case studies, and will be launched at the customer Power Breakfast in October. The 2011 process evaluation will explore the marketing campaign in greater detail.

Marketing research has not been explicitly conducted to identify the effectiveness of the nonresidential program marketing and outreach efforts. However, the marketing department reports customer retention as high, tracked through the Website and participation in the E newsletter. The marketing team reports 130 leads have been tracked through the Efficiency Avenue Website.

Program Marketing Handouts

The marketing and outreach review examined promotional flyers used for nonresidential energy-efficiency programs in 2010 and 2011. During events, Avista's key account executives utilize these flyers for outreach. The 2010 promotional handout used was a simple, two-page flyer with program descriptions. In 2011, the flyer expanded to include more information about Avista's commercial program services and benefits. The flyer includes the business home Website address.

Business Customer Website

Avista's nonresidential energy efficiency program Website provides extensive resources, dedicated for business customers and featuring Webpages, links to informational resources, and key contact information, including information about the following:

- Account executives contact information, by region;
- Energy-efficiency incentives, by state;
- Prescriptive program application forms;
- Site-specific program information;
- Project case studies;
- Energy pricing, energy conservation tips, and business and builder services;
- Energy Solutions newsletter sign-up and login; and
- Links to Every Little Bit residential Website and Efficiency Avenue.

Efficiency Avenue Website

Interviews with the marketing team revealed Efficiency Avenue was launched in 2009, providing an interactive online tool for businesses. At Efficiency Avenue—a feature of the Every Little Bit residential program campaign Website—customers can tour an imaginary business park, and click on pop outs demonstrating energy-efficiency opportunities and rebates by sector (for example, mixed use, agricultural, industrial, warehouses, and schools). Although Efficiency Avenue's features are not prominently placed anywhere on the main business Website, links are placed on the Every Little Bit Website and on a secondary Webpage containing information about energy-efficiency incentives.

Efficiency Avenue enables Avista to market by segment, directing customers to energy-efficiency projects and rebates available for their business types. The site provides relevant information about rebates, case studies, and prescriptive program application forms.

Avista's account executives reported Efficiency Avenue as an additional resource, reducing some outreach time commitments by answering basic customer program questions, and providing a way to leverage marketing dollars.

E Newsletter

According to the marketing team, Energy Solutions, an E-newsletter, reaches business customers twice each month. Many customers sign up for the Energy Solutions newsletter through the business home Website of Efficiency Avenue. The E newsletter provides a forum for answering typical business questions, features promotions, and informs customers about program changes and upcoming events.

Questline Electronic Business Services administers the E-newsletter. Promotional buttons and Website links inserted within the newsletter articles direct customers to typical business queries. Questline provides a Control Console report, incorporating metrics that can be viewed by Avista staff. Although we could not view the annual metrics, we understand, through a screenshot, these metrics include customers' subscriber status, activity, retention, and interests.

2.3.7 Program QA/QC and Verification

Avista's verification and inspection procedures differ by program type. Prescriptive programs have no specific requirements for pre- or post-inspections. Rather, inspections are conducted based on the project's perceived risk. In contrast, site-specific projects require preapproval and inspection. Most site-specific and large projects require installation verification. Account executives and the engineering team determine inspection requirements, based on project information identified and flagged in the project database.

Tracker, the project database, tracks projects through the pipeline, while ensuring quality assurance (QA) and quality control (QC) of the data collection, project, and savings estimations. Specifically, Tracker provides a standard procedure for project review, inspection, approval, and reporting.

Research Objectives

Reviewing Avista's QA and verification procedures sought to determine the extent and documentation of systems used to track and verify program savings. Research objectives included:

- Identifying and documenting procedures for determining program eligibility.
- Identifying and documenting procedures for pre- and post-project inspections.
- Identifying and documenting procedures or systems for QA and QC of data collection, data entry, and rebate processing.

Methods

For this research, the evaluation team interviewed Avista program staff and engineers, and reviewed program documentation. In addition to the 2011 DSM Business Plans, we reviewed specific materials outlining QA and verification procedures, including:

- Energy Solutions DSM Portfolio Process Analysis and other reports;[22]
- E-mail communications from staff, discussing verification requirements and procedures;
- Tracker screen shots and reports; and
- Installation documentation template and report samples.

Materials Review and Interviews with Avista Staff

Cadmus reviewed a third-party evaluation report of Avista's data tracking and rebate processing, conducted by Most Adams last year.[23] The evaluation report's recommendations focused on QA of data tracking and rebate payments.

According to interviews with Avista program staff and engineers, the Moss Adams' recommendations resulted in additional, documented policies and procedures, designed to strengthen the consistency of project approval, reporting, and communications through Tracker.

Avista's QA and verification procedures for data tracking and entering projects for site-specific programs or large prescriptive programs are outlined for the Dual Fuel Incentive Calculator (DFIC) and overall estimation of project savings. The *Energy Solutions DSM Portfolio Process Analysis*, compiled by Avista's engineering and auditing teams, outlines policies. Procedures include:

- Documented communication between Avista staff to inform project updates and issues.
- A task-approval request function requiring more than one engineer to review a project.
- A notification system, noting and avoiding conflict of interest issues.
- A reporting guideline ensuring inclusion of necessary information in reports.

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[22] Evaluation Report Quality Assurance Process Analysis (contained in the 2010 Evaluation, Measurement, and Verification Highlights)

[23] Data Management Review for Demand Side Management Programs, May 2011. Avista Utilities and Moss Adams.

Cadmus reviewed an installation verification template and sample reports to assess the inspection protocol for site-specific projects. Although the inspection template was a simple, one-page outline of procedures (without date of version control), it was apparent from sample reports that Avista follows a comprehensive approach to project inspections. The comprehensive reports included project photos, locations, times of inspection, and findings.

Avista staff indicated procedures for prescriptive programs pre- and post-inspection have not been documented. Further, prescriptive rebate forms provide notifications to customers that inspections may be randomly conducted. Prescriptive verification procedures focus on the efficiency ratings of technologies, spot checks, and risk levels, determined by the project size, type, and information provided by the customer.

2.4 Conclusions and Recommendations

2.4.1 Program Documentation

Conclusions

Avista programs are working well and meeting or exceeding reported energy savings goals in 2010. Highly qualified, dedicated, and long-term staff ensure quality control and efficient operations of the many prescriptive and site-specific programs. Although program overview, goals, and implementation plans are located in the 2011 DSM Business Plan, documented operational procedures were not easily accessible. Therefore, it is difficult to link the EM&V policies found in the high level planning documents to the program's operational management.

Recommendations

To ensure that long term staff memory becomes institutional memory, Cadmus recommends aggregating operational procedures and implementation plans into a comprehensive program manual or handbook. Centralizing operational documentation would also improve program implementation.

To provide Avista with specific recommendations about material that could be contained in a comprehensive program manual, Cadmus consulted our database of utility evaluations and best practice research of commercial and industrial programs. Best practice research and reports are available at the Best Practices Benchmarking for Energy Efficiency Programs Website.[24] The best practice Website is a comprehensive study, publicly available online, identifying excellent practices among nationally-recognized, energy-efficiency programs throughout the United

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[24] Best Practices Benchmarking for Energy Efficiency Programs; http://www.eebestpractices.com/index.asp
Study managed by Pacific Gas and Electric Company, under the auspices of the California Public Utility Commission and in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company.
Nonresidential Large Comprehensive Incentive Programs Best Practices Report (custom programs)
http://www.eebestpractices.com/Summary.asp?BPProgID=NR5
http://www.eebestpractices.com/pdf/BPSummaryTable_NR5.PDF
Nonresidential Lighting and HVAC Best Practices Reports
http://www.eebestpractices.com/Summary.asp?BPProgID=NR1
http://www.eebestpractices.com/pdf/BPSummaryTable_NR2.PDF

States. Best practices are based on detailed analyses of the design, marketing, operation, and implementation of programs identified as exemplary.

Through assessment of the best practice nonresidential program research, Cadmus identified some key program areas to be considered for inclusion in a comprehensive program manual. These include (but are not limited to): program overview, goals, logic models, process flowcharts, staff roles and responsibilities, roles of program partners (e.g. trade allies and implementation partners), enrollment and data collection procedures, marketing plans and strategies, specified target markets, QA procedures, and verification protocols.

2.4.2 Customer Feedback

Conclusions

Overall, customers proved very satisfied with all program elements. The majority of survey respondents did not encounter program participation challenges. Survey respondents, however, did suggest ways to improve program delivery. Customers felt there was a lack of information about program offerings.

Recommendations

Given research results gathered through the participant, nonparticipant, and partial participant surveys, the evaluation team offers the following recommendations:

- Enhance outreach and communication efforts for participants, nonparticipants, and partial participants, including:
- Continue program outreach through account executives, mailings, bill inserts, and e-mail updates.
- Develop additional printed program materials to educate customers about program opportunities.
- Consider regularly scheduled online Webinars to assist customers with questions about program incentives, eligibility, and application processing.

2.4.3 Trade Ally Feedback

Conclusions

Avista's informal network of trade allies works well, through updates to the mailing list, word of mouth, and strong communications between contractors and Avista's customers, program staff, and account representatives. Trade allies express strong satisfaction with program components, though they requested additional program guidance and greater opportunities for direct communication with Avista.

Most trade allies actively promote Avista's nonresidential rebate programs due to the enhanced business opportunities it offers. Interview results indicate that nearly 16 percent of participants found out about the program through contractor outreach efforts, demonstrating that trade allies are working on behalf of Avista's interests. Although the mailing list serves as an informal network for nonresidential programs, limited information has been documented about trade allies, the markets they serve, and their areas of specialization and qualifications. Consequently, Avista may be missing opportunities to leverage this efficient use of resources.

Recommendations

Based on evaluation program observations and research gathered through trade ally interviews, Cadmus recommends a more formalized network that would incorporate best practices for commercial energy efficiency programs. Best practices for trade ally programs might include regular training and education, online registration, and easily accessible program guidance:[25]

For improvements to the trade ally program, Cadmus recommends the following:

- Provide regular trade ally communications through targeted outreach efforts, such as a Website, monthly e-mails, or a newsletter. A Website dedicated for trade allies could enable registration, thereby providing a method for compiling (and updating) trade ally profiles and contact information.
- Consider providing additional promotional materials that would highlight various program technologies available to customers. This would not require that Avista endorse any one contractor.
- Explore ways to leverage strong working relationships forged between customers and contractors within the community by sponsoring additional program working sessions, luncheons, or Webinars that provide guidance for trade ally outreach efforts.

2.4.4 Application Processing and Data Tracking

Conclusions

Overall, application forms and program databases work well for tracking nonresidential participants and projects. Prescriptive forms include instructions, terms and conditions, and other key information to guide participants through the rebate process. Site-specific forms, by nature, are more complex, and require more information from participants. Some customers and trade allies expressed confusion about prescriptive program requirements listed on the forms, and requested more help in filling out the site-specific forms and worksheets.

In addition, while developing survey samples, the evaluation team found additional information could be collected to enhance customer participant tracking. The evaluability assessment checklist revealed several fields in the database that could be more consistently tracked.

Recommendations

Application Forms

- Consider offering site-specific application forms online. Although it would be ideal to enable submission of forms online, simply making the forms downloadable and mail-in would

[25] Best Practices Benchmarking for Energy Efficiency Programs; http://www.eebestpractices.com/index.asp Study managed by Pacific Gas and Electric Company, under the auspices of the California Public Utility Commission and in association with the California Energy Commission, San Diego Gas and Electric, Southern California Edison, and Southern California Gas Company.

provide a good first step. In addition, consider including guidelines for completing site-specific forms.

- Consider gathering additional feedback from customers and trade allies about how site-specific form enrollment and processing could be streamlined.

Data Tracking

- Gathering more detail about program and project measures in the participant database would enable a better understanding of the kinds of projects done in the past (by different types of customers and end-uses). Additional information could be used to market specific types of projects to other customers who have the same end-use equipment.
- To improve sampling precision levels for customer surveys, consider ways to improve tracking of nonresidential customers and program participants. For example:
    - Tracking additional fields (or more consistent entry) in the database including:
        - Program type (e.g., site-specific and prescriptive).
        - Measure descriptions.
        - Measure quantities.
    - Follow up and track partial participants' interest in the program.
- Continue plans for linking participant and tracking databases. Integrating databases could reduce potential errors, due to data transfers and improve efficiency of participant tracking information.

2.4.5 Marketing and Outreach

Conclusions

Although a marketing budget had not been allocated before 2011, Avista's nonresidential marketing and outreach strategy has worked well, and includes the Website, customer E- newsletter, and outreach efforts of the key account managers. However, lack of knowledge about the effectiveness of nonresidential marketing approaches could result in reduced understanding of target markets for meeting future program goal requirements.

Recommendations

Consider the following improvements to future marketing strategies:

- Ensure allocation in future marketing budgets dedicated for nonresidential program marketing and outreach efforts.
- Consider development of additional marketing materials targeted specifically for trade ally outreach to customers. These materials would enable Avista staff to leverage existing trade ally relationships in the community. Make them available at TA website for printing
- Consider conducting marketing surveys, and targeted marketing research that would gather additional information about customer facilities, technology end-uses, and other targeted research to identify:

- o Effectiveness of existing outreach efforts and future marketing campaigns.
- o Effectiveness of outreach through existing partners and supply chain channels.

2.4.6 Quality Assurance and Verification

Conclusions

Procedures for QA of data tracking, savings estimation, project approval, and inspection have been well-documented for site-specific projects. Documents indicate Avista follows a standardized protocol for inspection of site-specific projects, in particular. Though Avista uses a risk-based approach to pre- and post-inspections for prescriptive programs, guidelines or standardized procedures for this approach have not been documented.

Recommendations

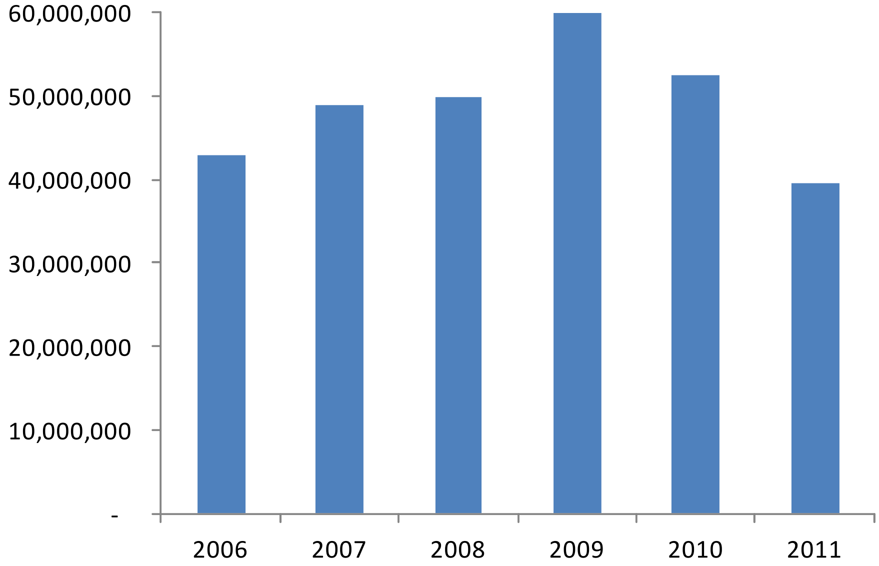
Consider developing a verification protocol to document pre- and post-inspection procedures for prescriptive programs, and ensure data tracking for project installation. In addition, protocols should highlight any differences in verification procedures used for prescriptive and site-specific programs.

2.4.7 Future Research Areas

Research methods for the 2010 process evaluation focused on analyzing and documenting how the nonresidential programs work in practice, while identifying important influences on its operation and achievements. As a first year process evaluation, the analyses established a framework for evaluation efforts, while gathering a wide net of information and potential areas for improvement about program planning, design, organizational structures, and implementation effectiveness.

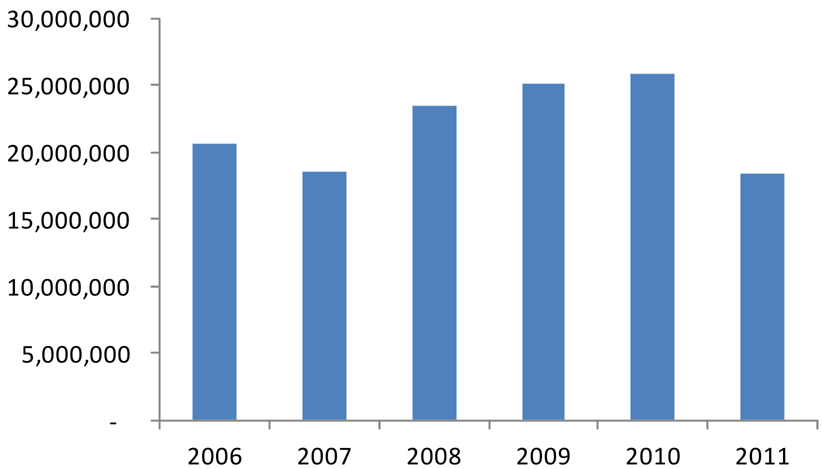
In 2011 and subsequent year process evaluations, Avista may consider delving deeper into program elements that may require more comprehensive research. As a starting point, Cadmus looked at the long term savings horizon in the context of historical trends for Avista's nonresidential programs. Figure 2-15 illustrates historical savings trends between 2006 and 2011. Overall program savings peaks in 2009 and 2010, and declines in 2011.

Figure 2-15. Total Sector kWh Savings Trends



Lighting customers surveyed during the 2010 process evaluation indicated that about 20 percent of participants relied on tax rebates for purchase decisions. However, discontinuation of ARRA funding in 2011 is expected to contribute to a decline in lighting program participation. Figure 2-16 demonstrates a peak in lighting participation for years 2009 and 2010 and a dip in 2011, supporting survey results. Research indicates that Avista may consider additional marketing strategies to negate this anticipated drop in program participation.

Figure 2-16. Total Sector kWh Trends for Lighting



Some additional examples of focused research efforts in 2011 may include:

- Conducting targeted marketing research of largest 100 customers with hourly demand data. Use such data to analyze demand patterns, identify opportunities, and provide account executives with needed intelligence to market energy efficiency measures.

- Examining historical trends for nonresidential program technology end-uses in comparison with future savings targets and technology potential.
- Analyzing market penetration by rate class, commercial and industrial sector, and technology types.
- Examining individual program processes (selected and prioritized by Avista's program managers) for potential improvements to efficiency and cost effectiveness.
- Conducting more in-depth research about nonparticipant spillover resulting from installation of energy-efficiency equipment outside of the program.
- Investigating potential improvements to TRC valuation resulting from nonresidential program non-energy benefits.

3 2010 Low-Income Process Report

3.1 Executive Summary

3.1.1 Program Overview

Avista's Washington and Idaho low-income weatherization program seeks to lower its customers' energy consumption and utility bills. At no cost to income-qualified customers, the program provides a complete home energy audit, installation of energy-efficient upgrades and health and safety measures, and energy-saving education.

3.1.2 Evaluation Activities and Objectives

Cadmus' process evaluation included two primary data collection activities: stakeholder interviews and participant surveys. We performed a telephone survey of 123 program participants, capturing their feedback concerning:

- Satisfaction with the program;
- Education provided on ways to save energy; and
- Participant household and behavioral characteristics.

We also performed in-depth interviews with utility staff, community action program (CAP) agency managers, and state-level administrators. These interviews elicited insights on program design and delivery, and identify bottlenecks, barriers to effective implementation, best practices, and opportunities for improvements.

3.1.3 Process Conclusions and Recommendations

Program Delivery

Conclusions

- Avista's low-income weatherization program has been successfully implemented, without significant delivery barriers.
- Avista homes weatherized by agencies without Avista funding may represent opportunities to claim "non-programmatic" savings.
- Periodic review of agency funding disbursements may allow for midstream reallocations.

Recommendation

- Work with agencies to track non-programmatic savings.

Communication

Conclusion

- Opportunities exist for Avista to increase its involvement in the program by accompanying CAP agency staff and state administrators in ridealongs and monitoring.

Recommendation

- Continue to coordinate with state and agency staff to participate in ridealongs and monitoring.

Program Tracking

Conclusions

- Current participant and measure data are not being used consistently or effectively to calculate robust expected savings estimates.
- Agencies are willing to provide additional building and measure details for Avista to incorporate into an improved expected savings calculation.
- Two key criteria that with implications on estimated savings are currently not being collected: 1) primary heating source reported by the homeowner, and 2) whether equipment is non-functioning upon replacement.
- While agencies reported no major problems in complying with reporting requirements, removing preapproval requirements and electronic reporting procedures may help streamline the program.

Recommendations

- Ensure consistency and accuracy of data collected for expected savings calculations.
- Work with CAPs for more detailed data collection.
- Eliminate preapproval requirements.
- Continue to communicate with agencies regarding opportunities for automating reporting.

Cost-Effectiveness Considerations

Conclusions

- While state resource portfolio requirements remain unclear in regard to holding low-income weatherization to the same cost-effectiveness standards as other DSM programs, a ruling on this issue will allow Avista to consider options for changing the design and delivery of their low-income weatherization program.

Recommendations

- Work with stakeholders to get clarity on whether low-income weatherization is held to the same cost-effectiveness requirements as other DSM program offerings

Quality Assurance and Control

Conclusions

- QA/QC protocols, implemented by both state monitors and agency staff, appear sufficient for guaranteeing completion of all work identified by the agency auditor and for confirming quality installation of the work completed.

- Reviewing inspection reports from state monitors will give Avista a better understanding of reoccurring issues or areas for concern with regard to agency implementation and quality installation of weatherization measures.

Recommendations

- Consider leveraging state resources for additional oversight.
- Request inspection reports from state monitors for Avista customer homes.

Participant Findings

Conclusions

- As about 12 percent of participants use non-electric or gas sources as their primary means of heating, Avista's expected savings estimates may not be accurate if assuming electric or gas heating systems in its savings calculations. This especially applies to shell measure savings calculations.
- As 28 percent of participants reported changing how they heat their homes following weatherization work, estimated savings for these participants may not be accurate, given Avista's deemed savings estimates.
- Low reported take-back levels indicated increases in consumption did not likely occur due to increased occupants moving into a home, increase occupancy of rooms within a home, or changes to thermostat set-points.

Participant Energy Education

Conclusions

- The program's energy-saving educational component appears to lack standardization across agencies; however, it appears to operate successfully, based on participant responses, high rates of reviewing materials, and reported energy-saving behavior changes.
- The energy education curriculum and delivery could focus more on actions saving the most energy.

Recommendations

- Focus energy education on actions resulting in high energy savings (e.g., reducing heating set points and how water use).

Non-Energy Benefits

Conclusions

- Participants reported additional benefits (e.g., increased comfort, improved health, reduced forced mobility) beyond cost-savings associated with reductions in energy consumption.
- An opportunity exists for Avista to quantify more non-energy benefits associated with this program.

Recommendation

- Consider funding additional research of non-energy benefits, in particular those benefits that can be added to the Total Resource Cost (TRC).

Participant Satisfaction

Conclusions

- Participants reported high satisfaction levels with Avista's low-income weatherization program overall.
- Participants also expressed satisfaction with measure installations, with the majority indicating either "excellent" or "good" ratings for each measure type.

3.2 Introduction

The process evaluation research assessed the following:

- Program design and delivery;
- Participant characteristics and satisfaction;
- Bottlenecks in program delivery;
- Program successes; and
- Opportunities for improvements.

3.2.1 Program Overview

As listed in Table 3-1, the low-income weatherization program consists of five components. Local Community Action Program (CAP) agencies within Avista's Idaho and Washington service territories implement the low-income programs. CAP agencies conduct a comprehensive audit of participant homes to determine any energy-efficient measures that can be applied to decrease a home's energy usage. Simultaneously, agency auditors determine if any measures are necessary to improve health and safety in a participant's home. The agency staff then determines the appropriate mix of measures to install in the home, based on audit results, the household needs, and expected energy savings, compared to expenses. Agencies leverage and combine funding from different programs to install the measures in the homes.

Table 3-1 describes measures installed under each program component, along with counts of measures installed in PY 2010 for both states combined.

Table 3-1. PY 2010 Measure Installations by Program Component

Low-Income Program Component	Measure Description	Measure Installations
Shell/Weatherization	Insulation (ceiling, floor, wall, duct); window/door installation; air infiltration	943
ENERGY STAR® Appliance	High-efficiency refrigerator replacement	132
Fuel Conversion*	Electric furnace and water heater replacement with gas units	216
Hot Water Efficiency	High-efficiency water heater replacement	14
HVAC Efficiency	High-efficiency gas furnace replacement	43

3.2.2 Process Evaluation Objectives

Cadmus' telephone survey of 123 customers sought to assess participants' experiences (including: satisfaction, energy education, and participant household and behavioral characteristics). We also performed in-depth interviews with utility staff, CAP agency managers, and state-level administrators, seeking greater insights into program design and delivery, identifying bottlenecks, barriers to effective implementation, best practices, and opportunities for improvements.

3.2.3 Evaluation Methodology and Information Sources

To determine participant's perspectives, gauge awareness, and satisfaction with measures and the overall program, Cadmus surveyed 123 participants from the 2010 program population. This was accomplished by randomly selecting participants from Avista's program participant database, and identifying a starting sample of 481 unique participants with valid name and telephone number information. Table 1-6 details the participant population, breaking out participation based on the Avista-funded measures installed by fuel type, and providing the survey's final sample size.

Table 3-2. Low-Income Participant Details and Survey Sample

	Quantity
Total Participants	557
Received electric measures	329
Received gas measures	104
Received both Electric and Gas Measures	124
Eligible Participants in Call List	481
Screened out due to change in occupancy or bad phone number	76
Completed Surveys	123
Number of Calls Required to Achieve Sample	1,238
Response Rate*	10%
Cooperation Rate**	40%
Sample Size Goal	120

* Response rate defined as: the number of customers completing a survey, divided by the number of eligible participants in the call list.

** Cooperation rate defined as: the number of customers completing a survey, divided by the number of customers reached by phone.

To address potential nonresponse bias, Cadmus conducted calls at different times during weekdays and weekends. After six unsuccessful calls, contacts were removed from the sample. Survey respondents' geographic distribution proportionally reflected the 2010 program's participant population.[26] Survey respondents were also evenly distributed across areas with program participants.[27]

For stakeholder interviews, Avista provided names and contact information for representatives from state administrators and the four CAP agencies delivering 2010 program services. Table 3-3 provides agencies and administrators delivering the program, and numbers of participants the agencies and administrators served.

[26] In 2010, Idaho had a total of 500 incented measures installed, and Washington had 1,006. Survey respondents represented a total of 54 incented measures in Idaho and 194 in Washington.

[27] The 2010 program population represented unique 77 zip codes, with a respondent population representing 40.

Table 3-3. Low-Income Weatherization Stakeholder Organizations

State	Organization	Role	2010 Participants Served
WA	SNAP	CAP agency	299
ID/WA	Community Action Partnership	CAP agency	197
WA	Rural Resources Community Action	CAP agency	32
WA	Community Action Center (CAC of Whitman County)	CAP agency	29
WA	Opportunities Industrialization Center (OIC) of Washington	CAP agency	0
WA	Washington Gorge Action Program (WGAP)	CAP agency	0
WA	Washington Department of Commerce	State administrator/monitor	n/a
ID	Community Action Partnership Association of Idaho (CAPAI)	State administrator/monitor	n/a

3.2.4 Report Organization

The process report first presents key findings across the different topic areas researched through the evaluation. These findings reflect the objective results determined through participant survey analysis and reported through stakeholder interviews. Sections on conclusions and recommendations follow, providing Cadmus interpretation of these findings and our recommendations for addressing key issues going forward.

Key finding topic areas are outlined in the following sections:

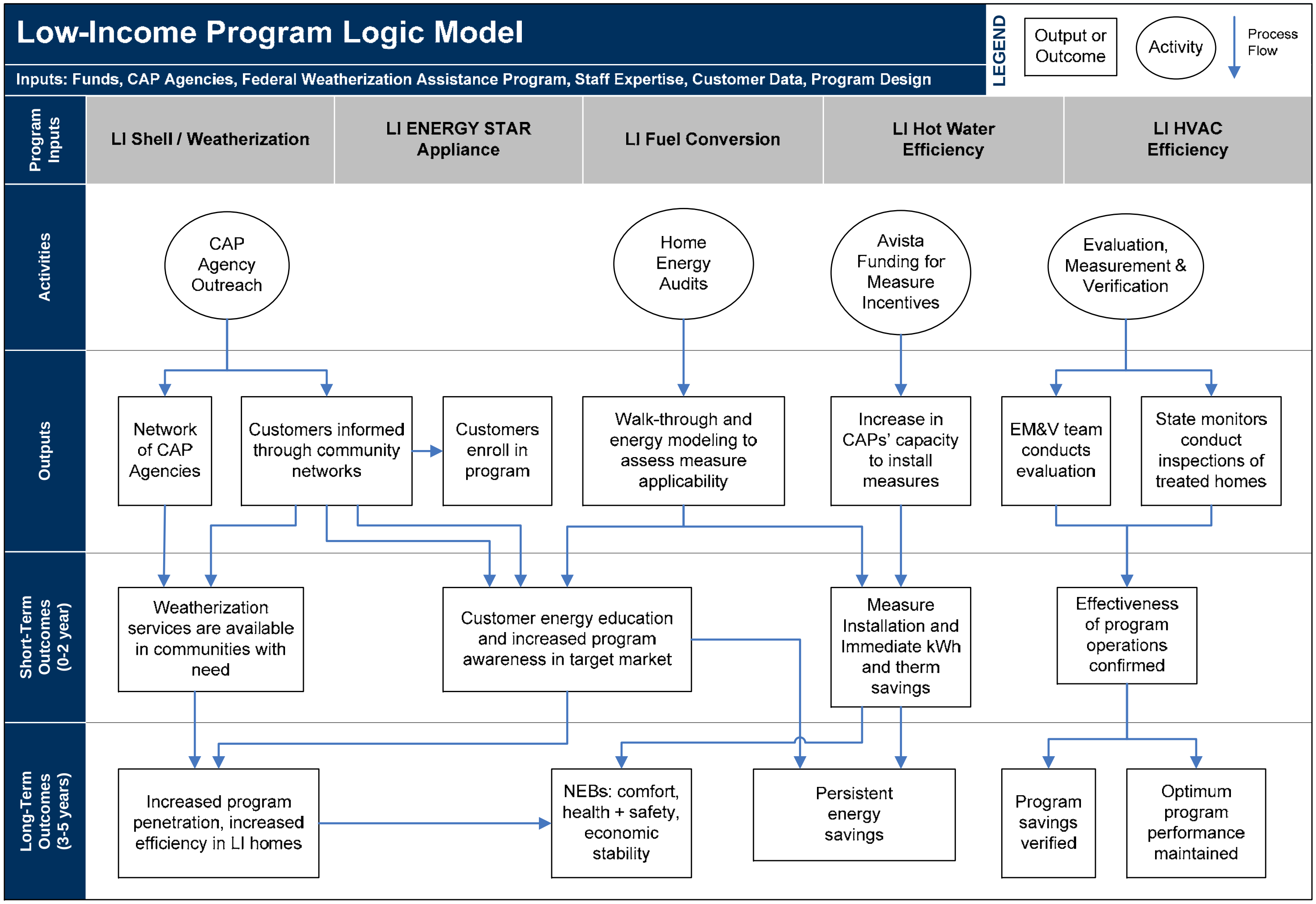
- Logic Model and Process Flow (Section 3.3.1)
- **Error! Reference source not found.** (Section 3.3.2)
- Communication (Section 3.3.3)
- Program Tracking (Section 3.3.4)
- Cost-Effectiveness Considerations (Section 3.3.5)
- Quality Assurance and Control (Section 3.3.6)
- Participant Findings (Section 3.3.7)
- Participant Energy Education (Section 3.3.8)
- Non-Energy Benefits (Section 3.3.9)
- Participant Satisfaction (Section 3.3.10)

3.3 Key Findings

3.3.1 Logic Model and Process Flow

Figure 3-1, below, shows the logic model for the low-income weatherization program, describing process flows involved in program implementation.

Figure 3-1. Low-Income Weatherization Program Logic Model



Key Indicators:
Outreach – Number of participating customers, length of CAP waiting lists, participant awareness of Avista funding
Home Energy Audits & Measure Incentives – Number/type of measures installed, energy savings, incentive amounts
EM&V – Process findings, program modification, impact analysis results, net-to-gross ratio, cost-effectiveness analysis results

3.3.2 Program Delivery

Program Overview and Design

Avista offers its low-income weatherization program in Washington and Idaho, via five CAP agencies (see Table 3-3). Measure offerings resemble those of typical residential programs, but are offered to eligible Avista customers at no cost.

The agencies perform audits for eligible customers, determining cost-effective measures that have the greatest benefits to households. Agencies follow participant prioritization and cost-effectiveness protocols for installing measures aligned with state and federal program requirements. Although the process of determining cost-effectiveness slightly differs across each state and agency, the standard procedure requires measures to meet a savings-to-investment ratio (SIR)[28] of 1 or greater.

The program leverages agency experience and technical skills to evaluate low-income homes and to identify the most appropriate combinations of measures. To ensure quality delivery, all weatherization and fuel conversion work undergoes multiple checks, with on-site and documentation audits conducted by agency staff. State-level monitors also perform inspections and review records for a sample of completed projects each year.

Agencies allocate funding from different sources to pay the complete costs of energy-saving measures and health and safety installations in a home. For eligible measures, Avista pays 100 percent of the measure costs. The agency also charges Avista a 15 percent administrative fee. In addition, Avista provides up to 15 percent of the total program budget for health and safety measures. Based on measure costs paid for by Avista for their 2010 projects, the average project cost per home paid by Avista (including both health and safety expenses and administration costs) is about $3,000 in Idaho and $3,500 in Washington.

Interviews with the four CAP agencies indicated very high satisfaction with the current program. Each agency expressed satisfaction with Avista's rebate structure and funding level. A few agencies praised Avista for funding measures not always available under traditional streams, such as window replacements. One agency indicated Avista's rebate structure simplified administrative processes, as they did not require as much mixing and matching with other funding sources. Furthermore, as Avista funding helped pay for additional health and safety measures (not always covered by alternative funding sources), it prevented agencies from having to preclude providing services to some homes. Two agencies indicated this proved particularly significant, with one agency saying they could not remain in business without Avista funding.

Home Energy Audits

After participant homes are selected from the waiting list and approved for weatherization, a Building Performance Institute (BPI) certified agency representative performs home energy audits. These audits are used to identify appropriate measures for installation. This section explores the audit tools agencies use in each state, information collected through audits, and criteria used by each agency to determine which measures to install.

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[28] A SIR provides the present value of energy savings (from a particular measure) with respect to the cost (to install the measure).

Audit Tools

Individual agencies vary in their methods for determining measures for installation in homes, how measures are prioritized, and how they provide this information to Avista. Of the agencies delivering Avista's program, the three methods are primarily used for determining measure installations: 1) Targeted Retrofit Energy Analysis Tool (TREAT) audit software; 2) the state preapproved measure list; and 3) Energy Audit 4 (EA4, Idaho only). Table 3-4 provides a summary of the audit tools used by each agency that was interviewed.

Table 3-4. Audit Tools Employed by Agency

State	Agency	Audit Tools			Notes
		TREAT	Preapproved List	EA4	
WA	SNAP	X	X		TREAT used primarily for multifamily and special projects
ID/WA	Community Action Partnership	X	X	X	TREAT used primarily for multifamily projects; EA4 used in Idaho only
WA	Rural Resources Community Action		X		
WA	Community Action Center (CAC of Whitman County)	X	X		TREAT only used for Avista projects

The TREAT model incorporates building-specific information with auditing information to provide expected savings estimates, and to perform SIR calculations to determine measures appropriate for installation. TREAT can also incorporate historical consumption data (e.g., 12 months of electricity or natural gas usage from the utility), allowing model calibration and more accurate savings estimates.

Two agencies interviewed use TREAT, with one using it for all projects, and the other using it only for Avista projects (understanding it to be a utility requirement). One agency reported the state did not require the use of TREAT, except for estimating savings in multifamily buildings or determining cost-effectiveness for measure installations not covered on the state's preapproved measure list. Neither agency integrates historical consumption data into TREAT calculations. However, one indicated they were conducting training in this regard, and expected to begin incorporating these data soon.

The state of Washington developed the preapproved measure list, based on measures that, on average, can be cost-effectively installed. State-level preapproved lists are generally approved by DOE to allow agencies to easily determine measures to install in homes without having to run individualized cost-effectiveness tests. Since agencies cite DOE requirements as their most stringent funding source, they believe the preapproval list should satisfy the needs of other funders as well.

Three agencies use the state preapproved measure list, though one agency reports to Avista using TREAT (running all Avista projects through this tool, while using the state preapproved measure list for all projects with other funding). The two agencies using only the state preapproved measure list report to Avista using a spreadsheet, developed by the utility, to calculate expected savings for each project. The spreadsheet is submitted to Avista as documentation of completed work and information required for invoicing. For each measure, agencies input project-specific details associated with installations, and the spreadsheet generates a savings estimate using Avista calculations. Based on discussions with the utility, expected savings calculations do not incorporate historical consumption, home square footage, primary heating system, or interaction effects.

In Washington, agencies must follow the state preapproved measure list or provide evidence of cost-effectiveness for measure installations using TREAT. Washington policy allows individual agencies to choose their methods for determining measure installations. Idaho requires a standard methodology, where all agencies model expected savings and cost-effectiveness testing using the Energy Audit 4 (EA4), an audit tool based on the National Energy Audit Tool (NEAT) auditing software, and developed specifically for Idaho agencies.

The one agency serving in Avista's Idaho territory uses EA4 for their Idaho projects and primarily uses the state preapproved list for their Washington projects. However, the agency will occasionally use TREAT in Washington for multifamily buildings or in special circumstances to provide evidence of cost-effectiveness for work outside of the preapproved list.

Measure Determination

All agencies begin work by reviewing customer eligibility, and by conducting an initial audit or home energy assessment. For agencies using TREAT and EA4, all measures in a home together must achieve an SIR value of one or greater to be eligible for a program rebate. The two agencies using state preapproved measure list defer to its preapproved measures in determining measures authorized for installation.

Agencies expressed satisfaction with Avista offering fuel-conversion measures, with a common response that participants seem to like these measures and that they appear to reduce the costs of customer energy bills.

Delivery Changes

Agencies indicated the only significant changes in program delivery have been in Avista staff overseeing the program. All agencies indicated these changes did not represent a burden, and program implementation has not been negatively impacted.

Agencies indicated the introduction of Recovery Act funding—and its requirements—affected program delivery, as this introduced stricter administrative procedures, implementation requirements, and training protocols. The Recovery Act also increased the number of homes to be weatherized by agencies, sometimes by 500 or 600 percent, with a strict deadline of March 2012. To meet increased output, agencies increased staff or hired additional contractors to help with internal management and program delivery. There was a great influx of new staff, and agencies required all new contractors to meet certification levels of existing staff.

Delivery Challenges

While agencies did not appear to face specific limitations integrating Avista funding for weatherization, a few barriers prevented more Avista homes from being weatherized or presented administrative challenges for agencies.

Tracking All Avista-Customer Weatherization

Agencies indicated not every weatherized Avista-customer home received Avista funding. Thus, the utility does not track these homes nor claim savings. Given staggered schedules for funding sources' contract year-end dates, agencies may have to push to exhaust single sources before their expiration. In some cases, agencies use these funds exclusively for Avista customer homes, without an investment of Avista funding.

Agencies, however, did not report a definite approach for ensuring Avista funding would always touch every Avista customer. One agency suggested Avista could request lists of additional homes not currently tracked—a request that agency would gladly provide.

Invoicing Structure

Several agencies reported invoicing Avista for weatherization work required more time-intensive administrative effort than did funding from other sources. Such sources provide agencies with funds upfront, while Avista requires individual invoices for every home weatherized, for which they then reimburse 100 percent of approved expenditures. This setup requires agencies to pay for weatherization work using other funding sources, and reallocating funding until Avista pays for the work. While all agencies cited Avista as very responsive and consistently paying invoices on time, a few agencies indicated that, in a "perfect world," upfront provision of Avista's funding would ease some administrative burdens in managing funding and paying for completed work.

Avista Preapproval Requirement

One agency noted Avista requires preapproval for certain efficiency measures before their installation. For example, the agency indicated they first had to report information on existing refrigerators to Avista (e.g., make/model, metering data), and then, once approved, could complete installation. The agency saw this as an extraneous check, given auditors and inspectors reviewed the work on-site, and Avista ultimately reviewed every invoice. Another agency indicated Avista had to preapprove all window installations as well. However, Avista staff reported this was not a program requirement.

Potential for Funding Reallocation

Due to agency capacity constraints and mandates to expend Recover Act dollars, some agencies could not exhaust Avista funding for weatherization in a given year. In 2010, at least one agency under contract to deliver weatherization using Avista funding did not invoice Avista for any projects.

Other agencies, however, did not have problems spending utility funds. One administrative agency indicated that, despite the influx of Recovery Act funding, they made a concerted effort to continue spending utility funding along with federal dollars. Upon expiration of Recovery Act funding, agency staff and the state believe utility funding will play an even greater role in low-income weatherization work.

One agency suggested Avista consider reviewing agency expenditures at various points throughout a program year, reallocating funding when agencies could not expend all available Avista funding. Reallocating funding to agencies with available capacity could help exhaust all available Avista funding before the program year's end.

3.3.3 Communication

Agencies reported regular and satisfactory communication with Avista. Most agencies indicated monthly interactions with Avista during invoicing, as well as through in-person meetings several times during the year. Agencies also cited Avista staff visiting their home offices and accompanying them to project sites, though a few agencies noted these visits have become less frequent over the past few years. Two agencies would welcome additional interaction with Avista, such as ridealongs with agency staff to project sites. Avista staff indicated that in 2011, they have been visiting the agencies more frequently and accompanying them into the field more regularly.

State administrators interacted with Avista a few times a year. They both deemed the frequency satisfactory, though welcomed and encouraged Avista to take a larger role in joining them on ridealongs for home inspections. One administrator also said Avista was the only utility that did not request inspection reports on homes where they provide funding.

Avista also interacts with state administrators through its role on the Weatherization Policy Advisory Council (WxPAC) in Washington and the Weatherization Policy Advisory Committee in Idaho, which meet semiannually to discuss issues pertaining to regional weatherization policy.

3.3.4 Program Tracking and Reporting

Overview

Avista requires agencies to provide some detailed information on projects completed. Generally, invoicing occurs monthly, and includes itemized breakouts of measures installed and measure costs.

Avista staff indicated that all agencies must submit the Avista-provided invoice spreadsheet. This form collects costs and measure information (e.g., square feet of insulation), for which Avista calculates expected savings for their program database. Avista staff indicated that agencies may provide copies of output from TREAT, or other auditing tools, but that the Avista's invoicing spreadsheet is the only form that is required.

The two agencies using TREAT modeling submit outputs from this program, which provides estimates for expected energy savings and SIR calculations for each measure installed.

Agencies employing state preapproved measure lists report using a spreadsheet developed by Avista for invoicing and program tracking. These agencies populate spreadsheets with cost and measure details for each installation (e.g., existing conditions, square feet of installed insulation). They do not include SIR calculations, as the state preapproved measure list does not require their calculation. Avista's reporting spreadsheet uses built-in savings calculations that automatically generate expected savings once an agency enters measure-specific inputs.

Avista requires preapproval for certain measures (such as refrigerator replacements). Agencies provide Avista with a list of measure details (e.g., make/model, metering results) for approval prior to on-site installation.[29]

[29] In 2010, Avista required preapproval for gas furnaces, gas water heaters, and refrigerator replacements as well as "other" measures not included in Avista's approved energy-efficiency measure list.

All agencies believed providing supporting documentation (including measure savings) for each project funded with Avista dollars was reasonable, and did not represent an excessive burden. A few agencies expressed an openness to provide Avista with more detailed information on completed projects (e.g., primary heating) upon Avista's request.

Primary Heating Fuel Tracking

Correct specification of a participant's primary heating system is a critical component in accurately calculating expected savings associated with weatherization upgrades. Primary heating refers to the predominate source used by a resident, and not necessarily the obvious system present in a home (e.g., use of electric room heaters or wood heat, rather than a central furnace).

While interviews revealed auditors discussed these heating preferences with occupants during initial home energy assessments, primary heating usually was not reported. One agency using TREAT indicated they would likely enter heating equipment identified on-site into their modeling calculations, rather than specifying the source customers regarded as their primary means of heating. The extent that primary heating sources may deviate from a household's apparent primary heating equipment (e.g., electric base boards, central furnace) could not be determined. Accurately specifying customer heating, however, impacts the results of expected savings calculations.

During initial audits, two agencies talked to homeowners about their primary heating equipment, as this could determine service priorities (for example, a broken heating system, such as a furnace, would advance a customer's priority on weatherization waiting lists). Agencies, however, did not explicitly or uniformly collect or report this information.

Suggestions for Improvements

Although all parties seemed satisfied with tracking requirements and processes, a few improvement opportunities emerged.

First, while standardized reporting across all agencies could be burdensome, Avista must collect all relevant measure information required for robust savings calculations. Cadmus's work on the *Avista 2010 Multi-Sector Gas Impact Evaluation Report* revealed Avista's expected savings calculations did not incorporate primary heating systems and square footage—two inputs agencies could provide.

Interviews largely revealed hand-written data tracking (rather than electronic entries). One state administrator noted a statewide push to standardize electronic reporting across all agencies.

Additionally, one agency reported the preapproval process Avista required for certain measures appeared excessive, as staff often internally checked off measure installations, and Avista ultimately would receive such information on through invoices. Though the agency readily complied, they suggested Avista might consider removing this redundancy.

3.3.5 Cost-Effectiveness Considerations

Overview

Under the Initiative 937 (I-937), Washington utilities are required to develop DSM program portfolios to pursue all available energy-conservation measures that are cost-effective. Similarly, Idaho utilities are also required to run cost-effective energy-efficiency programs. There has been recent debate across different states regarding whether low-income programs should be exempt from the cost-effectiveness requirements of DSM resource programs and portfolios.

By design, low-income weatherization programs are not delivered as cost-effective from the TRC perspective. While the TRC standard is fairly common requirement for states in considering utility program cost-effectiveness, the bulk of low-income weatherization program funding (e.g., HHS, DOE) require a SIR standard for considering the overall project cost-effectiveness. The SIR approach compares the energy cost savings over the lifetime of the package of weatherization materials to the cost of administration, labor, and materials associated with a project. Essentially, the SIR approach is inconsistent with the TRC, for which the later also accounts for changes to the utility supply cost.

While Avista is required to have a cost-effective program portfolio, individual programs do not necessarily need to perform cost-effectively from a TRC perspective. While the total portfolio benefits may be sufficient to absorb potentially non-cost-effective programs like low-income weatherization, the overall cost-effectiveness for the portfolio is decreased by individual programs that do not pass the TRC test.

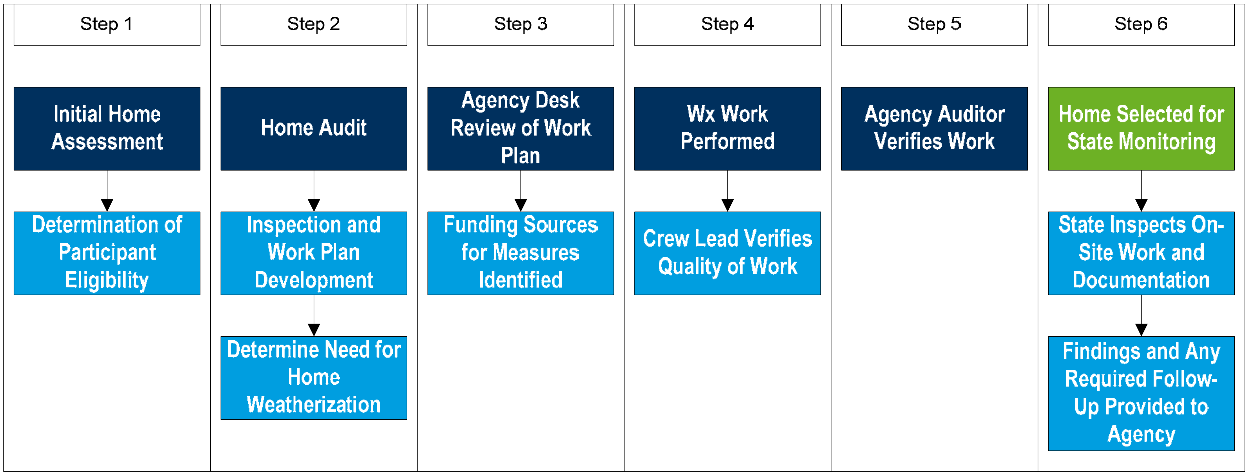
Another example of how the inherent design of low-income weatherization programs highlights the discontinuity between agency and utility perspectives is in the participant prioritization. Federal funding sources require agencies to prioritize eligible participation to focus first on households with elderly occupants, people with disabilities, or families with children. From a resource perspective, utilities are more likely to be interested in targeting eligible participants with the highest energy usage or arrearage. While these are not incompatible, high usage/arrearage customers have not historically been targeted given that the federal prioritization takes precedence and is more closely aligned with the mission of providing a welfare program, rather than an energy-saving program. Targeting eligible high usage/arrearage participants will likely result in higher cost-effectiveness from a TRC perspective, given the greater potential for energy savings, arrearage reduction, and the associated benefits.

3.3.6 Quality Assurance and Control

Overview

Low-income weatherization programs require rigorous, multistage quality assurance and control protocols, ranging from agency-level inspections and documentation reviews to state-level monitoring efforts. Interviews with agencies and state administrators indicated every project received multiple points of review, including work in progress, upon completion, and, potentially, through state monitoring. State monitors also reviewed 5 to 20 percent of jobs completed in each state. Figure 3-2 outlines a typical approach to delivery and the inspections occurring at each stage by agency staff and state monitors.

Figure 3-2. Low-Income Weatherization Delivery and Quality Assurance Flow



1. Initially, an agency assessor visited homes for a first walk-through, to determine whether auditing and weatherization was required. On this visit, one agency indicated the assessor provided one-on-one energy education with occupants, and provided a bundle of low-cost energy-savings measures, such as CFLs.
2. Once approved and scheduled for audit, agency auditors performed whole-house audits to determine measures needed. This process could include air flow testing (such as blower-door and duct blaster tests), checking insulation levels, and equipment inspections.
3. Agency office staff reviewed audit documentation, including every purchase order, confirming the proposed invoice matched the bid and included measures eligible for funding.
4. Work in the home was completed based on the auditor's prescription. Most agencies performed all auditing and shell-measure installation themselves, and often hired local contractors for electrical, plumbing, and some HVAC work. As work was performed on the home, the crew lead ensured work was completed to specification.
5. Upon work completion, an agency auditor supervisor performed a final inspection of completed work. Most agencies indicated final inspections were performed by different auditors than those conducting the initial audit, though agencies noted this was not always possible, due to scheduling and limited capacities. (The concept of using a different auditor remains open to debate: some agencies believing the initial auditor would be better placed to confirm specific problem areas had been addressed, while others believing a fresh perspective preferable.)
6. Upon agency work completion, homes could be selected for review by state auditors, which involved on-site reviews of work as well as documentation reviews. Monitored agency projects each received a summary report, detailing findings and recommendations for improvements.

Agency Inspections

Each agency interviewed conducted some internal inspections of processes for identifying measures to be installed as well as for quality and completion of installations. One agency staff member indicated that, after completion of the initial audit, all funding allocations for the proposed work were reviewed to ensure appropriate use of funds across the measures to be installed.

The agency indicated two quality checks were performed on a proposed project:

- The lead contractor responsible for performing the installations reviewed the initial audit to identify additional work required or work improperly specified.
- An auditor performed a final inspection following completion of all work by contractors, with the agency preferring this inspection performed by an auditor different from the one performing the initial home inspection (as noted, this was not always possible due to staffing and scheduling constraints).

Two other agencies outlined a similar approach, but stressed the importance of a desk review. Once the initial audit was performed, at least two different office staff reviewed the work plan to verify the measures' appropriateness, the calculations' accuracy, and funding allocations.

State Monitoring

State monitors visited homes, verified projects were appropriate, and determined work had been performed correctly. The state monitors delivered reports to the agencies for projects where monitoring occurred; reports concerning Avista participants are available to the utility upon request. Idaho and Washington state monitors did not indicate identification of significant or systemic issues.

Partly due to increases in completed homes resulting from the influx of Recovery Act funding, and partly due to increased new agency hires necessary to complete the work, state administrative agencies increased the volume of homes receiving on-site inspections. One state administrator indicated they increased inspections from 5 percent of completed homes to over 20 percent.

Inspection and Monitoring Results

When asked if agency or state audits identified systematic issues, all four agencies indicated quality assurance audits identified some discrete issues, but these were minor, isolated incidents. One agency found changes in protocols surrounding the use of Recovery Act funding resulted in a few instances where new procedures were not followed (e.g., CO sensors were installed without digital displays), though this same agency stressed most of its field staff, having worked with the agency for over five years, were very experienced.

Ultimately, participant homes will have been visited between three to six times.[30]

Changes in Quality Assurance and Control

Avista has expressed an interest in taking a larger role in verification of rebated weatherization work. Interviews with agencies and state administrators indicated this would be welcome and beneficial. Idaho and Washington respondents felt quality assurance protocols were sufficient, and would be glad to include Avista staff in future monitoring visits.

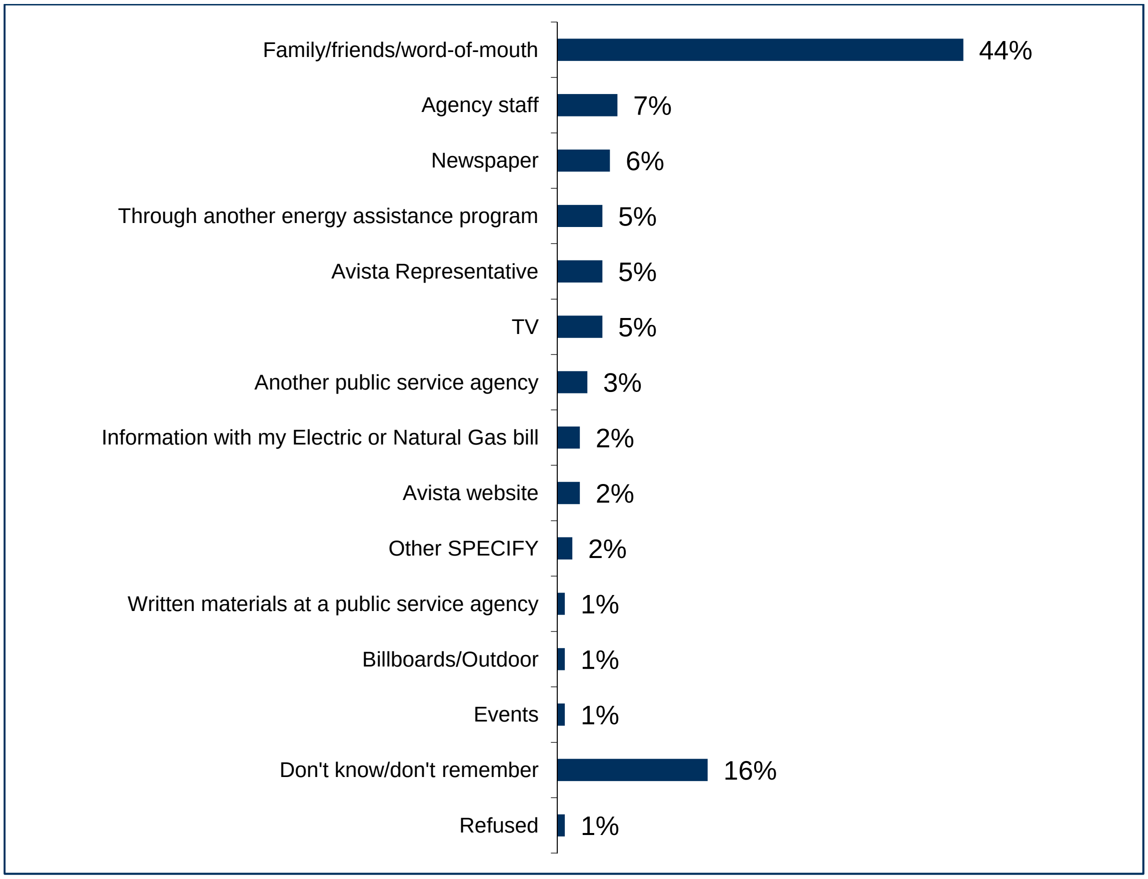
30 Including a potential final visit by third-party evaluator.

3.3.7 Participant Findings

Participant Awareness

As shown in Figure 1-11, respondents learned of the program through multiple sources.

Figure 3-3. How Respondents First Heard of the Program (n=123)



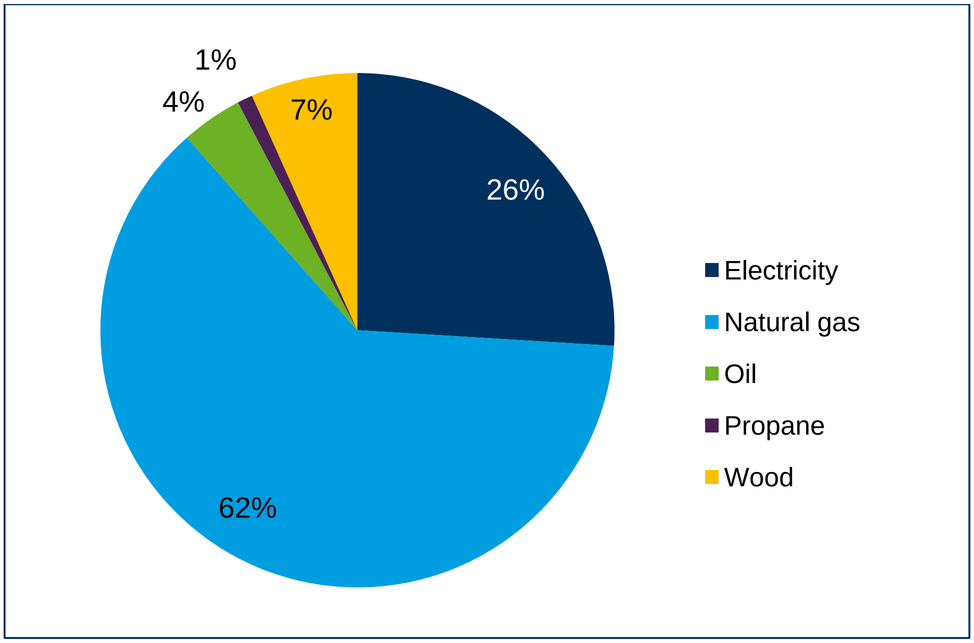
Respondents most commonly learned of the program through family, friends, and word-of-mouth (44 percent [n=54]).

Fifty percent of respondents (n=59) knew Avista helped pay for the weatherization program.

Participant HVAC Equipment

Figure 3-4 illustrates the distribution of primary heating systems reported by respondents.

Figure 3-4. Low-Income Participant Distribution of Primary Heating Fuel (n=104)*



* In presenting results, "don't know" and "refused" responses have been removed from calculation of percentages, unless otherwise noted.

As shown, most respondents (n=65) reported heating their homes with natural gas, while 26 percent (n=27) used electricity, and 1 percent (n=1) used propane. The remaining 11 percent used alternative sources, such as wood, oil, or a combination of these.

Table 3-5 provides the distribution of weatherization measures installed through the program, relative to the primary home heating type reported by survey respondents.

Table 3-5. Distribution of Weatherization Measures by Primary Heating Type

	Electric (n=27)		Gas (n=65)		Other * (n=12)		Total (n=104)	
Measure	n	%	n	%	n	%	n	%
Refrigerator	6	22%	15	23%	9	75%	30	29%
Insulation	15	56%	33	51%	2	17%	50	48%
Air Sealing	12	44%	27	42%	3	25%	42	40%
Furnace Repair/ Replacement	0	0%	0	0%	0	0%	0	0%
Furnace Conversion	0	0%	0	0%	0	0%	0	0%
Windows	10	37%	17	26%	2	17%	29	28%
Water Heater Conversion	2	7%	17	26%	1	8%	20	19%
Thermal Door	7	26%	21	32%	3	25%	31	30%
Water Heaters	1	4%	2	3%	0	0%	3	3%

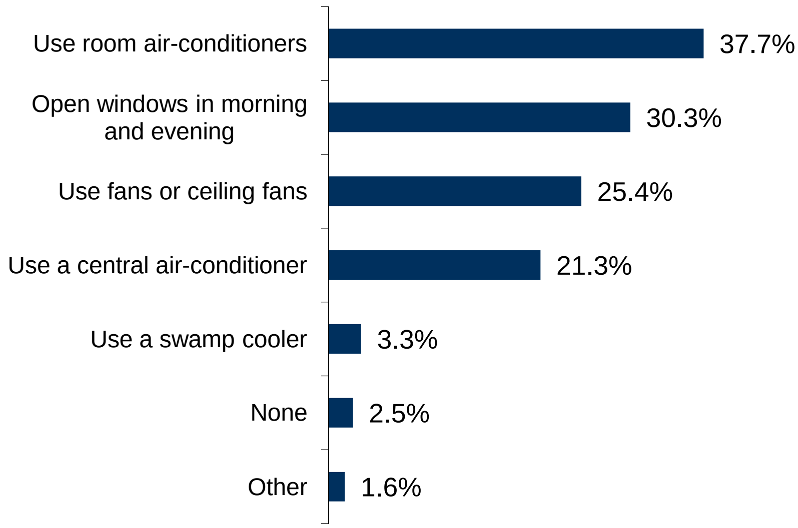
* "Other" heating corresponds to non-electric and non-natural gas primary heating, specified above in Figure 3-4.

The above comparison reveals a higher percentage of refrigerator replacements occurred for participants using non-electric or gas primary heating; however, a few of these respondents (n = 3) still received shell measures, for which savings estimates were tied directly to fuel savings corresponding to heating and cooling systems. The estimated savings for these three customers may explain a portion of the low realization rate observed in the impact evaluation.

Thirty-three percent of respondents (n=40) supplemented their primary systems with additional heating sources, the most common of which included electric space heaters (n=23) and wood heat (n=16).

Figure 3-5 illustrates the distribution of cooling methods reported by respondents. Respondents could provide multiple answers to this question.

Figure 3-5. Low-Income Participant Distribution of Cooling Methods (n=149)



Respondents most often cooled their homes using: room air-conditioners (37 percent, n=46); central air-conditioners (21 percent, n=26); fans or ceiling fans (25 percent, n=31); and opening windows in the morning and evening (30 percent, n=37). Additionally, 26 respondents used electric fans to supplement other cooling systems.

Take-Back

The survey asked participants several questions designed to identify take-back effects, including changes in usage patterns or household activities.

Fifteen percent of respondents (n=17) increased temperature settings on their thermostats; 40 percent (n=46) decreased this setting; and 45 percent (n=51) left it the same. While some participants increased their heating consumption after weatherization, twice as many reported decreasing their consumption through lowering their thermostat settings.

Respondents indicated very little change in the number of people present in the home and the number of rooms used. Seven percent of total respondents (n=9) had family or roommates move in after the work's completion, and 6 percent (n=7) had family or roommates move out. Four percent of respondents (n=5) used more rooms in their house after work was performed, while another 4 percent (n=5) used fewer rooms.

Twenty-eight percent of total respondents (n=35) reported they changed the way they heated their homes following program work's completion. Some of these respondents turned up their heat (n=5), while others reported turning down their heat (n=4). One respondent reported using more wood, while two respondents indicated using less wood.

3.3.8 Participant Energy Education

Overview

During the home audit or the initial walkthrough for preapproval, agencies provided some degree of energy-saving education to participants. While dialogues with homeowners about home energy savings generally occurred during the initial assessment, agencies indicated a recent drive to standardize the energy-savings education curriculum and information conveyed to homeowners. In most cases, agency staff discussed the audit with the participant as it was performed, and provided energy-savings tips relative to the particular home. Some agencies also provided energy-saving educational materials (e.g., pamphlets), and, in a few cases, provided a kit containing low-cost measures (e.g., CFLs, weather stripping, or smoke detectors).

Participant Response

Most respondents reported receiving energy-saving tips and pamphlets. Eighty-three percent (n=91) said contractors offered energy-saving tips. Of this group, 73 percent (n=66) said they received much information, 23 percent (n=21) said they received some information, and only 3 percent (n=3) said they received very little information.

Seventy-three percent of respondents (n=83) remembered a contractor providing them with a booklet or pamphlet about energy savings. Of this group, 71 percent (n=77) reported reading or looking at the pamphlet after the contractors left. Sixty-one percent of respondents (n = 69) implemented some energy-saving tips. Most frequently reported tips included:

- Using CFLs (18 percent);
- Lowering thermostat set points (13 percent);
- Covering windows with plastic (11 percent); and
- Lowering water heater set points (9 percent).

Benchmarking

To provide points of comparison, other evaluations of low-income weatherization programs show similar levels of participant recollection, and average levels of participant action regarding implementing tips they remembered.

In Quantec's 2003 evaluation of Ohio's Home Weatherization Assistance Program (HWAP), 76 percent of respondents recalled receiving energy education. Sixteen percent of participants reported turning down the heater thermostat, and three percent indicated turning down the water heat temperature.

Quantec's 2004–2006 Oregon REACH (Residential Energy Assistance Challenge) program evaluation isolated the effect of energy education among program participants. The report identified the following percents of participant action, along with associated energy savings (shown in Table 3-6):

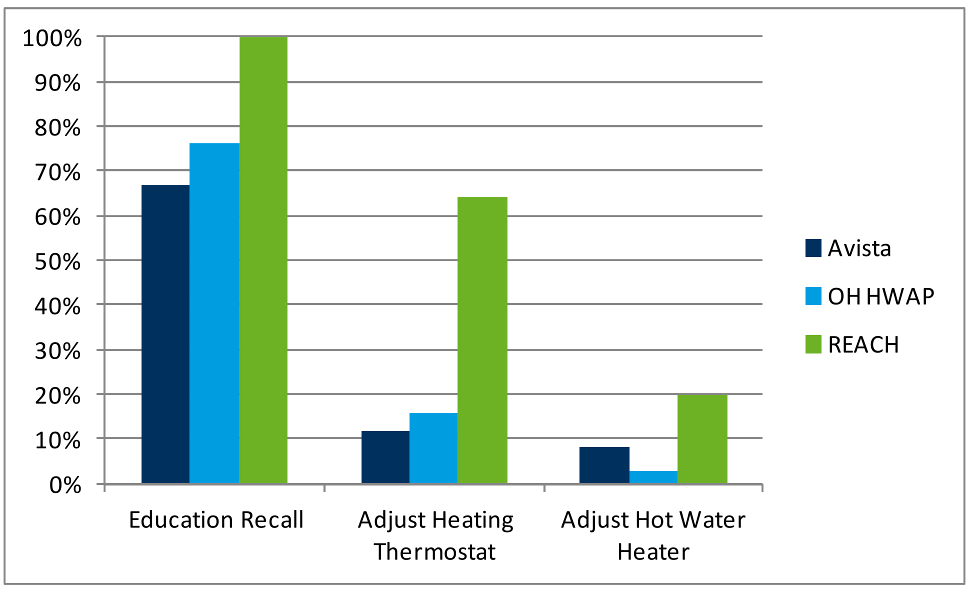
Table 3-6. OR REACH Evaluation Impacts of Energy Education

Education Impact	Installation Rate	Electric Savings (kWh)	Gas Savings (therms)
Adjust Hot Water Heater	20%	32.3	0.1
Adjust Heating	64%	210.6	0.8
Adjust Air Conditioning	4%	0.7	N/A
Decreased Shower Time	25%	96.8	0.2
Reduce Hot Water Use	41%	67.1	0.1

Participants in the OR REACH program reported higher percentages than Avista participants for adjusting both heating and hot water. In particular, reducing the set point for heating thermostats were shown to reflect significant savings potential for both gas and electric customers.

Table 3-7 provides a comparison of Avista findings to the OH HWAP and REACH studies mentioned above. Specifically, recall of receiving energy-education and two tips common to each study are included below.

Table 3-7. Energy Education Comparison



While Avista participants were average regarding the adjustment to hot water heat, both comparison studies resulted in higher levels of education recall and thermostat adjustment, which ranks among the highest energy-savings behavioral changes imparted through energy education.

3.3.9 Non-Energy Benefits

Overview

Non-energy benefits are program impacts, outside of direct energy savings, that provide additional benefits from different stakeholder perspectives (e.g., participant, utility, society). These benefits are not always as easily quantified or monetized as energy impacts. For this evaluation, Cadmus included a few questions in the participant telephone survey to collect information on non-energy benefits from the participant perspective; however, additional non-energy benefits associated with low-income weatherization programs may include:

- Economic impacts;
- Environmental impacts;
- Payment impacts (arrearage reduction);
- Reduced disconnections/reconnections; and
- Improved property values.

The participant survey included questions addressing ancillary participant benefits, including increased comfort, improved health, and reduced forced mobility.

Research Results

The sample's 59 respondents receiving air sealing or insulation were asked about non-energy benefits from work completed in their homes. Survey questions specifically targeted these respondents due to applicability of certain non-energy benefits, such as health and comfort benefits, associated with shell measures.

Eighty-five percent (n=50) of respondents found their home more comfortable to live in following the work.

Fifty-one percent said, following the work's completion, their electric bills became more affordable.

Fifty-nine percent said the work affected their health. Survey participants offered several, positive reasons for this, with a more comfortable home the most common response (n=12), and fixing a gas leak (n=2) the second most common. Other reasons cited included: reducing dust, eliminating mold, and decreasing fireplace soot.

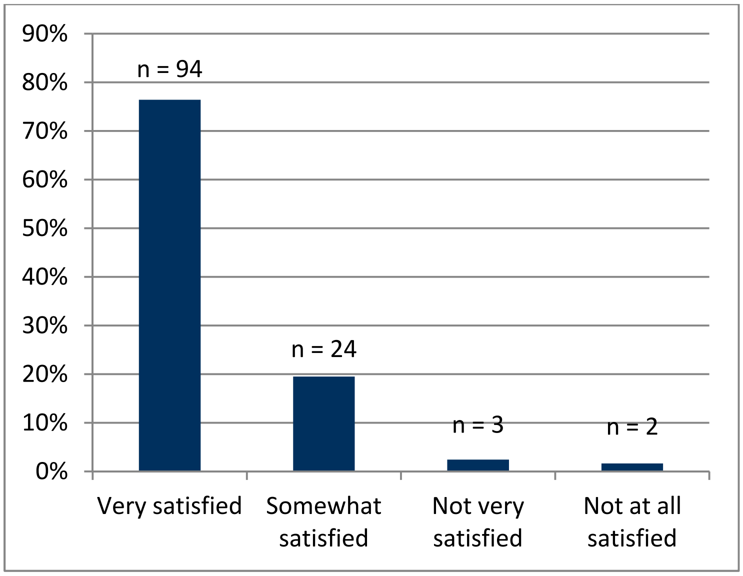
Weatherization programs have been associated with helping participants stay in their homes and reducing forced mobility. This helps avoid moving costs, helps keep children in the same schools, and helps participants retain their jobs. Forty-six percent (n=26) of 57 responding participants stated they were less likely to move in the near future upon the work's completion. Fifty-four percent (n=31) saw no change in their likelihood of moving.

3.3.10 Participant Satisfaction

Overall Program Satisfaction

Figure 3-6 summarizes participants' distribution of responses regarding overall program satisfaction.

Figure 3-6. Participants' Overall Satisfaction with Services Provided (n=123)



Seventy-six percent of respondents reported being very satisfied with program services, and 20 percent reported being somewhat satisfied.

Ninety percent of respondents thought program staff very courteous, with the remaining 10 percent finding agency staff somewhat courteous. Eighty-eight percent of respondents understood, prior to staff arrival, the work agency staff would conduct.

Weatherization Work Creating Additional Problems

Forty-nine respondents (83 percent) said the work did not create problems for them, but 10 respondents said it did. More serious issues cited included: a stove vent leaking when it rains; a hose breaking after it was moved to install a hot water heater, flooding a basement and ruining a carpet on stairs; and a heating system that "sounds like there is a train running through" the room. One respondent expressed displeasure with their new doors, saying they were too small, not installed properly, and the contractor took the screen doors, which they did not have permission to do.

Less serious complaints included the remodeling being inconvenient and less basement storage space. Three of the 10 respondents reported issues resolved to their satisfaction, while seven said they were not. Suggestions for different actions included putting a cover on a noisy heating system.

Suggestions for Program Improvements

Participants were asked for suggestions to improve the program. Many respondents could not think of ways to make the program better, though a few suggested better funding or better advertising to reach more people and provide additional services.

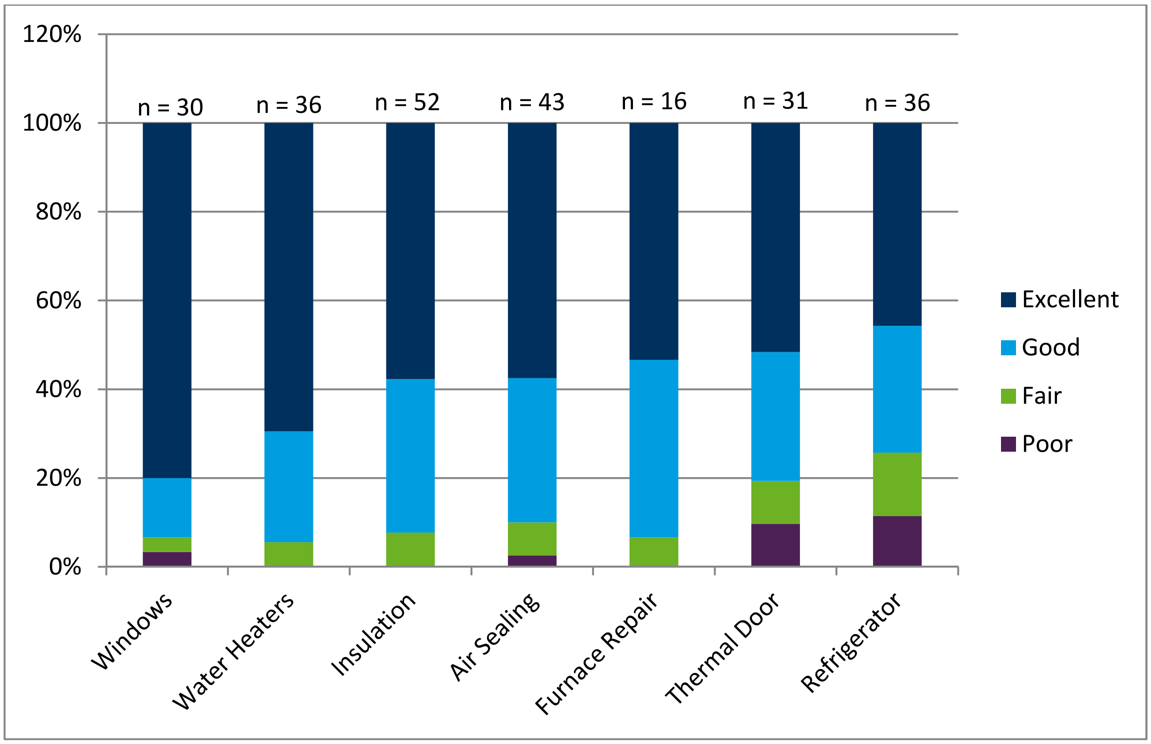
Six customers complained about contractors' insufficient follow-up on problems or customer wanting to speak to contractors' managers. Additionally, a few respondents wanted a better understanding of the work to be done and when it would be completed, regarding both the general timeframe and precisely when the contractors would be at their homes.

Seventy percent of respondents (n=86) knew who to call if experiencing problems. During the survey call, a phone number was provided to those who did not know who to contact.

Measure Satisfaction

The survey asked customers to rate different measures installed in their homes. Figure 3-7 presents measure-specific satisfaction ratings, with response data detailed in the sections that follow.

Figure 3-7. Measure Satisfaction Ratings



Refrigerators

Thirty-five individuals surveyed reported receiving a new energy-efficient refrigerator. Of this group, 74 percent (n=26) rated their new appliances as excellent or good. Eleven percent (n=4) rated their new refrigerators as poor. One respondent reported by Avista as having received a refrigerator indicated they had not received one.

When asked why they chose their appliance rating, respondents cited: the appliance worked (n=6); the refrigerator or freezer was a good size (n=6); and they needed a new refrigerator or freezer (n=6). Negative ratings resulted from: the refrigerator being too small (n=4); the appliance not keeping food at the right temperature (n=2); simply not liking it (n=3); and the appliance stopped working (n=1).

Forty-eight percent of respondents (n=16) said their old refrigerator worked fine prior to being replaced, and 48 percent said it worked, but had problems. One respondent said their refrigerator had not worked at all before replacement.

Insulation

Ninety-two percent (n=48) of 52 total respondents receiving new insulation rated it excellent or good. Four respondents rated it fair. Respondents offered no negative ratings.

When asked why they chose these ratings: 32 percent (n=15) said the insulation lowered their electric bills; 32 percent (n=15) said it kept their house warmer or cooler; 17 percent (n=8) said their house became more comfortable; and 17 percent (n=8) said the contractor did a nice job (respondents could give more than one reason). Although there were no negative ratings, 6 percent (n=3) said the insulation was insufficient to keep their house warm.

Air Sealing

Of 43 people reporting window frames or cracks sealed where outside air used to leak in (i.e., air sealing), 84 percent rated the measure good or excellent. One respondent rated it as poor, while three said they had not received air sealing services resembling the description provided.

When asked why they chose their rating, 35 percent of 34 respondents (n=12) indicated the contractor did a nice job; and 15 percent (n=5) cited keeping the house warmer or cooler. Another 12 percent of respondents (n=4) said it kept their house more comfortable. Although three respondents said the contractor did not finish the job, not enough information was available to assess the validity of these claims.

Furnaces

Fourteen of the 15 people with furnaces replaced or repaired rated the work good or excellent; none rated it as poor.

Six respondents said the contractor did a nice job, while four respondents said their homes were more comfortable or the new furnace kept the house warmer.

Four respondents said their furnace had not worked at all before its replacement or repair, while seven said it worked, but had problems. These statements may have implications on overall energy impacts associated with the program, as repair or replacement of heating systems not working prior to the weatherization would result in a net increase in energy usage for this measure.

The survey asked customers whether they noticed changes in their utility bills following work on their furnace. Over half of the respondents (n=8) said their utility bills became more affordable since receiving the new furnace, and no respondents said their heating bills increased.

Twelve furnace recipients had electric heating systems replaced with gas furnaces. When asked their opinion regarding the conversion from electric to gas, nine respondents liked their new gas furnace very much, while the other three liked it somewhat.

Windows

Thirty respondents had work done on windows, with 83 percent (n=25) receiving newly installed windows, and 17 percent (n=5) having some windows replaced and some repaired. Of 29 responding participants, 52 percent (n=15) remembered having broken or cracked glass in the windows prior to repairs or replacement, and 48 percent (n=14) remembered the glass being intact.

Ninety-three percent of respondents (n=28) rated the work completed on windows as good or excellent, while one respondent rated it fair, and one as poor. When asked for reasons for their ratings, respondents most commonly answered the contractor did a nice job—given by 40 percent of respondents (n=12). Nineteen percent of respondents (n=5) indicated they needed a new window or repair. Only a few respondents (n=4) offered negative comments, including they did not like the way the window worked and that their home was not as secure.

Doors

Of 31 respondents having a new door installed, 81 percent rated it good or excellent. However, 10 percent of respondents (n=3) rated it as poor. Twenty-five percent (n=7, out of 28 respondents) did not like the way the new door worked, and 18 percent (n=5) said the contractor did not finish the installation. One respondent reported the contractor made mistakes and had to come back to fix them (stoop was too high initially), but that the door ultimately worked really well.

A majority of respondents cited positive reasons for their ratings, including:

- The house was more secure/safer (five respondents, 18 percent).
- The contractor did a nice job (seven respondents, 25 percent).
- They liked the way the door looks (five respondents, 18 percent).

Water Heaters

The 36 respondents receiving new water heaters offered positive feedback, with 94 percent (n=34) rating it good or excellent, and none rating it poor.

Common reasons for the ratings included: the water heater worked (n=13), and it kept water at the right temperature (n=15). Respondents offered only five negative comments, including the water heater being too small, and it not keeping water at the right temperature. Sixty percent of respondents (n=21) said their old water heaters was functional prior to replacement, while 37 percent (n=13) said it worked, but had problems.

Thirty-three of the participants converted from electric to gas water heat. Sixty-nine percent (n=22) of these respondents reported liking their gas water heater very much, and, overall, 88 percent (n=28) liked it more than their old water heater. Only one respondent reported not liking it at all.

3.4 Conclusions and Recommendations

Based on the research findings determined through the process evaluation, this section outlines conclusions and recommendations, identified by topic area.

3.4.1 Program Delivery

Conclusions

- Avista's low-income weatherization program is being successfully implemented, with no significant barriers to delivery.

- Avista homes weatherized by agencies without Avista funding may represent opportunities to claim “non-programmatic” savings. A few agencies indicated they would be glad to provide Avista with information on their customer homes receiving weatherization without Avista funding.
- Periodic review of agency funding disbursement may allow for midstream reallocation. By shifting available funding from agencies not able to spend their allocation to agencies with additional capacity, more Avista expenditures can be made, and more projects can be completed.

Recommendations

Work with agencies to track non-programmatic savings.
Avista has an opportunity to track additional savings occurring through low-income weatherization where Avista funding did not touch their customer’s homes. We recommend working with agencies to determine the best approach for identifying such homes and weatherization work performed.

3.4.2 Communication

Conclusions

Avista has the following opportunities to increase their involvement in the program:

- Coordinating ride-alongs with CAP agency staff to achieve a better understanding of each agency’s implementation process (e.g., initial walk-through, audit, and inspection processes);
- Joining state administrators in monitoring completed Avista projects; and
- Leveraging state resources for monitoring additional Avista-customer projects.

Recommendations

Continue to coordinate with state and agency staff to participate in ridealongs and monitoring.
At the time interviews were performed, agency staff expressed satisfaction with the level and quality of communications with Avista, though they noted increased involvement (e.g., office visits, ridealongs) would be welcome. According to Avista staff, they have recently increased their involvement through ridealongs with agency staff. We recommend Avista continuing to engage agency staff in this regard, and to work with the state to participate in their monitoring efforts.

3.4.3 Program Tracking

Conclusions

- Current participant and measure data are not being used consistently or effectively to calculate robust expected savings estimates. As identified in the *Avista 2010 Multi-Sector Gas Impact Evaluation Report*, Avista overestimated expected savings per measure and did not appear account for key criteria in their savings calculations, including historical consumption, square footage, interaction effects, and primary heating system. Additionally, expected savings calculations appeared to be different between states and agencies. Avista should be able to account for these criteria and develop a consistent approach for applying improved expected savings calculations.

- While it appears unlikely that Avista could influence standardization of agency auditing and reporting processes across agencies and states, agencies were willing to provide additional building and measure details for Avista to incorporate into an improved expected savings calculation.
- Out of 15 survey respondents that reported receiving furnace installations, four indicated that their furnace did not work prior to weatherization. Additionally, of the 10 respondents that reported primarily heating their homes with non-electric or gas fuel, three received shell measure installations paid for by Avista (i.e., insulation, infiltration, windows, doors). The implication of both issues is that Avista will have overestimated savings for these participants by not tracking 1) whether the equipment was non-functioning at the time of replacement, and 2) primary heating fuel reported by the customers.
- While agencies reported no major problems in complying with reporting requirements, revamping these requirements may help streamline the program:
    - Removing preapproval requirements would eliminate additional time and paperwork required by the agencies. Other delivery process points appear to make these requirements redundant (e.g., agency audit, internal review, ultimate Avista invoice reimbursement).
    - Electronic reporting would help to automate and streamline reporting procedures, potentially reducing agency and utility time spent working with handwritten reports.

Recommendations

Avista to ensure consistency and accuracy of data collected for expected savings calculations.
Data collected through CAP agencies should be used to consistently in calculating more robust measure-level expected savings estimates.

Work with CAPs for more detailed data collection.
As agencies serve as direct contacts for program participants, opportunity exists for them to collect information critical to understanding energy impacts, and for correctly specifying appropriate savings algorithms. We recommend Avista identifies additional information to aid its savings calculations (e.g., primary heating/cooling systems) and to work with agencies to begin collecting and reporting these data to the utility.

Eliminate preapproval requirements.
Current program design requires preapproval for some measures. Eligibility of these measures must then be reported a second time, when the CAP agencies invoice Avista for projects. As preapprovals for such measures are almost always granted, this step appears redundant; we recommend Avista review the appropriateness of this step, and consider completely eliminating this requirement.

Continue to communicate with agencies regarding opportunities to automate reporting.
Electronic reporting should streamline the program, reducing the time and resources the agencies and Avista require to deal with paperwork. However, additional effort may be required to set up a system for coordinating reporting across different agencies. We recommend continuing to explore this option and to discuss potential solutions with stakeholder groups.

3.4.4 Cost-Effectiveness Considerations

Conclusions

By design, low-income weatherization programs are based on objectives (e.g., welfare provision) that are inconsistent with utility objectives (e.g., cost-effective energy savings). In particular, low-income weatherization run by agencies uses an SIR approach to considering cost-effectiveness (at the program-level), while Avista is required to provide cost-effective programs from a TRC perspective (passing cost-effectiveness at the measure and portfolio levels).

The issue of whether low-income weatherization programs should be held to the same cost-effectiveness standards as other DSM programs is unclear under state resource portfolio requirements. Eliciting a strict ruling on this issue will allow Avista to consider options for changing the design and delivery of their low-income weatherization program.

Recommendations

Work with stakeholders to get clarity on whether low-income weatherization programs are held to the same cost-effectiveness requirements as other DSM program offerings.
Cadmus recommends Avista coordinate with other utilities and stakeholder groups to request that the utility regulatory commissions in their territory states come to final resolutions on this issue.

If low-income programs are required to be cost-effective, Avista could consider the following options to continue supporting the program while achieving a higher cost-effectiveness ratio:

- Include additional analysis for non-energy benefits that can be included as program benefits under the TRC.
- Work with agencies to prioritize customers with high usage or arrearages.
- Only offer measures with the highest SIR. Some utilities have asked agencies working on their behalf to only use their dollars on measures with a SIR of 1.5 or above.
- Limit the list of measures eligible for utility funding to a very few with generally high cost-effectiveness levels.

Though these suggestions could be implemented if utility commissions required program cost-effectiveness, agencies will face difficulty in making this transition, which would put a greater burden on federal funding sources that are significantly smaller than they has been in the past few years. Weatherization program changes should always be discussed and considered in concert with delivery agencies and their advocates.

3.4.5 Quality Assurance and Control

Conclusions

- QA/QC protocols, implemented by both agencies and state monitors, appear sufficient for guaranteeing completion of work identified by the agency auditor and confirming quality installation of work completed.
- State administrators welcomed Avista to request inspection reports for Avista customer homes that receiving state monitoring. These reports will give Avista a better understanding of reoccurring issues or areas for concern with regard to agency implementation and quality installation of weatherization measures. In the case for one state, the administrator cited that Avista was the only utility that did not request this information.

Recommendations

Consider leveraging state resources for additional oversight.
Given Avista's initial concerns regarding installations' quality, the utility should consider leveraging the existing state infrastructure to pay for additional monitoring of Avista projects. As reported, the state will accept funding to perform additional inspections of projects in Avista territory and will provide monitoring reports directly to the utility.

Request inspection reports from state monitors for Avista customer homes.
Cadmus recommends that Avista begin requesting inspection reports from state administrators for those Avista customers that receiving monitoring. As state administrators indicated that they will gladly provide these materials to utilities, Avista should request these materials to be aware of monitoring issues identified by the state that affect program delivery and may impact energy savings for their customer's homes.

3.4.6 Participant Findings

Conclusions

- As about 12 percent of participants use non-electric or gas sources as their primary means of heating, Avista's expected savings estimates may not be accurate if they assume electric or gas heating systems in their savings calculations. This especially applies to shell measure savings calculations.
- Through the participant survey, Cadmus identified three participants (two electric customers, one gas customer) that reported receiving shell measures also reported using a primary heating source other than natural gas or electricity provided by Avista. Expected savings reported for these customers associated with heating and cooling savings (attributed to insulation, infiltration, windows, and doors) will have overestimated actual savings, since these installations would impact a non-electric or gas heating source, not provided by Avista.
- As 28 percent of participants reported changing how they heated their homes after weatherization work had been performed, estimated savings for these participants may not be accurate, using Avista's deemed savings estimates.

- Low take-back levels were reported, indicating increases in consumption likely did not occur due to increased occupants moving into a home, increased occupancy of rooms within a home, or changes to thermostat set-points.

3.4.7 Participant Energy Education

Conclusions

- Though the program's energy-saving educational component does not appear to be standardized across agencies, it appears to operate successfully, based on participant responses, high rates of reviewing materials, and reported energy-saving behavior changes.
- The energy education curriculum and delivery could focus more on actions saving the most energy.

Recommendations

Focus energy education on actions resulting in high energy savings.
While energy-saving education occurs through provided materials or agency staff performing initial inspections and home audits, participants must take away information about actions resulting in high energy savings. Cadmus recommends placing a greater emphasis on reducing heating set-points and reducing hot water use. These recommendations typically result in most households realizing higher savings levels.

3.4.8 Non-Energy Benefits

Conclusions

- Participants reported increased comfort and positive health impacts through weatherization work performed on their homes. Additionally, almost 50 percent indicated they were less likely to move as a result of work performed. Each of these findings represents additional benefits to participants beyond cost-savings associated with reduced energy consumption.
- An opportunity exists for Avista to quantify more non-energy benefits associated with this program. As low-income weatherization typically does not prove cost-effective in utility resource portfolios, non-energy benefits can be quantified to represent additional benefits attributed to the program and can be monetized for inclusion in cost-effectiveness calculations. Additional analyses include estimating: environmental impacts, economic impacts, changes in payment behavior, arrearage reductions, reduced disconnections/ reconnections, reduced mobility, and other participant ancillary benefits (e.g., comfort, health, safety).

Recommendations

Consider funding additional research of non-energy benefits.
Additional research can help Avista identify different non-energy benefits associated with low-income weatherization and their relative impacts on different stakeholder groups. This research can help quantify and monetize program-specific, non-energy benefits, which can be added into program cost-effectiveness testing from different cost-test perspectives. Cadmus recommends Avista consider funding additional non-energy benefit studies.

3.4.9 Participant Satisfaction

Conclusions

- Participants reported high levels of satisfaction with Avista's low-income weatherization program overall.
- Participants were also satisfied with the measure installations, with the majority indicating either "Excellent" or "Good" ratings for each measure type.

3.4.10 Future Research Areas

In light of 2010 process evaluation findings, Cadmus recommends Avista consider the following research areas for the 2011 evaluation period and future evaluations:

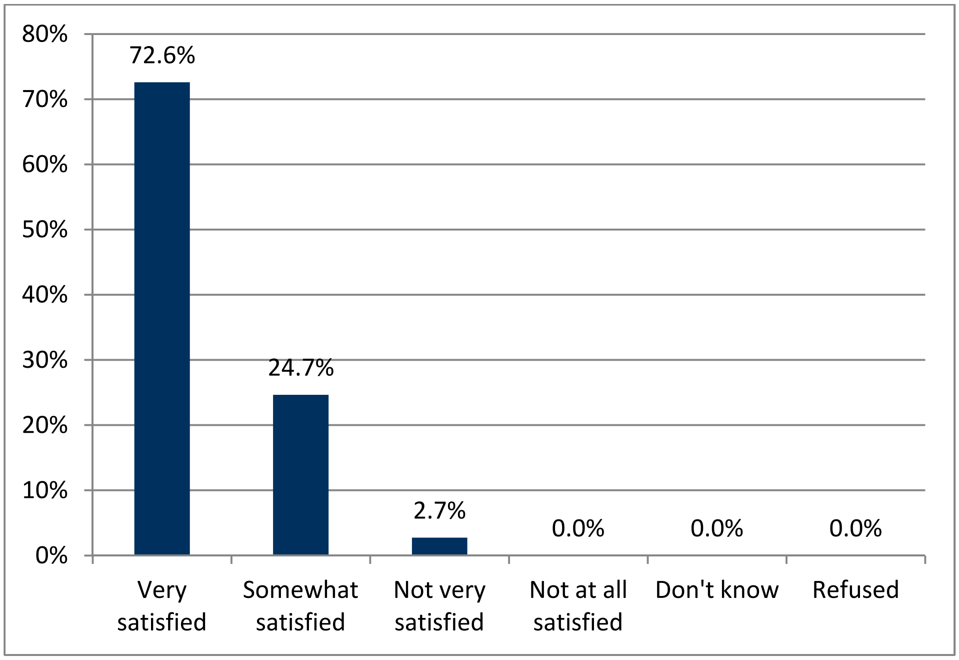
- Revise the participant survey to collect more detailed information in particular areas of interest. Three such areas may include: 1) additional non-energy benefits from the participant perspective; 2) specific changes to customer heating and cooling behaviors occurring after weatherization; and 3) non-functioning equipment prior to replacement.
- Consider identifying non-programmatic savings resulting from low-income weatherization performed on Avista customer homes, but not tracked by the utility.
- Assist with Washington Utilities and Transportation Commission hearings and data requests regarding cost-effectiveness requirements for low-income programs.
- Work with Avista to determine non-energy benefits and to prioritize benefits to be pursued with further research.
- Consider funding a market assessment to identify: the geographic breakout of eligible participant populations; historical participation; whether any target markets have been historically underserved; and additional targeting opportunities (e.g., energy burdens).

Appendix A: Residential Program Satisfaction Survey Results

ENERGY STAR Appliance Rebate Program Satisfaction

As shown in Figure A-1, 73 percent (n=53) of ENERGY STAR Appliance Rebate Program participants reported being very satisfied, while 25 percent (n=18) reported being somewhat satisfied, and 3 percent (n=2) reported being not very satisfied.

Figure A-1. ENERGY STAR Appliance Rebate Program: Overall Satisfaction (n=73)

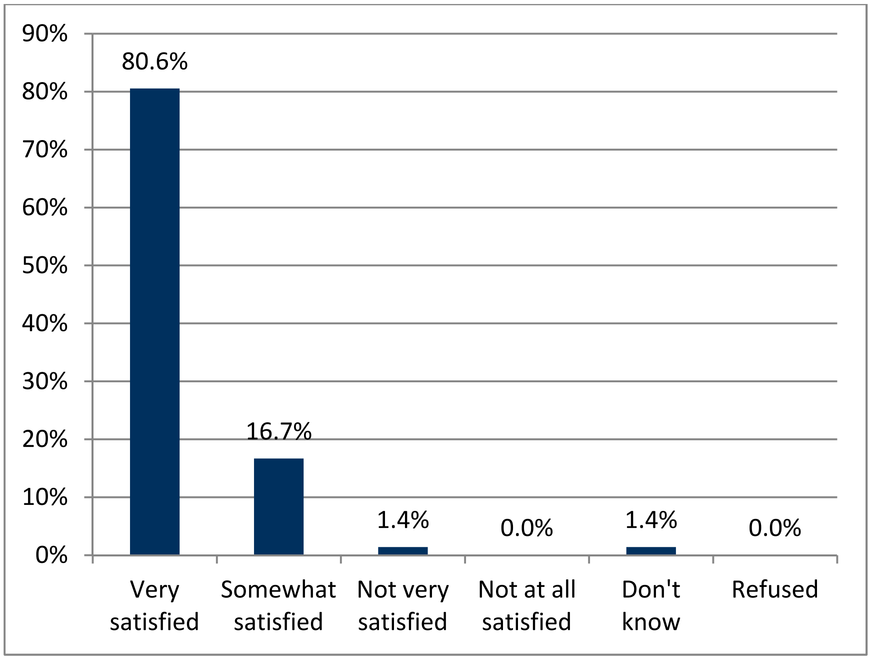


Comments from less-satisfied customers included: the rebate not being large enough; and being denied the rebate, despite being told they would qualify.

Heating and Cooling Efficiency Program Satisfaction

As shown in Figure A-2, participant satisfaction ran very high among Heating and Cooling Efficiency participants.

Figure A-2. Heating and Cooling Efficiency Program: Overall Satisfaction (n=72)

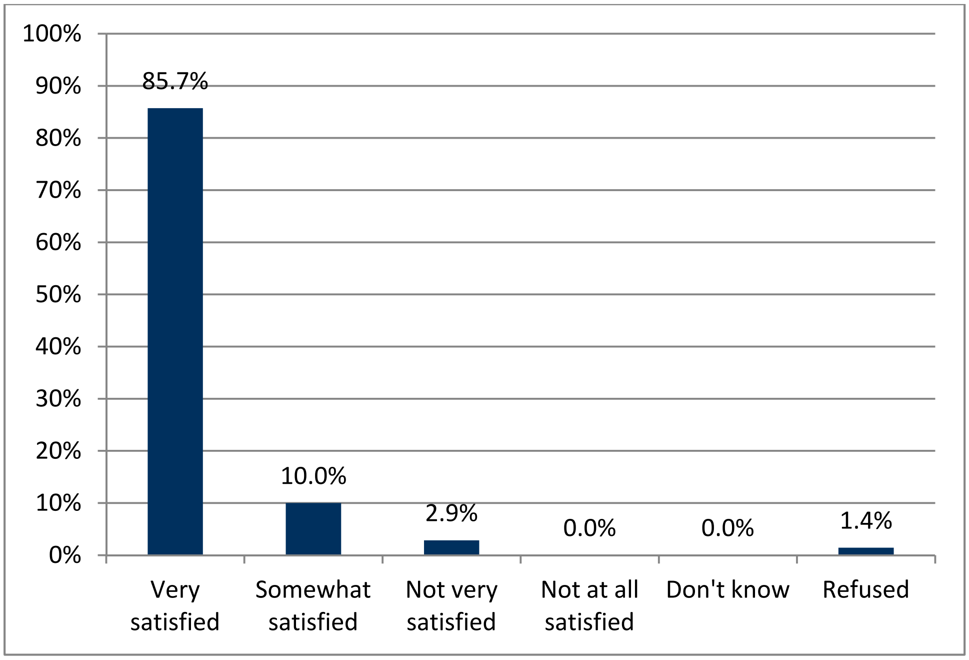


Generally, respondents expressed being very happy with the Heating and Cooling Efficiency program, with 81 percent (n=58) saying they were very satisfied. The rebate's size pleased respondents, per their feedback, as did the rebate's promptness and easy sign-up process. Somewhat satisfied respondents' comments included unhappiness that they could not receive a water heater rebate upon receiving a furnace rebate (seeming to stem from a misunderstanding of program requirements), and needing to fill out rebate paperwork four times before receiving rebates. One respondent reported being not very satisfied, saying the rebate was much lower than that received through another utility (Inland Power Company).

Weatherization and Shell Measures Satisfaction

As shown in Figure A-3**Error! Reference source not found.**, an overwhelming majority of weatherization participants expressed being very satisfied with the program.

Figure A-3. Weatherization and Shell Measures: Overall Satisfaction (n=70)

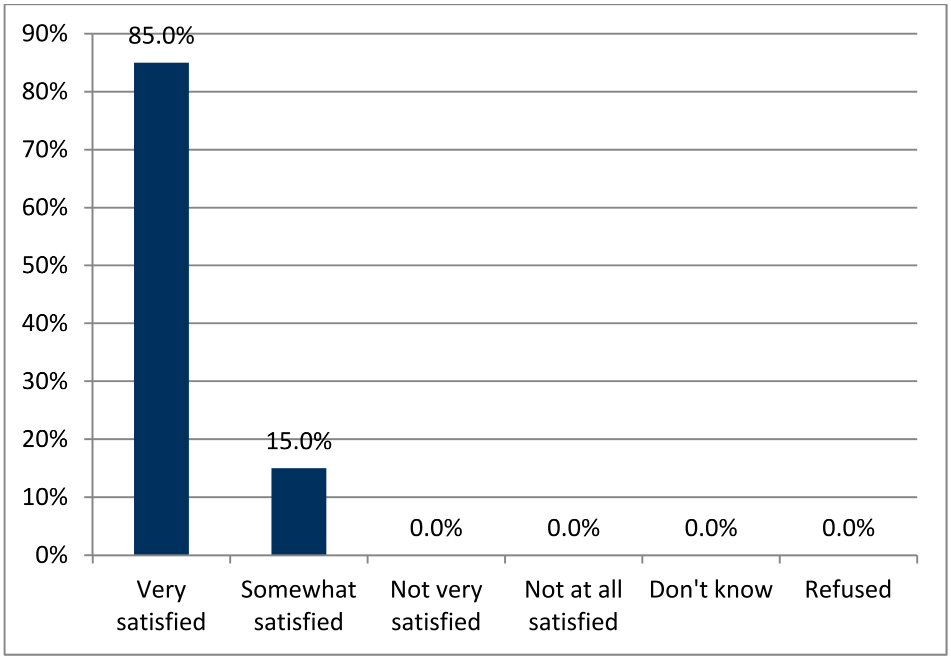


Weatherization and Shell Measures had the highest proportion of participants describing themselves as very satisfied, at 86 percent (n=60). Feedback from these respondents cited the helpfulness of people involved, the ease of the rebate process, and the rebate's size, which helped some afford the improvement. Somewhat satisfied customers (10 percent, n=7) said advertisements for the program lacked information, and timelines for returning the paperwork were unclear. Two respondents reported being not very satisfied, with one adding they installed windows, while expecting to receive a rebate, which they did not receive, and the other citing uncertainty regarding whether they would receive a rebate.

Water Heater Efficiency Program Satisfaction

As shown in Figure A-4, a large majority of respondents expressed being very satisfied with the Refrigerator Recycling program.

Figure A-4. Water Heater Efficiency: Overall Satisfaction (n=20)

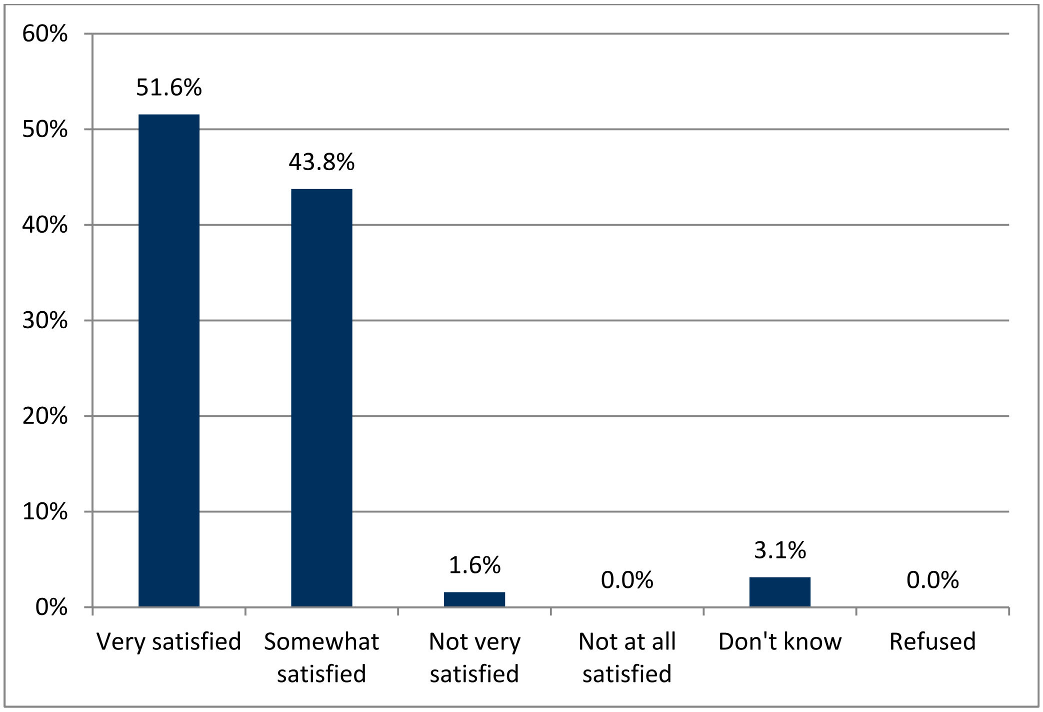


Seventeen respondents reported being very satisfied with the water heater program, while three reported being somewhat satisfied. None said they were not very satisfied or not at all satisfied. Very satisfied respondents cited the process as smooth and timely, and those involved as very helpful.

Home Energy Audit Program Satisfaction

Satisfaction among Home Energy Audit participants, while generally high, was less outstanding than that of other programs, reflecting the program providing a service very different from the other rebate programs. In all other programs surveyed, participants received cash rebates, while the Home Energy Audit program provided a paid service at a discounted rate. This difference could account for comparatively lower satisfaction levels for this program. The survey asked additional questions, summarized below, providing more detailed insights into customers' experiences with the program.

Figure A-5. Home Energy Audit Program: Overall Satisfaction (n=64)



As shown in Figure A-5, the audit program experienced the lowest percentage of very satisfied participants. While over half of participants described themselves this way, 44 percent (n=28) expressed being only somewhat satisfied. Comments from somewhat satisfied respondents included: wishing the discount was larger; and wanting the audit to be more in-depth and explained more clearly to customers. One respondent reported being not very satisfied, commenting the rebates were small relative to improvement costs, and, because they had a newer home, most rebates did not apply. This customer seemed to refer to Avista's other rebates, rather than the audit's discounted cost.

The survey asked additional questions of Audit program participants. Fifty-eight percent (n=37) rated the energy audit as excellent; 33 percent (n=21) rated it as good; and 9 percent (n=6) rated it as fair. Of 62 responding participants, 66 percent (n=41) cited auditors as excellent, 29 percent (n=18) described them as good, and 5 percent (n=3) described them as fair.

Most respondents thought auditors provided sufficient information: 69 percent (n=44) expressed being very satisfied; and 28 percent (n=18) expressed being somewhat satisfied (n=18). Two respondents (3 percent) described themselves as not very satisfied.

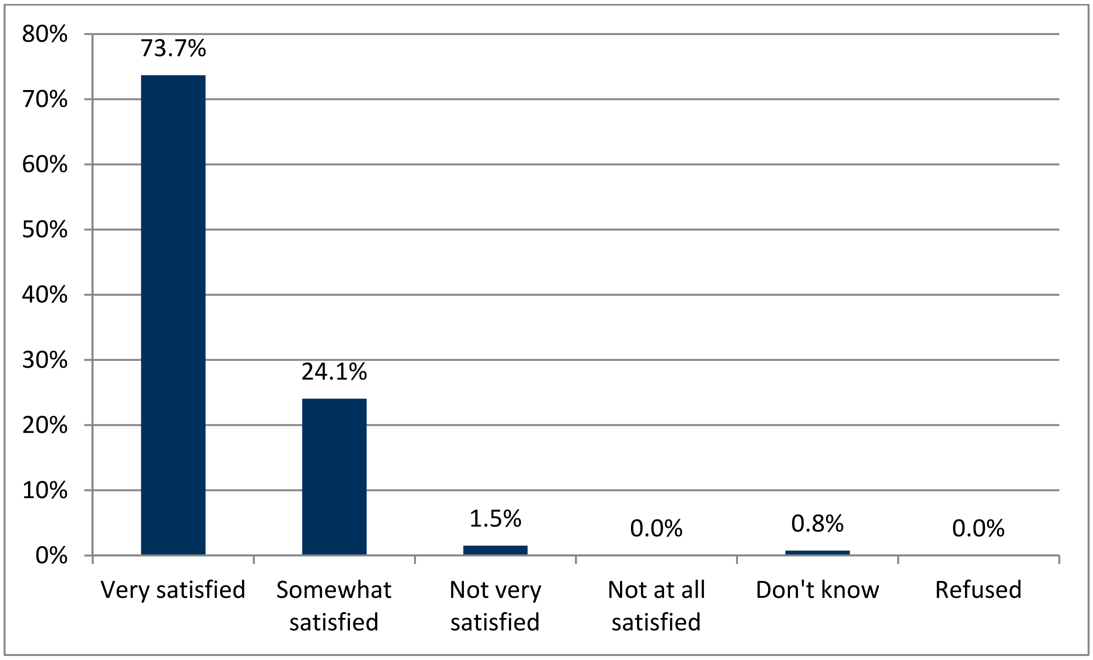
All but one of the 64 participants understood the auditors' recommendations for improving participant homes' energy-efficiency. Only 42 percent (n=27), however, installed or purchased new equipment or appliances. Improvements listed included: insulation, new windows, caulking and sealing, and new furnaces. One participant installed a photovoltaic array, while another installed a 15 kW wind turbine. Sixty percent (n=15) of responding participants received an Avista rebate for their improvement, and 54 percent received a tax break.

For participants not installing or purchasing new equipment, reasons cited included: not needing new appliances; not having the money; and auditors not making such recommendations. Eighty-six percent (n=32) of these respondents knew rebates or tax breaks might be available for some energy-saving measures.

Refrigerator Recycling Program Satisfaction

As shown in Figure A-6, respondents expressed satisfaction with the Refrigerator Recycling program.

Figure A-6. Refrigerator Recycling Program: Overall Satisfaction (n=133)

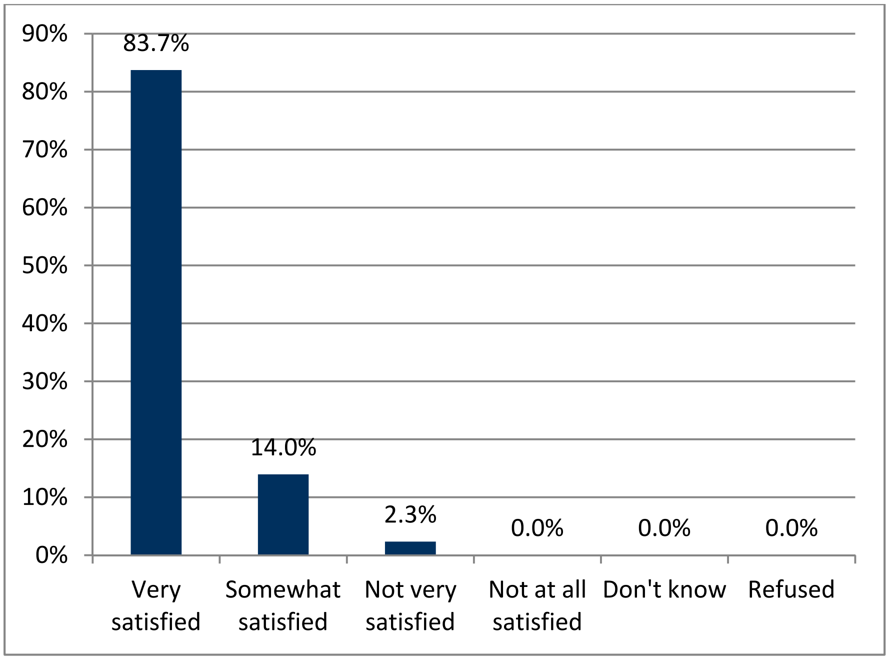


Specific feedback from respondents included: the process being efficient and prompt; and they were pleased to receive rebates. The few negative comments included: the rebate was not large enough; difficulties with application and program requirements; and a desire that Avista's program would accept all appliances for recycling.

Space and Water Conversion Program Satisfaction

As shown in Figure A-7, Conversion program participants were generally satisfied with the program, with 84 percent (n=36) rating themselves as very satisfied. Respondents expressed pleasure with how easy and fast the process was, and appreciated the rebate and energy bill savings. The Conversion program also received the highest percentage of very satisfied respondents (72 percent, n=31) regarding satisfaction with the rebate amount.

Figure A-7. Space and Water Conversion Program: Overall Satisfaction (n=43)



Appendix B: Additional Nonresidential Survey Detail

Customer Profile

Table B-1. Ownership by Customer Facility Table

Own/Lease	Participant		Nonparticipant		Partial Participant	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
Own	231	81.1	61	78.2	15	57.7
Lease	53	18.6	17	21.8	11	42.3
Manage	1	0.4	0	0.0	0	0.0
Total	285	100.0	78	100.0	26	100.0

Table B-2. Fuel Type by Customer Facility

Heating Fuel Type	Participants		Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
Gas	193	69.4	42	54.5	13	50.0
Electricity	62	22.3	25	32.5	10	38.5
Both, Electricity and Gas	7	2.5	6	7.8	3	11.5
Oil	3	1.1	1	1.3	0	0.0
Propane	3	1.1	1	1.3	0	0.0
Not Applicable (space not heated)	2	0.7	2	2.6	0	0.0
Heat reclaim	2	0.7	0	0.0	0	0.0
Space heated	1	0.4	0	0.0	0	0.0
Diesel	1	0.4	0	0.0	0	0.0
Steam	1	0.4	0	0.0	0	0.0
Natural gas	1	0.4	0	0.0	0	0.0
Waste fill	1	0.4	0	0.0	0	0.0
Wood	1	0.4	0	0.0	0	0.0
Total	278	100.00	77	100	26	100.0

Program Awareness

Table B-3. How Respondents Heard About the Program

How did you first hear of the program	Participants		Non-Participants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
Word of mouth	88	33.3	8	34.8	5	20.0
Avista Representative	46	17.4	3	13.0	8	32.0
Contractor marketing	42	15.9	3	13.0	3	12.0

Contacted Avista directly	23	8.7	1	4.3	1	4.0
Internet/Avista website	20	7.6	0	0.0	0	0.0
Electrician/Electric company	18	6.8	0	0.0	0	0.0
Printed materials	12	4.5	2	8.7	3	12.0
Trade organization	10	3.8	0	0.0	2	8.0
Received a rebate before	7	2.7		0.0	2	8.0
Another company	3	1.1	3	13.0	0	0.0
Previous experience with Avista	3	1.1		0.0	0	0.0
Electronic monthly newsletter	2	0.8	1	4.3	0	0.0
Prior knowledge	0	0.0	2	8.7	0	0.0
Television	1	0.4	0	0.0	0	0.0
Supplier – not electric	1	0.4	0	0.0	0	0.0
Program sponsored conference/trade show/workshop	0	0.0	0	0.0	1	4.0
Other	0	0.0	0	0.0	1	4.0
Total	264	-	23	-	25	-

Table B-4. Nonparticipant Program Awareness by Rate Class

Response	11	Percent	21	Percent	31	Percent	32	Percent	111	Percent
Yes	5	35.7	18	33.3	1	25.0	1	50.0	2	40.0
No	9	64.3	36	66.7	3	75.0	1	50.0	3	60.0
Total	14	100.0	54	100.0	4	100.0	2	100.0	5	100.0

Table B-5. Most Effective Way to Reach Customers

Most effective way to reach customers about program opportunities	Participants		Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
Mailings	31	17.1	42	53.2	9	36.0
Email	42	23.2	9	11.4	3	12.0
Mail - with the billing	42	23.2	5	6.3	2	8.0
Avista Representative	22	12.2	5	6.3	7	28.0
Telephone call	20	11.0	10	12.7	0	0.0
Advertisements/Flyers	14	7.7	1	1.3	0	0.0
Contractors/Vendors	9	5.0	2	2.5	0	0.0
Word of mouth	9	5.0	1	1.3	1	4.0
Website/Internet	9	5.0	1	1.3	1	4.0
Electronic Newsletter	0	0.0	4	5.1	1	4.0
Newspaper	4	2.2	0	0.0	0	0.0
Television	3	1.7	0	0.0	0	0.0
Magazine	3	1.7	0	0.0	0	0.0

Radio	2	1.1	0	0.0	0	0.0
Audit/Tax incentive	2	1.1	0	0.0	0	0.0
Trade association	1	0.6	1	1.3	0	0.0
Commercial outlet	1	0.6	0	0.0	0	0.0
Do not need anything	1	0.6	0	0.0	0	0.0
Social media	1	0.6	0	0.0	0	0.0
Public Service Announcements	1	0.6	0	0.0	0	0.0
Not Bill inserts	1	0.6	0	0.0	0	0.0
Personal visit	0	0.0	1	1.3	0	0.0
Fax	0	0.0	1	1.3	0	0.0
Other - Unspecified	0	0.0	0	0.0	1	4.0
Total	181	-	79	-	25	-

Purchase Patterns and Decision Making

Table B-6. Nonparticipant and Partial Participant Energy Efficiency Equipment Installation Outside of the Program

Was Energy Efficient Equipment Installed in Facilities	Non-Participants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
No	60	80.0	14	56.0
Yes	15	20.0	11	44.0
Total	75	100.0	25	100.0

Table B-7. Installed Energy Efficient Equipment

Energy Efficient Equipment Installed	Non-Participants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Lighting	5	26.3	8	53.3
HVAC units/Furnace/Heater	3	15.8	2	13.3
New thermostats	2	10.5	0	0.0
Variable frequency drives	1	5.3	0	0.0
Heat recovery system	1	5.3	0	0.0
Air conditioning unit	1	5.3	1	6.7
New windows	1	5.3	0	0.0
New doors	1	5.3	0	0.0
Lasers	1	5.3	0	0.0
Occupancy sensors	1	5.3	0	0.0
Motors	1	5.3	0	0.0
Cooler/Refrigerator/Freezer	1	5.3	3	20.0
Equipment - Unspecified	0	0.0	1	6.7
Total	19	100.0	15	100.0

Table B-8. Reasons for Installing Efficient Equipment

Reason for Installing Energy Efficient Equipment	Non-Participants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Save money	6	40.0	5	35.7
Better quality product	0	0.0	3	21.4
Problem with previous product	3	20.0	2	14.3
Need new product	2	13.3	0	0.0
Federal initiative	1	6.7	0	0.0
Want rebate	1	6.7	1	7.1
Previous product no longer available	1	6.7	0	0.0
Other - Unspecified	1	6.7	3	21.4
Total	15	100	14	100

Table B-9. Factors Influencing Installation of Efficient Equipment

Factors that Influenced Decision to Pursue Energy Efficient Equipment	Participants		Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
To save energy	99	35.0	6	40.0	5	35.7
Save on electric bills	92	32.5	7	46.7	7	50.0
Replace old equipment	71	25.1	2	13.3	1	7.1
For rebate/incentive	54	19.1	0	0.0	0	0.0
Replace broken equipment	30	10.6	0	0.0	1	7.1
To acquire the latest technology	18	6.4	0	0.0	0	0.0
Part of a broader remodeling	15	5.3	0	0.0	0	0.0
Tax credit or rebate	10	3.5	2	13.3	0	0.0
To reduce maintenance costs	10	3.5	1	6.7	0	0.0
Contractor recommendation	8	2.8	0	0.0	0	0.0
Better lighting	6	2.1	0	0.0	0	0.0
To help protect the environment	4	1.4	0	0.0	0	0.0
Participation in other Avista rebate programs	3	1.1	0	0.0	0	0.0
Need new equipment	3	1.1	0	0.0	0	0.0
Cost of equipment	2	0.7	0	0.0	0	0.0
Quality/more efficient	2	0.7	0	0.0	0	0.0
Sales Rep	1	0.4	0	0.0	0	0.0
Good business decision	1	0.4	0	0.0	0	0.0
Improve comfort	0	0.0	1	6.7	0	0.0
Had to	0	0.0	1	6.7	0	0.0
To follow the standards of the business	0	0.0	0	0.0	1	7.1
Total	283	-	15	-	14	-

Table B-10. Who Customers Talk to About Energy Efficiency

Who Respondents Would Talk to About Improving Energy Efficiency	Participants		Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
Avista	105	39.3	21	25.6	8	33.3
Equipment contractor	50	18.7	9	11.0	6	25.0
Don't Know	27	10.1	11	13.4	0	0.0
Equipment vendor	21	7.9	5	6.1	3	12.5
Administration/Board/Owner	2	0.7	15	18.3	3	12.5
Director/Manager	15	5.6	2	2.4	1	4.2
Myself	12	4.5	4	4.9	1	4.2
Electrician/Electric company	9	3.4	0	0.0	0	0.0
Maintenance crew	2	0.7	5	6.1	0	0.0
Friend/Associate/Individual person mentioned	6	2.2	0	0.0	0	0.0
Internal employees	4	1.5	0	0.0	0	0.0
Engineering	3	1.1	0	0.0	1	4.2
Facility management	3	1.1	0	0.0	0	0.0
Refused	2	0.7	1	1.2	0	0.0
Power company	1	0.4	2	2.4	0	0.0
Corporate office	0	0.0	2	2.4	1	4.2
Internet	2	0.7	0	0.0	0	0.0
Retail supplier	1	0.4	0	0.0	0	0.0
Local government	1	0.4	0	0.0	0	0.0
Architects	1	0.4	0	0.0	0	0.0
Depends on location	0	0.0	1	1.2	0	0.0
Landlord	0	0.0	1	1.2	0	0.0
County fairgrounds	0	0.0	1	1.2	0	0.0
BPA	0	0.0	1	1.2	0	0.0
Other	0	0.0	1	1.2	0	0.0
Total	267	100	82	100	24	100

Barriers and Benefits

Table B-11. Barriers to Participation

Most Significant Obstacles to Installing Energy Efficient Equipment	Participants		Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
High first cost	174	68.2	46	69.7	18	69.2
Don't know	26	10.2	13	19.7	0	0.0
Lack of staff time to dedicate to pursuing energy efficiency upgrades	15	5.9	3	4.5	3	11.5
Funding competition for other investments/improvements within organization	17	6.7	1	1.5	2	7.7
Lack of technical knowledge about energy efficiency	9	3.5	4	6.1	2	7.7

equipment						
Nothing, no obstacles	8	3.1	2	3.0	1	3.8
Time/Availability	10	3.9	0	0.0	0	0.0
Long return on investment	6	2.4	1	1.5	1	3.8
Installation	6	2.4	0	0.0	0	0.0
Lack of corporate support for energy efficiency investments	3	1.2	3	4.5	0	0.0
Funding	5	2.0	0	0.0	0	0.0
Refused	3	1.2	1	1.5	0	0.0
Regulations/Criteria/Deadlines	3	1.2	0	0.0	0	0.0
Having proper equipment	0	0.0	3	4.5	0	0.0
Finding contractor/installer	2	0.8	0	0.0	0	0.0
Size and complexity of project	2	0.8	0	0.0	0	0.0
Lack of need	0	0.0	2	3.0	0	0.0
System compatibility	0	0.0	1	1.5	1	3.8
Age of equipment	1	0.4	0	0.0	0	0.0
Own research	1	0.4	0	0.0	0	0.0
Economy	1	0.4	0	0.0	0	0.0
Resources - unspecified	1	0.4	0	0.0	0	0.0
Size and complexity of project	1	0.4	0	0.0	0	0.0
Installation	1	0.4	0	0.0	0	0.0
Building owner	0	0.0	1	1.5	0	0.0
Amount of downtime to customer	0	0.0	0	0.0	1	3.8
Too much of a hassle	0	0.0	0	0.0	1	3.8
Total	255	-	66	-	26	-

Table B-12. Ways to Overcome Barriers to Participation

What Avista Could do to Help Overcome these Obstacles	Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Don't know	13	18.8	7	26.9
Provide more information	14	20.3	3	11.5
Provide funding/loans/rebates	15	21.7	0	0.0
No obstacle/nothing	9	13.0	0	0.0
Lower cost/rate	8	11.6	0	0.0
Sales rep visit/call	5	7.2	0	0.0
Other	0	0.0	5	19.2
Increase rebate/cover cost	0	0.0	5	19.2
Continue with the rebate programs	0	0.0	3	11.5
No need to replace equipment, so nothing	2	2.9	0	0.0
Pay for more	2	2.9	0	0.0
Approve rebates	0	0.0	2	7.7
Be more compatible across systems	1	1.4	0	0.0
Extend time limits	0	0.0	1	3.8
Total	69	100	26	100

Table B-13. Participant Sources of Outside Funding

Did Participants Access Other Funding Sources	Participants	
	Number of Respondents	Percent
No	112	88.2
Yes	16	12.6
Total	127	100.0

Table B-14. Importance of Outside Funding

Importance of Other Funding Sources in decision to Participate	Participants	
	Number of Respondents	Percent
Very important	11	73.33
Somewhat important	4	26.67
Total	15	100.00

Participant Non-Energy Benefits

Table B-15. Presence of Non-Energy Benefits

Has the Program Rebated Project Provided Benefits Beyond Energy Savings	Participants	
	Number of Respondents	Percent
Yes	199	75.38
No	65	24.62
Total	264	100.00

Table B-16. Type of Non-Energy Benefits

Benefits Experienced Beyond Energy Savings	Participants	
	Number of Respondents	Percent
Increased occupant comfort	48	24.1
Lower maintenance costs	48	24.1
Better lighting	44	22.1
Increased productivity	35	17.6
Environmental benefits	27	13.6
Less waste	9	4.5
Increased technical knowledge	5	2.5
Upgrade equipment	5	2.5
Improve safety	4	2.0
Save energy/usage	3	1.5
Aesthetics	3	1.5
Water savings	2	1.0
Reliability/quality of new equipment	2	1.0
Marketing tool	1	0.5
Total	199	-

Program Challenges

Table B-17. Presence of Challenges

Were Aspects of the Program Challenging	Participants	
	Number of Respondents	Percent
Yes	39	13.8
No	244	86.2
Total	283	100.0

Table B-18. Description of Challenges

Aspects of the Program that were Challenging	Participants	
	Number of Respondents	Percent
Installation	9	24.3
Rebate/paperwork process	8	21.6
Information concerning program	4	10.8
Initial cost	4	10.8
Selection/identification of machine	3	8.1
Finding contractor/installer	2	5.4
Getting used to new product	2	5.4
Scheduling/timeframe	2	5.4
Matching dollars needed	1	2.7
Making the decision	1	2.7
Rebate/paperwork process	1	2.7
Not receiving the rebate within a reasonable timeframe	0	0.0
Time dedication necessary	0	0.0
Not receiving help in the process	0	0.0
Total	37	100

Program Satisfaction

Table B-19. Participant Program Overall Satisfaction

Satisfaction with the Program Overall	Participants	
	Number of Respondents	Percent
Very satisfied	193	68.0
Somewhat satisfied	81	28.5
Neither satisfied or dissatisfied	4	1.4
Somewhat dissatisfied	5	1.8
Very dissatisfied	1	0.4
Total	284	100.0

Table B-20. Rebate Amount Satisfaction

Satisfaction with Rebate Amount Received	Participants	
	Number of Respondents	Percent
Very satisfied	189	67.7
Somewhat satisfied	80	28.7
Neither satisfied or dissatisfied	5	1.8
Somewhat dissatisfied	2	0.7
Very dissatisfied	3	1.1
Total	279	100.0

Table B-21. Realized Energy Savings Satisfaction

Satisfaction with Energy Savings Realized	Participants	
	Number of Respondents	Percent
Very satisfied	119	47.4
Somewhat satisfied	108	43.0
Neither satisfied or dissatisfied	14	5.6
Somewhat dissatisfied	7	2.8
Very dissatisfied	3	1.2
Total	251	100.0

Table B-22. Rebate Speed Satisfaction

Satisfaction with the Speed Rebate was Received in	Participants	
	Number of Respondents	Percent
Very satisfied	199	72.6
Somewhat satisfied	62	22.6
Neither satisfied or dissatisfied	1	0.4
Somewhat dissatisfied	8	2.9
Very dissatisfied	4	1.5
Total	274	100.0

Table B-23. Commercial Offerings Satisfaction

Satisfaction with Avista's Offerings for Commercial Customers	Participants	
	Number of Respondents	Percent
Very satisfied	147	55.3
Somewhat satisfied	100	37.6
Neither satisfied or dissatisfied	6	2.3
Somewhat dissatisfied	10	3.8
Very dissatisfied	3	1.1
Total	266	100.0

Table B-24. Installed Measure Satisfaction

The Measure Installed	Participants	
	Number of Respondents	Percent
Very satisfied	222	78.4
Somewhat satisfied	57	20.1
Neither satisfied or dissatisfied	1	0.4
Somewhat dissatisfied	2	0.7
Very dissatisfied	1	0.4
Total	283	100.0

Table B-25. Application Form Satisfaction

Satisfaction with the Application Forms	Participants	
	Number of Respondents	Percent
Very satisfied	146	55.1
Somewhat satisfied	101	38.1
Neither satisfied or dissatisfied	8	3.0
Somewhat dissatisfied	8	3.0
Very dissatisfied	2	0.8
Total	265	100.0

Table B-26. Application Process Satisfaction

Satisfaction with the Application Process	Participants	
	Number of Respondents	Percent
Very satisfied	165	60.0
Somewhat satisfied	93	33.8
Neither satisfied or dissatisfied	7	2.5
Somewhat dissatisfied	9	3.3
Very dissatisfied	1	0.4
Total	275	100.0

Table B-27. Program Staff or Account Executive Satisfaction

Satisfaction with the Program Staff or Avista Account Executive	Participants	
	Number of Respondents	Percent
Very satisfied	199	81.9
Somewhat satisfied	32	13.2
Neither satisfied or dissatisfied	6	2.5
Somewhat dissatisfied	4	1.6
Very dissatisfied	2	0.8
Total	243	100.0

Nonparticipants

Table B-28. Rebate Amount Offered Satisfaction

Satisfaction with Rebate Amount Offered	Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Very satisfied	3	23.1	5	22.7
Somewhat satisfied	6	46.2	11	50.0
Neither satisfied or dissatisfied	1	7.7	1	4.5
Somewhat dissatisfied	2	15.4	1	4.5
Very dissatisfied	1	7.7	4	18.2
Total	13	100.0	22	100.0

Table B-29. Commercial Offerings Satisfaction

Satisfaction with Avista's Offerings for Commercial Customers	Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Very satisfied	2	18.2	8	33.3
Somewhat satisfied	4	36.4	10	41.7
Neither satisfied or dissatisfied	5	45.5	1	4.2
Somewhat dissatisfied	0	0.0	1	4.2
Very dissatisfied	0	0.0	4	16.7
Total	11	100.0	24.0	100.0

Table B-30. Application Form Satisfaction

Satisfaction with the Application Forms	Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Very satisfied	1	9.1	7	31.8
Somewhat satisfied	7	63.6	11	50.0
Neither satisfied or dissatisfied	1	9.1	2	9.1
Somewhat dissatisfied	2	18.2	1	4.5
Very dissatisfied	0	0.0	1	4.5
Total	11	100	22	100

Table B-31. Application Process Satisfaction

Satisfaction with the Application Process	Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Very satisfied	2	15.4	8	34.8
Somewhat satisfied	8	61.5	9	39.1
Neither satisfied or dissatisfied	0	0.0	2	8.7
Somewhat dissatisfied	2	15.4	2	8.7
Very dissatisfied	1	7.7	2	8.7
Total	13	100.0	23	100.0

Table B-32. Program Staff or Account Executive Satisfaction

Satisfaction with the Program Staff or Avista Account Executive	Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent
Very satisfied	7	58.3	14	60.9
Somewhat satisfied	2	16.7	6	26.1
Neither satisfied or dissatisfied	2	16.7	1	4.3
Somewhat dissatisfied	1	8.3	1	4.3
Very dissatisfied	0	0.0	1	4.3
Total	12	100	23	100

Satisfaction with Website and Marketing Materials

Table B-33. Website Satisfaction

Satisfaction with Information on Avista's Website	Participants		Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
Very satisfied	92	46.7	1	14.3	5	26.3
Somewhat satisfied	89	45.2	6	85.7	8	42.1
Neither satisfied or dissatisfied	9	4.6	0	0.0	4	21.1
Somewhat dissatisfied	6	3.0	0	0.0	0	0.0
Very dissatisfied	1	0.5	0	0.0	2	10.5
Total	197	100	7	100	19	100

Table B-34. Printed Materials Satisfaction

Satisfaction with Printed Program Materials	Participants		Nonparticipants		Partial Participants	
	Number of Respondents	Percent	Number of Respondents	Percent	Number of Respondents	Percent
Very satisfied	91	40.3	5	26.3	9	45.0
Somewhat satisfied	112	49.6	13	68.4	5	25.0
Neither satisfied or dissatisfied	7	3.1	0	0.0	3	15.0
Somewhat dissatisfied	10	4.4	0	0.0	2	10.0
Very dissatisfied	6	2.7	1	5.3	1	5.0
Total	226	100.0	19	100	20	100.0

Satisfaction with Contractor or Vendor Outreach

Table B-35. Satisfaction with Contractor's Service

Satisfaction Level with Contractor	Respondents	Percent
Very satisfied	171	79.5
Somewhat satisfied	32	14.9
Neutral, do not read Neither satisfied or not satisfied	2	0.9
Somewhat dissatisfied	7	3.3
Very dissatisfied	3	1.4
Total	215	100.0

Table B-36. Participant Reasons for Contractor's Service Satisfaction

Reason For Dissatisfaction with Contractor	Respondents	Percent
Misengineered/poor installation	3	37.5
Supplied with poor lights	1	12.5
Pushy salesman	1	12.5
Time completing job	1	12.5
Poor communication	1	12.5
Poor service	1	12.5
Total	8	100.0

Appendix C: Nonresidential Trade Ally Feedback

Trade Ally Profile

Table C-1. Number of Employees at Trade Ally Companies

Number of Employees	Respondents
1-10	4
11-20	4
21-30	4
31-40	1
41-50	1
>50	5
Refused	1
Total	20

Table C-2. Avista Nonresidential Program Projects Completed by Trade Allies in 2010

Number of Completed Projects	Respondents
1-10	11
11-20	4
21-30	1
41-50	1
>100	3
Total	20

Table C-3. Type of Materials Trade Allies Received from Avista

Program Materials Received	Respondents
Brochures	3
Rebate Forms	3
Program Updates	2
Avista Contact Info	1
Marketing Materials	1
Home Improvement Worksheets	1
Qualifying Product List	3
Do Not Know (DK)	4
Total	18

Trade Ally Communications with Customers

Table C-4. Benefits Promoted to Customers

Benefits of EE Equipment	Respondents
Reduced Energy Use	6
Reduced Energy Costs	13
Improved Productivity	2
Improved Comfort	4
Lower O&M Costs	2
Incentives from Avista	9
Environmental Benefits	3
Good Investment (ROI)	9
Better Equipment Quality/Warranty	2
Total	50

Table C-5. Customer Awareness of Avista Rebate Program

Customer Awareness	Respondents
Very Aware	6
Somewhat Aware	12
Somewhat Unaware	2
Total	20

Table C-6. Type of Information Customers Typically Request

Customer Information Requests	Respondents
Incentive Levels	9
Participation Requirements	4
Technology Information	4
Return on Investment Information	2
Energy Savings	1
Total	20

Barriers to Program Participation

Table C-7. Most Significant Obstacles to Installing Energy Efficient Equipment

Market Barriers	Respondents
Lack of Technical Knowledge	1
Availability of Capital	13
Uncertainty of Savings	2
Not Enough Time	1
None	2
Barrier is Service Center/Paperwork	1
Labor & Industry Codes in WA	1
Do Not Know (DK)	2
Total	23

Table C-8. Importance of Avista Rebates

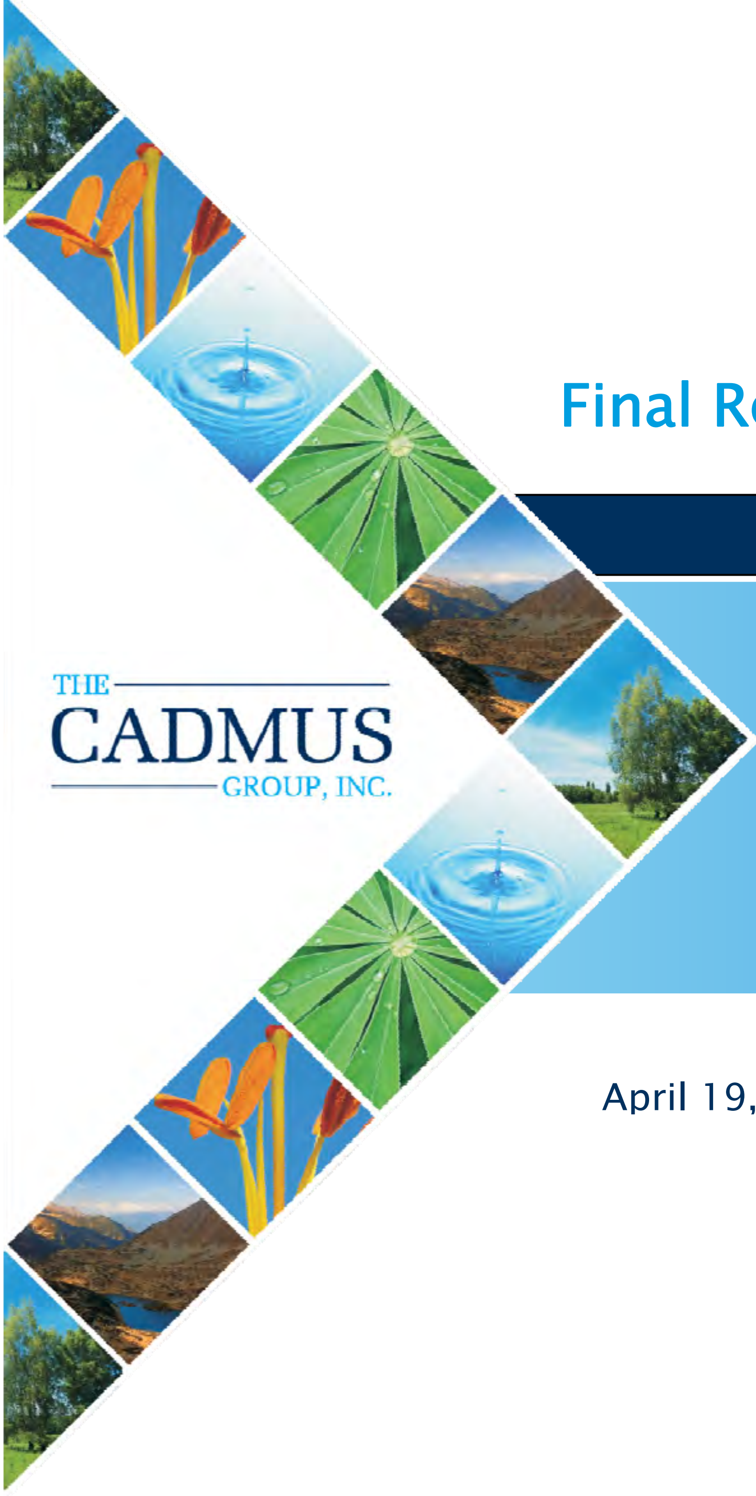
Importance	Trade Ally Comments	Respondents
Very Important	Initial Driving Force of Sale	1
	Sales Would Not Occur Without Rebates	8
	Most Important Factor	1
	Encourages Customer to Upgrade Sooner	1
	Helpful but Does Not Affect Sales	1
	No Reason Provided (NR)	3
Somewhat Important	Helpful, Especially When Coupled with Tax Incentive	1
	Helpful When Makes Up Difference in Competitive Pricing	2
	Helpful Along with Return On Investment (ROI) Calculation	1
	No Reason Provided (NR)	1
Neither Important or Unimportant	No Reason Provided (NR)	1
Total		21

Appendix 4

Net-to-Gross Evaluation of Avista's Demand-Side Management Programs

April 19, 2011

The Cadmus Group, Inc.



THE CADMUS GROUP, INC.

Final Report

Net-to-Gross Evaluation of Avista's Demand-Side Management Programs

April 19, 2011

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Contents

Executive Summary

This report summarizes The Cadmus Group's (Cadmus) analysis of net-to-gross (NTG) ratios in Avista's 2010 demand-side management (DSM) programs. In 2010, Avista commissioned Cadmus to conduct a net-to-gross evaluation for both its residential and nonresidential programs. The purpose of this evaluation was to determine the NTG ratios for Avista's DSM programs and provide a replicable methodology suitable for the company to use in updating future NTG estimates. Avista will use analysis results to determine whether portions of gross energy savings have been influenced by and attributable to its DSM programs, rather than other influences, such as consumer self-motivation.

Cadmus implemented a NTG methodology addressing Avista's DSM program portfolio. Freeridership and spillover comprise NTG's two components. Freeriders—customers who would have purchased a measure without a program's influence—reduce savings attributable to Avista's programs. Spillover—additional savings obtained by the customer's decision to invest in additional efficiency measures or activities due to their program participation— increase savings attributable to the program and improve program cost-effectiveness.

The freeridership component was based on a previously developed approach, which ascertained freeridership using patterns or responses of a series of six simple questions. The questions—which allowed "yes", "no" or "don't know" responses—dealt with whether participants would have installed the same equipment in the program's absence, at the same time, the same amount, and at the same efficiency. Response patterns to these questions were assigned freerider scores, and the confidence and precision estimates were calculated on score distributions. This specific approach is cited in the National Action Plan for Energy Efficiency (NAPEE) Handbook on DSM Evaluation (2007, page 5-1).

We calculated participant spillover by estimating savings attributable to additional measures installed and whether respondents credited Avista with influencing the decision. Measures were counted if they were eligible for program incentives, but no incentives were requested. NTG ratios then were calculated, accounting for both freeridership and spillover.

Summary of Results

Table 1 and Table 2 summarize freeridership and spillover percentages calculated for the residential and nonresidential program categories, respectively, along with the resulting NTG ratios.

Table 1. Residential NTG Ratios

Program Category	Responses	FR %	Spillover %	NTG
Residential Appliances	67	48%	0.0%	52.0%
Residential HVAC	67	39%	0.0%	61.0%
Residential Shell	67	45%	8.8%	63.8%
EnergyStar Homes	7	26%	0.0%	73.6%

Table 2. Nonresidential NTG Ratios

Program Category	Responses	FR %	Spillover %	NTG
EnergySmart Grocer	30	10%	0.0%	90.0%
NonRes Motors	9	41%	0.0%	59.0%
NonRes Prescriptive	59	13%	0.0%	87.0%
NonRes Site Specific	61	26%	0.2%	74.2%

In general, analysis results showed predictable trends. Residential programs showed relatively high freeridership, and commercial programs had relatively low scores. In all cases but one, however, scores were on the low end of the continuum found across other utilities.

The program evidences little participant spillover, which was also predictable. Participant spillover develops slowly, depending on increasing familiarity with energy efficiency and experience with program-incented measures. While freeridership accuracy depends on eliciting responses close to the adoption decision, spillover accuracy occurs in the longer term. Survey instruments attempting to gather both processes of the NTG puzzle usually fall short with one or the other estimates.

Response distributions used for calculating an average freeridership ratio contain information that can help program managers more effectively manage their programs. Three interesting issues emerged in our review of these distributions. First, the Avista ratios contained a significant proportion of customers who otherwise would not have adopted energy-efficient measures, suggesting Avista programs successfully attract first-time adopters.

Second, it appears Avista programs could be even more efficient if eligibility requirements were tightened. Our survey asked respondents whether they had already installed equipment *before* hearing about the Avista program. A number of respondents answered “yes” and were classified as freeriders.

Finally, a strong inverse relationship occurs between the proportion of the total measure cost covered by the incentive and the freeridership ratio. Where the incentive amount does not affect purchasing decisions, high freeridership can be expected.

Recommendations

Currently, two basic data collection models support our NTG calculations. The first is to use an internal process for gathering information quarterly through a short telephone survey of recent participants. The primary advantages this approach affords include: ongoing feedback to program staff; relatively low implementation costs, and tie-ins to customer service at the call center. The approach experiences a disadvantage in that it cannot be used for participant spillover because it is implemented in the same quarter as participation.

More universally accepted, the second model estimates freeridership and participant spillover as part of ongoing, annual, or biennial EM&V activity, and as part of larger customer surveys supporting process and impact evaluations. This approach offers several advantages: freeridership and spillover modules represent only a marginal incremental cost to an overall evaluation effort; questions can be better tailored to individual program efforts; and participant spillover feedback can be “staggered” to allow spillover sufficient time to develop, and spillover calculations within the context of a larger EM&V effort ensures engineering resources are available when needed. Disadvantages to this approach include: the overall customer survey burden, a lack of timely feedback as surveys are usually implemented once a year, or once every two years, and the “hot link” to customer service, unless arrangements are already in place.

This report serves as an example of another limited approach, engaging an independent contractor to develop and implement a methodology. This approach offers the advantage of focusing on the development of a methodology that can be implemented independently of any other EM&V activity. Its disadvantages include the initial cost and a lack of a mechanism to fine-tune or modify the approach, based on feedback and experience.

While we recognize advantages and disadvantages inherent in every model, we feel including NTG calculations as part of an ongoing evaluation effort would offer the greatest advantages, and we recommend Avista strongly consider this alternative.

Organization of This Report

This report includes the following sections:

- Section 1, Net-to-Gross Evaluation Overview, examines how Cadmus categorized Avista’s programs into similar groups, explains the survey designs, sample size determination, and describes Cadmus’ freeridership and spillover evaluation methodologies.
- Section 2, Freeridership Analysis, presents an in-depth review of freeridership calculation scores for each program category.
- Section 3, Spillover Analysis, presents an in-depth review of individual spillover survey responses and explains how savings were assigned to each response.
- Section 4, Net-to-Gross Analysis, explains how spillover and freeridership analyses have been combined to calculate a NTG ratio for each program category.
- Section 5, Conclusions and Recommendations, offers explanations for NTG scores, provides comparisons with NTG ratios in similar programs at other utilities, and concludes with recommendations for future Avista NTG evaluations.
- Appendix A, Program Categorization, maps program measures into homogeneous categories.
- Appendix B, Surveys, provides full-text versions of each survey administered to participants for assessing spillover and freeridership.
- Appendix C, Freeridership Scoring Matrix, shows all possible combinations of responses to the six freeridership survey questions, and the scores Cadmus assigned each combination.

1. Net-to-Gross Evaluation Overview

Net-to-gross (NTG) estimates serve as a critical part of demand-side management (DSM) program impact evaluations as they allow utilities to determine the portion of gross energy savings influenced by and attributable to their DSM programs, free from the result of other influences. Freeridership and spillover comprise NTG's two components. Freeriders are customers who would have purchased the measure without any program influence. Spillover is the amount of additional savings obtained by customers investing in additional energy-efficient measures or activities due to their program participation. Various methods can be used to estimate program freeridership and spillover. Our baseline evaluation approach uses self-reports through participant surveys.

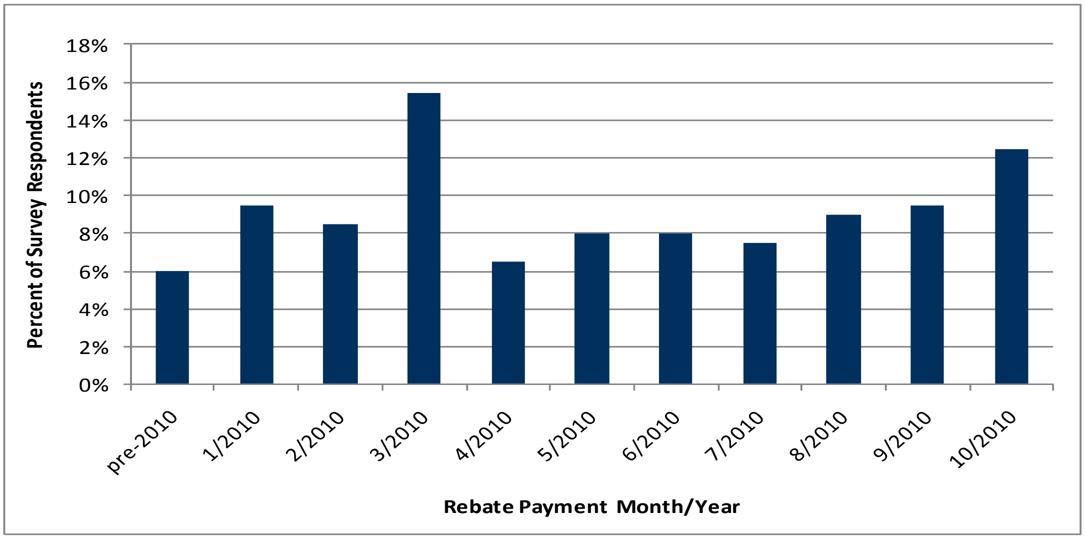
Program Categorization

Prior to designing the NTG surveys, Cadmus worked with Avista to conduct a thorough review of their DSM programs, determining the following:

- **Each program's unique characteristics.** Since each DSM program operates differently, we had to determine a clear understanding of them. This helped inform the survey design and question wording to assure nuances were acknowledged and accounted for.
- **The appropriate interviewee.** This step was critical as we had to be confident the survey questions reached the right decision maker. For example, a review of Avista's Energy Star Homes program indicated the decision maker was the home builder, not the customer purchasing the home. Thus, our survey questions were worded to apply to home builders, not homeowners.
- **The best time to implement the surveys**. Timing proved crucial as we wanted to reach the appropriate people while the decision to participate remained fresh in their minds. The standard practice has been to implement NTG surveys once a year or quarterly. We were limited, however, in our options for delivering surveys due to the evaluation's timing. Avista provided us a program participant database from 2010, and we conducted participant surveys in January and February 2011. Figure 1 shows, based on the rebate payment date for each survey respondent, most respondents had participated in the program within the previous year.[1]

[1] Nonresidential program rebate data we received from Avista did not include a payment date; so the same analysis was not conducted for nonresidential survey respondents.

Figure 1. Residential Survey Respondents by Rebate Payment Date



Resulting from the program review, Cadmus aggregated Avista's DSM programs into the following distinct categories:[2]

- Residential Appliances
- Residential HVAC
- Residential Shell
- Energy Star Homes
- Energy Smart Grocer
- Nonresidential Motors
- Nonresidential Prescriptive, and
- Nonresidential Site Specific

In creating the program categories, we balanced each program's unique characteristics that require the NTG influence to be measured differently, with retaining a sufficiently large participant population to obtain a statistically significant and reliable sample. Based on measure characteristics in each program category, we determined this required three unique surveys: one for residential participants; one for Energy Star home builders; and one for nonresidential participants. Participants were asked questions from one of the three surveys, depending on the measure for which they received a rebate from Avista.

Survey Design/Sampling

Direct questions (such as, "Would you have installed measure X without the program incentive?") tend to result in exaggerated "yes" responses. Participants surveyed likely provide answers they believe surveyors seek; so this question becomes the equivalent of asking: "Would

[2] Aggregation of measures into program categories is shown in Appendix A.

you have done the right thing on your own?" An effective solution to avoid such bias involves asking the question several different ways to check for consistent responses.

Cadmus designed survey questions to determine why customers installed a given measure and the program's influence over those decisions. The survey goal was to establish what the decision maker might have done in the program's absence. Five core freeridership questions addressed that answer:

- Would the participant have installed the measure without the program?
- Had the participant already ordered or installed the measure before learning about the program?
- Would the participant have installed the measure to the same efficiency level without the program incentive?
- Would the participant have installed the same quantity of measures without the program?
- In the absence of the program, when would the respondent have installed the measures?

Nonresidential program surveys seek to answer an additional freeridership question pertaining to whether participants had purchased and installed the measure in their most recent capital budget. The question was not included in the surveys for residential program participants. Our experience has shown most residential customers do not maintain long-term budgets, and they are often replacing equipment on failure; therefore, they likely would not have included the purchase in their budgets.

The spillover survey sought to answer three primary questions:

- Since participating in the program being evaluated, has the participant installed additional energy-efficient equipment or services that were not rebated through a utility program?
- How influential was the evaluated program in the participant's decision to install additional energy-efficient equipment in their home?
- What was the additional energy-efficient equipment installed, and how much or how many?

Freeridership Survey Questions

Cadmus reviewed each program category's unique aspects to determine whether each core freeridership question was appropriate and worded correctly. Six questions were included in the residential survey's freeridership portion. In the list below, a general description of each question precedes the full text of the question appearing in the survey. We use the general description in tables throughout the rest of this report when referring to the residential freeridership questions.

1. **Already Ordered or Installed**. When you first heard about the rebate from AVISTA for the [MEASURE], had you already purchased the [MEASURE]?
2. **Planning to Purchase**. When you first heard about the rebate from AVISTA, had you already been planning to purchase, or had you already begun collecting information about the [MEASURE]?

3. **Would Have Installed without Rebate.** Without a rebate from Avista would you still have purchased the exact same [MEASURE] for your home?
4. **Same Efficiency**. Without the rebate, would you have still purchased a [MEASURE] that was just as energy efficient, more efficient, or less efficient?
5. **Planning to Install Soon**. And without the rebate, would you have bought the [MEASURE] sooner, bought it at about the same time, bought it later in the same year, bought it in 1-2 years, bought it in 3-5 years, or bought it 5 or more years later?
6. **Purchased Same Measure Previously.** Before buying your [MEASURE] and receiving your rebate from Avista, had you ever purchased the same [MEASURE] for your home/business.

Six questions also were included in the nonresidential survey's freeridership portion. In the list below, a general description of each question precedes the full text of the question appearing in the survey. We use the following general description in figures throughout the rest of this report when referring to nonresidential freeridership questions.

1. **Already Ordered or Installed.** When you first heard about the rebate from AVISTA for the [MEASURE], had you already purchased the [MEASURE]?
2. **Already in Budget**. Was buying the [MEASURE] included your most recent capital budget before you participated in the program?
3. **Purchased Same Measure Previously**. Before your organization participated in the Avista program for the first time, had you ever purchased the same type of [MEASURE]?
4. **Would Have Installed without Rebate.** Would you have purchased the [MEASURE] without the rebate?
5. **Same Efficiency.** Without the rebate, would you have still purchased a [MEASURE] that was just as energy efficient, more efficient, or less efficient?
6. **Planning to Install Soon.** And without the rebate, would you have bought the [MEASURE] sooner, bought it at about the same time, bought it later in the same year, bought it in one to two years, bought it in three to five years, or bought it five or more years later?

We did not use the same freeridership question format for the Energy Star Homes program category. As previously explained, Cadmus interviewed builders participating in Avista's Energy Star Homes program category, not homeowners. We asked questions regarding builders' sales of Energy Star homes and the number of homes receiving rebates through Avista's program. Key questions used in the freeridership analysis for the Energy Star Homes program category included the following questions.

1. In an average year, about how many homes do you build?
2. About what percent of these homes would you say are built in Avista's service territory?
3. Since you began participating in Avista's Energy Star Homes program, what percent of the homes that you have built have been certified as Energy Star homes?

4. How long have you been building Energy Star homes in Avista's service territory?
5. Overall, how much influence did Avista's Energy Star Homes program, including the rebates, have on your decision to build Energy Star homes?
6. If the Avista Energy Star Homes program had not been available, would you still have built homes that would have qualified as Energy Star?
7. When you say you would not have built them to qualify for Energy Star certification, how would they have been different?

Spillover Survey Questions

As noted, the spillover questions sought to determine whether program participants had installed any other energy-saving measures since participating in the program. Savings participants received from additional measures would be considered spillover savings if the program significantly influenced their decisions to purchase additional measures and if they did not receive additional rebates for those measures.

For residential participants, we specifically asked whether they had installed the following types of measures:

- Energy-efficient appliances
- Moved into an Energy Star home
- Efficient HVAC equipment
- Windows or insulation
- Stopped using or recycled a refrigerator or freezer
- Sealed air leaks

For nonresidential participants, we specifically asked whether they had installed the following types of measures:

- Building controls
- Energy efficient appliances
- Custom measures
- Food service equipment
- HVAC equipment
- Lighting and lighting controls
- Economizer
- LEED certification
- Motors
- PC network controls
- Steam-trap replacement
- Side-stream filtration
- Variable frequency drives

- Ventilation
- Windows or insulation

For both residential and nonresidential surveys, if the participant installed one or more of these measures, they were asked additional questions about the installed measure's size and efficiency and that of the measure being replaced. This additional information allowed us to estimate the energy savings. The participant was then asked to rate how influential (on a scale of 1 to 10, with 1 being not at all influential and 10 being very influential) the Avista program was on their decision to install the additional measure. Finally, we asked participants why they did not apply for a rebate covering the additional measure.

Cadmus combined the freeridership and spillover questions in the same survey, asking them simultaneously through telephone interviews of randomly selected program participants. (Appendix B provides the survey delivered for both residential and nonresidential program categories.) Prior to beginning the live participant phone calls, Cadmus worked with the survey company to pretest the survey, ensuring all appropriate prompts and skip patterns were followed. Cadmus also monitored the initial phone calls to verify: (1) the survey respondents understood the questions; and (2) adjustments were not required.

Determining Sample Size

While it would be ideal to be able to ask every program participant about freeridership and spillover, this would be extremely costly to Avista, both in money and time. Instead, Cadmus relied on a statistically derived sample of program participants. Calculating the statistically significant sample size required four components:

- Population: The total number of unique participants for each program category.
- Confidence level: The probability a specific interval would include the true value of the mean.
- Precision: The interval width bracketing the true value of the mean.
- Expected survey response rates: Determining the total number of participants included on the survey call list to ensure receiving the desired number of responses.

Working with Discovery Research Group, the survey firm we partnered with in administering survey phone calls, we estimated residential and nonresidential response rates at 33 percent and 50 percent, respectively. Historically, nonresidential response rates are higher than residential response rates, probably because non-residential participants have more money and time invested in the rebate process than residential customers.

For this study, we used a 90-percent confidence interval and 10-percent precision (90/10) to calculate the sample size. Generally, these values have been accepted as the industry standard. After surveys have been collected and analyzed, however, it is not unusual for the actual confidence level and precision to vary from that planned. Sample sizes were selected conservatively to increase the likelihood that the confidence level and precision exceeding the desired levels, but population characteristics sometimes prevented desired levels from being achieved.

Determining the appropriate population of program participants proved complicated. In the program rebate database we received from Avista, some participants appeared multiple times, either because they installed multiple measures for the same program (e.g., installed windows and insulation), or they participated in several programs (e.g., installed an Energy Star clothes washer, heat pump, and insulation). If we had interviewed the same participant multiple times, participant freeridership and spillover savings levels might have been overrepresented in the sample. Rather, we selected only one measure a participant installed, and excluded the participant from the remaining program category samples.

Defining a unique customer was also complex. For nonresidential rebates, we noticed many instances where the same company contact person was the decision maker for multiple locations. As with residential participants, companies installed multiple measures or participated in multiple programs. If all installations across a company's various locations had the same company contact, we only considered them as a participant in one program category, and excluded them from the others.

Data quality issues had to be addressed. Issues with spelling of customer names, addresses, and phone numbers made it difficult to define unique customers in determining populations for each program category. Extra investment put into the quality of rebate data would make this task simpler and more accurate in the future.

Table 3 summarizes the sample size calculation for each residential program category.

Table 3. Residential Sample Size Summary

		Required		Actual	
Program Category	Population	Sample Size	Responses	Sample Size	Responses
Residential Appliances	12905	204	67	250	67
Residential HVAC	3362	201	66	250	67
Residential Shell	4717	202	67	250	67

Based on a 33 percent response rate, 90 percent confidence level, and 10 percent precision, we needed approximately 200 participants for each of program category to achieve the required sample of 67 responses. If residential survey response rates proved lower than our estimated 33 percent, we randomly selected 250 participants for the survey call lists instead of 200 to increase the likelihood we achieved the desired precision level. (Which we could do, as we had large populations from which to extract a sample.)

Table 4 shows a summary of the sample size calculations for each nonresidential program category.

Table 4. Nonresidential Sample Size Summary

		Required		Actual	
Program Category	Population	Sample Size	Responses	Sample Size	Responses
Energy Smart Grocer	87	76	38	64	30
Motors	42	52	26	27	9
Prescriptive	767	124	62	121	59
Site-Specific	471	118	59	128	61

Nonresidential DSM programs generally have fewer unique customers than residential, but they install more measures because of program design and building size. Consequently, populations for the nonresidential program categories were much smaller than the residential populations. This proved especially true for the Energy Smart grocers and motors categories. We were unable to achieve the required number of responses for either program due to small populations. For Energy Smart grocers, the required participant sample size was nearly 85 percent of the population (76 out of 87). We were only able to interview 30 participants, rather than the desired 38. For motors, we needed a sample size larger than the population (a sample of 52 participants, compared to a population of 42). Although we needed 26 responses, we were only able to interview nine participants.

Given the small Energy Smart grocers and motors populations, we were unable to achieve the desired precision at a 90 percent confidence interval (see this report's Freeridership Analysis section for more details).

Each nonresidential participant's freeridership scores were weighted by energy savings they achieved from measure installed. Large deviations in energy savings occurred between nonresidential participants, given the range of building sizes and types, and the quantity of measures installed. Using a savings-weighted approach to calculating freeridership, participants with low energy savings had little to no impact on the overall score. The average score was dominated by the freeridership of participants with the largest savings.

Rather than randomly select participants for the sample from the population, and risk including participants with low energy savings, we sorted the population by energy savings and only kept the top *n* participants (where *n* equaled the required sample size). This approach minimized the likelihood the average freeridership score would be dominated by one or a few large participants.

Freeridership Methodology

Cadmus developed a transparent, straightforward matrix approach to assign a score to participants, based on their objective responses to six survey questions. Question response patterns were assigned freeridership scores, and the confidence and precision estimates were calculated on the distribution of these scores. This specific approach is cited in the NAPEE Handbook on DSM Evaluation, 2007 edition, page 5-1.

The response patterns and scoring weights remain explicit; so they can be discussed, changed and results shown in real time. Our approach provided other important features, including:

- Derivation of a partial freeridership score, based on the likelihood of a respondent taking similar actions in the incentive's absence.
- Use of a rules-based approach for consistency among multiple respondents.
- Use of consistency checks and open-ended questions to ensure quantitative scores matched respondents' more detailed explanations regarding program attribution.
- The ability to change weightings in a "what if" exercise, testing the response set's stability.

The Cadmus method offered a key advantage by introducing the concept of partial freeridership. Experience has taught us that program participants do not fall neatly into freerider and not-freerider categories. For example, partial freeridership scores were assigned to participants with plans to install the measure; though, the program exerted some influence over their decision, other market characteristics beyond the program also proved influential. In addition, with partial freeridership, we could utilize "Don't Know" and "Refused" responses by classifying them as partial credit, rather than removing the entire respondent from the analysis.

Freeridership was assessed at three levels. First, each participant survey response was converted into freeridership matrix terminology. Each participant's combination of responses was then assigned a score from the matrix. Finally, all participants were aggregated into an average freeridership score for the entire program category.

Convert Responses to Matrix Terminology

We independently evaluated each survey question's response to assess participants' freeridership level for each question. Each survey response option was converted into a value of "yes" (100 percent freerider), "no" (0 percent freerider), or "partial" (50 percent freerider).

Table 5 lists six residential survey questions, their corresponding response options, and the value which we converted them to (in parentheses). "Don't Know" and "Refused" responses were converted to "Partial" for all but the first question. For that question, we determined if a participant was unsure whether they had already purchased the measure before learning about the rebate, they were unlikely to be a freerider.

Table 5. Assignments of Residential Response Options into Matrix Terminology

Already Ordered or Installed	Planning to Purchase	Installed without Program	Same Efficiency	Planning to Install Soon	Same Measure Previously
Yes (Yes)	Yes (Yes)	Yes (Yes)	Just as energy efficient (Yes)	Bought it sooner (Yes)	Yes (Yes)
No (No)	No (No)	No (No)	More efficient (Yes)	Bought it at the same time (Yes)	Some of the Measures (Partial)
Don't Know (No)	Don't Know (Partial)	Don't Know (Partial)	Less efficient (No)	Bought it later in the same year (Partial)	No (No)
Refused (No)	Refused (Partial)	Refused (Partial)	Don't Know (Partial)	Bought it in 1 to 2 years (No)	Don't Know (Partial)
			Refused (Partial)	Bought it in 3-5 years (No)	Refused (Partial)
				Bought it 5 or more years later	
				Don't Know (Partial)	
				Refused (Partial)	

Table 6 lists six nonresidential survey questions, their corresponding response options, and the value to which we converted them (in parentheses). For the same reasons cited for the residential questions, "Don't Know" and "Refused" responses were converted to "Partial" for all but the first question.

Table 6. Assignments of Nonresidential Response Options into Matrix Terminology

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon
Yes (Yes)	Yes (Yes)	Yes (Yes)	Yes (Yes)	More efficient (Yes)	Bought it sooner (Yes)
No (No)	No (No)	No (No)	No (No)	Same efficiency (Yes)	Bought it at the same time (Yes)
Don't Know (No)	Don't Know (Partial)	Don't Know (Partial)	Don't Know (Partial)	Less efficient (No)	Bought it later in the same year (Partial)
Refused (No)	Refused (Partial)	Refused (Partial)	Refused (Partial)	Don't Know (Partial)	Bought it in 1 to 2 years (No)
				Refused (Partial)	Bought it in 3-5 years (No)
					Bought it 5 or more years later (No)
					Don't Know (Partial)
					Refused (Partial)

Participant Freeridership Scoring

After converting survey responses into matrix terminology, we created a freeridership matrix, so the combination of each participant's responses to the six questions could be assigned a freeridership score. To create the matrix, we determined every combination of possible responses to the six survey questions, and then assigned a freeridership score of 0 to 100 percent to each combination. Appendix C contains the matrices created for Avista's residential and nonresidential programs.

Using these matrices, every participant combination of responses was assigned a score of 0 to 100 percent. For example, participants not purchasing the measure when first hearing about the rebate, but answering affirmatively to every subsequent question, were assigned a 100 percent freeridership score. For participants not purchasing the measure upon first hearing about the rebate, but answering affirmatively to every subsequent question (except stating they would not have purchased the exact same measure without the rebate), we reduced the freeridership score to 50 percent.

Program Category Freeridership Scoring

After assigning a freeridership score to every survey respondent, Cadmus calculated an average freerider score for the program category. For residential programs, the average freerider score was a straight average of respondent scores. For nonresidential programs, we weighted the respondent freeridership scores by the estimated savings of equipment installed, given the wide variation in nonresidential program participant energy savings. Savings-weighted freeridership and NTG scores serve a recent standard practice of the California Public Utilities Commission.

$$\textit{Savings Weighted Freeridership} = \frac{\sum[\textit{Respondent Score}] x\ [\textit{Rebated Measure kWh Savings}]}{\sum[\textit{Rebated Measure kWh Savings} - \textit{All Respondents}]}$$

We did not, however, use this same matrix approach for calculating freeridership scores for the Energy Star Homes program category. Instead, we used a market-based approach, utilizing information obtained from interviews with builders about the number of certified Energy Star homes built in Avista’s territory and the overall influence that Avista’s Energy Star program had on their decision to build Energy Star homes. Freeridership was calculated by weighting each surveyed builder’s freeridership score by the percent of total home sales in the sample that the builder represents. This weighting method was applied to account for size differences between builders interviewed and to ensure firms building the most certified Energy Star homes in Avista’s territory contributed more to the freeridership score than firms building the least amount of Energy Star homes in Avista’s territory.

$$\textit{Savings Weighted Freeridership} = \frac{\sum[\textit{Respondent's Score}] x\ [\textit{Respondent \% of Home Sales}]}{\sum[[\textit{Total Homes Sales}] - \textit{All Builders}]}$$

The Cadmus Freeridership Scoring Model

Cadmus has developed an Excel-based model to assist with freeridership calculation and improve consistency and quality of results. Our model translates raw survey responses into matrix terminology, and then assigns each participant’s response pattern a score from the matrix. Program participants in the sample can be then aggregated by program category to calculate the average freerider score.

The model incorporates the follow inputs described in this methodology:

- Raw survey responses for each participant, along with the program category for their rebated measure, and energy savings from that measure, if applicable.
- Figures converting the raw survey responses into matrix terminology for each program category, similar to those presented in Table 5 and Table 6.

- Custom freeridership scoring matrices for each unique survey type. For Avista, we created two unique matrices, one for residential programs and one for nonresidential programs.

The model uses a simple interface, allowing users to quickly reproduce a scoring analysis for any program category. It displays each participant's combination of responses and corresponding freeridership score, and then produces a summary table, providing the average score and precision estimates for the program category. The model uses the sample size and a two-tailed test target at the 90 percent confidence interval to determine the average score's precision.

Table 7 shows a summary table example for the residential appliances program category. The figure shows the final freeridership score in the lower right corner. The residential appliances program category averaged freeridership of 48 percent, meaning that 48 percent of the energy savings were derived from freeriders, and should be removed from gross program savings. Based on a 67 response sample size, the program's absolute precision was 7.2 percentage points.

Table 7. Freerider Scoring Model Output

Population (P):	12,905	SE of Mean:	0.0435	Adj. Relative Precision:	14.99%
Total Responses (n):	67	Relative Precision:	14.99%	Coefficient of Variation:	0.7457
Responses Removed:	0	Absolute Precision:	0.072	**Upper Bound Score:**	**0.55**
Variance of Mean:	0.1269	Finitie Pop. Correction:	1	**Weighted Mean Score:**	**0.48**
Standard Deviation:	0.3562	Adjusted SE:	0.04	**Lower Bound Score:**	**0.41**

Spillover Methodology

Spillover refers to additional savings generated by program participants due to their program participation, but not captured by program records. Spillover occurs when participants choose to purchase energy-efficient measures or adopt energy-efficient practices because of a program, but they choose not to participate or are otherwise unable to participate in the program. As these customers are not participants, so do not typically appear in program records of the savings generated by spillover impacts.

Examples of spillover include:

- Program participants adopting additional measures without an incentive.
- Consumers acting on the programs' influence resulting from changes in available energy-using equipment in the marketplace.
- Changes brought about by more efficient practices employed by architects and engineers, ultimately forcing consumer behavior into desired patterns.
- Changes in nonparticipants behaviors resulting from direct marketing or changes in stocking practices.

The energy-efficiency programs' spillover effect serves as an additional impact, which can be added to the program's valid results, in contrast to the freeriders' impacts (which reduce net savings attributable to the program).

In Avista's programs, Cadmus measured spillover by asking a sample of participants purchasing and receiving a rebate for a particular measure if, due to the program, they installed another efficient measure or undertook other energy-efficiency activity. Respondents were asked to rate, on a scale of 0 through 10, the relative influence of Avista's program and rebate on their decision to pursue additional savings. They were also asked to explain why they chose not to pursue a rebate for additional measures installed.

Participant Spillover Analysis

For calculating spillover savings, we used a top-down approach. We started the analysis with a subset only containing survey respondents who indicated they installed additional energy-savings measures after participating in an Avista program. From this subset, we removed participants who indicated the program had little influence on their decision to purchase additional measures, only keeping participants rating the influence as 8, 9, or 10. We also removed participants indicating they applied to Avista for rebates covering additional measures they installed. Although energy savings resulted from the measures these participants installed, they could not be attributed to the original program for which the participant received a rebate.

For remaining participants with legitimate spillover savings, we estimated energy savings from additional measures installed. Participants were asked detailed questions about spillover measures they installed to determine the new measures' efficiency levels and characteristics. Participants were also asked for details regarding the baseline equipment the new energy-efficient equipment replaced. Once the measures and the estimated baseline measures were determined, detailed measure attributes obtained from the survey questions were used in conjunction with fuel mix information for each respondent to establish the most appropriate deemed savings value to assign from Avista's TRM. In cases where the Avista TRM did not have applicable energy savings values, the Regional Technical Forum values and engineering calculations by Cadmus staff were utilized. For some measures, either the TRM database or the respondent did not provide enough information, and we were unable to estimate spillover savings.

The spillover percentage per program category was calculated by dividing the sum of the additional spillover savings reported by respondents for a given program category by total rebated gross savings achieved by all respondents in the program category:

$$Spillover\,\% = \frac{\sum \text{Spillover Measure kWh Savings for All Survey Respondents}}{\sum \text{Program Measure kWh Savings for All Survey Respondents}}$$

Spillover was not calculated for the Energy Star Homes program category because builders reported, since participating in Avista's program, almost 100% of the homes they built were Energy Star certified. This indicated the program had not influenced builders to make additional energy-efficient improvements to homes that would not have normally qualified for Energy Star certification.

2. Freeridership Analysis

After conducting participant surveys, Cadmus converted resulting responses into a freeridership score for each participant, using the Excel-based matrix approach described in the previous freeridership methodology section. Each participant's freerider score was derived by translating responses into a matrix value, and then using a rules-based calculation to obtain the final score. In this section, we present all combinations of responses we received for each program category, and the scores assigned to each combination. The figures that follow show participant responses rarely reflected each potential combination, but tended to group around a subset of common patterns. Freeridership scores, confidence intervals, and precision estimates were calculated for each program category, based on the distribution of scores within the matrix.

Residential Program Categories

Table 8 shows the results of freeridership calculations for Avista's residential programs. We discuss in-depth freeridership analysis for each residential program category in the following three sections.

Table 8. Residential Freeridership Results

Program Category	Responses (N)	FR Score	Upper Bound	Lower Bound
Residential Appliances	67	.48 (± .07)	0.55	0.41
Residential HVAC	67	.39 (± .08)	0.47	0.31
Residential Shell	67	.45 (± .08)	0.53	0.37

Of the three residential program categories, residential appliances had the highest freeridership level, with an average of 48 percent across all respondents and an absolute precision of 7 percentage points. The average freeridership score for residential shell measures was 45 percent, with an absolute precision of 8 percentage points. Finally, the average score for residential HVAC measures was 39 percent, with an absolute precision of 8 percentage points.

Residential Appliances

Table 9, below, shows: the unique response combinations from the residential appliance participant survey; the freeridership score assigned to each combination; and the number of responses for each combination.

Table 9. Frequency of Freeridership Scoring Combinations—Residential Appliances

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Rebate	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score	Number of Responses
Yes	x	x	x	x	x	100%	16
No	Yes	Yes	x	No	No	0%	1
No	Yes	Yes	x	Partial	No	25%	1
No	Yes	Yes	x	Yes	No	50%	22
No	Yes	Yes	x	Yes	Partial	75%	1
No	Yes	Yes	x	Yes	Yes	100%	1
No	Yes	Partial	Partial	Partial	No	0%	1
No	Yes	Partial	Yes	Yes	No	25%	1
No	Yes	No	No	Yes	No	0%	1
No	Yes	No	Yes	No	No	0%	1
No	Yes	No	Yes	Yes	No	13%	2
No	Partial	Yes	x	Yes	No	25%	4
No	No	Yes	x	No	No	0%	1
No	No	Yes	x	Partial	No	0%	1
No	No	Yes	x	Yes	No	13%	12
No	No	No	Yes	No	Partial	0%	1

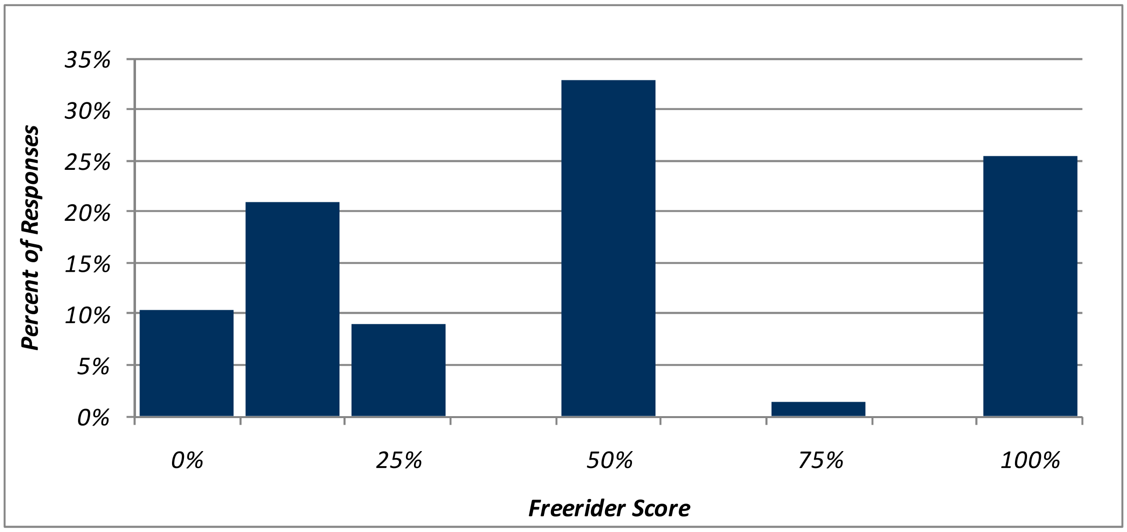
This is a subset of the complete residential freeridership scoring matrix, shown in its entirety in Appendix C.

Three patterns appeared in the residential appliance respondents' answers to freeridership questions, representing 75 percent (50 out of the 67) of residential appliance participants interviewed:

- Sixteen respondents had already purchased the measure before hearing about an Avista rebate. They were not asked further questions as they were considered 100 percent freeriders.
- Twenty-two respondents would have purchased the measure without the Avista rebate and within one year of their program-rebated purchase. They were scored as 50 percent freeriders because they had not purchased the same measure previously, and had not already purchased the rebated measure when hearing about the rebate.
- Twelve respondents were not planning to purchase the same measure when first hearing about the Avista appliance rebate program, and had not previously installed the same measure. However, they would have installed the exact same measure without a rebate and within a year. These respondents showed weak indications of being freeriders and, as a result, received partial credit, with a score of 12.5 percent.

Figure 2 shows a distribution of residential appliances survey respondents by the freeridership score assigned to each. Approximately 25 percent of residential appliance survey respondents were 100 percent freeriders. Additionally, almost 33 percent of respondents were considered 50 percent freeriders, while only 10 percent indicated no freeridership.

Figure 2. Distribution of Residential Appliance Freeridership Scores



Residential HVAC

Table 10 shows the unique response combinations from the residential HVAC participant survey, the freeridership score assigned to each combination, and the number of responses for each combination.

Table 10. Frequency of Freeridership Scoring Combinations—Residential HVAC

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Rebate	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score	Number of Responses
Yes	N/A	N/A	N/A	N/A	N/A	100%	13
No	Yes	Yes	N/A	No	N/A	0%	4
No	Yes	Yes	N/A	Yes	No	50%	21
No	Yes	Partial	Partial	No	No	0%	1
No	Yes	Partial	Yes	No	No	0%	1
No	Yes	No	No	No	No	0%	1
No	Yes	No	No	Yes	No	0%	3
No	Yes	No	Partial	No	No	0%	1
No	Yes	No	Yes	No	No	0%	1
No	Yes	No	Yes	Partial	No	0%	2
No	No	Yes	N/A	No	No	0%	3
No	No	Yes	N/A	Partial	No	0%	2
No	No	Yes	N/A	Yes	No	13%	3
No	No	Yes	N/A	Yes	Partial	25%	2
No	No	Yes	N/A	Yes	Yes	50%	3
No	No	Partial	Partial	Yes	No	0%	2
No	No	Partial	Yes	Yes	No	0%	2
No	No	No	No	No	No	0%	1
No	No	No	Partial	Yes	No	0%	1

This is a subset of the complete residential freeridership scoring matrix, shown in its entirety in Appendix C.

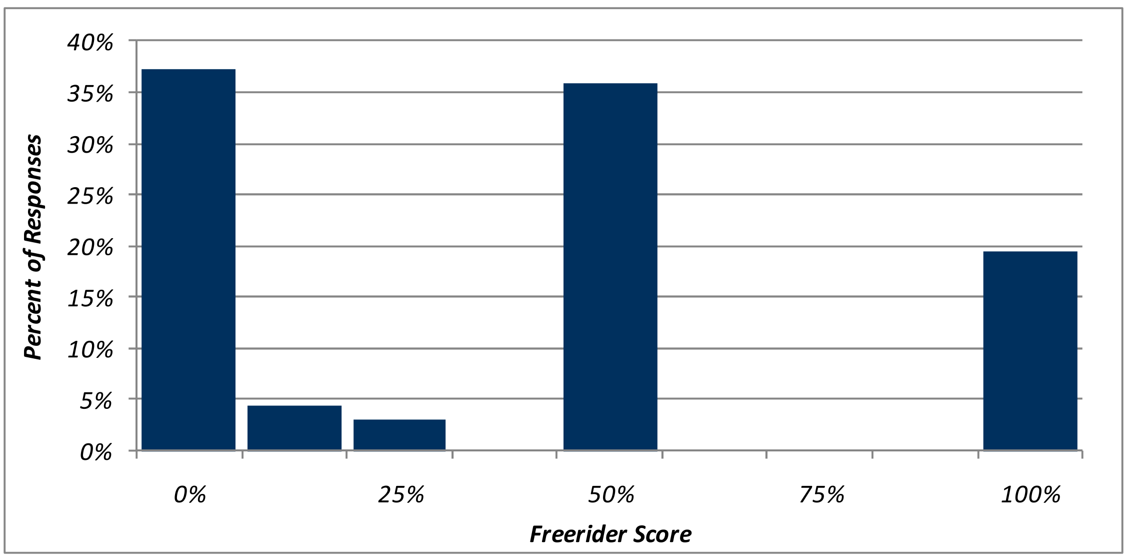
Two patterns appeared in the residential HVAC respondents' answers to freeridership questions, representing 57 percent (38 out of the 67) of residential HVAC participants interviewed.

- Thirteen respondents had already purchased the measure before hearing about an Avista rebate. They were not asked more questions as they were considered 100 percent freeriders.
- Twenty-one respondents would have purchased the measure without the Avista rebate and would have done it within one year of their program rebated purchase. These respondents were scored as 50 percent freeriders because they had not purchased the same measure previously, and had not already purchased the measure when hearing heard about the rebate.

Table 10 shows another significant detail: most of the other response patterns resulting from the residential HVAC interviews were scored as 0 percent freeriders.

Figure 3 shows a distribution of residential HVAC survey respondents by each one's assigned freeridership score. Over 35 percent of all respondents were not considered freeriders, compared to about 20 percent that were 100 percent freeriders. Of remaining respondents scored as partial freeriders, 35 percent were given a score of 50 percent.

Figure 3. Distribution of Residential HVAC Freeridership Scores



Residential Shell

Table 11 shows unique response combinations from the residential shell participant survey, the freeridership score assigned to each combination, and the number of responses for each combination

Compared to residential appliances and HVAC participants, more variety occurred in response combinations received for residential shell participants. As with the other two residential program categories, two significant patterns emerged in the residential shell respondents' answers to the freeridership questions. These two response patterns represented

46 percent (31 out of the 67) of residential HVAC participants interviewed, and are the same two patterns most commonly appearing in the residential appliance and HVAC responses.

- Twelve respondents had already purchased the measure before hearing about an Avista rebate. They were not asked anymore questions, as they were considered 100 percent freeriders.
- Nineteen respondents would have purchased the measure without the Avista rebate, and would have done so within one year of their program-rebated purchase. These respondents were scored as 50 percent freeriders, as they had not purchased the same measure previously, and had not already purchased the rebated measure upon hearing about the rebate.

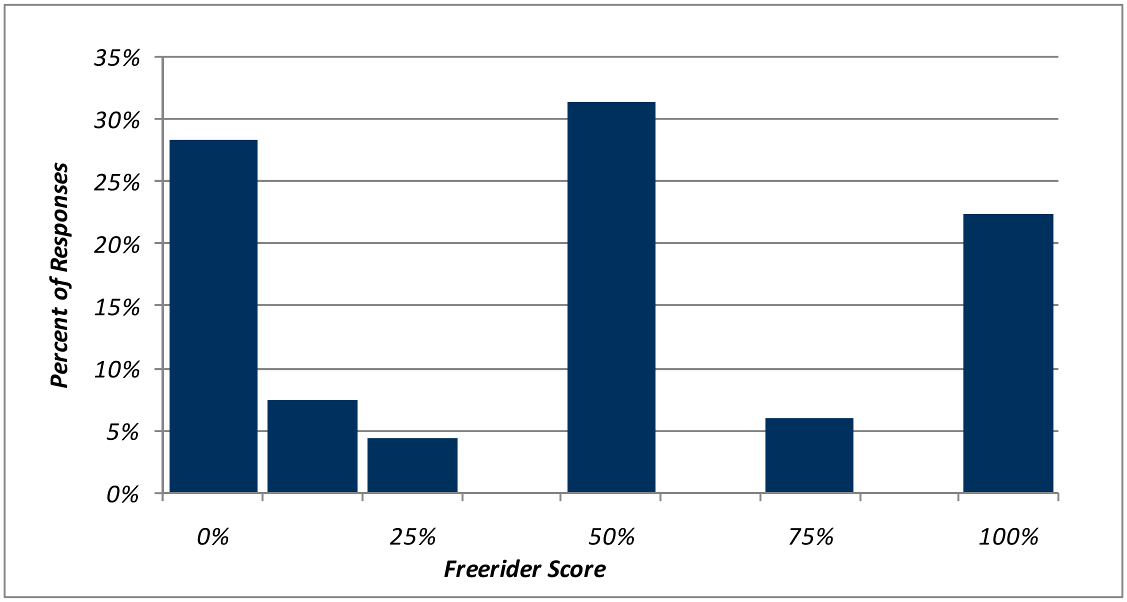
Table 11. Frequency of Freeridership Scoring Combinations—Residential Shell

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Program	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score	Number of Responses
Yes	N/A	N/A	N/A	N/A	N/A	100%	12
No	Yes	Yes	N/A	No	No	0%	1
No	Yes	Yes	N/A	Partial	No	25%	1
No	Yes	Yes	N/A	Yes	No	50%	19
No	Yes	Yes	N/A	Yes	Partial	75%	3
No	Yes	Yes	N/A	Yes	Yes	100%	3
No	Yes	Partial	Partial	Partial	No	0%	1
No	Yes	Partial	Yes	No	No	0%	1
No	Yes	Partial	Yes	Yes	No	25%	2
No	Yes	No	No	No	No	0%	1
No	Yes	No	No	Partial	No	0%	1
No	Yes	No	No	Yes	No	0%	3
No	Yes	No	Yes	No	No	0%	2
No	Yes	No	Yes	Yes	No	13%	1
No	Yes	No	Yes	Yes	Yes	50%	1
No	Partial	Yes	N/A	Yes	Yes	75%	1
No	No	Yes	N/A	No	No	0%	3
No	No	Yes	N/A	Partial	No	0%	1
No	No	Yes	N/A	Yes	No	13%	4
No	No	Yes	N/A	Yes	Yes	50%	1
No	No	No	Partial	No	No	0%	1
No	No	No	Yes	No	No	0%	2
No	No	No	Yes	Partial	No	0%	1
No	No	No	Yes	Yes	No	0%	1

This is a subset of the complete residential freeridership scoring matrix, shown in its entirety in Appendix C.

Figure 4 shows distributions of residential shell survey respondents by each one's assigned freeridership score. Almost 30 percent of all respondents were not considered freeriders, compared to about 20 percent that were 100 percent freeriders. Of the remaining respondents scored as partial freeriders, 30 percent were assigned a score of 50 percent.

Figure 4. Distribution of Residential Shell Freeridership Scores



Energy Star Homes

For Energy Star Homes, the freeridership survey questions' targeted home builders, not Avista customers purchasing the homes. Questions asked of builders were significantly different than questions asked of program participants in other residential program categories. Cadmus used the same objective process to assign freerider scores to builders as used to create the freerider matrices for the other programs, but, as there were a limited number of builders, we did not create a matrix of all possible combinations. The average freeridership score for builders was 26 percent. Builders interviewed represented 81% of the Energy Star homes built in Avista's service territory in 2010.[3] The freeridership result was among the better rates (i.e., lowest) for this type of program in the Pacific Northwest.

Table 12. Energy Star Homes Freeridership Results

Program Category	Responses (N)	FR Score
Energy Star Homes	7	0.26

Figure 5 shows each builder's response to freeridership questions asked as well as individual scores assigned each builder. Respondents 1 and 5 were the largest builders in the sample, accounting for 88 percent of the Energy Star homes built by the responding builders. As we used the percentage from the second column of Figure 5 to weight each respondent's score in calculating the program average, freeridership scores respondents 1 and 5 were assigned were primarily responsible for the program category's average score.

[3] Not enough identified manufactured home buyers appeared in the database to allow their freerider analysis; all respondents built stick-built homes.

Figure 5. Builder Freeridership Scores—Energy Star Homes

Respondent	Total Homes Built, as Percent of Total Homes in Sample	Percent of Homes Built That Are Energy Star	Number of Years Building Energy Star Homes in Avista's Territory	Amount of Influence Avista's Energy Star Program Had	Would Have Built Energy Star Homes Without Avista's Program	What Would Have Been Different	Free Rider Score
1	42%	95%	4.5 years	Not too influential	No	Would not have installed ES furnance	50%
2	6%	100%	1 year	Somewhat Influential	No		25%
3	2%	100%	2.5 years	Very Influential	No	Would not have installed as efficient lighting, appliances and insulation	75%
4	2%	100%	3 years	Very Influential	No	Would not have installed as much insulation	50%
5	46%	100%	4 years	Very Influential	No	Would have installed lower efficiency measures such as furnaces, windows and insulation and not as many inspections.	0%
6	1%	100%	12 years	Very Influential	Yes		75%
7	1%	25%	2 years	Somewhat Influential	Yes		100%

We included an open-ended response question in the Energy Star Homes survey and considered responses when assigning freeridership scores to builders. Table 13 shows the open-ended responses.

Table 13. Energy Star Homes—Suggestions for Improvement

Builder	Suggestion For Improvement
2	They do most of the ES Homes because of the new WA requirements, not because of the program.
4	They suggested that as costs of ES Homes go up that the rebates also increase, but understand's that this may not be feasible. They cannot continue their 100% commitment to Energy Star since the new codes have gone into effect - it is not cost effective for him anymore.
5	Since the changes to the energy codes and the ES standard being 15% higher than the code, ES is much more expensive to work with. The changes will probably make us regard the ES program as a choice now, and not as the standard option for building a house. The rebates will need to increase if we will continue to make 100% of their homes ES.
7	They expressed an extreme amount of difficulty in putting real numbers into savings. Customers felt that the payback period was too long, and many of them were not planning to be in their homes for long enough to reap the benefits. They also expressed frustration in determining the difference bewtween the ES New Homes Program and the new State Energy Code -- they felt that the requirements seemed to be in a grey area, and need more clarification/guidance.

Nonresidential Programs

Table 14 shows freeridership calculation results for Avista's nonresidential programs. The next four sections address in-depth freeridership analysis for each nonresidential program category.

Table 14. Nonresidential Freeridership Results

Program Category	Responses	FR Score	Upper Bound	Lower Bound
Energy Smart Grocer	30	0.10 (± 0.10)	0.20	0.00
Motors	9	0.41 (± 0.21)	0.62	0.20
Prescriptive	59	0.13 (± 0.06)	0.19	0.07
Site Specific	61	0.26 (± 0.07)	0.33	0.19

Freeridership scores were better (lower) than those determined by other recent studies in the Pacific Northwest. The precision estimates for Energy Smart grocer and motors were relatively low (greater than 10 percentage points). In 2010, few participated in these program categories, resulting in small sample sizes and few respondents, and causing low precision.

Table 14 shows freeridership scores calculated by weighting each respondent's freeridership score with their annual energy savings from the rebated energy-efficiency projects or measures.

Energy Smart Grocer

Table 15, below, shows the unique response combinations from the Energy Smart grocer participant survey, the freeridership score assigned to each combination, and the number of responses for each combination.

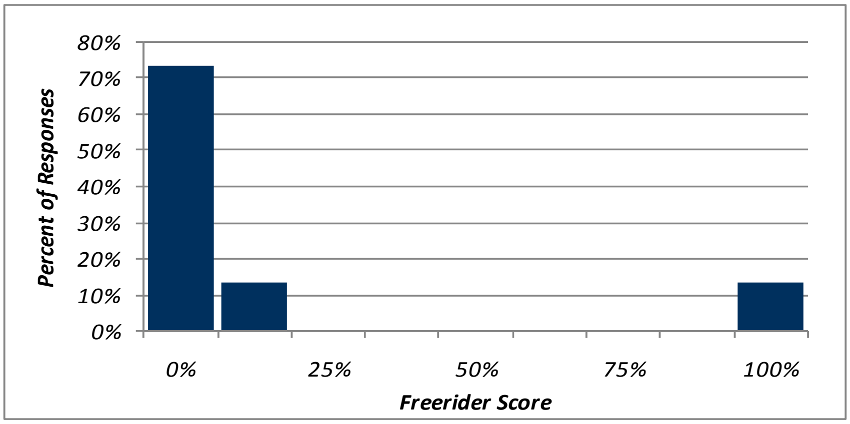
Table 15. Frequency of Freerideship Scoring Combinations—Energy Smart Grocers

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score	Number of Responses
Yes	No	No	No	No	No	100%	4
No	Yes	Yes	No	Partial	Partial	13%	1
No	Yes	No	No	Partial	No	0%	1
No	Yes	No	No	Partial	Partial	0%	1
No	Yes	No	No	Yes	No	0%	1
No	Yes	No	No	Yes	Yes	13%	1
No	Yes	No	Yes	Yes	No	0%	1
No	No	Yes	No	No	Yes	0%	1
No	No	Yes	No	Yes	Yes	13%	1
No	No	Yes	Yes	Yes	No	0%	1
No	No	Partial	No	No	No	0%	1
No	No	No	No	Partial	No	0%	4
No	No	No	No	Partial	Partial	0%	3
No	No	No	No	Yes	No	0%	5
No	No	No	Yes	Partial	No	0%	1
No	No	No	Yes	Yes	No	0%	1
No	No	No	Yes	Yes	Partial	0%	1
No	No	No	Yes	Yes	Yes	13%	1

This is a subset of the complete nonresidential freeridership scoring matrix, shown in its entirety in Appendix C.

Unlike the residential survey responses, where two to three combinations were more prevalent than others, few Energy Smart grocer participants responded in the same pattern as the others. Table 15 notably shows most response combinations were assigned a score of 0 percent, indicating most of the participants were not freeriders. This becomes more obvious in Figure 6, which shows almost 75 percent of the Energy Smart grocer survey respondents were not freeriders.

Figure 6.Distribution of Energy Smart Grocer Freeridership Scores



Prescriptive

Table 16 shows unique response combinations from the nonresidential prescriptive participant survey, the freeridership score assigned to each combination, and the number of responses for each combination.

Table 16.Frequency of Freeridership Scoring Combinations—Prescriptive

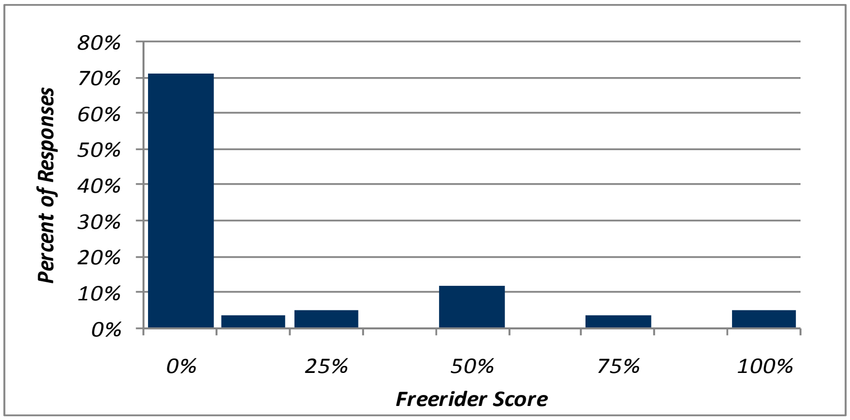
Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score	Number of Responses
Yes	No	No	No	No	No	100%	2
No	Yes	Yes	No	Yes	No	0%	1
No	Yes	Yes	No	Yes	Partial	25%	1
No	Yes	Yes	Yes	Partial	Yes	75%	1
No	Yes	Yes	Yes	Yes	No	0%	1
No	Yes	Yes	Yes	Yes	Partial	75%	1
No	Yes	Yes	Yes	Yes	Yes	100%	1
No	Yes	No	No	Yes	No	0%	2
No	Yes	No	No	Yes	Partial	0%	1
No	Yes	No	Yes	Yes	No	0%	3
No	Yes	No	Yes	Yes	Yes	50%	5
No	Partial	Yes	No	Yes	No	0%	1
No	Partial	Partial	Yes	Yes	Yes	50%	1
No	Partial	No	No	No	No	0%	1
No	Partial	No	No	Partial	No	0%	2
No	Partial	No	No	Yes	No	0%	1
No	Partial	No	Yes	Yes	No	0%	1
No	Partial	No	Yes	Yes	Yes	25%	1
No	No	Yes	No	Yes	No	0%	3
No	No	Yes	Yes	Yes	No	0%	1
No	No	Yes	Yes	Yes	Partial	25%	1
No	No	Yes	Yes	Yes	Yes	50%	1
No	No	Partial	Partial	Yes	No	0%	1
No	No	Partial	Partial	Yes	Partial	0%	1
No	No	No	No	No	No	0%	3
No	No	No	No	Partial	No	0%	5
No	No	No	No	Partial	Partial	0%	2
No	No	No	No	Yes	No	0%	6
No	No	No	No	Yes	Yes	0%	1
No	No	No	Partial	Partial	No	0%	1
No	No	No	Partial	Yes	No	0%	3
No	No	No	Yes	Yes	No	0%	1
No	No	No	Yes	Yes	Yes	13%	2

This is a subset of the complete nonresidential freeridership scoring matrix, shown in its entirety in Appendix C.

As with Energy Smart grocer participants, there was a wide variety of response combinations for the prescriptive program category. Only three respondents were assigned a 100 percent freeridership score. Two of the respondents had already purchased and installed the rebated equipment when they heard about the Avista program.

Figure 7 shows distributions of nonresidential prescriptive responses by freeridership score assigned. Over 70 percent of the prescriptive survey respondents were not freeriders.

Figure 7.Distribution of Prescriptive Freeridership Scores



Motors

Table 17 shows unique response combinations from the nonresidential motors participant survey, the freeridership score assigned to each combination, and the number of responses for each combination.

Table 17.Frequency of Freerideship Scoring Combinations—Motors

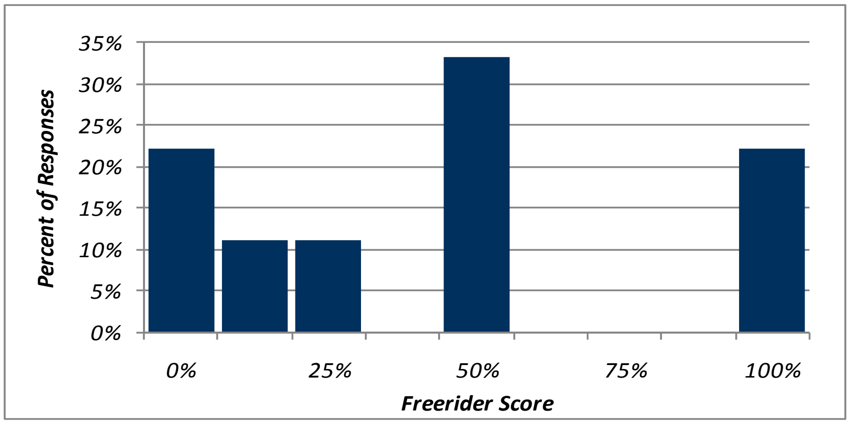
Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score	Number of Responses
Yes	No	No	No	No	No	100%	2
No	Yes	No	Yes	Yes	Yes	50%	1
No	Partial	No	Yes	Yes	Partial	13%	1
No	Partial	No	Yes	Yes	Yes	25%	1
No	No	Yes	Yes	Yes	Yes	50%	2
No	No	No	No	Partial	No	0%	2

This is a subset of the complete nonresidential freeridership scoring matrix, shown in its entirety in Appendix C.

Avista's motors programs had few participants in 2010. Cadmus was unable to reach most of the participants, interviewing only nine of them. With the small sample size, each response had a significant impact on the average freeridership score for the motors program category. Two of the nine respondents were 100 percent freeriders as they had already purchased and installed the motor equipment before learning about Avista's rebate. Two other respondents were determined to be 0 percent freeriders as they had not already purchased the equipment, the purchase was not in their capital budgets, they had not previously purchased similar equipment, and they would not have installed it without the program.

Figure 8 shows distributions of nonresidential motors responses by assigned freeridership score.

Figure 8. Distribution of Motors Freeridership Scores



Site Specific

Table 18 shows the unique response combinations from the nonresidential, site-specific participant survey, the freeridership score assigned to each combination, and the number of responses for each combination.

Similar to other nonresidential program categories, no apparent pattern emerged as a common response combination for the site-specific survey respondents, which appeared to have a variety of slightly different reasons for participating in the program and varying freeridership levels. Seven respondents were classified as 100 percent freeriders because they either had already purchased the equipment before hearing about Avista's rebate, or they had included the equipment purchase in their capital budget, planned on purchasing the equipment soon anyway, and would have made the purchase even if Avista's rebate had not been available.

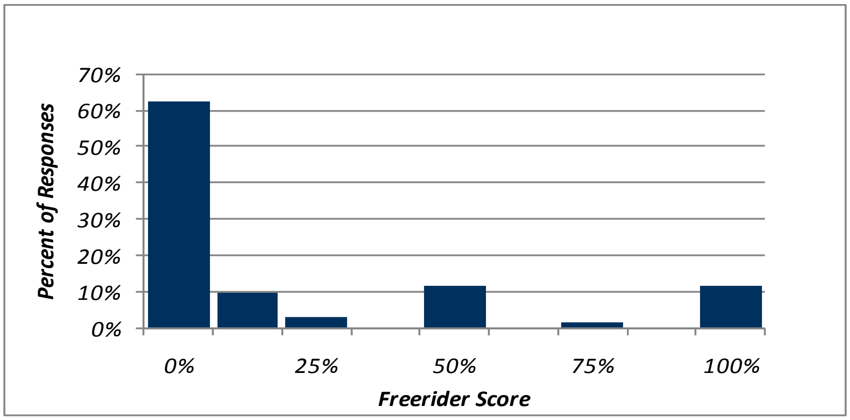
Table 18.Frequency of Freerideship Scoring Combinations—Site-Specific

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score	Number of Responses
Yes	No	No	No	No	No	100%	5
No	Yes	Yes	Partial	No	Yes	0%	1
No	Yes	Yes	Yes	No	Yes	0%	1
No	Yes	Yes	Yes	Yes	No	0%	1
No	Yes	Yes	Yes	Yes	Yes	100%	2
No	Yes	Partial	Yes	Yes	No	0%	1
No	Yes	No	No	No	Yes	0%	1
No	Yes	No	No	Partial	No	0%	2
No	Yes	No	No	Partial	Partial	0%	1
No	Yes	No	No	Yes	Yes	13%	1
No	Yes	No	Partial	No	Yes	0%	2
No	Yes	No	Yes	No	No	0%	1
No	Yes	No	Yes	No	Yes	0%	2
No	Yes	No	Yes	Partial	Yes	25%	1
No	Yes	No	Yes	Yes	No	0%	2
No	Yes	No	Yes	Yes	Yes	50%	6
No	Partial	Yes	No	Partial	Partial	0%	1
No	Partial	Yes	Yes	Yes	Yes	75%	1
No	Partial	Partial	Partial	Partial	Partial	0%	1
No	Partial	Partial	Partial	Yes	Partial	13%	1
No	Partial	Partial	Yes	Partial	No	0%	1
No	Partial	No	No	No	No	0%	2
No	Partial	No	Partial	Partial	No	0%	1
No	Partial	No	Yes	Yes	No	0%	1
No	Partial	No	Yes	Yes	Yes	25%	1
No	No	Yes	No	Partial	No	0%	2
No	No	Yes	Partial	No	No	0%	1
No	No	Yes	Yes	No	Yes	0%	1
No	No	Yes	Yes	Yes	Yes	50%	1
No	No	Partial	No	Yes	Partial	0%	1
No	No	No	No	No	Yes	0%	1
No	No	No	No	Partial	No	0%	2
No	No	No	No	Partial	Partial	0%	2
No	No	No	No	Yes	No	0%	1
No	No	No	No	Yes	Partial	0%	1
No	No	No	Partial	Yes	No	0%	2
No	No	No	Partial	Yes	Yes	0%	1
No	No	No	Yes	Yes	No	0%	1
No	No	No	Yes	Yes	Yes	13%	4

This is a subset of the complete nonresidential freeridership scoring matrix, shown in its entirety in Appendix C.

Figure 9 shows distribution of responses by assigned freeridership score. Over 60 percent of site-specific survey respondents were not freeriders.

Figure 9. Distribution of Site-Specific Freeridership Scores



3. Spillover Analysis

This section presents a detailed analysis of additional energy-efficient measures customers installed after participating in an Avista program. The figures below indicate that, while many participants subsequently installed more energy-efficient measures after receiving a rebate from Avista, few reported the program significantly influenced their purchases, and therefore, cannot be considered spillover. Additionally, some participants significantly influenced by the program have applied for rebates for additional measures they installed, and cannot be included in the spillover analysis.

As mentioned in the spillover methodology section, deemed savings values from Avista's TRM were used to calculate spillover measure savings. In cases where the Avista TRM did not have applicable energy savings values, Regional Technical Forum values and engineering calculations by Cadmus staff were utilized. For some measures, either the TRM database or the respondent did not provide sufficient information; so we were unable to estimate spillover savings.

The spillover percentage for a program category was calculated by dividing the sum of additional spillover savings, reported by participants for a given program category, by the total rebated gross savings achieved by all respondents in the program category.

Residential Program Categories

Table 19 shows spillover analysis results for Avista's residential program categories.

Table 19. Residential Spillover Summary

Program Category	Spillover Savings (kWh)	Spillover Savings (therms)	Participant Program Savings (kWh)	Participant Program Savings (therms)	Spillover %
Residential Appliances	0	0	7,614	184	0.0%
Residential HVAC	0	0	42,105	6,642	0.0%
Residential Shell	3,237	-4	36,309	5,254	8.8%
Energy Star Homes	0	0	117,083	4,788	0.0%

Only the residential shell program category had measurable spillover savings. Though the potential spillover savings were higher, most residential participants installing additional energy-efficient equipment reported the program did not have much influence on their purchasing decisions. Further, some had applied for a rebate for the additional measure purchased. Table 20 summarizes how many participants were excluded from the spillover analysis.

Table 20. Effects of Program Influence and Rebates on Residential Spillover

Program Category	Respondents Installing Additional Measures	Respondents Indicating High Program Influence	Respondents Not Receiving Rebate for Spillover Measure
Residential Appliances	13	0	0
Residential HVAC	10	0	0
Residential Shell	18	5	3

Thirteen of the residential appliance participants reported installing additional measures after participating in an appliance program. None of the 13 reported the program influenced them in their decision to purchase; so all were excluded from the spillover analysis. Likewise, none of the 10 residential HVAC participants installing additional measures were influenced by the HVAC program; so they were excluded as well. Five participants reported their participation in a residential shell program proved highly influential in their decision to install additional energy-efficient measures. Two of the five respondents reported currently being in the process of receiving an Avista rebate for the additional measure; so associated energy savings were not applied to the spillover savings used in the analysis.

Table 21 displays the three additional measures residential shell participants installed that qualified as spillover.

Table 21. Residential Spillover Measures

Program Category	Fuel Type	Spillover Measure Installed	Quantity	Per Unit Elec Savings (kWh)	Per Unit Gas Savings (therms)	Total Elec Savings (kWh)	Total Gas Savings (therms)
Residential Shell	Electric	Air Source Heat Pump	1	3,237	0	3,237	0
Residential Shell	Gas	Recycled Refrigerator	1	NA	NA	NA	NA
Residential Shell	Gas	Sealed Air Leaks	1	NA	NA	NA	NA

Of the three measures qualifying as spillover measures, only one measure, an air source heat pump, accurately matched savings values in Avista's TRM. While the recycled refrigerator and sealed air leaks measures did meet spillover-qualifying criteria, we were unable to obtain sufficient information about these measures to confidently estimate their energy savings. Thus, these two measures were excluded from the final spillover savings, presented in Table 19.

The spillover survey's timing may be a reason residential spillover savings were small. For many participants interviewed, not enough time may have elapsed between participating in the program and internalizing the energy-efficiency improvements' results.

Energy Star Homes

Spillover was not calculated for the Energy Star Homes program category because most builders reported, since participating in Avista's Energy Star Homes program, almost 100% of their homes have been Energy Star certified. This indicates the program had not influenced builders to make additional energy-efficiency improvements to homes that normally would not have qualified for Energy Star certification.

Nonresidential Program Categories

Table 22 shows spillover calculation results for Avista's nonresidential programs.

Table 22. Nonresidential Spillover Summary

Program	Spillover Savings (kWh)	Spillover Savings (therms)	Program savings (kWh)	Program Savings (therms)	Spillover %
Energy Smart Grocer	2,184	0	649,741	0	0.0%
Motors	3,589	0	551,653	0	0.0%
Prescriptive	1,469	-5	3,155,031	60,300	0.0%
Site Specific	10,620	-17	5,981,642	185,682	0.2%

The prescriptive and site-specific program categories both had measurable spillover savings. As with the residential programs, the potential for nonresidential spillover savings was higher, but many participants installing additional energy-efficient equipment reported the program did not have much influence on their purchasing decisions. Some also had applied for rebates for additional measures purchased. Table 23 summarizes how many participants were excluded from the nonresidential spillover analysis for these reasons.

Table 23. Effects of Program Influence and Rebates on Nonresidential Spillover

Program Category	Respondents Installing Additional Measures	Respondents Indicating High Program Influence	Respondents Not Receiving Rebate for Spillover Measure
Energy Smart Grocer	4	1	1
Motors	2	2	2
Prescriptive	18	9	8
Site Specific	21	7	4

Four of the Energy Smart grocer participants reported they installed additional measures after participating in the program, but only one reported the program influenced their decision. Both motors respondents reported being highly influenced by the motor program to install additional measures, and had not received rebates for the measures. Of the 18 prescriptive program participants who installed additional measures, only eight said the program influenced them and had not received additional rebates. Finally, only four of 21 site-specific participants installing additional measures were influenced by the program and did not apply for additional rebates.

Although several survey respondents installed multiple spillover measures, Table 23 represents unique survey respondents, not spillover measures installed. In the next series of figures, we provide an analysis of installed measures that qualified as spillover.

Energy Smart Grocer

Table 24 displays the two measures qualifying as spillover in the Energy Smart grocer program category.

Table 24. Energy Smart Grocer Spillover Measures

Program Category	Fuel Type	Spillover Measure Installed	Quantity	Per Unit Elec Savings (kWh)	Per Unit Gas Savings (therms)	Total Elec Savings (kWh)	Total Gas Savings (therms)
Energy Smart Grocer	Electric	Refrigerator; Energy Star rated; 2 doors	1	1,630	0	1,630	0
Energy Smart Grocer	Electric	Ice Maker; Water Cooled; 401 to 500 lbs/day	1	554	0	554	0

Motors

Table 25 shows the three measures qualifying as spillover for the motors program category.

Table 25. Motors Spillover Measures

Program Category	Fuel Type	Spillover Measure Installed	Quantity	Per Unit Elec Savings (kWh)	Per Unit Gas Savings (therms)	Total Elec Savings (kWh)	Total Gas Savings (therms)
Motors	Electric	Compressor Motor; 100 HP	2	1,588	0	3,116	0
Motors	Electric	Network Controls; Replaced Older Controls	1	120	0	120	0
Motors	Electric	CFL Fixture; 40-55 Watts; Replaced >200 Watt Incandescents	1	353	-3	353	-3

Prescriptive

Table 26 displays the eight measures qualifying as spillover for the prescriptive program category. Two gas, forced-air furnaces were not credited with savings because the new furnace replaced an existing furnace with the same efficiency. The Energy Star replacement windows were not credited with savings because of the uncertainty of key information (i.e., quantity, square feet) needed to accurately associate a savings value with the measure.

Table 26. Prescriptive Spillover Measures

Program Category	Fuel Type	Spillover Measure Installed	Quantity	Per Unit Elec Savings (kWh)	Per Unit Gas Savings (therms)	Total Elec Savings (kWh)	Total Gas Savings (therms)
Prescriptive	NA	Occupancy Sensor Controlled by Wall Switch	6	101	-1	606	-6
Prescriptive	NA	CFL's less than 30 Watts; Replaced Incandescent > 100 Watts	2	151	-1	302	-2
Prescriptive	Gas	Gas Forced Air Furnace, .94 AFUE, Replaced .94 AFUE	1	0	0	0	0
Prescriptive	Gas	Gas Forced Air Furnace, .94 AFUE, Replaced .94 AFUE	2	0	0	0	0
Prescriptive	Gas	Replacement Windows; Energy Star Rated	NA	0	0	0	0
Prescriptive	NA	Air Conditioner; Efficient	3	146	0	439	0
Prescriptive	Gas	Gas Forced Air Furnace	1	0	3	0	3
Prescriptive	Electric	LED Light Fixtures, Replaced Lights > 120 Watts	2	61	0	122	0

Site Specific

Table 27 shows five measures qualifying as spillover for the site-specific program category.

Table 27. Site-Specific Spillover Measures

Program Category	Fuel Type	Spillover Measure Installed	Quantity	Per Unit Elec Savings (kWh)	Per Unit Gas Savings (therms)	Total Elec Savings (kWh)	Total Gas Savings (therms)
Site Specific	Electric	Occupancy Sensor; Timer Lighting Control	22	101	0	2,222	0
Site Specific	Electric	LED Lights; 15 to 20 Watts; Replaced > 120 Watt Incandescents	88	61	0	5,368	0
Site Specific	Gas	Occupancy Sensor; Controlled by Wall Switch	30	101	-1	3,030	-30
Site Specific	Dual Fuel	Gas Boiler; .98 AFUE - 98% EF; Replaced .79 AFUE	1	0	2	0	2
Site Specific	Dual Fuel	Gas Forced Air Furnace; .98 AFUE - 98% EF; Replaced .79 AFUE	3	0	4	0	11

4. Net-to-Gross Analysis

Freeridership and spillover comprise NTG's two components. Freeriders—customers who would have purchased a measure without a program's influence—reduce savings attributable to Avista's programs. Spillover—additional savings obtained by the customer's decision to invest in additional efficiency measures or activities due to their program participation— increase savings attributable to the program. Final NTG ratios for each program category were calculated using the formula below.

$$\textit{Net-to-gross ratio} = (1 - \textit{Freeridership}) + \textit{Spillover}$$

Table 28 summarizes freeridership and spillover percentages calculated for the residential program categories, along with the resulting NTG ratio.

Table 28. Residential NTG Ratios

Program Category	Responses	FR %	Spillover %	NTG
Residential Appliances	67	48%	0.0%	52.0%
Residential HVAC	67	39%	0.0%	61.0%
Residential Shell	67	45%	8.8%	63.8%
EnergyStar Homes	7	26%	0.0%	73.6%

Table 29 summarizes freeridership and spillover percentages we calculated for the nonresidential program categories, along with the resulting NTG ratio.

Table 29. Nonresidential NTG Ratios

Program Category	Responses	FR %	Spillover %	NTG
EnergySmart Grocer	30	10%	0.0%	90.0%
NonRes Motors	9	41%	0.0%	59.0%
NonRes Prescriptive	59	13%	0.0%	87.0%
NonRes Site Specific	61	26%	0.2%	74.2%

5. Conclusions and Recommendations

What We Did

Cadmus implemented a NTG methodology addressing Avista's DSM program portfolio. The freeridership component was based on a previously developed approach, which ascertained freeridership using patterns or responses of a series of six simple questions. The questions—which allowed "yes", "no" or "don't know" responses—dealt with whether participants would have installed the same equipment in the program's absence, at the same time, and at the same efficiency.

Participant spillover was calculated by estimating savings attributable to additional measures installed and whether respondents credited Avista with influencing the decision. Measures were counted if they were eligible for program incentives, but no incentives were requested.

NTG ratios then were calculated, accounting for both freeridership and spillover.

What We Found

In general, analysis results showed predictable trends. Residential and appliance programs showed relatively high freeridership, and commercial programs had relatively low scores. In all cases but one, however, scores were on the low end of the continuum found in other utilities, regardless of the methodology used, and accounting for differences in program definitions. Avista's freeridership scores showed, in most cases, a healthy proportion of respondents were clearly "pure" participants, and, convincingly, would not have adopted energy-efficient technologies without Avista's programs.

The program evidences little participant spillover, which was also predictable. Participant spillover develops slowly, depending on increasing familiarity with energy efficiency and experience with program-incented measures. While freeridership accuracy depends on eliciting responses close to the adoption decision, spillover accuracy occurs in the longer term. Survey instruments attempting to gather both processes of the NTG puzzle usually fall short with one or the other estimates.

Freeridership is More than a Ratio

Response distributions used for calculating an average freeridership ratio contain information that can help program managers more effectively manage their programs. Three interesting issues emerged in our review of these distributions.

First, as noted, the Avista ratios contained a significant proportion of customers who otherwise would not have adopted energy-efficient measures. This finding is not something we normally see in other freerider studies. While it may not significantly affect the *mean* freerider ratio, response distributions strongly suggest Avista programs successfully attract first-time adopters.

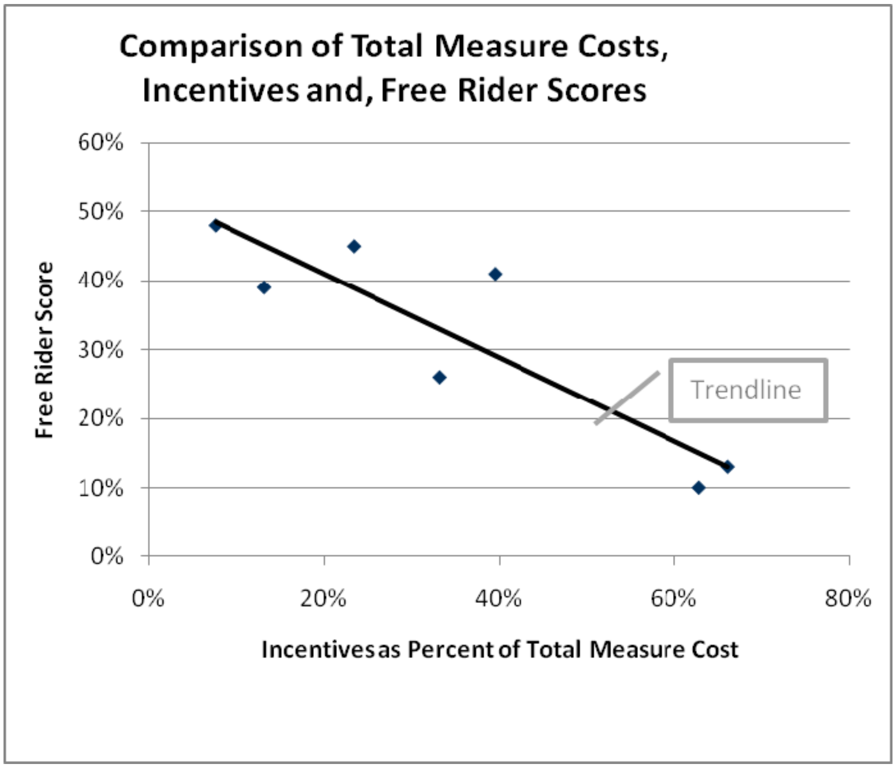
Second, it appears Avista programs could be even more efficient if eligibility requirements were tightened. Our survey asked respondents whether they had already installed equipment *before* hearing about the Avista program. A number of respondents answered "yes" and were classified as freeriders, along with respondents who consistently responded they would not have installed the equipment at all except for the program. Removing the "already installed" responses from the analysis significantly improved the freerider ratios, as shown in 30. This may indicate program requirements and program incentive quality control could be tightened.

Table 30. Effect on Freeridership of Removing "Already Installed" Responses

	With "Already Installed"		*Without "Already Installed"*	
Survey Category	Responses	FR Score	Responses	FR Score
Residential Appliances	67	0.48	51	0.31
Residential HVAC	67	0.39	54	0.24
Residential Shell	67	0.45	55	0.33
Energy Star Homes	7	0.26	7	0.26
Energy Smart Grocer	30	0.1	26	0.05
Motors	9	0.41	7	0.17
Prescriptive	59	0.13	57	0.11
Site Specific	61	0.26	56	0.12

Finally, to test the hypothesis that incentive levels affect freeridership, we graphed the proportion of total measure cost covered by the incentive with the freeridership ratio found in our analysis. As seen in Figure 10, a strong inverse relationship occurs between the proportion of the total measure cost covered by the incentive and the freeridership ratio. The upper left side of the graph represents residential appliances, which typically have small incentives relative to appliance costs. Where the incentive amount does not affect purchasing decisions, high freeridership can be expected. The right-hand end of the trend line represents the Energy Smart grocer and nonresidential prescriptive programs, which have low freeridership rates and incentives covering 60 percent of the total cost, according to program records.

Figure 10. Proportion of Measure Cost Incented and Freeridership Ratio



Recommendations for Ongoing Freeridership and Spillover Measurement

Cadmus' methodology and approach in calculating freeridership relies on a five-minute survey, with up to six questions. Scoring, calculation, and statistics are automated and Excel-based. We created two templates: one for residential programs, and one for commercial programs.[4] Results appear to be reliable and valid, as evidenced by comparison to other programs and by the strong inverse relationship between incentives and measure costs.

Participant spillover remains a labor-intensive effort. Although the survey instrument addresses measure adoption and program influence, estimation of spillover savings has proved problematic, relying on references to TRM and RTF values as well as engineering expertise. Considering the low participant spillover found in this study, it may not be cost-effective to include both freeridership and spillover in the same survey.

Currently, two basic data collection models support our NTG calculations.

The Energy Trust of Oregon (ETO) employs the first model. The ETO uses an internal process for gathering information quarterly through a short telephone survey of recent participants (the survey does not address participant spillover). Program managers receive results at the end of the

[4] Energy Star Homes is a program implemented by builders, not by end-use customers, and, as has been previously discussed relies on a slightly different algorithm.

quarter, providing a useful tool for fine-turning the program, while offering the flexibility to include new measures. Until recently, the surveys were implemented by the ETO Call Center. This provided an additional opportunity for interactions with customers. Currently, ETO is considering contracting the survey portion to an independent survey house, while maintaining a "hot" link to the call center for customer inquiries.

The primary advantages this approach affords include: ongoing feedback to program staff; relatively low implementation costs, and tie-ins to customer service at the Call Center. It should be noted this approach was adopted after over seven years of evolving freeridership methodologies, and is being applied to a small group of mature programs with high participation rates. The survey also includes a few questions on customer satisfaction, as required by the Oregon PUC. Completing the survey is estimated to take less than five minutes.

The approach experiences a disadvantage in that it cannot be used for participant spillover because it is implemented (usually) in the same quarter as participation. Additionally, its implementation frequency may not be applicable to new programs or programs with low participation, where statistically valid samples may be too small to project ratios to an annual cohort.

More universally accepted, the second model estimates freeridership and participant spillover as part of ongoing, annual, or biennial EM&V activity, and as part of larger customer surveys supporting process and impact evaluations.

This approach offers several advantages: freeridership and spillover modules represent only a marginal incremental cost to an overall evaluation effort; questions can be better tailored to individual program efforts; and participant spillover feedback can be "staggered" to allow spillover sufficient time to develop, and spillover calculations within the context of a larger EM&V effort ensures engineering resources are available when needed. Disadvantages to this approach include: the overall customer survey burden, a lack of timely feedback as surveys are usually implemented once a year, or once every two years, and the "hot link" to customer service, unless arrangements are already in place.

Two other approaches have been attempted, on a limited basis. NYSERDA attempted to integrate freeridership as part of the program application process, but the survey questions did not lend themselves to online implementation, and the effort was dropped.

This report serves as an example of a second limited approach, engaging an independent contractor to develop and implement a methodology. This approach offers the advantage of focusing on the development of an approach that can be implemented independently of any other EM&V activity. Its disadvantages include the initial cost (although the product can be used in a cost-effective manner), and a lack of a mechanism to fine-tune or modify the approach, based on feedback and experience.

While we recognize advantages and disadvantages inherent in every model, we feel including NTG calculations as part of an ongoing evaluation effort would offer the greatest advantages, and we recommend Avista strongly consider this alternative.

Appendix A: Program Categorization

Table A1. Residential Program Categorization

Program Category	Program/Measure
Residential HVAC	Electric High Efficiency A/C Replacment Electric High Efficiency Air Heat Pump Electric New High Efficiency Ground Heat Pump Electric Replacement High Efficiency Ground Heat Pump Electric to Air Heat Pump Conversion Gas High Efficiency Boiler Gas High Efficiency Furnace Variable Speed Motor High Efficiency Ductless Heat Pumps
Residential Appliance	Electric\Gas Energy Star Clothes Washer Electric\Gas Energy Star Dishwasher Electric Energy Star Freezer Electric Energy Star Refrigerator Electric High Efficiency Water Heater Gas High Efficiency Water Heater 40 gal Gas High Efficiency Water Heater tankless Electric to Gas Water Heater Conversion
Residential Shell	Electric\Gas Insulation - Ceiling/Attic Electric\Gas Insulation - Floor Electric\Gas Insulation - Wall Electric\Gas Replacement Windows Electric\Gas Fireplace Damper
Refrigeration Recycle*	Refrigeration Recycling
EnergyStar Home	Electric Estar Home All Electric Electric Estar Home Electric/Gas Gas- Estar Home Gas Only

**The 2010 residential rebate data did not contain any refrigerator recycling participants.*

Table A2. Nonresidential Program Categorization

Program Category	Program/Measure
Energy Smart Grocer	Energy Smart
Motors	Green Motors program (Instate Rebate) Prescriptive Motors Site-Specific Motors
Prescriptive	Prescriptive Clothes Washers Prescriptive Demand Controlled Ventilation Prescriptive Food Service Prescriptive Refrigerated Warehouse Prescriptive Side-Stream Filtration Prescriptive Steam-Trap Replacement Prescriptive PC Network Controls Prescriptive Lighting Prescriptive LED Traffic Signals Variable Frequency Drive Incentives Vending Machine Controller Rebates Electric to Natural Gas Water Heater Conversion Rebate
Site-specific	Site-specific Compressed Air Site-specific Industrial Processes Site-specific Appliances Site-specific HVAC Site-specific LEED Site-specific Shell Site-specific Lighting

Appendix B: Surveys

Attached in a separate document.

Appendix C: Freeridership Scoring Matrix

Tables C1 and C2 show scoring matrices Cadmus developed for assessing freeridership in Avista's residential and nonresidential programs, respectively. Cadmus converted the responses to each freeridership survey question into either a Yes, No, or Partial freerider credit. All possible combinations of these responses to the six survey questions were then assigned a freeridership score. Cadmus assigned the scores by 1/8 and ¼ increments (12.5%, 25%, 50%, 75%, and 100%). A survey respondent receiving a score of 100% would be a 100% freerider. Likewise, a score of 0% would indicate the respondent is not a freerider. Scores between 0% and 100% would indicate respondents are partial freeriders.

In the tables below, an N/A shows situations where a skip pattern appears in the survey design. For example, in the residential survey appearing in Table C1, respondents who answered "Yes" to the first freerider question were not asked the remaining questions because they were automatically assigned a 100% score.

Full versions of Tables C1 and C2 are included in the Freeridership_Calculator_Avista Excel file, accompanying this report.

Table C1. Residential Freeridership Scoring Matrix

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Program	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score
Yes	N/A	N/A	N/A	N/A	N/A	100.00%
No	Yes	Yes	N/A	Yes	Yes	100.00%
No	Yes	Yes	N/A	Yes	Partial	75.00%
No	Yes	Yes	N/A	Yes	No	50.00%
No	Yes	Yes	N/A	Partial	Yes	75.00%
No	Yes	Yes	N/A	Partial	Partial	50.00%
No	Yes	Yes	N/A	Partial	No	25.00%
No	Yes	Yes	N/A	No	Yes	0.00%
No	Yes	Yes	N/A	No	Partial	0.00%
No	Yes	Yes	N/A	No	No	0.00%
No	Yes	Partial	Yes	Yes	Yes	75.00%
No	Yes	Partial	Yes	Yes	Partial	50.00%
No	Yes	Partial	Yes	Yes	No	25.00%
No	Yes	Partial	Yes	Partial	Yes	50.00%
No	Yes	Partial	Yes	Partial	Partial	25.00%
No	Yes	Partial	Yes	Partial	No	12.50%
No	Yes	Partial	Yes	No	Yes	0.00%
No	Yes	Partial	Yes	No	Partial	0.00%
No	Yes	Partial	Yes	No	No	0.00%

Table C1. Residential Freeridership Scoring Matrix

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Program	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score
No	Yes	Partial	Partial	Yes	Yes	50.00%
No	Yes	Partial	Partial	Yes	Partial	25.00%
No	Yes	Partial	Partial	Yes	No	12.50%
No	Yes	Partial	Partial	Partial	Yes	25.00%
No	Yes	Partial	Partial	Partial	Partial	12.50%
No	Yes	Partial	Partial	Partial	No	0.00%
No	Yes	Partial	Partial	No	Yes	0.00%
No	Yes	Partial	Partial	No	Partial	0.00%
No	Yes	Partial	Partial	No	No	0.00%
No	Yes	Partial	No	Yes	Yes	0.00%
No	Yes	Partial	No	Yes	Partial	0.00%
No	Yes	Partial	No	Yes	No	0.00%
No	Yes	Partial	No	Partial	Yes	0.00%
No	Yes	Partial	No	Partial	Partial	0.00%
No	Yes	Partial	No	Partial	No	0.00%
No	Yes	Partial	No	No	Yes	0.00%
No	Yes	Partial	No	No	Partial	0.00%
No	Yes	Partial	No	No	No	0.00%
No	Yes	No	Yes	Yes	Yes	50.00%
No	Yes	No	Yes	Yes	Partial	25.00%
No	Yes	No	Yes	Yes	No	12.50%
No	Yes	No	Yes	Partial	Yes	25.00%
No	Yes	No	Yes	Partial	Partial	12.50%
No	Yes	No	Yes	Partial	No	0.00%
No	Yes	No	Yes	No	Yes	0.00%
No	Yes	No	Yes	No	Partial	0.00%
No	Yes	No	Yes	No	No	0.00%
No	Yes	No	Partial	Yes	Yes	25.00%
No	Yes	No	Partial	Yes	Partial	12.50%
No	Yes	No	Partial	Yes	No	0.00%
No	Yes	No	Partial	Partial	Yes	12.50%
No	Yes	No	Partial	Partial	Partial	0.00%
No	Yes	No	Partial	Partial	No	0.00%
No	Yes	No	Partial	No	Yes	0.00%
No	Yes	No	Partial	No	Partial	0.00%
No	Yes	No	Partial	No	No	0.00%

Table C1. Residential Freeridership Scoring Matrix

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Program	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score
No	Yes	No	No	Yes	Yes	0.00%
No	Yes	No	No	Yes	Partial	0.00%
No	Yes	No	No	Yes	No	0.00%
No	Yes	No	No	Partial	Yes	0.00%
No	Yes	No	No	Partial	Partial	0.00%
No	Yes	No	No	Partial	No	0.00%
No	Yes	No	No	No	Yes	0.00%
No	Yes	No	No	No	Partial	0.00%
No	Yes	No	No	No	No	0.00%
No	Partial	Yes	N/A	Yes	Yes	75.00%
No	Partial	Yes	N/A	Yes	Partial	50.00%
No	Partial	Yes	N/A	Yes	No	25.00%
No	Partial	Yes	N/A	Partial	Yes	50.00%
No	Partial	Yes	N/A	Partial	Partial	25.00%
No	Partial	Yes	N/A	Partial	No	12.50%
No	Partial	Yes	N/A	No	Yes	0.00%
No	Partial	Yes	N/A	No	Partial	0.00%
No	Partial	Yes	N/A	No	No	0.00%
No	Partial	Partial	Yes	Yes	Yes	50.00%
No	Partial	Partial	Yes	Yes	Partial	25.00%
No	Partial	Partial	Yes	Yes	No	12.50%
No	Partial	Partial	Yes	Partial	Yes	25.00%
No	Partial	Partial	Yes	Partial	Partial	12.50%
No	Partial	Partial	Yes	Partial	No	0.00%
No	Partial	Partial	Yes	No	Yes	0.00%
No	Partial	Partial	Yes	No	Partial	0.00%
No	Partial	Partial	Yes	No	No	0.00%
No	Partial	Partial	Partial	Yes	Yes	25.00%
No	Partial	Partial	Partial	Yes	Partial	12.50%
No	Partial	Partial	Partial	Yes	No	0.00%
No	Partial	Partial	Partial	Partial	Yes	12.50%
No	Partial	Partial	Partial	Partial	Partial	0.00%
No	Partial	Partial	Partial	Partial	No	0.00%
No	Partial	Partial	Partial	No	Yes	0.00%
No	Partial	Partial	Partial	No	Partial	0.00%
No	Partial	Partial	Partial	No	No	0.00%

Table C1. Residential Freeridership Scoring Matrix

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Program	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score
No	Partial	Partial	No	Yes	Yes	0.00%
No	Partial	Partial	No	Yes	Partial	0.00%
No	Partial	Partial	No	Yes	No	0.00%
No	Partial	Partial	No	Partial	Yes	0.00%
No	Partial	Partial	No	Partial	Partial	0.00%
No	Partial	Partial	No	Partial	No	0.00%
No	Partial	Partial	No	No	Yes	0.00%
No	Partial	Partial	No	No	Partial	0.00%
No	Partial	Partial	No	No	No	0.00%
No	Partial	No	Yes	Yes	Yes	25.00%
No	Partial	No	Yes	Yes	Partial	12.50%
No	Partial	No	Yes	Yes	No	0.00%
No	Partial	No	Yes	Partial	Yes	12.50%
No	Partial	No	Yes	Partial	No	0.00%
No	Partial	No	Yes	Partial	Partial	0.00%
No	Partial	No	Yes	No	Yes	0.00%
No	Partial	No	Yes	No	No	0.00%
No	Partial	No	Yes	No	Partial	0.00%
No	Partial	No	Partial	Yes	Yes	12.50%
No	Partial	No	Partial	Yes	Partial	0.00%
No	Partial	No	Partial	Yes	No	0.00%
No	Partial	No	Partial	Partial	Yes	0.00%
No	Partial	No	Partial	Partial	Partial	0.00%
No	Partial	No	Partial	Partial	No	0.00%
No	Partial	No	Partial	No	Yes	0.00%
No	Partial	No	Partial	No	Partial	0.00%
No	Partial	No	Partial	No	No	0.00%
No	Partial	No	No	Yes	Yes	0.00%
No	Partial	No	No	Yes	Partial	0.00%
No	Partial	No	No	Yes	No	0.00%
No	Partial	No	No	Partial	Yes	0.00%
No	Partial	No	No	Partial	Partial	0.00%
No	Partial	No	No	Partial	No	0.00%
No	Partial	No	No	No	Yes	0.00%
No	Partial	No	No	No	Partial	0.00%
No	Partial	No	No	No	No	0.00%

Table C1. Residential Freeridership Scoring Matrix

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Program	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score
No	No	Yes	N/A	Yes	Yes	50.00%
No	No	Yes	N/A	Yes	Partial	25.00%
No	No	Yes	N/A	Yes	No	12.50%
No	No	Yes	N/A	Partial	Yes	25.00%
No	No	Yes	N/A	Partial	Partial	12.50%
No	No	Yes	N/A	Partial	No	0.00%
No	No	Yes	N/A	No	Yes	0.00%
No	No	Yes	N/A	No	Partial	0.00%
No	No	Yes	N/A	No	No	0.00%
No	No	Partial	Yes	Yes	Yes	25.00%
No	No	Partial	Yes	Yes	Partial	12.50%
No	No	Partial	Yes	Yes	No	0.00%
No	No	Partial	Yes	Partial	Yes	12.50%
No	No	Partial	Yes	Partial	Partial	0.00%
No	No	Partial	Yes	Partial	No	0.00%
No	No	Partial	Yes	No	Yes	0.00%
No	No	Partial	Yes	No	Partial	0.00%
No	No	Partial	Yes	No	No	0.00%
No	No	Partial	Partial	Yes	Yes	12.50%
No	No	Partial	Partial	Yes	Partial	0.00%
No	No	Partial	Partial	Yes	No	0.00%
No	No	Partial	Partial	Partial	Yes	0.00%
No	No	Partial	Partial	Partial	Partial	0.00%
No	No	Partial	Partial	Partial	No	0.00%
No	No	Partial	Partial	No	x	0.00%
No	No	Partial	Partial	No	x	0.00%
No	No	Partial	Partial	No	x	0.00%
No	No	Partial	No	Yes	Yes	0.00%
No	No	Partial	No	Yes	Partial	0.00%
No	No	Partial	No	Yes	No	0.00%
No	No	Partial	No	Partial	Yes	0.00%
No	No	Partial	No	Partial	Partial	0.00%
No	No	Partial	No	Partial	No	0.00%
No	No	Partial	No	No	x	0.00%
No	No	Partial	No	No	x	0.00%
No	No	Partial	No	No	x	0.00%

Table C1. Residential Freeridership Scoring Matrix

Already Ordered or Installed	Planning to Purchase	Would Have Installed without Program	Same Efficiency	Planning to Install Soon	Purchased Same Measure Previously	Score
No	No	No	Yes	Yes	Yes	12.50%
No	No	No	Yes	Yes	Partial	0.00%
No	No	No	Yes	Yes	No	0.00%
No	No	No	Yes	Partial	Yes	0.00%
No	No	No	Yes	Partial	Partial	0.00%
No	No	No	Yes	Partial	No	0.00%
No	No	No	Yes	No	Yes	0.00%
No	No	No	Yes	No	No	0.00%
No	No	No	Yes	No	Partial	0.00%
No	No	No	Partial	Yes	Yes	0.00%
No	No	No	Partial	Yes	No	0.00%
No	No	No	Partial	Yes	Partial	0.00%
No	No	No	Partial	Partial	Yes	0.00%
No	No	No	Partial	Partial	Partial	0.00%
No	No	No	Partial	Partial	No	0.00%
No	No	No	Partial	No	Yes	0.00%
No	No	No	Partial	No	Partial	0.00%
No	No	No	Partial	No	No	0.00%
No	No	No	No	Yes	Yes	0.00%
No	No	No	No	Yes	No	0.00%
No	No	No	No	Yes	Partial	0.00%
No	No	No	No	Partial	Yes	0.00%
No	No	No	No	Partial	Partial	0.00%
No	No	No	No	Partial	No	0.00%
No	No	No	No	No	Yes	0.00%
No	No	No	No	No	Partial	0.00%
No	No	No	No	No	No	0.00%

Table C2. Nonresidential Freeridership Scoring Matrix

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score
Yes	x	x	x	x	x	100.00%
No	Yes	Yes	Yes	Yes	Yes	100.00%
No	Yes	Yes	Yes	Yes	Partial	75.00%
No	Yes	Yes	Yes	Yes	No	0.00%
No	Yes	Yes	Yes	Partial	Yes	75.00%
No	Yes	Yes	Yes	Partial	Partial	50.00%
No	Yes	Yes	Yes	Partial	No	0.00%
No	Yes	Yes	Yes	No	Yes	0.00%
No	Yes	Yes	Yes	No	Partial	0.00%
No	Yes	Yes	Yes	No	No	0.00%
No	Yes	Yes	Partial	Yes	Yes	75.00%
No	Yes	Yes	Partial	Yes	Partial	50.00%
No	Yes	Yes	Partial	Yes	No	0.00%
No	Yes	Yes	Partial	Partial	Yes	50.00%
No	Yes	Yes	Partial	Partial	Partial	25.00%
No	Yes	Yes	Partial	Partial	No	0.00%
No	Yes	Yes	Partial	No	Yes	0.00%
No	Yes	Yes	Partial	No	Partial	0.00%
No	Yes	Yes	Partial	No	No	0.00%
No	Yes	Yes	No	Yes	Yes	50.00%
No	Yes	Yes	No	Yes	Partial	25.00%
No	Yes	Yes	No	Yes	No	0.00%
No	Yes	Yes	No	Partial	Yes	25.00%
No	Yes	Yes	No	Partial	Partial	12.50%
No	Yes	Yes	No	Partial	No	0.00%
No	Yes	Yes	No	No	Yes	0.00%
No	Yes	Yes	No	No	Partial	0.00%
No	Yes	Yes	No	No	No	0.00%
No	Yes	Partial	Yes	Yes	Yes	75.00%
No	Yes	Partial	Yes	Yes	Partial	50.00%
No	Yes	Partial	Yes	Yes	No	0.00%
No	Yes	Partial	Yes	Partial	Yes	50.00%
No	Yes	Partial	Yes	Partial	Partial	25.00%
No	Yes	Partial	Yes	Partial	No	0.00%
No	Yes	Partial	Yes	No	Yes	0.00%
No	Yes	Partial	Yes	No	Partial	0.00%
No	Yes	Partial	Yes	No	No	0.00%

Table C2. Nonresidential Freeridership Scoring Matrix

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score
No	Yes	Partial	Partial	Yes	Yes	50.00%
No	Yes	Partial	Partial	Yes	Partial	25.00%
No	Yes	Partial	Partial	Yes	No	0.00%
No	Yes	Partial	Partial	Partial	Yes	25.00%
No	Yes	Partial	Partial	Partial	Partial	12.50%
No	Yes	Partial	Partial	Partial	No	0.00%
No	Yes	Partial	Partial	No	Yes	0.00%
No	Yes	Partial	Partial	No	Partial	0.00%
No	Yes	Partial	Partial	No	No	0.00%
No	Yes	Partial	No	Yes	Yes	25.00%
No	Yes	Partial	No	Yes	Partial	12.50%
No	Yes	Partial	No	Yes	No	0.00%
No	Yes	Partial	No	Partial	Yes	12.50%
No	Yes	Partial	No	Partial	Partial	0.00%
No	Yes	Partial	No	Partial	No	0.00%
No	Yes	Partial	No	No	Yes	0.00%
No	Yes	Partial	No	No	Partial	0.00%
No	Yes	Partial	No	No	No	0.00%
No	Yes	No	Yes	Yes	Yes	50.00%
No	Yes	No	Yes	Yes	Partial	25.00%
No	Yes	No	Yes	Yes	No	0.00%
No	Yes	No	Yes	Partial	Yes	25.00%
No	Yes	No	Yes	Partial	Partial	12.50%
No	Yes	No	Yes	Partial	No	0.00%
No	Yes	No	Yes	No	Yes	0.00%
No	Yes	No	Yes	No	Partial	0.00%
No	Yes	No	Yes	No	No	0.00%
No	Yes	No	Partial	Yes	Yes	25.00%
No	Yes	No	Partial	Yes	Partial	12.50%
No	Yes	No	Partial	Yes	No	0.00%
No	Yes	No	Partial	Partial	Yes	12.50%
No	Yes	No	Partial	Partial	Partial	0.00%
No	Yes	No	Partial	Partial	No	0.00%
No	Yes	No	Partial	No	Yes	0.00%
No	Yes	No	Partial	No	Partial	0.00%
No	Yes	No	Partial	No	No	0.00%

Table C2. Nonresidential Freeridership Scoring Matrix

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score
No	Yes	No	No	Yes	Yes	12.50%
No	Yes	No	No	Yes	Partial	0.00%
No	Yes	No	No	Yes	No	0.00%
No	Yes	No	No	Partial	Yes	0.00%
No	Yes	No	No	Partial	Partial	0.00%
No	Yes	No	No	Partial	No	0.00%
No	Yes	No	No	No	Yes	0.00%
No	Yes	No	No	No	Partial	0.00%
No	Yes	No	No	No	No	0.00%
No	Partial	Yes	Yes	Yes	Yes	75.00%
No	Partial	Yes	Yes	Yes	Partial	50.00%
No	Partial	Yes	Yes	Yes	No	0.00%
No	Partial	Yes	Yes	Partial	Yes	50.00%
No	Partial	Yes	Yes	Partial	Partial	25.00%
No	Partial	Yes	Yes	Partial	No	0.00%
No	Partial	Yes	Yes	No	Yes	0.00%
No	Partial	Yes	Yes	No	Partial	0.00%
No	Partial	Yes	Yes	No	No	0.00%
No	Partial	Yes	Partial	Yes	Yes	50.00%
No	Partial	Yes	Partial	Yes	Partial	25.00%
No	Partial	Yes	Partial	Yes	No	0.00%
No	Partial	Yes	Partial	Partial	Yes	25.00%
No	Partial	Yes	Partial	Partial	Partial	12.50%
No	Partial	Yes	Partial	Partial	No	0.00%
No	Partial	Yes	Partial	No	Yes	0.00%
No	Partial	Yes	Partial	No	Partial	0.00%
No	Partial	Yes	Partial	No	No	0.00%
No	Partial	Yes	No	Yes	Yes	25.00%
No	Partial	Yes	No	Yes	Partial	12.50%
No	Partial	Yes	No	Yes	No	0.00%
No	Partial	Yes	No	Partial	Yes	12.50%
No	Partial	Yes	No	Partial	Partial	0.00%
No	Partial	Yes	No	Partial	No	0.00%
No	Partial	Yes	No	No	Yes	0.00%
No	Partial	Yes	No	No	Partial	0.00%
No	Partial	Yes	No	No	No	0.00%

Table C2. Nonresidential Freeridership Scoring Matrix

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score
No	Partial	Partial	Yes	Yes	Yes	50.00%
No	Partial	Partial	Yes	Yes	Partial	25.00%
No	Partial	Partial	Yes	Yes	No	0.00%
No	Partial	Partial	Yes	Partial	Yes	25.00%
No	Partial	Partial	Yes	Partial	Partial	12.50%
No	Partial	Partial	Yes	Partial	No	0.00%
No	Partial	Partial	Yes	No	Yes	0.00%
No	Partial	Partial	Yes	No	Partial	0.00%
No	Partial	Partial	Yes	No	No	0.00%
No	Partial	Partial	Partial	Yes	Yes	25.00%
No	Partial	Partial	Partial	Yes	Partial	12.50%
No	Partial	Partial	Partial	Yes	No	0.00%
No	Partial	Partial	Partial	Partial	Yes	12.50%
No	Partial	Partial	Partial	Partial	Partial	0.00%
No	Partial	Partial	Partial	Partial	No	0.00%
No	Partial	Partial	Partial	No	Yes	0.00%
No	Partial	Partial	Partial	No	Partial	0.00%
No	Partial	Partial	Partial	No	No	0.00%
No	Partial	Partial	No	Yes	Yes	12.50%
No	Partial	Partial	No	Yes	Partial	0.00%
No	Partial	Partial	No	Yes	No	0.00%
No	Partial	Partial	No	Partial	Yes	0.00%
No	Partial	Partial	No	Partial	Partial	0.00%
No	Partial	Partial	No	Partial	No	0.00%
No	Partial	Partial	No	No	Yes	0.00%
No	Partial	Partial	No	No	Partial	0.00%
No	Partial	Partial	No	No	No	0.00%
No	Partial	No	Yes	Yes	Yes	25.00%
No	Partial	No	Yes	Yes	Partial	12.50%
No	Partial	No	Yes	Yes	No	0.00%
No	Partial	No	Yes	Partial	Yes	12.50%
No	Partial	No	Yes	Partial	Partial	0.00%
No	Partial	No	Yes	Partial	No	0.00%
No	Partial	No	Yes	No	Yes	0.00%
No	Partial	No	Yes	No	Partial	0.00%
No	Partial	No	Yes	No	No	0.00%

Table C2. Nonresidential Freeridership Scoring Matrix

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score
No	Partial	No	Partial	Yes	Yes	12.50%
No	Partial	No	Partial	Yes	Partial	0.00%
No	Partial	No	Partial	Yes	No	0.00%
No	Partial	No	Partial	Partial	Yes	0.00%
No	Partial	No	Partial	Partial	Partial	0.00%
No	Partial	No	Partial	Partial	No	0.00%
No	Partial	No	Partial	No	Yes	0.00%
No	Partial	No	Partial	No	Partial	0.00%
No	Partial	No	Partial	No	No	0.00%
No	Partial	No	No	Yes	Yes	0.00%
No	Partial	No	No	Yes	Partial	0.00%
No	Partial	No	No	Yes	No	0.00%
No	Partial	No	No	Partial	Yes	0.00%
No	Partial	No	No	Partial	Partial	0.00%
No	Partial	No	No	Partial	No	0.00%
No	Partial	No	No	No	Yes	0.00%
No	Partial	No	No	No	Partial	0.00%
No	Partial	No	No	No	No	0.00%
No	No	Yes	Yes	Yes	Yes	50.00%
No	No	Yes	Yes	Yes	Partial	25.00%
No	No	Yes	Yes	Yes	No	0.00%
No	No	Yes	Yes	Partial	Yes	25.00%
No	No	Yes	Yes	Partial	Partial	12.50%
No	No	Yes	Yes	Partial	No	0.00%
No	No	Yes	Yes	No	Yes	0.00%
No	No	Yes	Yes	No	Partial	0.00%
No	No	Yes	Yes	No	No	0.00%
No	No	Yes	Partial	Yes	Yes	25.00%
No	No	Yes	Partial	Yes	Partial	12.50%
No	No	Yes	Partial	Yes	No	0.00%
No	No	Yes	Partial	Partial	Yes	12.50%
No	No	Yes	Partial	Partial	Partial	0.00%
No	No	Yes	Partial	Partial	No	0.00%
No	No	Yes	Partial	No	Yes	0.00%
No	No	Yes	Partial	No	Partial	0.00%
No	No	Yes	Partial	No	No	0.00%

Table C2. Nonresidential Freeridership Scoring Matrix

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score
No	No	Yes	No	Yes	Yes	12.50%
No	No	Yes	No	Yes	Partial	0.00%
No	No	Yes	No	Yes	No	0.00%
No	No	Yes	No	Partial	Yes	0.00%
No	No	Yes	No	Partial	Partial	0.00%
No	No	Yes	No	Partial	No	0.00%
No	No	Yes	No	No	Yes	0.00%
No	No	Yes	No	No	Partial	0.00%
No	No	Yes	No	No	No	0.00%
No	No	Partial	Yes	Yes	Yes	25.00%
No	No	Partial	Yes	Yes	Partial	12.50%
No	No	Partial	Yes	Yes	No	0.00%
No	No	Partial	Yes	Partial	Yes	12.50%
No	No	Partial	Yes	Partial	Partial	0.00%
No	No	Partial	Yes	Partial	No	0.00%
No	No	Partial	Yes	No	Yes	0.00%
No	No	Partial	Yes	No	Partial	0.00%
No	No	Partial	Yes	No	No	0.00%
No	No	Partial	Partial	Yes	Yes	12.50%
No	No	Partial	Partial	Yes	Partial	0.00%
No	No	Partial	Partial	Yes	No	0.00%
No	No	Partial	Partial	Partial	Yes	0.00%
No	No	Partial	Partial	Partial	Partial	0.00%
No	No	Partial	Partial	Partial	No	0.00%
No	No	Partial	Partial	No	Yes	0.00%
No	No	Partial	Partial	No	Partial	0.00%
No	No	Partial	Partial	No	No	0.00%
No	No	Partial	No	Yes	Yes	0.00%
No	No	Partial	No	Yes	Partial	0.00%
No	No	Partial	No	Yes	No	0.00%
No	No	Partial	No	Partial	Yes	0.00%
No	No	Partial	No	Partial	Partial	0.00%
No	No	Partial	No	Partial	No	0.00%
No	No	Partial	No	No	Yes	0.00%
No	No	Partial	No	No	Partial	0.00%
No	No	Partial	No	No	No	0.00%

Table C2. Nonresidential Freeridership Scoring Matrix

Already Ordered or Installed	Already In Budget	Purchased Same Measure Previously	Would have Installed without Program	Same Efficiency	Planning to Install Soon	Score
No	No	No	Yes	Yes	Yes	12.50%
No	No	No	Yes	Yes	Partial	0.00%
No	No	No	Yes	Yes	No	0.00%
No	No	No	Yes	Partial	Yes	0.00%
No	No	No	Yes	Partial	Partial	0.00%
No	No	No	Yes	Partial	No	0.00%
No	No	No	Yes	No	Yes	0.00%
No	No	No	Yes	No	Partial	0.00%
No	No	No	Yes	No	No	0.00%
No	No	No	Partial	Yes	Yes	0.00%
No	No	No	Partial	Yes	Partial	0.00%
No	No	No	Partial	Yes	No	0.00%
No	No	No	Partial	Partial	Yes	0.00%
No	No	No	Partial	Partial	Partial	0.00%
No	No	No	Partial	Partial	No	0.00%
No	No	No	Partial	No	Yes	0.00%
No	No	No	Partial	No	Partial	0.00%
No	No	No	Partial	No	No	0.00%
No	No	No	No	Yes	Yes	0.00%
No	No	No	No	Yes	Partial	0.00%
No	No	No	No	Yes	No	0.00%
No	No	No	No	Partial	Yes	0.00%
No	No	No	No	Partial	Partial	0.00%
No	No	No	No	Partial	No	0.00%
No	No	No	No	No	Yes	0.00%
No	No	No	No	No	Partial	0.00%
No	No	No	No	No	No	0.00%

Appendix 5

2010 – 2011 Washington Electric Conditions
Relating to Avista's 2010-2011 Biennial Conservation Plan

Washington State Utilities and Transportation Commission

May 13, 2010

2010 – 2011 Washington Electric Conditions

On May 13, 2010, the Commission approved, with conditions, Avista's 2010-2011 Biennial Conservation Plan, and associated targets, by Order No. 01 in Docket No. UE-100176. The conditions specified multiple requirements including programmatic, evaluation, reporting, stakeholder involvement, cost-recovery and other items.

Conditions From Docket UE-100176	Status
Company Retains Responsibility. Nothing within this Order relieves Avista of the sole responsibility for complying with RCW 19.285, which requires Avista to use methodologies consistent with those used by the Pacific Northwest Electric Power and Conservation Planning Council ("Council"). Specifically, the Conditions regarding the need for a high degree of transparency, and communication and consultation with external stakeholders, diminish neither Avista's operational authority nor its ultimate responsibility for meeting the biennial conservation target approved herein.	✓
Avista must maintain and use an external conservation Advisory Group of stakeholders to advise the Company on the topics described in subparagraphs (i) through (x) below. To meet this condition, Avista may continue to use its External Energy Efficiency Board created under Docket UE-981126, and its Integrated Resource Planning Technical Advisory Committee created under WAC 480-100-238.	✓
1A Advisory Group shall advise on development and modification of protocols to evaluate, measure, and verify energy savings in Avista's programs	✓
1B Advisory Group shall advise on development of conservation potential assessments under RCW 19.285.040(1)(a) and WAC 480-109-010(1)	✓
1C Advisory Group shall advise on methodology inputs and calculations for updating cost-effectiveness	✓
1D Advisory Group shall advise on review of data sources and values used to update supply curves	✓
1E Advisory Group shall advise on consideration of the need for tariff modifications or mid-course program corrections	✓

1F Advisory Group shall advise on review appropriate level of and planning for marketing conservation programs and incentives to customers for measures and services	✓
1G Advisory Group shall advise on consideration of issues related to conservation programs for customers with limited income	✓
1H Advisory Group shall advise on comparing program achievement results with annual and biennial targets	✓
1I Advisory Group shall advise on review of conservation program budgets and actual expenditures compared to budgets	✓
1J Advisory group should meet quarterly at a minimum and Avista permit any member to request an additional meeting with reasonable notice	✓
2A(1) Submit annual budgets to Advisory Group and Commission no later that November 1 each year	✓
2A(1a) In odd-numbered years, annual budget may be submitted as part of Biennial Conservation Plan	✓
2A(1b) In even-numbered years, annual budget may be submitted as part of DSM Business Plan	✓
2B Avista must provide proposed budget in a detailed format with a summary page indicating the proposed budget and savings for each electric conservation program and subsequent supporting spreadsheets providing further detail for each program and line item shown in summary sheet	✓
3A Avista must maintain its conservation tariffs, with program descriptions, on file with the Commission	✓
3B Program details about specific measures, incentives, and eligibility requirements must be filed as tariff attachments or as revisions to Company's DSM Business Plan	✓
3C Avista may propose other methods for managing its program details in Biennial Conservation Plan required, after consultation with Advisory group	✓

4A Avista has identified a number of potential conservation measures as qualifying measures in its Revised Report filed April 16, 2010. Commission is not obligated to accept savings identified in Revised Report. Avista must demonstrate prudence and cost-effectiveness of conservation programs to the Commission after the savings are achieved.	✓
4B Except as provided in subparagraph 4C, Avista must use Council's Regional Technical Forum's ("RTF's") "deemed" savings for electricity measures	✓
4C If savings amounts for prescriptive programs have not been established by the RTF, estimates must be based on a rigorous impact evaluation that has verified savings levels, and be presented to Advisory Group for comment	✓
4D When Avista proposes a new program, it must present it to Advisory Group for comment with program details fully defined. After consultation with Advisory Group Avista must file a revision to its DSM Business Plan	✓
4E Avista must provide opportunities for Advisory Group to review and assist with development of evaluation, measurement, and verification protocols for conservation programs	✓
4F Avista must spend between 3 and 6 percent of conservation budget on evaluation, measurement, and verification (EM&V), including a reasonable proportion on independent, third-party EM&V. Must perform EM&V annually on a multi-year schedule of selected programs such that over EM&V cycle all major programs are covered. EM&V function includes impact, process, market, and cost test analyses.	✓
4F (cont.) Results must verify level at which claimed energy savings have occurred, evaluate existing internal review processes, and suggest improvements to the program and ongoing EM&V processes. An annual independent, third-party EM&V report involving analysis of program impacts and process impacts must be part of Annual report on Conservation Acquisition. Avista may ask Commission to modify spending band following full Advisory Group consultation.	✓
5A All Sectors included-Avista must offer a mix of tariff-based programs that ensure it is serving each customer sector, including programs targeted to limited-income subset of residential customers. Modifications to programs must be filed with Commission as revisions to tariffs or as revisions to Avista's DSM Business Plan as appropriate.	✓
5B Outreach on programs-Avista must establish a strategy and proposed implementation budget for informing participants about program opportunities inrelevant market channels for each of its energy efficiency programs. Must share strategies and budgets with Advisory Group for review and comments, and provide updates at Advisory Group meetings.	✓

5C Incentives and Conservation Program Implementation-Avista must offer a cost-effective portfolio of programs in order to achieve all available conservation that is cost-effective, reliable, and feasible. Programs and incentives may be directed to consumers, retailers, or trade allies as appropriate for measures that save energy. Incentive levels and other methods of encouraging energy conservation need to be periodically	✓
5C (cont.) examined to ensure they are neither too high nor too low. Incentive levels and implementation methods should not unnecessarily limit acquisition of all achievable energy conservation.	✓
5D Conservation Efforts without approved EM&V Protocol-Avista may spend up to 10 percent of conservation budget on programs whose savings impact has not yet been measured as long as overall portfolio of conservation passes Total Resource Cost (TRC) test as modified by Council. Programs may include educational, behavior change, and pilot projects.	✓
5D (cont.) Company may ask Commission to modify this spending limit following full Advisory Group consultation.	✓
6A Six-Month Report on Conservation Acquisition, comparing budgeted to actual kWh's and expenditures	✓
6B 2011 DSM Business Plan, containing any changes to program details and an annual budget	✓
6C 2010 Annual Report on Conservation Acquisition, including an evaluation of cost effectiveness and comparing budgets to actuals	✓
6D Revisions to cost recovery tariff with requested effective date of July 1, 2011	✓
6E Six-Month Report on Conservation Acquisition, comparing budgeted to actual kWh's and dollar activity	✓
6F Biennial Conservation Plan including revised program details and program tariffs, together with identification of 2012-2021 achievable conservation potential, requesting effective date of January 1, 2012. This filing will satisfy the requirement in WAC 480-109-010 to file 10-year Achievable Conservation Potential and Biennial Conservation Target on/before Jan 31.	✓

6G 2011 annual Report on Conservation Acquisition, including an evaluation of cost-effectiveness	✓
6H Two-year report on conservation program achievement . This filing is the one required in WAC 480-109-040(1) and RCW 19.285.070, which require that the report also be filed with the Washington Department of Commerce.	✓
7A Must consult with Advisory Group to facilitate completion of a 10-year conservation potential analysis by Nov 1, 2011. Must be based on current conservation potential assessment study of Avista's service area within Washington State. May be conducted within context of Avista's integrated resource plan. If use supply curves that make up conservation potential in Council's Northwest Power Plan, supply curves must be updated for new assumptions and measures.	✓
7B Must consult with Advisory Group between July 1, 2011 and October 31, 2011 to identify achievable conservation potential for 2012-2021 and set annual and biennial targets for 2012-2013 biennium, including revisions to program details.	✓
7C During consultation described above, Avista must review with Advisory Group whether standard-efficiency fuel conversion savings should be included in 2012-2013 Biennial Conservation Target.	✓
8A Primary cost effectiveness test is Total Resource Cost (TRC) as modified by Council, modified calculation of TRC includes quantifiable non-energy benefits, a risk adder, and a 10% conservation benefit adder that increases avoided costs by 10%	✓
8B Avista must provide calculations of Program Administrator Cost test (also called Utility Cost Test), Ratepayer Impact Measure test, and Participant Cost test	✓
8C Overall conservation cost-effectiveness must be evaluated at portfolio level. Costs in cluded in portfolio level analysis include conservation-related administrative costs. Avista must continue to evaluate measure and program level cost tests.	✓
9A Annual tariff rider filing will recover future year's budgeted expenses and any significant variances between budgeted and actual income and expenditures during previous period	✓
9B Funds collected through rider must be used on approved conservation programs and their administrative costs	✓

9C Rate spread and rate design must match Avista's underlying base volumetric rates	✓