Opinion Dynamics

PACIFICORP UTAH LOW-INCOME WEATHERIZATION

EVALUATION FOR PROGRAM YEARS 2022-2023

JUNE 30, 2026

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I. EXECUTIVE SUMMARY

This report presents findings from the process and impact evaluation of Rocky Mountain Power's Low-Income Weatherization Program (referred to as the "Program" throughout this report) in operation in Utah during the 2022 and 2023 program years. Opinion Dynamics, an E Source company, performed the evaluation on behalf of Rocky Mountain Power.

The Utah Department of Workforce Services, Housing and Community Development Division (HCD), known for serving low-income customers, implements the Program. HCD receives funding from Rocky Mountain Power to target low-income customers with building weatherization services.[1] The agencies focus on existing single-family (including manufactured) homes and multifamily properties. Multifamily properties qualify for the program if at least 66% of tenant units are occupied by low-income customers of Rocky Mountain Power.[2] Through the Program, participants receive energy efficiency measures at no cost to them. Agency staff begin by conducting an energy audit on participant homes to assess the condition of the home and identify what energy-saving measures are needed. The Program offers a variety of energy-efficiency measures such as insulation, duct sealing, window replacements, and refrigerator replacements. Measures are typically directly installed by agency staff, although some smaller measures, such as LED bulbs and faucet aerators, may be self-installed by the homeowner.

The core objectives for this evaluation were to (1) document and measure effects of the Program (energy and non-energy) and (2) identify areas of potential improvement. For the process evaluation, we reviewed program materials, interviewed agency staff, and analyzed participant responses to a telephone survey. To quantify energy savings, we conducted an engineering analysis. This report also includes the results from the program's cost-effectiveness tests conducted by a third-party consultant, Apex Analytics.

I.I PROCESS RESULTS

The process evaluation examined Program operations from multiple perspectives. Rocky Mountain Power and HCD have worked together for several years to deliver the Program. Over this time, HCD and its subcontracting agencies have developed expertise in implementing the Program despite the complex funding environment surrounding low-income weatherization services. HCD combines funds from Rocky Mountain Power with those from government organizations and other utilities to reach more low-income customers, demonstrating a best practice in low-income energy efficiency program delivery.[3] It is common for utilities to work with nonprofit agencies to promote their energy efficiency programs to low-income customers since these organizations generally have well-established relationships with eligible communities already.

HCD maintains a waitlist of customers who are eligible and approved to receive weatherization services. Customers are placed on the waitlist after meeting income qualifications and confirming their home has not received weatherization services in the last 15 years. HCD uses a point system to determine where customers are positioned on its list, with households including young, disabled, elderly, and particularly energy-burdened residents receiving more points than other households. HCD indicated they observe a wait time of approximately two to twelve months until an eligible and approved applicant receives services; however, HCD indicated that this wait is longer in the Wasatch Front than other areas of their service territory. Survey findings show that nearly two-thirds (64%) of surveyed 2022–2023 participants received weatherization services within six months of submitting an application.

[1] Weatherization refers to the process of making a building more energy efficient.
[2] "Low income" qualifications are based on 200% of federal poverty guidelines or 60% of the state median income, whichever is greater.
[3] Drehobl, Ariel and Castro-Alvarez, Fernando, "Low Income Energy Efficiency Programs: A Baseline Assessment of Programs Serving the 51 Largest Cities," ACEEE, November 2017.

During participation, agency staff provide Program participants with tips about ways to save energy in their homes. Coupling informal energy education with home audits and measure installation is one way implementation staff take advantage of their visits to help induce behavioral changes that may further reduce their energy costs. It is also considered a best practice of energy efficiency programs designed to serve low-income customers.[4] Most (71%) surveyed participants recalled this education, and of those, 97% took the actions recommended by agency staff. The most common actions taken included turning off lights when not in use and seasonally lowering/increasing the thermostat temperature. Using a scale from 0 to 10, where 0 means "not at all helpful" and 10 means "extremely helpful," most surveyed participants (74%) rated the helpfulness of the energy education at an 8 or higher, with an average rating of 8.7. Over half (59%) of the participants recalled receiving ways to improve health and safety (H&S) in their home.

In the telephone survey, we asked participants if the air quality, appearance, and comfort improved, stayed the same, or worsened after they received services. According to survey responses, 68% of participants experienced an improvement in their home's comfort. Air quality (55%) and appearance of the home (32%) also improved for many participants. This provides further evidence of the positive impact of the Program beyond energy-saving benefits.

Participant experience with the Program was very positive. A majority of surveyed participants (82%) reported being "completely satisfied" with the Program, with 93% saying they would recommend the Program to others.

1.2 IMPACT RESULTS

An engineering analysis was conducted to estimate ex-post energy savings from the Program. Overall, the Program achieved 68% of its ex-ante gross savings for the full evaluation period (2022-2023). The lower realization rate is due to an error in the estimation of ex-ante savings. Over one-quarter (26%) of the participant population included both per-measure savings assumptions as well as per-participant savings assumptions, resulting in double-counted ex-ante savings for these participants. Without this error, the overall realization rate would have been 108%. Table 1 presents the ex-post net savings for each program year and in total.

Table 1. Ex-Ante Gross and Ex-Post Net Energy Savings (kWh)

Program Year	Participation	Ex-Ante Gross Energy Savings (kWh)	Ex-Post Net Energy Savings (kWh)	Realization Rate
2022	229	249,655	156,365	63%
2023	269	227,813	168,485	74%
Total	**498**	**477,468**	**324,850**	**68%**

Note: For this low-income program, the net-to-gross ratio is assumed to equal 1, and therefore, gross savings are equal to net savings.

1.3 COST-EFFECTIVENESS RESULTS

Apex Analytics estimated the cost-effectiveness of Rocky Mountain Power's 2022–2023 Utah Program without non-energy benefits (NEBs). The Program passes the PacifiCorp Total Resource Cost Test (PTRC), Total Resource Cost Test (TRC), and Utility Cost Test (UCT).

[4] Kushler, Martin, York, Dan and Witte, Patti, "Meeting Essential Needs: The Results of a National Search for Exemplary Utility-Funded Low-Income Energy Efficiency Programs," ACEEE Report Number U053, September 2005.

Table 2. 2022–2023 Program Benefit/Cost Ratios (Without NEBs)

Program Year	PTRC	TRC	UCT	RIM	PCT[a]
2022–2023	10.04	9.13	1.18	0.52	n/a

[a] Low-income programs have no customer costs and therefore a cost benefit ratio cannot be calculated for this test.

CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation results, our team offers the following recommendations:

- **Conclusion:** Rocky Mountain Power is adhering to best practices by delivering the Program through trusted, community-based agencies with established relationships in low-income communities. These agencies are well positioned to braid utility, state, and federal funding to maximize the Program's reach and are delivering a high-quality participant experience, as reflected in participant feedback. All participants we spoke with affirmed this, reporting they would recommend the Program to others.
- **Conclusion:** Most surveyed participants (36 of 44) reported high satisfaction with their Program experience (rating of 8 or higher on 0-10 scale); however, eight respondents indicated moderate to low satisfaction (rating of 7 or less) due to installations being completed incorrectly or damage or mess left behind in their home by implementation staff.
  - **Recommendation:** Rocky Mountain Power should work closely with agency staff to ensure installers are adequately trained and consistently follow proper installation protocols. Consider offering refresher training(s) to strengthen installers' skills and reinforce knowledge of measures and installation procedures.
  - **Recommendation:** Rocky Mountain Power should re-evaluate the Program's post-installation inspection process to ensure all measures are completed to specification and that no damage or debris is left in participants' homes. Strengthening quality assurance protocols, such as implementing standardized inspection checklists or follow-up verification, can help identify and resolve issues, improve workmanship consistency, and enhance the overall participant experience.
- **Conclusion:** The Program achieved 324,850 kWh in ex-post net energy savings during the 2022 and 2023 program years, resulting in a realization rate of 68% for the evaluation period. The lower realization rate is due to an error in the ex-ante saving calculation, where the Program double-counted energy savings for 26% of the population, claiming both measure-level and participant-level savings.
  - **Recommendation:** Rocky Mountain Power should apply the evaluated measure-level deemed savings values when calculating ex-ante savings for the next Program cycle and continue to apply the most recent evaluated assumptions when forecasting future Program savings. Per-participant estimations often result in less accurate forecasting because the measure mix installed each program year differs based on the agency's leveraged funding sources and the homes that participate.

2. INTRODUCTION

Rocky Mountain Power's Low-Income Weatherization Program (referred to as the "Program" throughout this report) provides energy efficiency measures to eligible residential participants through a partnership with the Utah Department of Workforce Services, Housing and Community Development (HCD). HCD subcontracts with the following eight nonprofit agencies to install energy efficiency measures in the homes of eligible households:

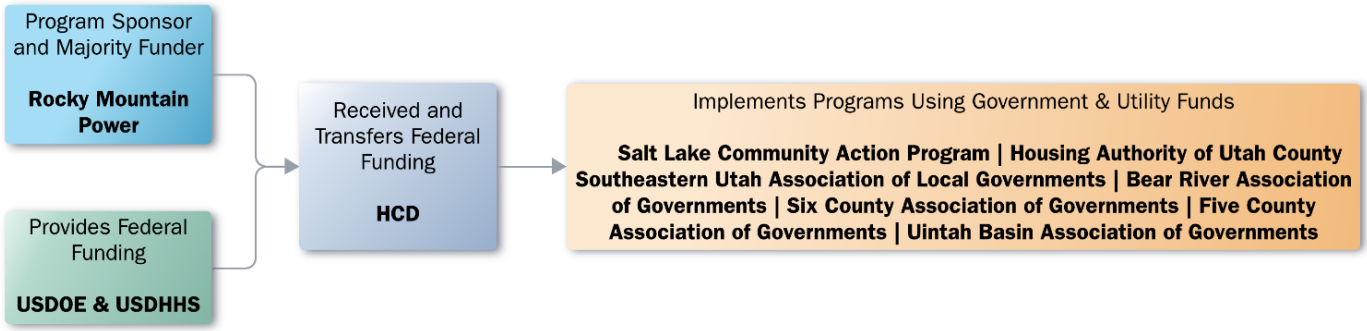
- Bear River Association of Governments
- Salt Lake Community Action Program
- Housing Authority of Utah County
- Six County Association of Governments
- Five County Association of Governments
- Uintah Basin Association of Governments
- Southeastern Utah Association of Local Governments
- Mountainland Association of Governments

The agencies serve different counties covered by Rocky Mountain Power's Utah service territory using funds from the utility, as well as governmental funding sources.[5] Partnering with agencies that historically serve Utah's low-income communities streamlines Rocky Mountain Power's access to the participants targeted by this program.

Rocky Mountain Power provides the agencies with 50% of the cost of eligible weatherization measures installed. Agencies are also reimbursed for administrative costs based on 10% of Rocky Mountain Power's installed measure costs. To cover any remaining costs for installing weatherization measures, the implementing agencies leverage federal funding from the United States Department of Energy (DOE) and the United States Department of Health and Human Services (DHHS). HCD administers the federal funds to the implementing agencies and monitors completed weatherization projects.

Leveraging utility, state, and federal funding sources allows the agencies to provide comprehensive weatherization services to more low-income households than they may have otherwise. Figure 1 displays Rocky Mountain Power's Utah Program funding sources and roles of oversight and implementation.

Figure 1. Funding and Oversight for Rocky Mountain Power's Low-Income Weatherization Program



[5] State of Utah, Workforce Services. "Public Programs and Resources." Housing and Community Development. Updated 2024. https://jobs.utah.gov/housing/scso/index.html. Program names and counties served by the non-profit agencies are provided on the State of Utah's Workforce Services website.

2.1 PROGRAM IMPLEMENTATION

Program implementation involves the following steps, which are detailed in the 2023 Utah Energy Efficiency and Peak Reduction Annual Report:[6]

- Income verification based on HCD guidelines to ensure participants qualify for program participation[7]
- Energy audit using a DOE-approved tool to determine eligible measures (audit results must indicate a savings-to-investment ratio [SIR] of 1.0 or greater)
- Installation of eligible measures
- Post-inspections of all projects
- Billing notification from HCD to Rocky Mountain Power within 60 days of job completion, which must be accompanied by a homeowner agreement, invoice form with installed measures, and associated measure cost for each weatherized home

The Program is available to low-income residential customers in existing single-family (including manufactured) and multifamily homes served by Rocky Mountain Power in the state of Utah. Duplexes and fourplexes are eligible if low-income tenants occupy one-half of the building. Larger multifamily properties are also eligible if low-income qualifying tenants occupy at least 66% of the units. “Low income” eligibility is based on 200% of the federal poverty guidelines.

Agencies install weatherization measures for participants based on heating fuel type and need. Measures vary by household and are classified as either “major” or “supplemental.” Major measures include floor, wall, and ceiling insulation, and window replacements, while supplemental measures include LED bulbs and fixtures, duct sealing and insulation, attic ventilation, ground cover and other vapor barrier materials, evaporative cooler replacement, window air conditioner replacement, refrigerator replacement, thermal doors, timed thermostats, weather stripping, furnace fans, energy efficient showerheads, pipe insulation, and faucet aerators. Major measures and a portion of supplemental measures are only available where an electric heating system heats at least 51% of the home.

2.2 EVALUATION OBJECTIVES

Program evaluation objectives are listed in Table 3, along with the evaluation activity used to address each objective.

Table 3. Evaluation Objectives by Evaluation Activities

Objective	Process Evaluation	Impact Evaluation
Document and measure effects of the Program	✓	✓
Verify measure installation and savings		✓
Review program operations	✓	
Document all other funding used by agencies to provide no-charge services to participants	✓	
Provide data to support Program cost-effectiveness assessments		✓
Identify areas of potential improvement	✓	✓
Document compliance with regulatory requirements	✓	
Survey participants and agency staff	✓	

[6] https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/environment/dsm/utah/UT_Energy_Efficiency_and_Peak_Reduction_Report_2023.pdf

[7] https://jobs.utah.gov/housing/scso/wap/index.html

3. DATA SOURCES AND METHODOLOGY

In this section, we review the data sources and methodologies used to conduct the research from the process and impact evaluations and cost-effectiveness tests.

3.1 PROGRAM TRACKING DATA

We requested and received program tracking data for program years 2022 and 2023 to support both impact and process evaluations. These data are tracked at the measure level; therefore, program participants who received more than one measure are listed multiple times.

We received the following key variables in the program tracking data:

- Customer name, address, and phone number
- Project ID
- Bill account number (customer identifier)
- Implementation agency
- Cost recovery date
- Project creation date
- Project last update date
- Measure category, type, sub-type, and name
- Measure level kWh/year savings for some measures
- Direct install costs
- Measure costs

For the Utah evaluation, we used the program tracking data to identify participants and the measures installed to develop the participant telephone survey sample. Program tracking data were also used to support the engineering analysis.

3.2 PROCESS EVALUATION

For the process evaluation, we interviewed agency staff and surveyed Program participants.

3.2.1 AGENCY INTERVIEWS

We conducted an interview with an HCD representative. The agency interview helped inform our review of Program operations, compliance with regulatory requirements, as well as major accomplishments and challenges related to Program implementation.

3.2.2 PARTICIPANT SURVEY

We fielded a telephone survey with customers who participated in the Program between 2022 and 2023. We used information gathered through the participant telephone survey to verify the installation of measures, estimate lighting in-service rates (ISRs),[8] and inform process-related findings.

Of the 498 Program participants, we had valid phone numbers for 430. A total of 44 participants completed the survey, yielding a response rate of 13%, and a cooperation rate of 77% (Table 4).[9]

Table 4. Utah Customer Telephone Survey

Population Frame	Unique Telephone Numbers	Final Survey Responses	Survey Response Rate	Survey Cooperation Rate
498	430	44	13%	77%

Up to three attempts were made to reach each Program participant. Final dispositions for survey outreach are listed in Table 5.

Table 5. Participant Survey Disposition

Survey Disposition	Sample
Complete	**44**
Answering machine	221
Disconnected	39
Callback	55
Call blocked	19
No answer	15
Refusal	13
Language barrier	11
Business number	8
Busy	4
Do not call list	1
Total	**430**

3.3 IMPACT EVALUATION

We performed an engineering review of per-measure deemed savings and developed revised assumptions for the ex-post analysis. As part of the engineering review, we updated the per-measure savings assumptions used in the previous evaluation with more current resources. Appendix B provides detailed ex-post equations, assumptions, and sources for each Program measure. We estimated program-level savings by multiplying the per-measure savings by the measure quantity provided in the Program tracking database.

[8] In-service rates represent the rate at which measures that were originally installed remain installed at the time of the survey (i.e., have not been since removed).

[9] Response rate is calculated using American Association for Public Opinion Research (AAPOR) Response Rate 3. The cooperation rate depicts the proportion of eligible respondents who completed the survey out of those who were contacted.

We applied an ISR of 79% for lighting measures based on participant survey responses and assumed an ISR of 100% for all non-lighting measures.

3.4 COST EFFECTIVENESS

Inputs for cost-effectiveness testing were calculated through the engineering analysis. We provided these inputs to Apex Analytics, which conducted the final modeling and provided outputs for this report.

4. RESULTS

This section details the results from the process and impact evaluations and cost-effectiveness testing conducted for the 2022 and 2023 program years.

4.1 PROCESS EVALUATION

In the following sections, we present findings from the agency interviews and Program participant survey.

4.1.1 AGENCY PERSPECTIVE

We interviewed the weatherization program manager from HCD in December 2025. HCD subcontracts with eight local government and Community Action programs that support HCD low-income weatherization projects on behalf of Rocky Mountain Power. We spoke with HCD to gain a deeper understanding of the Program's operations, how funds from multiple sources are used to service customers, and any key areas of improvement that could be made to the Program. We present HCD's perspective on topics we addressed during the interview in Table 6.

Table 6. Agency Feedback

Topic	Feedback
Balance of Funding	During the evaluation period, HCD weatherized 758 total homes, of which over 60% were customers of Rocky Mountain Power. HCD leverages Rocky Mountain Power funds to supplement funding from government sources (i.e., DOE and Low-Income Home Energy Assistance Program (LIHEAP)) and other utilities to maximize the number of homes weatherized per year. The Utah weatherization agencies expend federal funds to install the measures.
Waitlist Process	Customers are initially placed on a waitlist when they apply for the Program. The waitlist is maintained at the subgrantee agency level for the service area the agency covers. HCD staff estimated that 80% of customers on the waitlist are referred and directly added to the list from their LIHEAP application. A priority point system determines a customer's position on the waitlist; households with the most points appear at the top of the waitlist. By federal statute, agencies provide a preferential status (through an increase in points allocated) to households with elderly or disabled occupants, young children (preschool age and younger), high-energy users, and customers with a high energy burden. Customers at the top of the waitlist are called first, and a home energy audit is completed. Once services are received, the agency removes them from the list. HCD staff reported that customers typically wait two to twelve months to receive services. Based on survey findings, most customers (64%) who participated during the evaluation period (2022-2023) received weatherization services within six months of applying.
Current Waitlist	At the time of the interview, HCD could not provide the total waitlist count but reported that 44 households were on the Wasatch Front waitlist, the region with the highest number of clients in its service territory.
Challenges and Barriers	The agency reported that several staffing changes had occurred since the beginning of the evaluation period, but that these changes have not resulted in any challenges or barriers. HCD indicated that a previous version of its audit software produced higher payback estimates across a broader set of measures compared to the current software, enabling the installation of more upgrades. In contrast, the current required audit tool generates lower payback estimates, which limits the number of measures that can be implemented - even when additional measures may provide meaningful energy savings for customers. Agency staff noted that this constraint reduces their ability to deliver maximum benefits to Program participants.
Marketing and Outreach	Most participation is based on referrals from LIHEAP; however, some customers contact the agency directly to receive services. Agency staff indicated that they strive to balance maintaining a steady pipeline of projects for staff with keeping the waitlist manageable so homes can be weatherized within a reasonable timeframe.

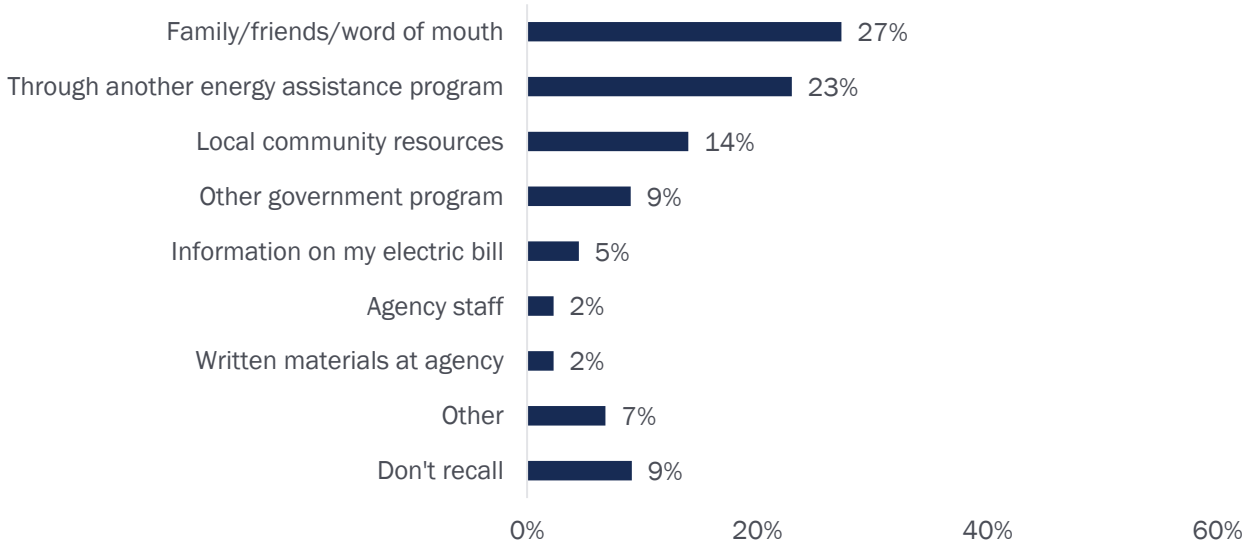
4.1.2 PARTICIPANT PERSPECTIVE

We used a telephone survey to collect data about participant household characteristics and Program experience. Based on demographic data, approximately 84% of surveyed participants (37 of 44) resided in single-family homes, 9% lived in mobile or manufactured homes (4 of 44), and the remaining three participants lived in a duplex, townhouse, or apartment. Nearly all respondents (91%; 40 of 44) owned their homes, while a minority (1%; 3 of 44) reported renting their residence. The final surveyed participant said that their home is part of a trust that they do not own.

PROGRAM AWARENESS

Surveyed participants were asked how they discovered the Program. As shown in Figure 2, respondents most frequently learned about the Program through word of mouth of family, friends, and neighbors (27%; 12 of 44). This finding is consistent with the previous evaluation, which also identified word of mouth as the primary way participants learned about the Program. Other top channels included energy assistance initiatives (23%; 10 of 44) and local community resources (14%; 6 of 44), such as the public library or church. A minority of respondents could not recall how they heard about the Program (9%; 4 of 44).

Figure 2. How Participants Learned of the Program (n=44)



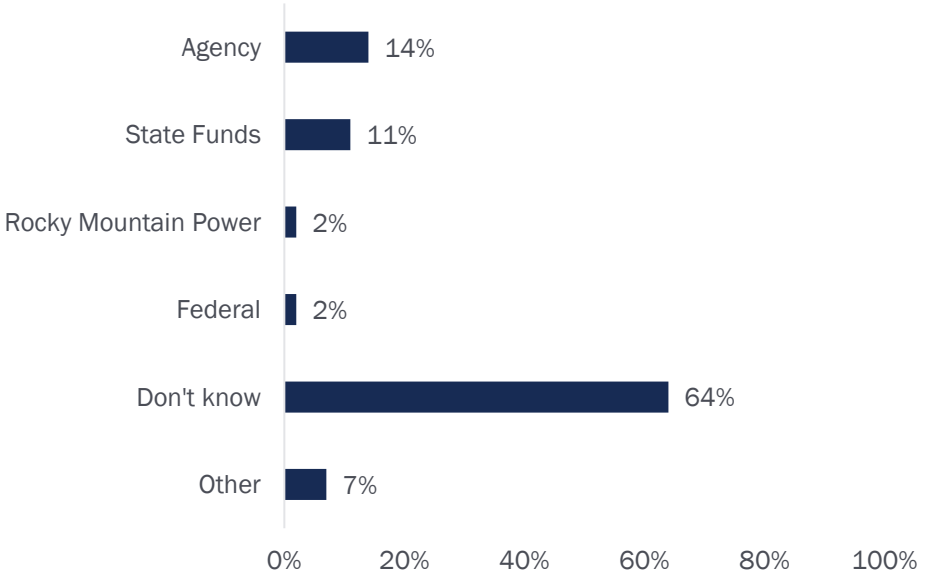
Note: Other responses include Medicaid, a WIC pamphlet, and the hospital.

Of the 44 participants we surveyed, only one identified Rocky Mountain Power as a funding source of the Program (Figure 3). This finding is consistent with historical trends, which show that Program participants have often had difficulty recognizing Rocky Mountain Power as a funding source for the services they receive. Notably, participants' ability to identify Rocky Mountain Power as a funding source has decreased from earlier evaluation periods.[10]

Most respondents could not identify any funding sources (64%; 28 of 44), and those who could often only associated the Program with the implementation agency, not Rocky Mountain Power.

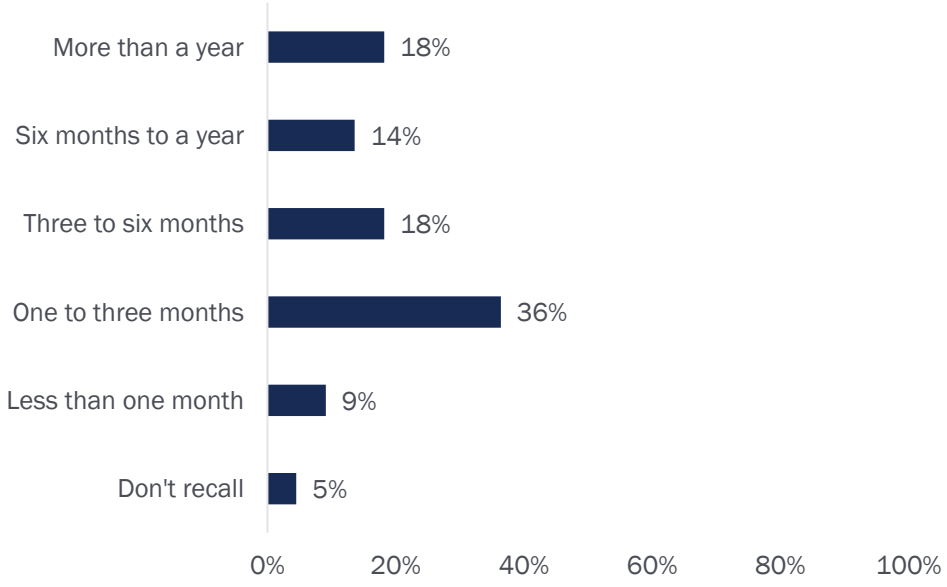
[10] Eleven percent of respondents identified Rocky Mountain Power as a funding source in the 2018-2019 evaluation.

Figure 3. Participant Awareness of Program Funding Sources (n=44)



Nearly two-thirds of respondents (64%; 28 of 44) received services within six months of submitting an application, with almost half (45%; 20 of 44) receiving services within three months. However, just under one-fifth (18%; 8 of 44) waited more than a year to receive services after applying (Figure 4). These findings are similar to those observed during the previous evaluation.

Figure 4. Time Between Application Process and Weatherization Services (n=44)



ENERGY EDUCATION

The opportunity to present energy-saving recommendations during audits or measure installations has positively impacted customers and likely led to behavioral changes that enhance the energy savings from the Program. As shown in Figure 5, most survey respondents (71%; 31 of 44) recalled receiving tips from agency staff about actions they could take to save energy. Of those, nearly all (97%; 30 of 31) took at least some of the recommended energy-saving actions

since participating in the Program. The one participant who had not carried out any of the energy-saving actions shared that they intend to act on the recommendations in the future.

Figure 5. Recollection of Energy Education from Weatherization Staff and Whether Actions Were Taken (n=44)

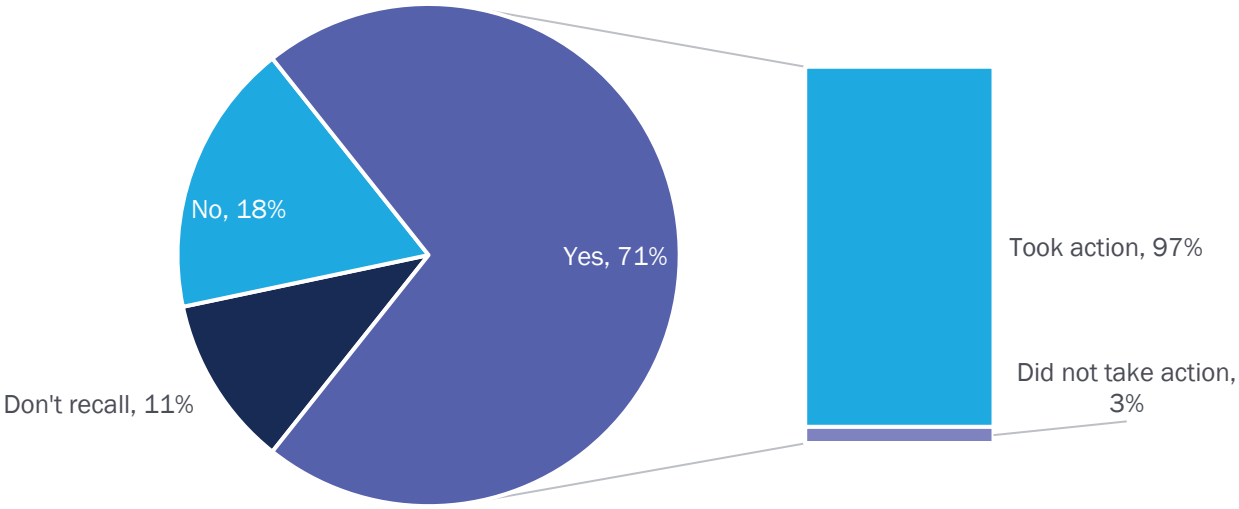
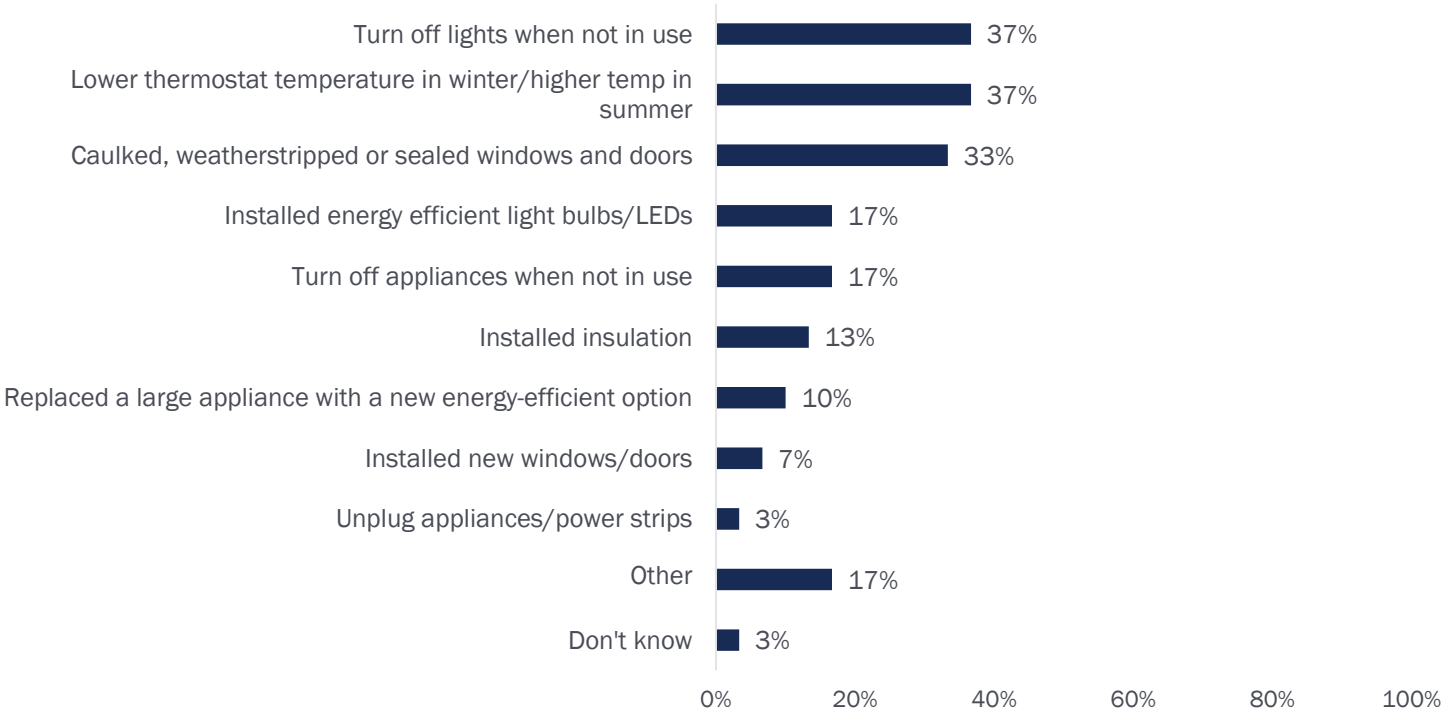


Figure 6 displays the top energy-saving actions taken by participants who acted on recommendations provided by agency staff. The two most common actions taken included turning off lights when not in use and seasonally adjusting the thermostat temperature (i.e., increasing in summer, decreasing in winter). Energy saving actions included in the other category include keeping windows and doors closed (7%; 2 of 30), and nonspecific responses about conserving energy usage (10%; 3 of 30).

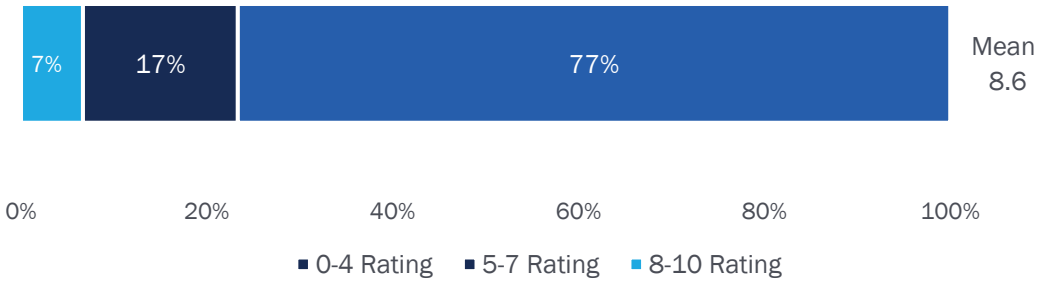
Figure 6. Top Energy Actions Taken (n=30)



Note: Multiple responses allowed.

Participants provided positive feedback on the energy education received from agency staff; (77%; 23 of 30) of participants indicated the education they received was "extremely helpful" (Figure 7).

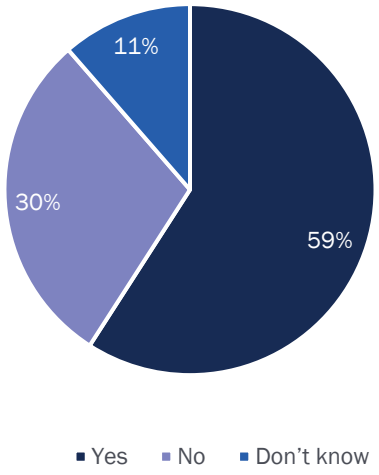
Figure 7. Helpfulness of Energy Education (n=30)



Note: The scale is from 0 to 10, where 0 is "Not at All Helpful" and 10 is "Extremely Helpful." Percentages do not sum to 100% due to rounding. The analysis excludes one respondent who indicated they did not know how they would rate the energy education.

In addition to providing tips for saving energy at home, over half of surveyed participants (59%; 26 of 44) reported that agency staff discussed health and safety improvements with them (Figure 8).

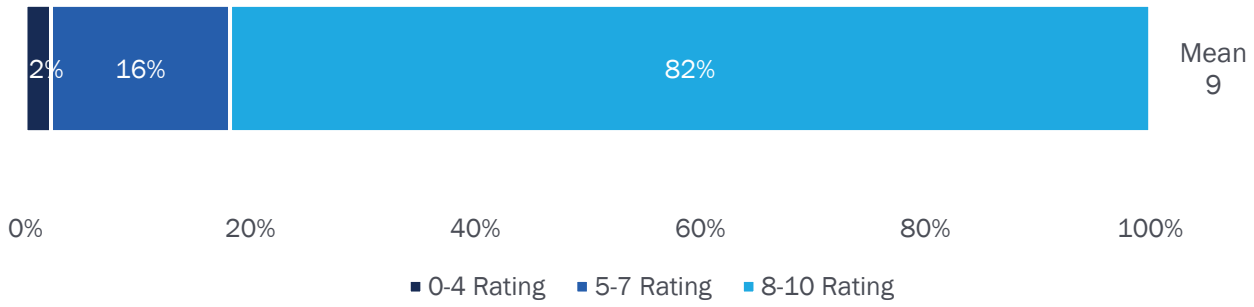
Figure 8. Whether Agency Staff Discussed Ways to Improve Health and Safety in the Home (n=44)



PROGRAM DELIVERY AND SATISFACTION

Surveyed participant feedback was positive, with the majority (82%; 36 of 44) sharing they were "completely satisfied" with their Program experience (Figure 9). The remaining eight respondents who were not completely satisfied with their experience (score of 7 or lower on a 0 to 10 scale) shared that this was due to projects not done correctly, (7 of 8) or damage or mess left behind after the services were completed (1 of 8). Verbatim responses provided by customers are included in Table 7 below. Despite varying levels of satisfaction with the Program, all surveyed participants indicated that they would recommend the Program to others.

Figure 9. Program Satisfaction (n=44)



Note: Scale from 0 to 10, where 0 is "Completely Dissatisfied" and 10 is "Completely Satisfied."

Table 7. Participant Reasons for Low Satisfaction Rating (n=8)

Verbatim Responses from Participants Who Rated Satisfaction Less Than or Equal to 7
Because when they did my roof, they did not take the cooler off the roof. They left it where it sat and it was leaking. They did not fix it even after the patch. They would not fix it.
Due to the threshold on the garage door and the ceiling that was never repaired.
It was two windows that were falling apart. And an interior door was seeping cold air.
Just because the way they installed them. In the bathroom, they put the medicine cabinet back in crooked.

Verbatim Responses from Participants Who Rated Satisfaction Less Than or Equal to 7
They are limited on their resources and skills. Just for this location and area of the county. They should have more skills and more knowledge. Maybe a training program. I had to actually do some of the work myself. I had to disconnect a breaker that was rewired and was turned off. They had 2 circuit breakers into one. They didn't have the right amp. It almost caught my grandma's house on fire.
They broke things and didn't fix them. The furnace doesn't work well.
They came in and did the work and stuff like that, but my house is still not comfortable. I mean my light bill is still really high.
They put some holes in the walls. One didn't tell me. When they were putting insulation in my attic, the guy's foot and knee came through my ceiling. They did repair it, but they did not finish it. Same thing with the hole in the guest bathroom. I asked about windows and they said no. I have single pane windows and there is sand that comes through. They had a guy put a hot water heater in. The plumber moved it from the closet to the laundry room. I am not a plumber, but he shrunk the water line down. It affects everything in the house. When someone showers or flushes the toilet. I can't wash dishes when someone showers because it puts less water through.

Just over half of respondents (56%; 24 of 44) shared suggestions to improve the Program. The most common recommendation was for the Program to expand its offerings and services provided to customers (10 of 20), with many calling out specific interest in window replacements.[11] Multiple respondents also noted that the Program could benefit from shortening its customer wait times (4 of 20). Three respondents provided additional suggestions, including having a larger budget to complete more projects, expanding coverage to rural areas, the elderly, and people with disabilities, and agency staff taking responsibility for their work. Table 8 provides verbatim suggestions from survey respondents.

[11] The Program offers window replacements on a case-by-case basis as deemed necessary by agency staff.

Table 8. Recommendations to Improve the Program

Participant Recommendations for Program Improvements	
Communication and Education	Give a list of things they would be working on. I was only told the things they would be working on and not given a written list.
	Shuffling of workload. Managing work schedule. They had so many jobs at different places.
	They need people who know what they are doing to run it. The people who ran it previously left, new crew is the pits.
Additional Offerings	If the client requests it, please do it.
	I hoped for more upgrades. I'm a senior citizen. I really hoped for a heater.
	More funding for more repairs.
	More money to help more people.
	The only thing I wished they could have done was the windows. It sounded like they didn't have the leeway to be able to do it. The grease trap (the exhaust fan) wasn't properly installed. They said it was a fire hazard. They didn't install it at all.
	I mean it would be great if they replaced windows, but that can be expensive. [a]
	Do a full, complete job. Some of the questions you are asking me, they should have asked and should have done, but they didn't. For one, like if they got on the roof they would have noticed that the fireplace needed to be sealed right there where the roof joins. They would have noticed that some of the slate on the roof was cracked. Doing the windows, maybe my ducts should have been checked to see if there might have been cracks in them and seal them if needed. One of the rooms in my house gets no air or heat. I am not the original owner of this house.
	First off, finishing all of the recommended fixes would have been our biggest help.
	Windows.[a]
	The windows
Marketing	Also, letting more people know about the program
Easier Application Process	Easier application process. They said to drop it off at a certain location and when we did it was the wrong location. It took about 2 weeks for the transfer to the right location. We dropped it off at the address on the paperwork. It was the wrong address. When we tried to re-apply there was a difference between earned income and unearned income. They didn't approve the application since it was earned income. You needed check stubs from your employer. It is just rental units and since I didn't have check stubs it was denied.
Follow Through	Making sure that things are installed like they say they would.
	They should have done a follow up sooner than now.
Shorten the wait time	Shorten the time between application and the work being completed.
	It takes so long for the application process to be completed. Then the time from when you put in the application until they get out here.
	If at all possible, make the timeline shorter between when you get approved and when the work is completed.
	I just think it would be nice to have the services more often. I think you have to wait like 10 years. I think it would be kind of nice to get it done more often than that.
Other	Bigger budget
	Do more for rural areas and for people that are elderly or with disabilities.
	They could stand behind their work. This refers to roofing contractor.

[a] The Program offers window replacements on a case-by-case basis as deemed necessary by agency staff.

Note: A single response may fall into multiple categories based on the open-ended answer.

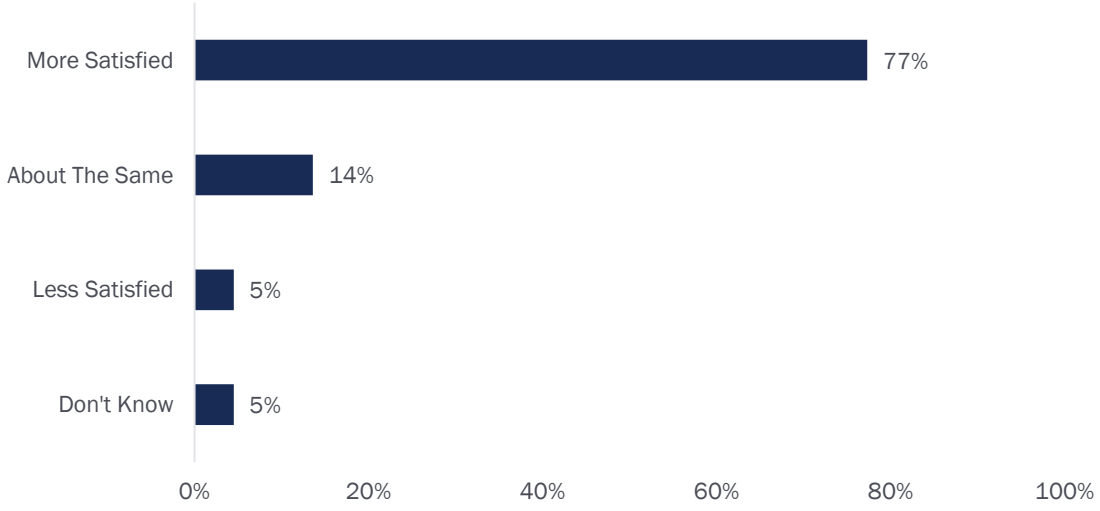
Most surveyed participants (70%; 31 of 44) said the application process was “extremely easy,” providing a rating of 8 or higher on a scale from 0 to 10, where 0 means “extremely difficult” and 10 means “extremely easy.” Seven of the remaining participants indicated the process was moderately easy (rating of 6 or 7) or provided a neutral view (rating of

5), while five indicated some level of difficulty with the application process (rating of 4 or lower). The final participant indicated they did not know what to rate the process.

All participants indicated they were pleased with the weatherization staff (100%; 44 of 44), stating "yes" when asked if the agency staff was courteous and respectful towards them and their family members.

According to tracking data, of the 38 participants who received LED bulbs through the Program, 37 (97%) recalled receiving them, and 24 (65%) were able to verify the number of bulbs installed. Of these 24 participants, 22 (92%) reported that all of the LEDS remained installed. Notably, the majority of respondents who received new LEDs through the Program (77%; 17 of 22) reported higher levels of satisfaction with the new bulbs compared to their previous lighting (Figure 10).

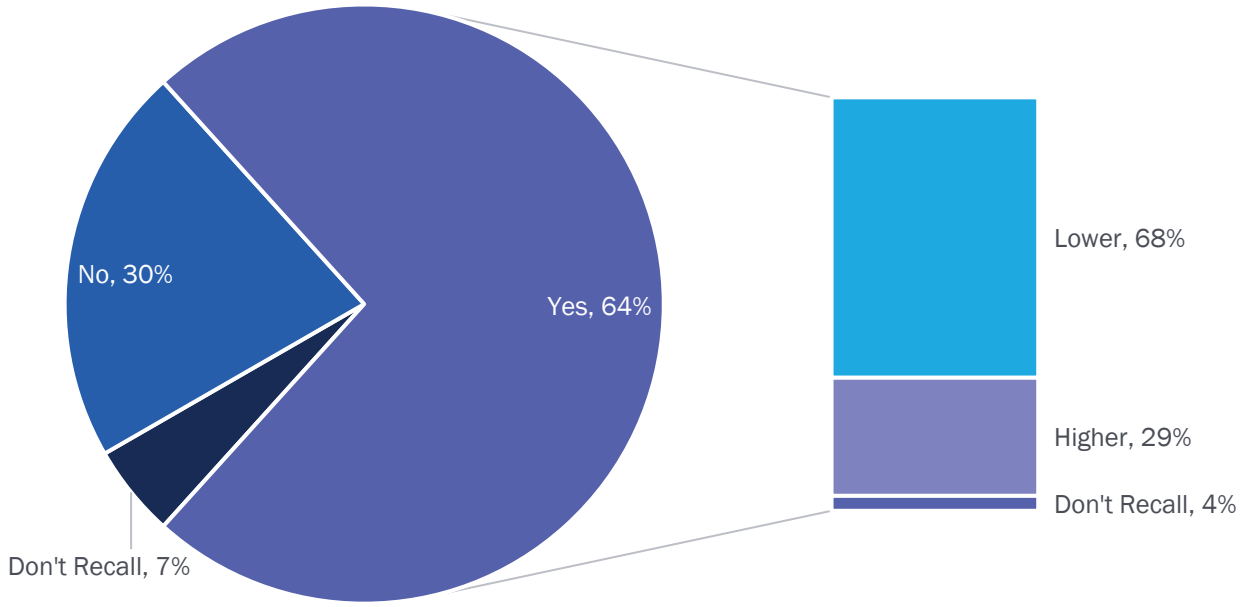
Figure 10. Satisfaction with LEDs Over Previous Bulbs in the Home (n=22)



PERCEIVED PROGRAM IMPACT

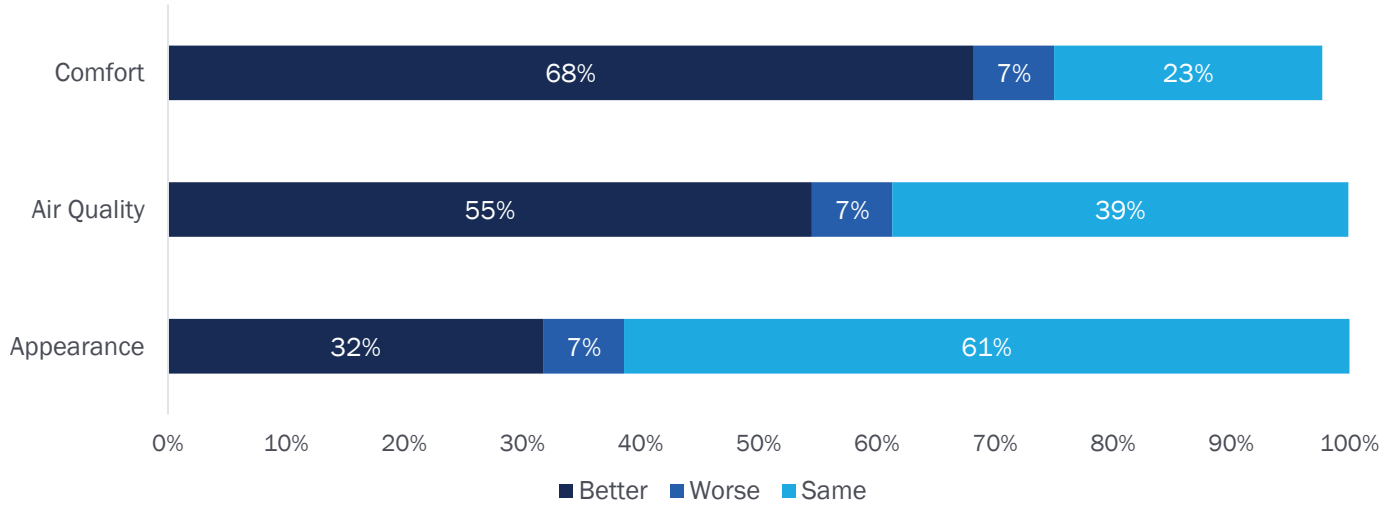
Just under two-thirds of surveyed participants (64%; 28 of 44) noticed a change in their electric bill since receiving weatherization services through the Program. Of those who observed a change, most (68%; 19 of 28) have seen a decrease in their bills, while a minority (29%; 8 of 28) said their bills have risen (Figure 11).

Figure 11. Change Noticed in Electric Bill (n=44)



To explore the non-energy benefits experienced by participants, we asked respondents if the air quality, appearance, and comfort of their homes had improved, stayed the same, or worsened since receiving Program services. Most surveyed participants reported an improvement in their home comfort (68%; 30 of 44) and air quality (55%; 24 of 44) following Program services (Figure 12). Additionally, nearly one-third of respondents (32%; 14 of 44) observed an improvement in their home's appearance.

Figure 12. Impact of Measures on Home Characteristics (n=44)



4.2 IMPACT EVALUATION

A total of 498 customers participated in the Program during the 2022 and 2023 program years. Table 9 summarizes the number of customers who received each measure, from most common (lighting) to least common (duct sealing and insulation with electric heating only). Other common measures include a furnace fan, ceiling and wall insulation, and air conditioner tune-ups.

Table 9. Utah Participation Counts and Measures for Program Years 2022–2023

Measures	2022	2023	Total	Percent
Total # of Homes Treated	**229**	**269**	**498**	**100%**
LED light bulbs	188	170	358	72%
Furnace Fan	74	54	128	26%
Ceiling Insulation	59	44	103	21%
Wall Insulation	37	20	57	11%
AC Tune-Up	13	28	41	8%
Refrigerator Replacement	14	13	27	5%
Duct Sealing and Insulation	14	11	25	5%
Ceiling Insulation (CAC Only)	0	21	21	4%
Duct Sealing and Insulation (CAC w/ Electric Heating)	0	9	9	2%
Evaporative Cooler Replacement	0	6	6	1%
Window Replacement	1	3	4	0.8%
Floor Insulation	3	0	3	0.6%
Duct Sealing and Insulation (Electric Heating Only)	0	2	2	0.4%

4.2.1 PROGRAM SAVINGS

In Table 10, we present the annual ex-ante gross and ex-post net energy savings for the Program. The Program achieved 324,850 kWh in ex-post net energy savings and a net savings realization rate of 68% for the 2022 and 2023 program years. The low realization rate reflects overestimated ex-ante savings, which included both per-participant and measure-level savings for 26% of participants. Removing the additional per-participant savings to eliminate double counting would have resulted in an overall realization rate of 108%.

Table 10. Ex-Ante Gross and Ex-Post Net Energy Savings (kWh)

Program Year	Participation	Ex-Ante Gross Energy Savings (kWh)	Ex-Post Net Energy Savings (kWh)	Realization Rate
2022	229	249,655	156,365	63%
2023	269	227,813	168,485	74%
Total	**498**	**477,468**	**324,850**	**68%**

Note: For this low-income program, the net-to-gross ratio is assumed to be equal to 1, and therefore, gross savings are equal to net savings.

For 2022–2023, we assumed an ISR of 100% for all non-lighting measures and applied an ISR (79%) for lighting using results from the 2022–2023 participant survey results, as noted in the Data Sources and Methodology section. Measure-specific deemed savings are described in more detail in Appendix B. Ex-post gross and ex-post net savings are equal because it is assumed that low-income customers would not have the disposable income to make weatherization

upgrades without the Program, negating free-ridership. This is a common assumption across low-income program evaluations nationwide.

On average, customers saved 652 kWh per year after installing the Program measures. Table 11 presents the ex-post savings by measure type with the proportion of savings attributable to each measure. The majority of ex-post savings (74%) result from lighting upgrades and furnace fan replacements.

Table 11. Ex-Post Net Savings by Measure

Measure	Quantity		Unit of Measure	Ex-Post Per Unit Net Savings	Ex-Post Net Savings		Percent of Total Ex-Post Savings
	2022	2023			2022	2023	
LED light bulbs	2,695	2,416	Bulbs	31.07	83,721	75,054	49%
Furnace Fan	74	54	Fans	644.60	47,700	34,808	25%
Duct Sealing and Insulation (CAC w/ Elec Htg)	0	9	Participants	3,067.31	0	27,606	8%
Refrigerator Replacement	14	13	Refrigerators	581.78	8,145	7,563	5%
Wall Insulation	37	20	Participants	187.46	6,936	3,749	3%
Duct Sealing and Insulation	14	11	Participants	289.48	4,053	3,184	2%
Ceiling Insulation	59	44	Participants	64.92	3,830	2,857	2%
Duct Sealing and Insulation (Elec Htg Only)	0	2	Participants	2,739.07	0	5,478	2%
AC Tune-Up	13	28	Systems	111.80	1,453	3,130	1%
Evaporative Cooler Replacement	0	6	Systems	570.19	0	3,421	1%
Ceiling Insulation (CAC Only)	0	21	Participants	75.54	0	1,586	0.5%
Floor Insulation	3	0	Participants	170.10	510	0	0.2%
Window Replacement	1	3	Windows	15.96	16	48	0.02%
Total	**2,910**	**2,627**			**156,365**	**168,485**	**100%**

Note: Percentage of total savings may not sum to 100% due to rounding

4.3 COST EFFECTIVENESS

Apex Analytics estimated the cost-effectiveness of Rocky Mountain Power's 2022–2023 Utah Program without NEBs. The Program passes the PTRC, TRC, and UTC. The following assumptions were utilized in the analysis:

- Realization Rates: Rocky Mountain Power provided updated realization rates due to changes between the original predicted and evaluated energy savings in PY2022–PY2023.
- Modeling Inputs: Measure savings, costs, and NEBs; measure lives, incentive levels, Program delivery, and portfolio costs based on estimates provided by Rocky Mountain Power.
- Net-to-Gross (NTG): Ratios are assumed to be 1.0, consistent with condition (8)(a) to Order 01 in Docket UE-152072.

Table 12 presents the cost-effectiveness results at the program level without NEBs for 2022-2023.

Table 12. 2022–2023 Program Cost-Effectiveness Results (Without NEBs)

Cost-Effectiveness Test	Levelized $/kWh	NPV[a] Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.012	$31,995	$321,302	$289,307	10.04
Total Resource Cost Test (TRC) No Adder	$0.012	$31,995	$292,117	$260,122	9.13
Utility Cost Test (UCT)	$0.088	$246,737	$291,845	$45,108	1.18
Participant Cost Test (PCT)		$0	$529,165	$529,165	Pass[b]
Ratepayer Impact Measure Test (RIM)		$561,158	$291,845	($269,313)	0.52
Lifecycle Revenue Impacts ($/kWh)					$0.00001

[a] Net Present Value (NPV).

[b] Low-income programs have no customer costs and therefore a cost benefit ratio cannot be calculated for this test.

APPENDIX A. ACRONYM GLOSSARY

Table 13. Acronym Glossary

Acronyms	Meaning
DHHS	United States Department of Health & Human Services
DOE	United States Department of Energy
HCD	Utah Department of Workforce Services, Housing and Community Development Division
H&S	Health and Safety
IRP	Integrated Resource Plan
kWh	Kilowatt-hour
LED	Light-Emitting Diode Light Bulb
LIW	Low-Income Weatherization
LIHEAP	Low-Income Home Energy Assistance Program
NEB	Non-Energy Benefit
PCT	Participant Cost Test
PTRC	PacifiCorp Total Resource Cost Test
RIM	Ratepayer Impact Measure Test
SIR	Savings-to-Investment Ratio
TRC	Total Resource Cost
TRM	Technical Reference Manual
UCT	Utility Cost Test

APPENDIX B. IMPACT ANALYSIS DETAILS

In this appendix, we describe the measure-level savings assumptions for each eligible Program measure.

B.I LED LIGHT BULBS

Table 14 documents the inputs and methodology for estimating LED savings.

Table 14. Algorithms and Inputs for LED Light Bulbs

Algorithms Used		
kWh Savings	= ((Baseline Watts – LED Watts) / 1,000) × (1 – Leakage) × Hours × WHFe × ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.5.8		
Parameter	**Value**	**Source/Notes**
Baseline Watts	43.0	IL TRM V13.0 halogen equivalent wattage for a standard 9W LED.
LED Watts	9.0	LED wattage distributed within the program.
Percentage of Bulbs Outside Utility Jurisdiction (Leakage)	0%	Measures are directly installed and therefore 100% remain in utility jurisdiction.
Annual Hours of Use (Hours)	1,089	IL TRM V13.0. Average Annual Average of Use for Residential LEDs. This aligns with Program guidelines, which state that lights must be on for at least two hours a day to qualify.
Energy Waste Heat Factor (WHFe)	1.06	IL TRM V13.0 for single-family housing type (participants predominantly live in single-family or mobile homes).
In-Service Rate (ISR)	79%	2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.

Table 15 provides the deemed savings for LED light bulbs using the assumptions from Table 14.

Table 15. LED Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per LED	31.07

B.2 FURNACE FAN

Table 16 documents the inputs and methodology for estimating furnace fan savings.

Table 16. Algorithms and Inputs for Furnace Fans

Algorithms Used		
kWh Savings (cooling)	= CapacityCool × (1/$nCool_{base}$ – 1/$nCool_{ECM}$) × FLHcool × %Cool	
kWh Savings (heating)	= FLHheat × ΔkWheat	
kWh Savings (circulation mode)	= Circulation Hours × ΔkWcirc	
kWh Savings	= Cooling kWh Savings + Heating kWh Savings + Circulation Mode Savings	
Source of Algorithm: Cadmus Focus on Energy Evaluated Deemed Savings Changes. November 14, 2014.		
Parameter	**Value**	**Source/Notes**
Capacity of Central Cooling Equipment (CapacityCool)	36 kBTU	Approximately 0.0016 tons of cooling is needed per square foot. Rounded to the nearest nominal tonnage. Total conditioned floor area (1,839 sf) from 2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Cooling Efficiency without ECM ($nCool_{base}$)	12.64 SEER	Weighted average by equipment type and age from the IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Cooling Efficiency with ECM ($nCool_{ECM}$)	14.00 SEER	2015 Federal minimum standard central cooling efficiency.
Full Load Cooling Hours (FLHcool)	785	EPA Calculator. Assume Salt Lake City.
Full Load Heating Hours (FLHheat)	2,443	
Change in Demand for Heating (ΔkWheat)	0.116	Cadmus Focus on Energy Evaluated Deemed Savings Changes. November 14, 2014.
Hours of Circulation (Circulation Hours)	1,020	Cadmus Focus on Energy Evaluated Deemed Savings Changes. November 14, 2014.
Change in Demand for Circulation (ΔkWcirc)	0.207	Cadmus Focus on Energy Evaluated Deemed Savings Changes. November 14, 2014.
Percent of Homes with Central Cooling (%Cool)	69%	2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
In-Service Rate (ISR)	100%	Assumed 100% of furnace fans remain installed as it is not likely to be removed by the participant.

Table 17 provides the deemed savings for furnace fans, using the assumptions from Table 16.

Table 17. Furnace Fans Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per fan	644.60

B.3 DUCT SEALING & INSULATION

Table 18 documents the inputs and methodology for estimating duct sealing and insulation savings.

Table 18. Algorithms and Inputs for Duct Sealing and Insulation

Algorithms Used		
kWh Savings (cooling)	= ((((DEafter – DEbefore) / DEafter) × FLHcool × CapacityCool × TRFcool) / 1,000 / ηCool) × %Cool × ISR	
kWh Savings (heating)	= ((((DEafter – DEbefore) / DEafter) × FLHheat × CapacityHeat × TRFheat) / ηHeat / 3,412) × %ElecHeat × ISR	
kWh Savings	= Cooling kWh Savings + Heating kWh Savings	
Source of Algorithm: Illinois TRM V13.0 Section 5.3.4		
Parameter	**Value**	**Source/Notes**
DEafter (cooling)	94%	From BPI "Guidance on Estimating Distribution Efficiency." Assume average for tightly sealed ducts for all duct locations insulated to R-8.
DEafter (heating)	96%	
DEbefore (cooling)	80%	From BPI "Guidance on Estimating Distribution Efficiency." Average for duct leakage that is both average and leaky for all duct locations for uninsulated and insulated to R-2 or R-4.
DEbefore (heating)	87%	
Full Load Cooling Hours (FLHcool)	785	EPA Calculator. Assume Salt Lake City.
Full Load Heating Hours (FLHheat)	2,443	
Capacity of Central Cooling Equipment (CapacityCool)	36,000 BTU	Approximately 0.0016 tons of cooling is needed per square foot. Rounded to the nearest nominal tonnage. Total conditioned floor area (1,839 sf) from 2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Output Capacity of Heating Equipment (CapacityHeat)	64,365 BTU	Average between 20 and 50 BTUh of heating required per square foot from National Renewable Energy Laboratory (NREL) and South Carolina State University studies.
Thermal Regain Factor for Cooling (TRFcool)	1.00	IL TRM V13.0. Assumed ducts located in unconditioned space.
Thermal Regain Factor for Heating (TRFheat)	1.00	
Cooling Efficiency (nCool)	12.64 SEER	Weighted average by equipment type and age from the IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Heating Efficiency (nHeat)	1.56 COP	
Percent of Homes with Central Cooling (%Cool)	69%	2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Percent of Homes with Electric Heating (%ElecHeat)	2%	
In-Service Rate (ISR)	100%	Assumed 100% of duct sealing and insulation remain installed as it is not likely to be removed by the participant.

Table 19 provides the deemed savings for duct sealing and insulation, using the assumptions from Table 18.

Table 19. Duct Sealing and Insulation Deemed Savings

Metric	HVAC Type	Deemed Savings per Measure
Annual kWh per Home	Unknown	289.48
	CAC w/ Electric Heat	3,067.31
	No cooling w/ Electric Heat	2,739.07

B.4 REFRIGERATOR REPLACEMENT

Table 20 documents the inputs and methodology for estimating refrigerator replacement savings.

Table 20. Algorithms and Inputs for Refrigerator Replacement

Algorithms Used		
kWh (existing)	= ([83.32 + (Age × 3.68) + (Pre-1990 × 485.04) + (Size × 27.15) + (%Side-by-side × 406.78) + (Primary × 161.86) + (CDD/365.25 × unconditioned × 15.37) + (HDD/365.25 × unconditioned × -11.07)) × Part Use Factor	
kWh (ENERGYSTAR)	= 0.90 * kWh_{code}	
kWh savings	= ($kWh_{existing}$ – $kWh_{ENERGYSTAR}$) * ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.1.6, Federal Code, ENERGYSTAR		
Parameter	**Value**	**Source/Notes**
Age of Existing Refrigerator (Age)	15.00	IL TRM V13.0.
Percentage Refrigerators Manufactured Pre-1990 (Pre1990)	0%	Based on Age assumption, assuming 2022 is age of replacement.
Capacity of Existing Refrigerator (Size)	22.62	Weighted capacity of refrigerators from 2020 RECS for Mountain North Division.
Percentage of Refrigerators Side-by-Side (SidebySide)	31%	Percentage of side-by-side refrigerators from 2020 RECS for Mountain North Division.
Percentage of Refrigerators Primary Unit (Primary)	100%	All refrigerators replace primary units.
Cooling Degree Day (CDD)	1,286	ASHRAE Fundamentals 2021 for Utah.
Heating Degree Day (HDD)	5,404	
Percentage Refrigerators Operating in Unconditioned Space (Unconditioned)	0%	Assumed 100% of refrigerators operate in conditioned space as program targets the replacement of primary units.
Part Time Use Adjustment Factor (Part Use Factor)	1.00	Replaced refrigerator is the primary refrigerator and operates continuously.
Energy Consumption of Code Compliant Refrigerators (kWh_{code})	507.81	Federal standard for refrigerators manufactured after 2014 based on weighted capacity from RECS data for Mountain North Division.
In-Service Rate (ISR)	100%	Assumed 100% of refrigerators remain installed as it is not likely to be removed by the participant.

Table 21 provides the deemed savings for refrigerators, using the assumptions from Table 20.

Table 21. Refrigerator Replacement Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per Refrigerator	581.78

B.5 WALL INSULATION

Table 22 documents the inputs and methodology for estimating wall insulation savings.

Table 22. Algorithms and Inputs for Wall Insulation

Algorithms Used		
kWh Savings (cooling)	= (((1/Rexisting – 1/Rwall) × Area × (1 – Framing Factor) × 24 × CDD × DUA) / (1,000 × ηCool)) × ADJcool × %Cool × ISR	
kWh Savings (heating)	= (((1/Rexisting – 1/Rwall) × Area × (1 – Framing Factor) × 24 × HDD) / (ηHeat × 3,412)) × ADJHeat × %ElecHeat × ISR	
kWh Savings	= Cooling kWh Savings + Heating kWh Savings	
Source of Algorithm: Illinois TRM V13.0 Section 5.6.4		
Parameter	**Value**	**Source/Notes**
Existing Insulation R-value (Rexisting)	5.0	IL TRM V13.0. Minimum of R-5 for uninsulated assemblies. "LIW TRL" sheet in program database indicates that the baseline description is no insulation for this measure.
R-value after Installing Wall Insulation (Rwall)	15.0	"LIW TRL" sheet in program database specifies an efficiency requirement "Up to R-26." Utah's current state energy code 2015 IECC for CZ requires R-20, R-13 cavity insulation + R-5 insulated, or R-13 cavity insulation + R-2 insulated sheathing (if >25% exterior structural sheathing). Assume R-15 as a conservative estimate.
Area of Installed Insulation (Area)	1,440	Calculated wall area by multiplying wall height (assuming 8-foot ceilings * number of stories) by wall length (√conditioned floor area * 4 walls) where number of stories (1.40) from RECS 2020 data for Mountain North and conditioned floor area (1,839 sf) from 2022–2023 Low-Income Weatherization Program (Utah) Participant Survey. Reduced by 25% as a conservative estimate provided limited program specific data.
Framing Factor	25%	IL TRM V13.0.
Cooling Degree Day (CDD)	1,286	ASHRAE Fundamentals 2021 for Utah.
Heating Degree Day (HDD)	5,404	
Discretionary Use Adjustment (DUA)	0.75	Discretionary Use Adjustment for cooling. Common to most TRMs. Accounts for fact that all cooling systems will not operate 100% of time requiring cooling.
Cooling Efficiency (nCool)	12.64 SEER	Weighted average by equipment type and age from the IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Heating Efficiency (nHeat)	1.56 COP	
Cooling Savings Adjustment (ADJcool)	75%	IL TRM V13.0. Adjustment for cooling savings to account for inaccuracies in prescriptive engineering algorithms.
Heating Savings Adjustment (ADJheat)	63%	
Percent of Homes with Central Cooling (%Cool)	69%	2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Percent of Homes with Electric Heating (%ElecHeat)	2%	
In-Service Rate (ISR)	100%	Assumed 100% of wall insulation remain installed as it is not likely to be removed by the participant.

Table 23 provides the deemed savings for wall insulation, using assumptions from Table 22.

Table 23. Wall Insulation Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per Home	187.46

B.6 CEILING INSULATION

Table 24 documents the inputs and methodology for estimating ceiling insulation savings.

Table 24. Algorithms and Inputs for Ceiling Insulation

Algorithms Used		
kWh Savings (cooling)	= (((1/Rexisting - 1/Rattic) × Area × (1 – Framing Factor) × 24 × CDD × DUA) / (1,000 × ηCool)) × ADJcool × %Cool × ISR	
kWh Savings (heating)	= (((1/Rexisting - 1/Rattic) × Area × (1 – Framing Factor) × 24 × HDD) / (ηHeat × 3,412)) × ADJHeat × %ElecHeat × ISR	
kWh Savings	= Cooling kWh Savings + Heating kWh Savings	
Source of Algorithm: Illinois TRM V13.0 Section 5.6.5		
Parameter	**Value**	**Source/Notes**
Existing Insulation R-value (Rexisting)	20.0	Program materials for WY (not provided for UT) indicate the baseline description is "less than R-30 in place." We assume some ceilings will already have some insulation in place and therefore assume an existing R-value of R-20 for the average.
R-value after Installing Attic Insulation (Rattic)	49.0	Utah current state energy code IECC 2015. According to the Program database, all measures were installed in Climate Zone 5.
Area of Installed Insulation (Area)	1,314	Calculated attic footprint square footage by dividing total conditioned floor area (1,839 sf) from 2022–2023 Low-Income Weatherization Program (Utah) Participant Survey by the number of stories (1.40) from RECS 2020 data for Mountain North.
Framing Factor	7%	IL TRM V13.0.
Cooling Degree Day (CDD)	1,286	ASHRAE Fundamentals 2021 for Utah.
Heating Degree Day (HDD)	5,404	
Discretionary Use Adjustment (DUA)	0.75	Discretionary Use Adjustment for cooling. Common to most TRMs. Accounts for fact that all cooling systems will not operate 100% of time requiring cooling.
Cooling Efficiency (nCool)	12.64 SEER	Weighted average by equipment type and age from the IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Heating Efficiency (nHeat)	1.56 COP	
Cooling Savings Adjustment (ADJcool)	114%	IL TRM V13.0. Adjustment for cooling and heating savings to account for inaccuracies in prescriptive engineering algorithms.
Heating Savings Adjustment (ADJheat)	63%	
Percent of Homes with Central Cooling (%Cool)	69%	2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Percent of Homes with Electric Heating (%ElecHeat)	2%	
In-Service Rate (ISR)	100%	Assumed 100% of ceiling insulation remain installed as it is not likely to be removed by the participant.

Table 25 provides the deemed savings for ceiling insulation, using the assumptions from Table 24.

Table 25. Ceiling Insulation Deemed Savings

Metric	HVAC Type	Deemed Savings per Measure
Annual kWh per Home	Unknown	64.92
	CAC w/ Gas Heat	75.54

B.7 COOLING SYSTEM TUNE-UP

Table 26 documents the inputs and methodology for estimating cooling system tune-up savings.

Table 26. Algorithms and Inputs for Cooling System Tune-Up

Algorithms Used.23		
kWh Savings	= (CapacityCool × FLHcool × (1/nCool))/1,000 × MFe × ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.3.10		
Parameter	**Value**	**Source/Notes**
Capacity of Central Cooling Equipment (CapacityCool)	36,000 BTU	Approximately 0.0016 tons of cooling is needed per square foot. Rounded to the nearest nominal tonnage. Total conditioned floor area (1,839 sf) from 2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Full Load Cooling Hours (FLHcool)	785	EPA Calculator. Assume Salt Lake City.
Cooling Efficiency (nCool)	12.64 SEER	Weighted average by equipment type and age from the IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Maintenance Energy Savings Factor (MFe)	0.05	IL TRM V13.0.
In-Service Rate (ISR)	100%	This measure requires a trained professional perform services on the equipment and does not include installing any devices that can be removed.

Table 27 provides the deemed savings for cooling system tune-ups, using the assumptions from Table 26.

Table 27. Central AC Tune-Up Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per System	111.80

B.8 EVAPORATIVE COOLER REPLACEMENT

Table 28 documents the inputs and methodology for estimating evaporative cooler replacement savings.

Table 28. Algorithms and Inputs for Evaporative Cooler Replacement

Algorithms Used		
kWh Savings	= (CapacityCool × FLHcool × (1/nCool))/1,000 × %EvapSavings × ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.3.3 and Building America Evaporative Condenser research (2012).		
Parameter	**Value**	**Source/Notes**
Capacity of Central Cooling Equipment (CapacityCool)	36,000 BTU	Approximately 0.0016 tons of cooling is needed per square foot. Rounded to the nearest nominal tonnage. Total conditioned floor area (1,839 sf) from 2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Full Load Cooling Hours (FLHcool)	785	EPA Calculator. Assume Salt Lake City.
Cooling Efficiency (nCool)	13.00 SEER	Baseline efficiency from Building America Evaporative Condenser report (2012).[12]
Percentage of evaporative cooling energy savings (%EvapSavings)	26%	Baseline efficiency from Building America Evaporative Condenser report (2012).[13]
In-Service Rate (ISR)	100%	Assumed 100% of evaporative coolers remain installed as it is not likely to be removed by the participant.

Table 29 provides the deemed savings for evaporative cooler replacements, using the assumptions from Table 28.

Table 29. Evaporative Cooler Replacement Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per System	570.19

[12] https://www1.eere.energy.gov/buildings/publications/pdfs/building_america/measure_guide_evap_condensers.pdf
[13] Ibid.

B.9 FLOOR INSULATION

Table 30 documents the inputs and methodology for estimating floor insulation savings.

Table 30. Algorithms and Inputs for Floor Insulation

Algorithms Used		
kWh Savings (cooling)	= (((1/Rexisting – 1/Rfloor) × Area × (1 – Framing Factor) × 24 × CDD × DUA) / (1,000 × ηCool)) × ADJcool × %Cool × ISR	
kWh Savings (heating)	= (((1/Rexisting – 1/Rfloor) × Area × (1 – Framing Factor) × 24 × HDD) / (ηHeat × 3,412)) × ADJHeat × %ElecHeat × ISR	
kWh Savings	= Cooling kWh Savings + Heating kWh Savings	
Source of Algorithm: Illinois TRM V13.0 Section 5.6.3		
Parameter	**Value**	**Source/Notes**
Existing Insulation R-value (Rexisting)	3.53	IL TRM V13.0. Assumed 3/4" plywood subfloor and carpet with pad. "LIW TRL" does not specify a program specific baseline description for this measure.
R-value after Installing Floor Insulation (Rfloor)	22.53	"LIW TRL" sheet in program database specifies an efficiency requirement "Up to R-30." Utah's current state energy code 2015 IECC for CZ 5 (all measures installed in Climate Zone 5) requires R-30 or insulation sufficient to fill the framing cavity, R-19 minimum. Assume R-19 as a conservative estimate.
Area of Installed Insulation (Area)	1,314	Calculated attic footprint square footage by dividing total conditioned floor area (1,839 sf) from 2022–2023 Low-Income Weatherization Program (Utah) Participant Survey by the number of stories (1.40) from RECS 2020 data for Mountain North.
Framing Factor	12%	IL TRM V13.0.
Cooling Degree Day (CDD)	612	Five year average cooling degree days with base temperature 75F and heating degree days with base temperature 50F from degreedays.net for Utah.
Heating Degree Day (HDD)	2,513	
Discretionary Use Adjustment (DUA)	0.75	Discretionary Use Adjustment for cooling. Common to most TRMs. Accounts for fact that all cooling systems will not operate 100% of time requiring cooling.
Cooling Efficiency (nCool)	12.64 SEER	Weighted average by equipment type and age from the IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Heating Efficiency (nHeat)	1.56 COP	
Cooling Savings Adjustment (ADJcool)	75%	IL TRM V13.0. Adjustment for cooling and heating savings to account for inaccuracies in prescriptive engineering algorithms.
Heating Savings Adjustment (ADJheat)	63%	
Percent of Homes with Central Cooling (%Cool)	69%	2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Percent of Homes with Electric Heating (%ElecHeat)	2%	
In-Service Rate (ISR)	100%	Assumed 100% of floor insulation remain installed as it is not likely to be removed by the participant.

Table 31 provides the deemed savings for floor insulation, using assumptions from Table 30.

Table 31. Floor Insulation Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per Home	170.10

B.10 WINDOWS

Table 32 documents the inputs and methodology for estimating window savings.

Table 32. Algorithms and Inputs for Windows

Algorithms Used		
Source of Algorithm: Used RESFEN6 (LBNL Software) to model a home with new windows. We estimate savings per window, and then apply to the total number of windows replaced.		
Parameter	**Value**	**Source/Notes**
Location	Salt Lake City, UT	Input for RESFEN6. The closest city in the RESFEN6 database to the homes that received new windows.
House Type	1 Story Existing Frame	Input for RESFEN6. House Type that most closely corresponds with the homes that received new windows.
HVAC System	Electric Heat Pump	Input for RESFEN6. Electric Heat Pump is the only Electric Heating option in the RESFEN6 Modeling Software.
Window Area	9 ft^2	Input for RESFEN6. Standard Window Size for Window Savings Modeling.
U-Factor Base	0.88	Input for RESFEN6. RESFEN6 Preset Value for Single Clear, Non-Metal Frame Window.
U-Factor New	0.28	Input for RESFEN6. RESFEN6 Preset Value for Double Low-E, Medium Solar Gain, Non-Metal Thermally Improved Frame Window.
SHGC Base	0.64	Input for RESFEN6. RESFEN6 Preset Value for Single Clear, Non-Metal Frame Window.
SHGC New	0.31	Input for RESFEN6. RESFEN6 Preset Value for Double Low-E, Medium Solar Gain, Non-Metal Thermally Improved Frame Window.
Percent of Homes with Central Cooling (%Cool)	69%	2022–2023 Low-Income Weatherization Program (Utah) Participant Survey.
Percent of Homes with Electric Heating (%ElecHeat)	2%	
In-Service Rate (ISR)	100%	Assumed 100% of windows remain installed as it is not likely to be removed by the participant.

Table 33 provides the deemed savings for windows, using the assumptions Table 32.

Table 33. Window Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per Window	15.96

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