Opinion Dynamics
an E Source Company

PACIFICORP IDAHO LOW-INCOME WEATHERIZATION

EVALUATION FOR PROGRAM YEARS 2022-2023

JUNE 30, 2026

CONTENTS

1. Executive Summary 5
   - 1.1 Process Results 5
   - 1.2 Impact Results 6
   - 1.3 Non-Energy Benefit Results 7
     - 1.3.1 External Payment Analysis 7
     - 1.3.2 Arrearage Analysis 7
   - 1.4 Cost-Effectiveness Results 8
   - 1.5 Conclusions and Recommendations 8
2. Introduction 9
   - 2.1 Program Implementation 10
   - 2.2 Evaluation Objectives 10
3. Data Sources and Methodology 12
   - 3.1 Program Tracking Data 12
   - 3.2 Process Evaluation 12
     - 3.2.1 Agency Interviews 12
     - 3.2.2 Participant Survey 13
   - 3.3 Impact Evaluation 13
   - 3.4 Non-Energy Benefits 14
     - 3.4.1 External Payment Analysis 15
     - 3.4.2 Arrearage Analysis 15
   - 3.5 Cost-Effectiveness 15
4. Results 16
   - 4.1 Process Evaluation 16
     - 4.1.1 Agency Perspective 16
     - 4.1.2 Participant Perspective 17
   - 4.2 Impact Evaluation 19
     - 4.2.1 Program Savings 20
   - 4.3 Non-Energy Benefits 21
     - 4.3.1 External Payment Analysis 21
     - 4.3.2 Arrearage Analysis 22
   - 4.4 Cost-Effectiveness 22

Appendix A. Acronym Glossary 26

Appendix B. Impact Analysis Details 27
   - B.1 Ductless Heat Pump 27
   - B.2 Air Sealing 28
   - B.3 Floor Insulation 29
   - B.4 Water Heater Pipe Insulation 30
   - B.5 LED Light Bulbs 31
   - B.6 Ceiling Insulation 32
   - B.7 Wall Insulation 33
   - B.8 Duct Sealing & Insulation 35
   - B.9 Windows 36
   - B.10 Water Heater Repair 37
   - B.11 Refrigerator Replacement 38
   - B.12 Thermal Doors 39
   - B.13 Furnace Repair 40
   - B.14 CFL Light Bulbs 41
   - B.15 Duct Sealing 42

TABLES & FIGURES

Table 1. Ex-Ante Gross and Ex-Post Net Energy Savings (kWh) 6

Table 2. Payment Assistance Amounts Summary for Participants and Comparison Group 7

Table 3. Arrearage Summary for Participant and Comparison Groups 8

Table 5. Evaluation Objectives by Evaluation Activities 10

Table 6. Idaho Customer Telephone Survey 13

Table 7. Participant Survey Disposition 13

Table 8. LED Installation Rates Over Time by State . 14

Table 9. Participant Recommendations for Program Improvements (n=2) 18

Table 10. Idaho Participation Counts and Measures for Program Years 2022–2023 19

Table 11. Ex-Ante Gross and Ex-Post Net Energy Savings (kWh) 20

Table 12. Ex-Post Net Savings by Measure 21

Table 13. Payment Assistance Amounts Summary for Participants and Comparison Group 22

Table 14. Arrearage Summary for Participant and Comparison Groups 22

Table 36. Acronym Glossary 26

Table 37. Algorithms and Inputs for Ductless Heat Pump 27

Table 38. Ductless Heat Pump Deemed Savings 27

Table 39. Algorithms and Inputs for Air Sealing 28

Table 40. Air Sealing Deemed Savings 28

Table 41. Algorithms and Inputs for Floor Insulation 29

Table 42. Floor Insulation Deemed Savings 29

Table 43. Algorithms and Inputs for Water Heater Pipe Insulation 30

Table 44. Water Heater Pipe Insulation Deemed Savings 30

Table 45. Algorithms and Inputs for LED Light Bulbs 31

Table 46. LED Deemed Savings 31

Table 47. Algorithms and Inputs for Ceiling Insulation 32

Table 48. Ceiling Insulation Deemed Savings 32

Table 49. Algorithms and Inputs for Wall Insulation . 33

Table 50. Wall Insulation Deemed Savings 34

Table 51. Algorithms and Inputs for Duct Sealing and Insulation 35

Table 52. Duct Sealing and Insulation Deemed Savings 35

Table 53. Algorithms and Inputs for Windows 36

Table 54. Window Deemed Savings 36

Table 55. Algorithms and Inputs for Water Heater Insulation Blanket 37

Table 56. Water Heater Insulation Blanket Deemed Savings 37

Table 57. Algorithms and Inputs for Refrigerator Replacement 38

Table 58. Refrigerator Replacement Deemed Savings 38

Table 59. Algorithms and Inputs for Thermal Doors . 39

Table 60. Thermal Door Deemed Savings 39

Table 61. Algorithms and Inputs for Air Filter Replacement 40

Table 62. Air Filter Replacement Deemed Savings .. 40

Table 63. Algorithms and Inputs for CFL Light Bulbs 41

Table 64. CFL Deemed Savings 41

Table 65. Algorithms and Inputs for Duct Sealing 42

Table 66. Duct Sealing Deemed Savings 42

Figure 1. Funding and Oversight for Rocky Mountain Power's Low-Income Weatherization Program 9

I. EXECUTIVE SUMMARY

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

Two Idaho nonprofit agencies known for serving low-income communities implement the Program:

- Eastern Idaho Community Action Partnership (EICAP)
- Southeastern Idaho Community Action Agency (SEICAA)

These agencies receive funding from Rocky Mountain Power to provide building weatherization services to low-income customers.[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 Rocky Mountain Power's low-income customers.[2] Through the Program, participants receive no-cost energy efficiency measures. Agency staff begin by conducting an energy audit on participant homes to assess the home's condition and identify the necessary energy-saving measures. The Program offers a variety of energy-efficiency measures, including insulation, air sealing, window replacements, and LED light bulbs. Measures are typically directly installed by agency staff, although some smaller measures, such as LED bulbs, may be self-installed by the homeowner.

The core objectives for this evaluation were to: (1) document and measure the 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 a deemed savings review of current ex-ante savings assumptions. To quantify non-energy benefits, such as reduced external payments and arrearages required by participants, we conducted a payment and arrearage analysis comparing participant bill history with a comparison group of low-income customers. This report also includes the results from the cost-effectiveness tests conducted by a third-party consultant, ICF International (ICF).

I.I PROCESS RESULTS

The process evaluation examined Program operations from multiple perspectives. Rocky Mountain Power has worked with its implementers, EICAP and SEICAA, for several years to deliver the Program. Over this time, they have developed expertise in delivering the Program despite its complex funding environment surrounding low-income weatherization services. The agencies combine funds from Rocky Mountain Power with those from government organizations to reach more low-income customers, demonstrating a best practice in low-income energy efficiency program delivery.[3] Utilities often collaborate with nonprofit agencies to promote their energy efficiency programs for low-income customers, as these organizations typically already have strong relationships with eligible communities. Both agencies maintain a waitlist for weatherization services, prioritizing households with a high energy burden and disabled, elderly, or minor (under 18) residents. One agency generally serves participants within four months of

[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.

receiving their application, whereas participants may wait up to three years to receive services through the other agency.

Although agency staff feel that the Program is operating smoothly, both noted challenges related to COVID-19 that persisted into early 2022. SEICCA also noted specific challenges in identifying homes that both qualified for and required weatherization assistance during the evaluation period.

Staff from both agencies speak to Program participants about ways to save energy in their homes. Coupling energy efficiency education with home audits and measure installation is one way implementation staff can use home visits to help induce behavioral changes that may further reduce energy costs. It is also considered a best practice of energy efficiency programs designed to serve low-income clients.[4] Four of the six survey respondents recalled receiving energy education from the Program; all (4 of 4) found the information at least somewhat helpful, with two rating it as extremely helpful.

The Program aims to improve the health, comfort, and aesthetics of participant households. In the telephone survey, we asked Program participants if the air quality, appearance, and comfort of their homes were better, the same, or worse after they participated. Four of six respondents reported an improvement in comfort, three reported an improvement in air quality, and two reported an improvement in their home's appearance.

Participants' experience with the Program was very positive overall. Four of the surveyed participants reported being "completely satisfied" with the Program, and the remaining two indicated moderate satisfaction; however, all participants would recommend it to others. Two participants suggested ways to improve the Program, with one requesting that the Program offer window replacements[5] and the other requesting more communication from staff on ways to reduce their bill.

1.2 IMPACT RESULTS

We conducted a deemed savings review to estimate the energy savings from the Program. Table 1 presents the ex-post net savings for each program year and in total. Overall, the Program achieved 216% of its ex-ante gross savings for the full evaluation period (2022–2023).

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	27	31,995	52,088	163%
2023	45	103,661	241,057	233%
Total	**72**	**135,656**	**293,145**	**216%**

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.

[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.

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

The average annual ex-post net energy savings per participant was 1,884 kWh during the 2022–2023 evaluation period. Despite only being installed in 26 cases, representing just over one-third (36%) of homes that participated during the evaluated program years, over half (51%) of program savings are attributable to ductless heat pumps. These units target replacing operable electric space heating, including electric resistance heat, which is much less efficient than the ductless heat pump option.

We describe the impact evaluation in more detail in the sections below and document all ex-post algorithms and assumptions in Appendix B.

1.3 NON-ENERGY BENEFIT RESULTS

1.3.1 EXTERNAL PAYMENT ANALYSIS

To estimate some of the Program's non-energy benefits, we analyzed the differences in external assistance payments between participants and a control group. These payments, offered by low-income nonprofit agencies, assist low-income customers in covering their electric bills. The non-energy benefits were factored into the Program's cost-effectiveness assessment during the evaluation period.

Table 2 presents the average change in assistance payments, both annually and overall, for the evaluation period. Assistance payments decreased by an average of 16% for Program participants and increased by 5% for the comparison group. A net decrease in external payments of $31.85 is shown after participation in the Program, resulting in a positive non-energy benefit.

Table 2. Payment Assistance Amounts Summary for Participants and Comparison Group

Program Year	Participant Group				Comparison Group				Net Difference Amount
	Pre	Post	Change	%Change	Pre	Post	Change	%Change	
2022	$ 142.77	$ 395.98	$ 253.21	177%	$ 125.24	$ 415.58	$ 290.34	232%	$ 37.13
2023	$ 418.18	$ 72.76	$ (345.42)	-83%	$ 430.19	$ 111.35	$(318.84)	-74%	$ 26.58
Total	**$ 280.48**	**$ 234.37**	**$ (46.11)**	**-16%**	**$ 277.72**	**$ 263.247**	**$ (14.25)**	**-5%**	**$ 31.85**

1.3.2 ARREARAGE ANALYSIS

Our team also examined the change in customer arrearages (i.e., the unpaid ending monthly balance on a customer's bill). To estimate this non-energy benefit, we calculated the change in arrearages for Program participants and compared this to the change in arrearages for the comparison group. On average, Program participants' arrearage increased by $23.71 per month, and a $4.44 increase was observed for the comparison group (Table 3). This resulted in a net difference of $19.26. These results indicate participants' monthly arrearages did not decrease after participating in the Program; therefore, we observed no net Program benefit.

Table 3. Arrearage Summary for Participant and Comparison Groups

	Participant Group				Comparison Group				Net Difference in Arrearages	Net Program Benefit
	Pre	Post	Change in Debt	%Change	Pre	Post	Change in Debt	%Change		
Monthly Arrearage	$ 41.61	$ 64.32	$ 23.71	58%	$ 93.22	$ 97.67	$ 4.44	5%	$ 19.26	None

1.4 COST-EFFECTIVENESS RESULTS

Apex Analytics estimated the cost-effectiveness of Rocky Mountain Power's evaluated savings for the Program based on 2022–2023 costs and savings. The Program does not pass any of the cost-effectiveness tests with or without non-energy benefits (NEBs) (Table 4).

Table 4. 2022–2023 Program Benefit/Cost Ratios by NEB Inclusion

NEB Status	PTRC	TRC	UCT	RIM	PCT[a]
Program with NEBs	0.52	0.48	0.37	0.22	n/a
Program without NEBs	0.46	0.43	0.37	0.22	n/a

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

1.5 CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation results, our team offers the following conclusions and 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:** The Program exceeded its expected savings forecast, achieving 293,145 kWh in ex-post net energy savings during the 2022 and 2023 program years, resulting in a realization rate of 216% for the evaluation period. The primary driver behind the difference in ex-ante and ex-post savings during the evaluation period is the savings assumption applied to ductless heat pumps; 1,665 kWh applied for ex-ante, 5,779.97 kWh applied for ex-post. Although ductless heat pumps were only installed in 36% (26 of 72) of participant homes, they account for over half (51%) of Program savings as the Program aims to install them in homes where they will replace existing, operable electric heating systems, including electric resistance, which is highly inefficient.
  - Recommendation: Given evidence from the two most recent evaluations (2020–2021 and 2022–2023) that ex-post savings differ significantly from ex-ante assumptions for ductless heat pumps, we recommend that Rocky Mountain Power apply the ex-post deemed savings for ductless heat pumps in the next Program cycle.
  - Recommendation: Once ductless heat pump units have been installed in at least 100 homes, Rocky Mountain Power should conduct a consumption analysis across this population to more robustly evaluate the contribution of heat pumps to overall Program savings.

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 two local weatherization agencies in Idaho:

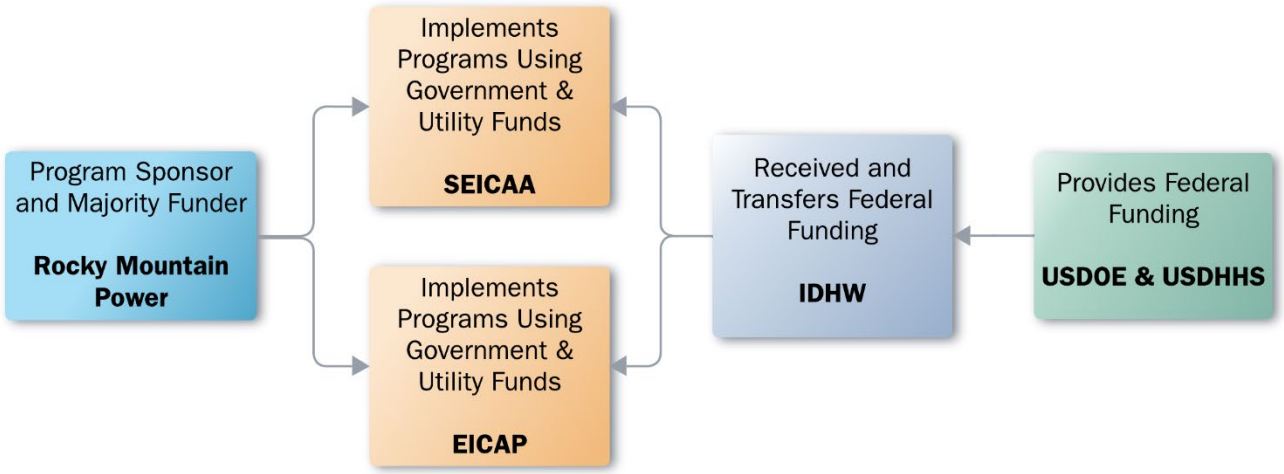
- Eastern Idaho Community Action Partnership (EICAP)[6]
- Southeastern Idaho Community Action Agency (SEICAA)[7]

Partnering with agencies historically serving Idaho's low-income communities allows Rocky Mountain Power to have streamlined access to the participants targeted by this program.

Rocky Mountain Power provides the agencies with 85% of the cost of eligible weatherization measures installed. The agencies also leverage government funding from the United States Department of Energy (DOE) and the United States Department of Health and Human Services (DHHS). These funds are allocated to and administered by the Idaho Department of Health and Welfare (IDHW) to SEICAA and EICAP.

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 Idaho Program funding sources and roles of oversight and implementation.

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



[6] EICAP serves Bingham County, Custer County, Bonneville County, Butte County, Clark County, Fremont County, Jefferson County, Lemhi County, Madison County and Teton County.

[7] SEICAA serves Bannock County, Bear Lake County, Bingham County, Caribou County, Franklin County, Oneida County and Power County.

2.1 PROGRAM IMPLEMENTATION

Program implementation involves the following steps, which are detailed in the 2023 Idaho Energy Efficiency and Peak Reduction Annual Report:[8]

- Income verification based on IDHW guidelines to ensure participants qualify for Program participation
- Energy audit using a DOE-approved tool to determine measures that are cost-effective to install
- Installation of measures that have a Savings-to-Investment Ratio of 1.0 or greater based on the DOE energy audit tool
- Post-inspections of all projects
- Billing notification to Rocky Mountain Power, which includes the measures installed and the associated cost of each project, along with the associated invoice

The Program is available to low-income residential customers in existing single-family (including manufactured) and multifamily homes served by Rocky Mountain Power in Idaho. Duplexes and fourplexes are eligible if low-income tenants occupy one-half of the property. Larger multifamily properties are eligible if low-income qualifying tenants occupy at least 66% of the tenant units. "Low income" qualifications follow Federal guidelines, and Program eligibility is based on 200% of federal poverty guidelines or 60% of State Median Income (SMI), whichever is greater.[9]

Agencies directly install 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 water heater or furnace repairs and replacements, duct sealing and insulation, ductless heat pumps, air sealing, ceiling, floor, and wall insulation, window replacements, and attic ventilation, while supplemental measures include, but are not limited to, LED and CFL light bulbs, refrigerator replacements, doors, and water heater pipe insulation.

2.2 EVALUATION OBJECTIVES

Program objectives are listed in Table 5, along with the evaluation activity used to address each objective.

Table 5. Evaluation Objectives by Evaluation Activities

Objective	Process Evaluation	Impact Evaluation	Payment and Arrearage Analyses
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	✓		
Quantify NEBs through payment and arrearage analyses			✓

[8]https://www.pacificorp.com/content/dam/pcorp/documents/en/pacificorp/environment/dsm/idaho/ID_Energy_Efficiency_and_Peak_Reduction_Report_2023.pdf

[9] Note that the maximum eligibility for Low-Income Home Energy Assistance Program (LIHEAP) funding is 60% State Median Income (SMI).

Objective	Process Evaluation	Impact Evaluation	Payment and Arrearage Analyses
Provide data to support Program cost-effectiveness assessments		✓	✓
Identify areas of potential improvement	✓	✓	
Document compliance with regulatory requirements	✓		
Survey participants and agency staff	✓		

3. DATA SOURCES AND METHODOLOGY

In this section, we review data sources and methodologies used to conduct the research for the process and impact evaluations, non-energy benefits analyses, 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 the impact and process evaluation. These data are tracked at the measure level. Therefore, Program participants who received more than one measure or treatment 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
- Participant-level kWh/year savings
- Direct install costs
- Measure costs

For the Idaho evaluation, we used the program tracking data to identify Program participants and the measures installed to develop the participant telephone survey sample. The program tracking data were also used to support the non-energy benefit and engineering analyses.

3.2 PROCESS EVALUATION

For the process evaluation, we interviewed agency staff and surveyed Program participants. We also reviewed Program activities, outputs, and outcomes based on program theory and explored ways Program staff could improve their organization of such information to align with evaluation best practices.

3.2.1 AGENCY INTERVIEWS

We conducted interviews with staff from the two agencies who implement the Program, SEICAA and EICAP. Each interview was conducted with a single representative from the organization. The agency interviews 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 and inform process-related findings.[10]

Of the 72 customers who participated in Idaho in 2022–2023, we had valid phone numbers for 71. We used a census approach to invite these 71 participants to take the survey. A total of 6 participants completed the survey, yielding a response rate of 14% and cooperation rate of 100% (Table 6).[11]

Table 6. Idaho Customer Telephone Survey

Population Frame	Unique Telephone Numbers	Final Survey Responses	Survey Response Rate	Survey Cooperation Rate
72	71	6	14%	100%

Up to three attempts were made to reach each Program participant. Final dispositions for survey outreach are listed in Table 7.

Table 7. Participant Survey Disposition

Survey Disposition	Sample
Complete	**6**
Answering machine	29
No answer	16
Callback	7
Disconnected	7
Business number	2
Language barrier	2
Wrong number	1
Do not call list	1
Total	**71**

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 updated sources. We estimated program-level savings by multiplying the per-measure savings by the measure quantity provided in the program tracking database. Detailed ex-post equations, assumptions, and sources for each Program measure are available in Appendix B.

[10] Too few survey responses were collected to estimate lighting in-service rates for the evaluation period.

[11] 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 did not achieve a sufficient number of survey responses to calculate an LED in-service rate (ISR) for the current evaluation period.[12] For 2022–2023, we assumed an ISR of 100% for all non-lighting measures and applied an average ISR (76%) for lighting. This average was calculated by taking the mean ISR for LIW Programs operating in Utah (82%) and Wyoming (87%),[13] along with the ISR based on responses to the 2020–2021 Idaho participant survey (60%). LED ISRs over time by state are displayed in Table 8 for context.

Table 8. LED Installation Rates Over Time by State

Evaluation Period	Program Participant Count	Number of Survey Completes	ISR
Utah			
2014–2015	725	70	76%
2018–2019	540	79	96%
2020–2021	428	44	75%
2022--2023	498	44	79%
Average ISR	**N/A**	**N/A**	**82%**
Wyoming			
2014–2015	40	8	73%
2018–2019	40	8	100%
2020–2021	17	3	N/A[a]
2022--2023	14	2	N/A[a]
Average ISR	**N/A**	**N/A**	**87%**
Idaho			
2014–2015	94	21	N/A[b]
2018–2019	133	16	N/A[b]
2020–2021	50	7	60%
2022--2023	72	7	N/A[a]
Average ISR	**N/A**	**N/A**	**60%**
Overall Average ISR	**N/A**	**N/A**	**76%**

[a] Too few survey responses to the LED verification section to calculate an ISR value.

[b] Evaluation used a consumption analysis to measure Program impacts, which do not require an ISR value.

3.4 NON-ENERGY BENEFITS

Low-income weatherization programs often create benefits for participants beyond energy savings. We conducted an external payment analysis and an arrearage analysis to measure these non-energy benefits (NEB). The net difference in external payments received by customers pre- and post-Program participation was included as a NEB input for cost-effectiveness testing.[14]

[12] 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).

[13] Mean ISRs for Utah and Wyoming LIW Programs were calculated using ISRs from evaluations of program years 2014–2015, 2018–2019, 2020–2021, and 2022-2023.

[14] The arrearage analysis resulted in no observed NEB for the Program.

3.4.1 EXTERNAL PAYMENT ANALYSIS

The external payment analysis relied on monthly client assistance payments received by participants and a comparison group from 2021 to 2025. These payments are provided by low-income nonprofit agencies and help low-income customers pay their Rocky Mountain Power electric bills.

We established pre- and post-participation periods for each customer based on their cost recovery date (i.e., the date they received Program services) in the program tracking data, whereas all months between the start of the evaluation period (January 2022) and the cost recovery date were considered the pre-participation period, and all months between the cost recovery date and the end of the evaluation period (December 2023) were defined as the post-participation period. To determine the pre- and post-period for comparison group customers (i.e., 2024 and 2025 Program participants), we estimated the average cost recovery date across all participants from the evaluation period. We compared changes to external assistance payments between Program participants and the comparison group over the evaluation period.

3.4.2 ARREARAGE ANALYSIS

We also received arrearage data from Rocky Mountain Power that provided customers' monthly unpaid account balances from 2021 to 2025. This range of data allowed us to establish a 12-month pre- and post-participation period for each customer, based on their cost recovery date in the program tracking data, to understand how Program services have impacted customers' arrearages. To determine the pre- and post-period for comparison group customers, we estimated the average cost recovery date across all participants from the evaluation period. We compared participant and comparison group unpaid account balances to better understand how Program participation and subsequent energy savings have impacted customer arrearages.

We excluded 59 participants and 57 comparison group customers from the analysis due to insufficient arrearage data (i.e., cases where fewer than 12 months of pre- and post-participation data were included in the data).

3.5 COST-EFFECTIVENESS

Opinion Dynamics calculated inputs for cost-effectiveness testing through the engineering analysis and non-energy benefit analyses. We provided these inputs to Apex Analytics, which conducted the final cost-effectiveness modeling and outputs.

4. RESULTS

This section details the results from the process and impact evaluations, non-energy benefit analyses, 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 conducted two agency interviews in November and December 2025, with representatives from EICAP and SEICAA. The goal was to gain a deeper understanding of the Program's operations and identify any key opportunities for improvement. We present each agency's perspective in the subsections below. Almost all (97%) 2022–2023 Program participants received services from EICAP, while the remaining participants (3%) received services from SEICAA.

EASTERN IDAHO COMMUNITY ACTION PARTNERSHIP (EICAP)

EICAP typically provides weatherization services to about 80 customers annually, with roughly one-third (30%) being Rocky Mountain Power customers. EICAP receives funding from multiple sources, including Rocky Mountain Power, other local utilities, and additional state and federal funding sources, to provide Program participants with weatherization services.

Customers who receive energy assistance through IDHW are added to EICAP's weatherization waitlist. This list includes roughly 300 people, with Rocky Mountain Power customers comprising approximately one-third (30%). On average, customers spend two to three years on the waitlist before receiving Program services. EICAP prioritizes customers based on the date of their application, the utility service they use, and whether the household includes small children or seniors. The agency reviews the waitlist daily to re-prioritize applicants based on the length of time they have been waiting for services. Once an applicant reaches the top of the waitlist, EICAP sends a letter and waits to hear back from the applicant.

EICAP agency staff noted that when additional work is needed before weatherization services can be implemented (i.e., health and safety improvements), they can complete the upfront work using their federal home aid funding from their affordable housing program. This funding allows them to minimize deferrals that would have likely occurred otherwise and ultimately weatherize seven additional homes, on average, per year.

EICAP reported that there were no changes to the Program's design during the 2022-2023 program period, and they did not experience any significant challenges. However, EICAP drew attention to the administrative reimbursement rate, which has remained unchanged since 2006 despite substantial increases in general costs. The agency highlighted how adjusting the reimbursement rate to reflect rising costs over the past 20 years would significantly reduce administrative burden.

SOUTHEASTERN IDAHO COMMUNITY ACTION AGENCY (SEICAA)

Funding for low-income weatherization services SEICAA provides comes from various state and federal sources, such as the DOE, Bonneville Power Administration (BPA), Community Services Block Grant (CSBG), and LIHEAP in addition to Rocky Mountain Power.

Similar to EICAP, SEICAA maintains a waitlist of eligible customers who may receive weatherization services, consisting of approximately 6,000 individuals who receive energy assistance through IDHW. Customers can also join the list by calling the agency directly. Agency staff review this list to verify income eligibility and prioritize households based on the presence of young children and elderly or disabled residents in the home, as well as high energy burden. For customers who rent their home, the property owner's signature is required before services can be provided.

Once SEICAA determines a customer is eligible and an appointment is set, weatherization services are typically completed within four months.

Agency staff did not report any major changes to the Program's design during the 2022–2023 program years; however, several staffing changes over the past few years limited recall of specifics that occurred during the evaluation period. SEICAA reported that the Program is running smoothly from their perspective. The only challenge noted was that in early 2022, they had difficulty identifying all-electric homes in their region, as most homes received gas or propane services.

4.1.2 PARTICIPANT PERSPECTIVE

We used the participant survey to collect data about household characteristics and Program experience. Six of the 71 participants from 2022–2023 completed the survey.

PROGRAM AWARENESS

When asked how they heard about the Program, two respondents reported hearing about it through a Rocky Mountain Power representative, and two said they heard about it through word of mouth from family, friends, or neighbors. Of the final two respondents, one learned about the Program from agency staff, while the other did through a local senior center.

The SEICAA representative shared that implementation staff place signs in the front yards of homes to acknowledge that both SEICAA and Rocky Mountain Power support the weatherization services provided through the Program. Despite this, only one of the six participants identified Rocky Mountain Power as a funding source for the Program. Another participant mentioned Eastern Idaho Special Services as a source of funding, while the remaining four participants stated they were unsure.

Despite all being served by the same agency, half of respondents (3 of 6) received Program services within three months of submitting their application, while the other half (3 of 6) waited approximately a year.

ENERGY EDUCATION

The Program does not formally offer energy education; however, most surveyed participants (4 of 6) indicated that agency staff shared energy-saving tips with them during the visit. Of the final two respondents, one indicated they did not receive energy education, and one did not recall if they had. All respondents who recalled receiving education took at least some of the recommended energy-saving actions. Half of these respondents (2 of 4)

adjusted their thermostat seasonally to conserve energy (i.e., lowered thermostat temperature in winter and increased it in summer). Other energy-saving actions taken included closing windows and doors, and caulking and weather sealing windows and doors.

Although the Program does not officially provide energy education, the opportunities taken to present energy-saving recommendations during audits or measure installations positively impacted Program participants. All four surveyed participants who recalled receiving education from agency staff reported it was at least somewhat helpful, two of whom found the information to be extremely helpful.

In addition to tips for saving energy, three participants indicated agency staff also discussed ways to improve health and safety in their homes.

PROGRAM DELIVERY AND SATISFACTION

Participant feedback about the Program varied. On a scale from 0 to 10, where 0 is extremely dissatisfied, and 10 is extremely satisfied, most surveyed participants (4 of 6) reported being "completely satisfied" with their overall experience with the Program, as indicated by a rating of 8 or higher. The remaining two participants provided ratings of 5 and 6, indicating moderate satisfaction. The mean satisfaction score was 9.3. Despite varying satisfaction scores, all survey respondents said they would recommend the Program to others.

Two of the six participants provided suggestions to improve the Program in the future (Table 9).

Table 9. Participant Recommendations for Program Improvements (n=2)

Participant Verbatim Recommendations for Program Improvements
It would be great if they could do windows.[a]
Communication with the clients and following through. If they would have like communicated about ways to cut my power bill down.

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

All six respondents indicated the application process was "extremely easy." Additionally, the majority of participants were very pleased with the staff in their home, reporting that agency staff were courteous and respectful (5 of 6) and worked carefully to protect their home (5 of 6).

PERCEIVED PROGRAM IMPACT

Both surveyed participants flagged in the program tracking data as having received a refrigerator replacement recalled the weatherization staff installing the refrigerator. These participants also both indicated higher satisfaction with the new refrigerator compared to their previous equipment.

Two of the three participants flagged as having received LED light bulbs recalled the bulbs being installed by agency staff. Among these two participants, one reported higher satisfaction with the new LEDs compared to their previous lighting and said they have purchased and installed additional LED bulbs since receiving those installed through the

Program. The other participant, who stated they already had LEDs prior to receiving Program services, expressed lower satisfaction with the lighting installed through the Program.

Four of the six participants noticed a change in their electric bill since receiving Program services, with most (3 of 4) reporting a decrease in their bill. Interestingly, one respondent said they have observed an increase in their bill since participating in the Program.

We also explored non-energy benefits that may have resulted from Program services. We asked participants if they felt the air quality, appearance, and comfort of their home was better, the same, or worse after receiving weatherization services. Surveyed participants most commonly reported improvements in the comfort of their home (4 of 6) following Program services, while three reported an improvement in air quality, and two observed an improvement in their home's appearance.

4.2 IMPACT EVALUATION

A total of 72 customers participated in the Program between 2022 and 2023. Table 10 summarizes the number of customers who received each measure, from the most common (LED light bulbs) to the least common (furnace replacement). Other common measures include air sealing, water heater pipe insulation, and ceiling insulation.

Table 10. Idaho Participation Counts and Measures for Program Years 2022–2023

Measures	2022	2023	Total	Percent Treated
Total # of Treated Homes	**27**	**45**	**72**	**100%**
LED Light Bulbs	24	43	67	93%
Air Sealing	24	41	65	90%
Water Heater Pipe Insulation	25	40	65	90%
Ceiling Insulation	19	27	46	64%
Window Replacement	15	29	44	61%
Floor Insulation	16	24	40	56%
Furnace Repair	14	23	37	51%
Thermal Doors	13	22	35	49%
Attic Ventilation	12	16	28	39%
Ductless Heat Pump	0	26	26	36%
Water Heater Repair	14	12	26	36%
Duct Sealing and Insulation	2	12	14	19%
Wall Insulation	5	3	8	11%
Refrigerator Replacement	0	6	6	8%
Ground Cover Vapor Barrier	0	4	4	6%
CFL Light Bulbs	3	0	3	4%
Duct Sealing	0	1	1	1%
Water Heater Replacement	0	1	1	1%
Furnace Replacement	0	1	1	1%

4.2.1 PROGRAM SAVINGS

Table 11 presents the annual ex-ante and ex-post net energy savings for the Program. The Program achieved 293,145 kWh in energy savings between 2022 and 2023 program years, resulting in a realization rate of 216% for the evaluation period. As observed in the prior evaluation, the primary driver behind the difference in savings is the savings assumption applied to ductless heat pumps. Although ductless heat pumps were installed in 36% of participant homes, they account for over 50% of Program savings (Table 12). The Program replaces operable electric heating, including electric resistance, which is highly inefficient, with ductless heat pumps.

For 2022–2023, we assumed an ISR of 100% for all non-lighting measures and applied an average ISR (76%) for lighting, as described 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.

Table 11. 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	27	31,995	52,088	163%
2023	45	103,661	241,057	233%
Total	**72**	**135,656**	**293,145**	**216%**

On average, customers saved 1,884 kWh per year after installing Program measures. Table 12 compares the ex-post savings by measure type with the proportion of savings attributable to each measure. The majority of ex-post savings (75%) result from ductless heat pumps, air sealing, and floor insulation upgrades.

Table 12. 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	
Ductless Heat Pump	0	26	Heat Pumps	5,779.97	0	150,279	51%
Air Sealing	24	41	Participants	597.34	14,336	24,491	13%
Floor Insulation	16	24	Participants	739.48	11,832	17,748	10%
Water Heater Pipe Insulation	25	40	Per six feet of insulation	262.96	6,574	10,518	6%
LED Light Bulbs	192	344	Bulbs	29.96	5,752	10,306	5%
Ceiling Insulation	19	27	Participants	157.60	2,994	4,255	2%
Wall Insulation	5	3	Participants	802.11	4,011	2,406	2%
Duct Sealing and Insulation	2	12	Participants	824.86	1,650	9,898	4%
Window Replacement	15	60	Windows	55.75	836	3,345	1%
Water Heater Repair	14	12	Water Heaters	129.94	1,819	1,559	1%
Refrigerator Replacement	0	6	Refrigerators	581.78	0	3,491	1%
Thermal Doors	13	27	Doors	43.68	568	1,179	1%
Furnace Repair	14	23	Furnaces	45.49	637	1,046	1%
CFL Light Bulbs	24	0	Bulbs	44.94	1,079	0	0.4%
Duct Sealing	0	1	Participants	534.43	0	534	0.2%
Attic Ventilation	12	16	Participants	0.00	0	0	0%
Ground Cover Vapor Barrier	0	4	Participants	0.00	0	0	0%
Water Heater Replacement	0	1	Water Heaters	0.00	0	0	0%
Furnace Replacement	0	1	Furnaces	0.00	0	0	0%
Total	**375**	**668**			**52,088**	**241,057**	**100%**

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

4.3 NON-ENERGY BENEFITS

The Program is expected to provide participants with additional benefits beyond energy savings. We conducted an external payment and an arrearage analysis to determine these non-energy benefits.

4.3.1 EXTERNAL PAYMENT ANALYSIS

To complete the external payment analysis, we compared changes to external assistance payments between 2022–2023 Program participants and a comparison group of future participants during the evaluation period.

Table 13 presents the change in external assistance payments, both annually and overall, for the evaluation period. Assistance payments decreased by 16% on average for Program participants. As Program participants required $31.85 less in payment assistance after participation than the comparison group, these results represent a net benefit attributable to the Program. This net benefit was included as an input for cost-effectiveness testing.

Table 13. Payment Assistance Amounts Summary for Participants and Comparison Group

Program Year	Participant Group				Comparison Group				Net Difference Amount
	Pre	Post	Change	%Change	Pre	Post	Change	%Change	
2022	$ 142.77	$ 395.98	$ 253.21	177%	$ 125.24	$ 415.58	$ 290.34	232%	$ 37.13
2023	$ 418.18	$ 72.76	$ (345.42)	-83%	$ 430.19	$ 111.35	$ (318.84)	-74%	$ 26.58
Total	**$ 280.48**	**$ 234.37**	**$ (46.11)**	**-16%**	**$ 277.72**	**$ 263.47**	**$ (14.25)**	**-5%**	**$ 31.85**

4.3.2 ARREARAGE ANALYSIS

In addition to the external payment analysis, we examined the change in arrearages after Program participation. An arrearage is the unpaid monthly balance on a customer's bill. To estimate this non-energy benefit, we calculated the change in arrearages for Program participants and compared this to the change in arrearages for a comparison group.

The net difference in customer arrearages is $19.26. Arrearages increased for both customer groups; the average monthly arrearages for the participant group rose by $23.71, while the control group saw an increase of $4.44 (Table 14). Although this result is unexpected, several factors may explain the increase in bills, including higher energy use as some customers may have previously under-consumed to maintain lower bills, as well as external influences such as rate changes, weather variability, and changes in household circumstances.

As the participant group's monthly arrearages did not decrease, no non-energy benefits were attributable to the Program.

Table 14. Arrearage Summary for Participant and Comparison Groups

	Participant Group				Comparison Group				Net Difference in Arrearages	Net Program Benefit
	Pre	Post	Change in Debt	%Change	Pre	Post	Change in Debt	%Change		
Monthly Arrearage	$ 41.61	$ 64.32	$ 23.71	58%	$ 93.22	$ 97.67	$ 4.44	5%	$ 19.26	None

4.4 COST-EFFECTIVENESS

Apex Analytics estimated the cost-effectiveness of Rocky Mountain Power's 2022–2023 Program operating in Idaho. The Program does not pass any of the cost-effectiveness tests with or without NEBs.

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.

Table 15 presents the cost-effectiveness results at the program level for 2022-2023 by inclusion of NEBs.

Table 15. 2022–2023 Program Benefit/Cost Ratios by NEB Inclusion

NEB Status	PTRC	TRC	UCT	RIM	PCT[a]
Program with NEBs	0.52	0.48	0.37	0.22	n/a
Program without NEBs	0.46	0.43	0.37	0.22	n/a

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

Table 16 presents the cost-effectiveness results without NEBs for 2022-2023.

Table 16. 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	$0.02	$582,660	$269,756	($312,904)	0.46
Total Resource Cost Test (TRC) No Adder	$0.02	$582,660	$248,386	($334,274)	0.43
Utility Cost Test (UCT)	$0.17	$582,660	$213,688	($368,972)	0.37
Participant Cost Test (PCT)		$0	$925,428	$925,428	Pass[b]
Ratepayer Impact Measure Test (RIM)		$990,394	$213,688	($776,706)	0.22
Lifecycle Revenue Impacts ($/kWh)					$0.00027

[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.

Table 17 presents the cost-effectiveness results, including NEBs for 2022-2023.

Table 17. 2022–2023 Program Cost-Effectiveness Results (Including NEBs)

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.02	$582,660	$303,297	($279,363)	0.52
Total Resource Cost Test (TRC) No Adder	$0.02	$582,660	$281,929	($300,731)	0.48
Utility Cost Test (UCT)	$0.17	$582,660	$213,688	($368,972)	0.37
Participant Cost Test (PCT)		$0	$992,512	$992,512	Pass[a]
Ratepayer Impact Measure Test (RIM)		$990,394	$213,688	($776,706)	0.22
Lifecycle Revenue Impacts ($/kWh)					$0.00

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

Table 18 presents the cost-effectiveness results at the program level for 2022 by inclusion of NEBs.

Table 18. 2022 Program Benefit/Cost Ratios by NEB Inclusion

NEB Status	PTRC	TRC	UCT	RIM	PCT[a]
Program with NEBs	0.56	0.53	0.28	0.19	n/a
Program without NEBs	0.42	0.39	0.28	0.19	n/a

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

Table 19 presents the cost-effectiveness results, without NEBs at the program level for 2022.

Table 19. 2022 Program Cost-Effectiveness Results (Without NEBs)

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.22	$147,975	$62,164	($85,811)	0.42
Total Resource Cost Test (TRC) No Adder	$0.22	$147,975	$57,982	($89,993)	0.39
Utility Cost Test (UCT)	$0.22	$147,975	$41,810	($106,165)	0.28
Participant Cost Test (PCT)		$0	$197,956	$197,956	Pass[a]
Ratepayer Impact Measure Test (RIM)		$225,146	$41,810	($183,335)	0.19
Lifecycle Revenue Impacts ($/kWh)					$0.00

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

Table 20 presents the cost-effectiveness results, including NEBs at the program level for 2022.

Table 20. 2022 Program Cost-Effectiveness Results (Including NEBs)

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.22	$147,975	$82,766	($65,209)	0.56
Total Resource Cost Test (TRC) No Adder	$0.22	$147,975	$78,585	($69,390)	0.53
Utility Cost Test (UCT)	$0.22	$147,975	$41,810	($106,165)	0.28
Participant Cost Test (PCT)		$0	$239,161	$239,161	Pass[a]
Ratepayer Impact Measure Test (RIM)		$225,146	$41,810	($183,336)	0.19
Lifecycle Revenue Impacts ($/kWh)					$0.00

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

Table 21 presents the cost-effectiveness results at the program level for 2023 by inclusion of NEBs.

Table 21. 2023 Program Benefit/Cost Ratios by NEB Inclusion

NEB Status	PTRC	TRC	UCT	RIM	PCT[a]
Program with NEBs	0.51	0.47	0.40	0.22	n/a

Program without NEBs	0.48	0.44	0.40	0.22	n/a

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

Table 22 presents the cost-effectiveness results, without NEBs at the program level for 2023.

Table 22. 2023 Program Cost-Effectiveness Results (Without NEBs)

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.15	$434,685	$207,592	($227,093)	0.48
Total Resource Cost Test (TRC) No Adder	$0.15	$434,685	$190,404	($244,281)	0.44
Utility Cost Test (UCT)	$0.15	$434,685	$171,878	($262,807)	0.40
Participant Cost Test (PCT)		$0	$727,472	$727,472	Pass[a]
Ratepayer Impact Measure Test (RIM)		$765,248	$171,878	($593,370)	0.22
Lifecycle Revenue Impacts ($/kWh)					$0.0003

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

Table 23 presents the cost-effectiveness results, including NEBs at the program level for 2023.

Table 23. 2023 Program Cost-Effectiveness Results (Including NEBs)

Cost-Effectiveness Test	Levelized $/kWh	NPV Costs	NPV Benefits	Net Benefits	Benefit/Cost Ratio
Total Resource Cost Test (PTRC) + Conservation Adder	$0.01	$434,685	$220,531	($214,154)	0.51
Total Resource Cost Test (TRC) No Adder	$0.01	$434,685	$203,344	($231,341)	0.47
Utility Cost Test (UCT)	$0.15	$434,685	$171,878	($262,807)	0.40
Participant Cost Test (PCT)		$0	$753,351	$753,351	Pass[a]
Ratepayer Impact Measure Test (RIM)		$765,248	$171,878	($593,370)	0.22
Lifecycle Revenue Impacts ($/kWh)					$0.00033

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

APPENDIX A. ACRONYM GLOSSARY

Table 24. Acronym Glossary

Acronyms	Meaning
CFL	Compact Fluorescent Light Bulb
DHHS	United States Department of Health & Human Services
DOE	United States Department of Energy
EICAP	Eastern Idaho Community Action Partnership
IDHW	Idaho Department of Health and Welfare
kWh	Kilowatt-hour
LED	Light Emitting Diode Light Bulb
LIHEAP	Low-Income Home Energy Assistance Program
LIW	Low-Income Weatherization
NEB	Non-Energy Benefit
PCT	Participant Cost Test
PTRC	PacifiCorp Total Resource Cost Test
RIM	Ratepayer Impact Measure Test
SEICAA	Southeastern Idaho Community Action Agency
TRC	Total Resource Cost
TRM	Technical Reference Manual
UCT	Utility Cost Test

APPENDIX B. IMPACT ANALYSIS DETAILS

B.I DUCTLESS HEAT PUMP

Table 25 documents the inputs and methodology for estimating ductless heat pump savings.

Table 25. Algorithms and Inputs for Ductless Heat Pump

Algorithms Used		
kWh Savings (cooling)	= ((Btuh × FLHcool / DuctlessSaveCool × (1 / nCoolbase × (1 – Derating)) – (Btuh × FLHcool × (1 / nCooleff × (1 – Derating)))) / 1,000	
kWh Savings (heating)	= ((Btuh × FLHheat / DuctlessSaveHeat × (1 / nHeatbase × ClimateAdj × (1 – Derating))) – (Btuh × FLHheat × (1 / nHeateff × ClimateAdj × (1 – Derating)))) / 1,000	
kWh Savings	= (Cooling kWh Savings + Heating kWh Savings) × ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.3.1		
Parameter	**Value**	**Source/Notes**
Equipment capacity (Btuh)	24,000	Average square footage from RECS 2020 (1,690) requires a 2-ton mini-split system to serve the whole home.
Full Load Cooling Hours (FLHcool)	554	EPA Calculator. Assume average between cities in Idaho.
Full Load Heating Hours (FLHheat)	2,443	
Ducted Cooling Load Adjustment (DuctlessSaveCool)	0.91	Accounts for heating and cooling loads displaced by ductless systems that are not subject to losses from existing ductwork. IL TRM V13.0 and RECS 2020 for Mountain North Division.
Ducted Heating Load Adjustment (DuctlessSaveHeat)	1.00	
Cooling efficiency of existing cooling equipment (nCoolbase)	13.70 SEER2	IL TRM V13.0 for time of sale baseline for unknown cooling type with installed ductless heat pump. Assumption based on the decision to replace existing system(s) with the desire to add cooling.
Cooling efficiency of installed ductless heat pump (nCooleff)	16.00 SEER2	Minimum for Rocky Mountain Power WattSmart Program. https://wattsmarthomes.com/rebates/ductless-heat-pumps-UT/
Quality Install Derating factor (Derating)	10%	IL TRM V13.0 for quality installation.
Heating efficiency of existing electric heating equipment (nHeatbase)	5.30 HSPF2	IL TRM V13.0 for time of sale baseline for unknown heating type with installed ductless heat pump. Pacificorp confirmed that only permanently installed operable electric space heat (including electric resistance) is replaced by ductless heat pumps.
Heating efficiency of installed ductless heat pump (nHeateff)	8.10 HSPF2	Minimum for Rocky Mountain Power WattSmart Program. https://wattsmarthomes.com/rebates/ductless-heat-pumps-UT/
Heating Climate Adjust Factor (ClimateAdj)	77%	IL TRM V13.0 for single family homes in Chicago, IL (most representable climate to Idaho). Accounts for observed discrepancies between HSPF related to HSPF2 by Standard AHRI 210/240 rating conditions.
In-Service Rate (ISR)	100%	This measure requires a trained professional install equipment that is not easily removed.

Table 26 provides the deemed savings for ductless heat pumps, using the assumptions from Table 25.

Table 26. Ductless Heat Pump Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per System	5,779.97

B.2 AIR SEALING

Table 27 documents the inputs and methodology for estimating air sealing savings.

Table 27. Algorithms and Inputs for Air Sealing

Algorithms Used		
kWh Savings (cooling)	= ((((CFM50existing – CFM50new)/Nfactor) × 60 × 24 × CDD × DUA × 0.018) / (1,000 × ηCool) × LM) × %Cool × ISR	
kWh Savings (heating)	= ((((CFM50existing – CFM50new)/Nfactor) × 60 × 24 × HDD × 0.018) / (nHeat × 3,412)) × %ElecHeat × ISR	
kWh Savings	= Cooling kWh Savings + Heating kWh Savings	
Source of Algorithm: Illinois TRM V13.0 Section 5.6.1		
Parameter	**Value**	**Source/Notes**
Existing Infiltration Rate (ACH50existing)	17.40	ENERGY STAR savings analysis assumptions for Idaho (Use Climate Zone 6 as it covers the majority of the State). Assume "Whole House Air Sealing." https://www.energystar.gov/ia/home_improvement/home_sealing/Measure_Upgrade_Assumptions.pdf?945a-eddc
Improved Infiltration Rate (ACH50new)	13.10	
Existing Infiltration Rate (CFM50existing)	3,920	Converts ACH50 to CFM50 (=ACH50×Volume/60 minutes), where volume is the total conditioned floor area (1,690 sf) from RECS 2020 data for Idaho (Mountain North) multiplied by an assumed ceiling height of 8 feet http://www.pureenergyaudits.com/docs/Blower_Door_Handout_ACI_Baltimore.pdf
Improved Infiltration Rate (CFM50new)	2,951	
Nfactor	17.18	BPI Technical Standards for the Building Analyst Professional. Majority of Idaho is located in Zone 2 applied across 1, and 1.5 stories as the average number of stories per 2020 RECs is 1.40 stories multiplied by the average Height Correction Factor (0.95).
Conversion	1,440	Converts ft^3/min to ft^3/day by multiplying 60 (mins/hour) by 24 (hours/day).
Cooling degree day (CDD)	343	ASHRAE Fundamentals 2021 for Idaho.
Heating degree day (HDD)	7,891	
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.
Heat capacity of air	0.018	Volumetric heat capacity of air.
Cooling Efficiency (nCool)	12.64 SEER	Weighted average by equipment type and age from IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Heating Efficiency (nHeat)	1.56 COP	
Latent multiplier (LM)	3.20	IL TRM V13.0 for Chicago, IL, most representable climate to Idaho.
Percent of homes with central cooling (%Cool)	60%	RECS Survey 2020 for Mountain North Division.
Percent of Homes with electric heating (%ElecHeat)	25%	RECS Survey 2020 for Mountain North Division.
In-service rate (ISR)	100%	From the Low-Income Weatherization Program Summary in the Demand Side Management Report (issued May 2024). Post-Installation Inspections completed to verify installation of measures.

Table 28 provides the deemed savings for air sealing, using the assumptions from Table 27.

Table 28. Air Sealing Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per home	597.34

B.3 FLOOR INSULATION

Table 29 documents the inputs and methodology for estimating floor insulation savings.

Table 29. 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) / (3,412 × ηHeat)) × 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, assuming 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". In absence of a statewide energy code, the IECC energy code for Idaho's climate zone (zone 6), 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)	1,208	Calculated foundation footprint square footage by dividing total conditioned floor area (1,690 sf) by the number of stories (1.40) from RECS 2020 data for Idaho (Mountain North)
Framing factor	12%	IL TRM V13.0.
Cooling Degree Day (CDD)	313	Five year average cooling degree days with base temperature 75F and heating degree days with base temperature 50F from degreedays.net for Idaho.
Heating Degree Day (HDD)	3,829	
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%	IL TRM V13.0. Adjustment for heating savings to account for inaccuracies in prescriptive engineering algorithms
Percent of Homes with Central Cooling (%Cool)	60%	RECS Survey 2020 for Mountain North Division.
Percent of Homes with Electric Heating (%ElecHeat)	25%	RECS Survey 2020 for Mountain North Division.
In-Service Rate (ISR)	100%	Assumed 100% of installed floor insulation remain installed as it is a major measure and not likely to be removed by the participant.

Table 30 provides the deemed savings for floor insulation, using the assumptions from Table 29.

Table 30. Floor Insulation Deemed Savings

Metric	Deemed Saving Per Measure
Annual kWh per home	739.48

B.4 WATER HEATER PIPE INSULATION

Table 31 documents the inputs and methodology for estimating water heater pipe insulation savings.

Table 31. Algorithms and Inputs for Water Heater Pipe Insulation

Algorithms Used		
kWh Savings	= ((1/Rexist – 1/Rnew) × Cinside × L × ΔT × 8,766)/ ηDHW / 3412) × %ElecWH × ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.4.1.		
Parameter	**Value**	**Source/Notes**
R-value of uninsulated water heater pipe (Rexist)	0.42	IL TRM V13.0. Average values for 1/2" and 3/4" diameter for both copper and PEX types
R-value of added water heater pipe insulation (Radded)	2.00	Calculated. Radded = Insulation thickness (inches) / Conductivity at 100°F. Assumed ½" insulation thickness base on standard pipe insulation thickness. Conductivity of 0.25 based on 100°F fluid temperature with an outer radius <1.0 inches from ASHRAE Fundamentals Chapter 23 (Table 2).
Total R-value of water heater pipe insulation (Rnew)	2.42	Calculated. Rnew = Radded+Rexist
Inside circumference of the pipe (Cinside)	0.16	IL TRM V13.0. Average values for 1/2" and 3/4" diameter for both copper and PEX types
Effective linear feet of pipe length (L)	5.17	Calculated using equation from IL TRM V13.0. L = Lhorizontal + αLvertical, Assume 6 feet of insulation (consistent with 2018-2019 evaluation). Per IL TRM V13.0, assume 3 feet for vertical and remaining length for horizontal. IL TRM V13.0 average value for 1/2-inch and 3/4-inch diameter for both copper and PEX type α = 0.72
Supplied water and outside air temperature differential (ΔT)	60°F	IL TRM V13.0. Assumes 125°F water leaving the hot water tank and average temperature of basement of 65°F
Annual hours per year	8,766	Conversion
Recovery efficiency of water heater (nDHW)	0.98	Typical recovery efficiency for electric resistance heaters (IL TRM, IN TRM, ARK TRM)
BTU to kWh Conversion	3,412	Standard conversion
Percent of homes with electric water heating (%ElecWH)	100%	Program targets homes with electric hot water heaters.
In-Service Rate (ISR)	100%	From the Low-Income Weatherization Program Summary in the Idaho Demand Side Management Report (issued May 2024). Post-Installation Inspections completed to verify installation of measures.

Table 32 provides the deemed savings for water heater pipe insulation, using the assumptions from Table 31.

Table 32. Water Heater Pipe Insulation Deemed Savings

Metric	Deemed Savings Per Measure
Annual kWh per 6 feet	262.96

B.5 LED LIGHT BULBS

Table 33 documents the inputs and methodology for estimating LED savings.

Table 33. 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)	76%	Average survey results across Wyoming, Utah, and Idaho from 2014–2023 conducted participant surveys.

Table 34 provides the deemed savings for LED light bulbs using the assumptions from Table 33.

Table 34. LED Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per LED	29.96

B.6 CEILING INSULATION

Table 35 documents the inputs and methodology for estimating ceiling insulation savings.

Table 35. 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	"LIW TRL" sheet in Program database indicates 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)	38.0	"LIW TRL" sheet in Program database specifies an efficiency requirement "Up to R-48." In absence of a statewide energy code, the IECC energy code for Idaho's climate zone (Zone 6), requires R-48. Assume R-38 as a conservative estimate.
Area of Installed Insulation (Area)	1,208	Calculated attic footprint square footage by dividing total conditioned floor area (1,690 square feet) by the number of stories (1.40) from RECS 2020 data for Idaho (Mountain North).
Framing factor	7%	IL TRM V13.0.
Cooling Degree Day (CDD)	343	ASHRAE Fundamentals 2021 for Idaho.
Heating Degree Day (HDD)	7,891	
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 savings to account for inaccuracies in prescriptive engineering algorithms.
Heating savings adjustment (ADJheat)	63%	IL TRM V13.0. Adjustment for heating savings to account for inaccuracies in prescriptive engineering algorithms.
Percent of homes with central cooling (%Cool)	60%	RECS Survey 2020 for Mountain North Division.
Percent of homes with electric heating (%ElecHeat)	25%	RECS Survey 2020 for Mountain North Division.
In-service rate (ISR)	100%	Assumed 100% of ceiling insulation remain installed as it is a major measure and not likely to be removed by the participant.

Table 36 provides the deemed savings for ceiling insulation, using the assumptions from Table 35.

Table 36. Ceiling Insulation Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per home	157.60

B.7 WALL INSULATION

Table 37 documents the inputs and methodology for estimating wall insulation savings.

Table 37. 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 V12.0. 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". In absence of a statewide energy code, the IECC energy code for Idaho's climate zone (Zone 6), requires R-20, R-13 cavity insulation + R-5 insulated sheathing (if <25% exterior structural sheathing), 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)	1,380	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) and conditioned floor area (1,690 square feet) from RECS 2020 data for Idaho (Mountain North). Reduced by 25% as a conservative estimate provided limited program-specific data.
Framing factor	25%	IL TRM V13.0.
Cooling degree day (CDD)	343	ASHRAE Fundamentals 2021 for Idaho.
Heating degree day (HDD)	7,891	
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%	IL TRM V13.0. Adjustment for heating savings to account for inaccuracies in prescriptive engineering algorithms.
Percent of homes with central cooling (%Cool)	60%	RECS Survey 2020 for Mountain North Division.
percent of homes with electric heating (%ElecHeat)	25%	RECS Survey 2020 for Mountain North Division.
In-service rate (ISR)	100%	Assumed 100% of wall insulation remain installed as it is a major measure and not likely to be removed by the participant.

Table 38 provides the deemed savings for wall insulation, using the assumptions from Table 37.

Table 38. Wall Insulation Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per home	802.11

B.8 DUCT SEALING & INSULATION

Table 39 documents the inputs and methodology for estimating duct sealing and insulation savings.

Table 39. 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)	96%	From BPI "Guidance on Estimating Distribution Efficiency." Assume average for tightly sealed ducts for all duct locations insulated to R-8
DEafter (heating)	95%	
DEbefore (cooling)	87%	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)	85%	
Full Load Cooling Hours (FLHcool)	554	EPA Calculator. Assume average between cities in Idaho
Full Load Heating Hours (FLHheat)	2,443	
Capacity of central cooling equipment (CapacityCool)	36,000	Approximately 0.0016 tons of cooling is needed per square foot. Rounded to the nearest nominal tonnage. Total conditioned floor area (1,690 sf) from RECS 2020 data for Idaho (Mountain North).
Output capacity of heating equipment (CapacityHeat)	59,133	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. Duct location is unknown. Assumed 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)	60%	RECS Survey 2020 for Mountain North Division.
Percent of homes with electric heating (%ElecHeat)	25%	RECS Survey 2020 for Mountain North Division.
In-service rate (ISR)	100%	Assumed 100% of duct sealing and insulation remain installed as it is a major measure and not likely to be removed by the participant

Table 40 provides the deemed savings for duct sealing and insulation, using the assumptions from Table 39.

Table 40. Duct Sealing and Insulation Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per home	824.86

B.9 WINDOWS

Table 41 documents the inputs and methodology for estimating windows savings.

Table 41. 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**
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)	60%	RECS Survey 2020 for Mountain North Division.
Percent of Homes with Electric Heating (%ElecHeat)	100%	Program requires 51% of conditioned floor area be electrically heated.
In-Service Rate (ISR)	100%	Assumed 100% of windows remain installed as it is not likely to be removed by the participant.

Table 42 provides the deemed savings for windows, using the assumptions Table 41.

Table 42. Window Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per Window	55.75

B.10 WATER HEATER REPAIR

Table 43 documents the inputs and methodology for estimating savings from water heater repairs. Program staff identified repairs are completed for electric water heaters only and include both the water heater insulation blanket and water heater pipe insulation. Savings are for the water heater insulation blanket only, as water heater pipe insulation savings are detailed in Section B.4

Table 43. Algorithms and Inputs for Water Heater Insulation Blanket

Algorithms Used		
kWh Savings	= ((1/Rexist – 1/Rnew) × Abase × ΔT × 8,766) / ηDHW / 3412) × %ElecWH × ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.4.7.		
Parameter	**Value**	**Source/Notes**
Overall thermal resistance coefficient prior to adding insulating blanket (Rexist)	12.00	IL TRM V13.0.
Overall thermal resistance coefficient after adding insulating blanket (Rnew)	20.00	IL TRM V13.0.
Surface area of storage tank prior to adding insulating blanket (Abase)	24.78	Average surface area for various size water heaters from the IL TRM V13.0 and 2020 RECS data for Mountain North Division.
Supplied water and outside air temperature differential (ΔT)	60°F	IL TRM V13.0. Assumes 125°F water leaving the hot water tank and average temperature of basement of 65°F
Annual hours per year	8,766	Conversion
Recovery efficiency of water heater (nDHW)	0.98	Typical recovery efficiency for electric resistance heaters (IL TRM, IN TRM, ARK TRM)
BTU to kWh Conversion	3,412	Standard conversion
Percent of homes with electric water heating (%ElecWH)	100%	Program targets homes with electric hot water heaters.
In-Service Rate (ISR)	100%	From the Low-Income Weatherization Program Summary in the Demand Side Management Report (issued May 2024). Post-Installation inspections completed to verify installation of measures.

Table 44 provides the deemed savings for water heater insulation blanket, using the assumptions from Table 43.

Table 44. Water Heater Insulation Blanket Deemed Savings

Metric	Deemed Savings Per Measure
Annual kWh per water heater	129.94

B.II REFRIGERATOR REPLACEMENT

Table 45 documents the inputs and methodology for estimating refrigerator replacement savings.

Table 45. Algorithms and Inputs for Refrigerator Replacement

Algorithms Used		
kWh Savings (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 Savings (ENERGYSTAR)	= 0.90 * kWh_{Code}	
kWh Savings	= (kWhexisting – kWhENERGYSTAR) * ISR	
Source of Algorithm: Illinois TRM V13.0 Section 5.3.4		
Parameter	**Value**	**Source/Notes**
Age of Existing Refrigerator (Age)	15.00	IL TRM V13.0. Measure life.
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 (CZ 6) Division.
Percentage of Refrigerators Side-by-Side (SidebySide)	31%	Percentage of side-by-side refrigerators from 2020 RECS for Mountain North (CZ 6) Division.
Percentage of Refrigerators Primary Unit (Primary)	1.00	All refrigerators replace primary units.
Cooling Degree Day (CDD)	343	ASHRAE Fundamentals 2021 for Idaho.
Heating Degree Day (HDD)	7,891	ASHRAE Fundamentals 2021 for Idaho.
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 (kWhcode)	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 46 provides the deemed savings for refrigerator replacement, using the assumptions from Table 45.

Table 46. Refrigerator Replacement Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per home	581.78

B.12 THERMAL DOORS

Table 47 documents the inputs and methodology for estimating thermal door savings.

Table 47. Algorithms and Inputs for Thermal Doors

Algorithms Used		
kWh Savings (cooling)	= (((1/Rexisting – 1/Rnew) × Area × 24 × CDD × DUA) / (1,000 × ηCool)) × %Cool × ISR	
kWh Savings (heating)	= (((1/Rexisting – 1/Rnew) × Area × 24 × HDD) / (3,412 × ηHeat)) × %ElecHeat × ISR	
kWh Savings	= Cooling kWh Savings + Heating kWh Savings	
Source of Algorithm: Iowa TRM V9.0 Section 2.6.5		
Parameter	**Value**	**Source/Notes**
Existing Insulation R-value (Rexisting)	3.13	Iowa TRM V9.0.
R-value after Installing Thermal Door (Rnew)	3.85	ASHRAE 2021 Fundamentals Section 15, Table 6. Assume double glazing with 1/2 inch air space insulated steel slab with wood edge in wood frame, 25% glazing.
Area of door in square feet (area)	20.25	Standard entry door: 6.75 feet by 3 feet.
Cooling degree day (CDD)	343	ASHRAE Fundamentals 2021 for Idaho.
Heating degree day (HDD)	7,891	
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 ILTRM V13.0 and 2020 RECS data for Mountain North Division
Heating Efficiency (nHeat)	1.56 COP	
Percent of homes with central cooling (%Cool)	60%	RECS Survey 2020 for Mountain North Division.
Percent of homes with electric heating (%ElecHeat)	100%	Program requires 51% of conditioned floor area be electrically heated.
In-service rate (ISR)	100%	Assumed 100% of installed thermal doors remain installed as they are a major measure and not likely to be removed by the participant.

Table 48 provides the deemed savings for thermal door, using the assumptions from Table 47.

Table 48. Thermal Door Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per door	43.68

B.13 FURNACE REPAIR

Table 49 documents the inputs and methodology for estimating furnace repair savings. Program staff identified furnace repairs are completed for electric equipment only and include replacing air filters, opening doors and unblocking registers, adjusting airflow dampers, resealing duct joints, and insulating exposed ductwork. Savings are for the replacement of air filters only, as duct sealing and duct insulation savings are detailed in Sections B.8 and B.15. Other furnace repair measures do not contribute to energy savings.

Table 49. Algorithms and Inputs for Air Filter Replacement

Algorithms Used		
kWh Savings	= ((kWhCool × %Cool) + kWhHeat) × %Savings × ISR	
Source of Algorithm: Lawrence Berkeley National Laboratory (LBNL) "System Effects of High Efficiency Filters in Homes."		
Parameter	**Value**	**Source/Notes**
Cooling Consumption (kWhCool)	1,814 kWh	RECS 2020 Microdata for single family detached housing for Mountain North Region for air conditioners and air source heat pumps.
Heating Consumption (kWhHeat)	3,466 kWh	RECS 2020 Microdata for single family detached housing for Mountain North Region for electric furnaces.
Percent Savings from Maintaining a Clean Air Filter (%Savings)	1.0%	LBNL Study "System Effects of High Efficiency Filters in Homes." http://eetd.lbl.gov/sites/all/files/lbnl-6144e.pdf
Percent of homes with central cooling (%Cool)	60%	RECS Survey 2020 for Mountain North Division.
In-Service Rate (ISR)	100%	From the Low-Income Weatherization Program Summary in the Demand Side Management Report (issued May 2024). Post-Installation inspections completed to verify installation of measures.

Table 50 provides the deemed savings for replacing air filters, using the assumptions from Table 49.

Table 50. Air Filter Replacement Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per Participant	45.49

B.14 CFL LIGHT BULBS

Table 51 documents the inputs and methodology for estimating CFL savings.

Table 51. Algorithms and Inputs for CFL Light Bulbs

Algorithms Used		
kWh Savings	= ((Baseline Watts – CFL Watts) / 1,000) × (1 – Leakage) × Hours × WHFe × ISR	
Source of Algorithm: Illinois TRM V7.0 Section 5.5.8		
Parameter	**Value**	**Source/Notes**
Baseline Watts	72.0	IL TRM V7.0 halogen equivalent wattage for a 21W CFL.
CFLWatts	21.0	CFL 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 lighting. 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)	76%	Average survey results across Wyoming, Utah, and Idaho from 2014–2023 conducted participant surveys.

Table 52 provides the deemed savings for CFL light bulbs using the assumptions from Table 51.

Table 52. CFL Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per CFL	44.94

B.15 DUCT SEALING

Table 53 documents the inputs and methodology for estimating duct sealing savings.

Table 53. Algorithms and Inputs for Duct Sealing

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 V10.0 Section 5.3.4		
Parameter	**Value**	**Source/Notes**
DEafter (cooling)	95%	From BPI "Guidance on Estimating Distribution Efficiency." Assume average for tightly sealed ducts for all duct locations.
DEafter (heating)	92%	
DEbefore (cooling)	87%	From BPI "Guidance on Estimating Distribution Efficiency." Average for duct leakage that is both average and leaky for all duct locations.
DEbefore (heating)	86%	
Full Load Cooling Hours (FLHcool)	554	EPA Calculator. Assume average between cities in Idaho.
Full Load Heating Hours (FLHheat)	2,443	
Capacity of central cooling equipment (CapacityCool)	36,000	Approximately 0.0016 tons of cooling is needed per square foot. Rounded to the nearest nominal tonnage. Total conditioned floor area (1,690 sf) from RECS 2020 data for Idaho (Mountain North).
Output capacity of heating equipment (CapacityHeat)	59,133	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 V12.0. Duct location is unknown. Assumed 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)	60%	RECS Survey 2020 for Mountain North Division.
Percent of homes with electric heating (%ElecHeat)	25%	RECS Survey 2020 for Mountain North Division.
In-service rate (ISR)	100%	Assumed 100% of duct sealing remain installed as it is a major measure and not likely to be removed by the participant.

Table 54 provides the deemed savings for duct sealing, using the assumptions from Table 53.

Table 54. Duct Sealing Deemed Savings

Metric	Deemed Savings per Measure
Annual kWh per home	534.43

Opinion **Dynamics**

CONTACT:

Megan Campbell
Senior Vice President
mcampbell@opiniondynamics.com

BOSTON
PORTLAND
SAN DIEGO
SAN FRANCISCO

All product or company names that may be mentioned in this publication are tradenames, trademarks or registered trademarks of their respective owners.