Wyoming Low-Income Weatherization Program Evaluation Report

For Program Years 2011-2013

Prepared for Rocky Mountain Power by

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Table of Acronyms

Acronym	Meaning
AAPOR	American Association for Public Opinion Research
AC	Apartment Complex
ARRA	American Recovery and Reinvestment Act
BPI	Building Performance Institute
BTU	British Thermal Unit
CCS	Council of Community Services
CFL	Compact Fluorescent Light Bulb
CSA	Conditional Savings Analysis
COOP	Cooperation Rate
DSM	Demand Side Management
FPL	Federal Poverty Level
kWh	Kilowatt-hour
LIEAP	Low Income Energy Assistance Program
MH	Mobile Home
NEB	Non-Energy Benefit
PCT	Participant Cost Test
PTRC	PacifiCorp Total Resource Cost Test
RIM	Ratepayer Impact Measure Test
RIMS-II	Regional Input-Output Modeling System
RR	Response Rate
SD	Single-Family Dwelling
SIR	Savings-to-Investment Ratio
TRC	Total Resource Cost
TREAT	Targeted Retrofit Energy Analysis Tool
UCT	Utility Cost Test
USDHHS	United States Department of Health & Human Services
USDOE, DOE	United States Department of Energy
WAP	Weatherization Assistance Program
WYDFS	Wyoming Department of Family Services
WWS	Wyoming Weatherization Services

REPORT SUMMARY

Introduction

Rocky Mountain Power's Low-Income Weatherization Assistance Program (WAP) in Wyoming focuses on the installation of permanent energy efficient materials and is intended to reduce the electricity requirements and increase the penetration of weatherization and efficiency measures in residential dwellings inhabited by low-income households.[1] Rocky Mountain Power's contract for Wyoming weatherization services is held by two subgrantee agencies: the Council of Community Service (CCS) and Wyoming Weatherization Services (WWS). Both agencies manage various funding sources to provide energy saving improvements and installation at no cost to qualifying low-income households. During the program years covered by this evaluation, 2011-2013, CCS was not successful in weatherizing homes within Rocky Mountain Power's service territory. Administrative oversight from the Wyoming Department of Family Services, Child and Home Support Division (WYDFS) provides the necessary link between the weatherization agencies and the federal funding system, which is largely the United States Department of Energy (USDOE) and also includes the United States Department of Health and Human Services (USDHHS).

From a utility perspective, coordination of support for low-income weatherization with Wyoming's WAP is a best practice because the substantial federal contributions are viewed as leverage. This process establishes high standards, provides training to weatherization specialists, ensures quality control and takes into account the health, safety, repair and replacement problems endemic to the low-income portion of the housing stock.

Agencies coordinate by providing weatherization specialists and crews to deliver services directly aimed at improving energy efficiency of the home.[2] Each agency leverages funding from Rocky Mountain Power, USDOE, USDHHS, and other sources to achieve comprehensive weatherization of low-income customers' homes. Questar and Source Gas are the major natural gas providers in this area of Wyoming and neither company contributes to low-income funding for residential dwellings heated with natural gas.

In program year 2011, Rocky Mountain Power determined agencies would be unable to immediately provide weatherization services; therefore, the utility continued the prior year's practice of providing direct distribution of energy-saving measures. Rocky Mountain Power contracted the distribution of compact fluorescent light (CFL) kits to fulfill the direct distribution of energy savings measures. This practice was implemented by a 2008 amendment to the low-income tariff, which had allowed for Rocky Mountain Power to provide program benefits to eligible Wyoming customers until a standard delivery model was developed. The standard delivery model, in this case, is to coordinate utility funding with WAP under USDOE and State guidelines. Rocky Mountain Power's energy kit contractor, Niagara

[1] Rocky Mountain Power Schedule No. 118, Low Income Weatherization Option for Income Qualifying Customers, October 5, 2012.

[2] **Energy Efficiency -** The use of less energy to provide the same or an improved level of service to the energy consumer; or the use of less energy to perform the same function.

Conservation, was responsible for mailing CFL kits to eligible low-income customers in the Wyoming service territory through the 2011 and 2012 program years. The kits contained four 13-Watt CFLs, and were distributed to all identified income eligible customers.

Both subgrantee agencies entered into a contract with Rocky Mountain Power in 2012; however, WWS was the only agency who began delivering weatherization services to eligible Rocky Mountain Power homes. In June 2012 Rocky Mountain Power sent out the last shipment of CFL kits, completing their goal of providing direct energy-savings measures (CFLs) to every identified income eligible customer. This signaled the end of the CFL kit program, and the official transition to a standard weatherization program.

Evaluation Approach

Rocky Mountain Power contracted with Smith & Lehmann Consulting to conduct a process and impact evaluation for program years 2011, 2012 and 2013. The process evaluation assesses program delivery and opportunities for improvement, while the impact evaluation provides an assessment of energy impacts of the program and inputs for calculating program cost-effectiveness. Some of the components of the evaluation approach are discussed below.

- ### Data Collection

  Rocky Mountain Power provided program participant and energy-saving improvement (measure) data, as well as program cost data and reported energy savings. Rocky Mountain Power also produces annual reports of expected energy savings and program cost-effectiveness. To complete the analysis of evaluated energy savings, Rocky Mountain Power provided program participant (treatment group) and nonparticipant (comparison group) billing and payment histories.

- ### Process Approach

  Smith & Lehmann Consulting conducted telephone interviews with the WYDFS, CCS, and WWS. The evaluation team also conducted a telephone survey with a random sample of Rocky Mountain Power customers who received weatherization services to assess customer satisfaction with program delivery and efficacy, verify program services, and obtain opinions on various program components. Smith & Lehmann Consulting conducted a separate telephone survey with a random sample of Rocky Mountain Power customers who were mailed CFL kits.

- ### Evaluation Approach to Program Energy Savings

  Planned Energy Savings: The evaluation team collected and is reporting Rocky Mountain Power's program (*ex-ante*) estimates of energy savings.

  Evaluated Energy Savings: Smith & Lehmann Consulting developed a pooled conditional savings analysis (CSA) regression model of energy (kWh) savings associated with the weatherization

measures installed. The regression model was run to estimate weather-normalized, program-induced energy (kWh) savings based on participant and nonparticipant billing data.

According to WWS, approximately 5-10 percent of Rocky Mountain Power homes have an all-electric heating source. Consequently, Rocky Mountain Power measures installed by the program can vary from whole-home weatherization (insulation) to only installing energy-efficient electric lighting (CFLs).

Smith & Lehmann Consulting conducted a separate analysis of energy (kWh) savings associated with mailed CFL kits. Since these homes received a set of energy efficient CFLs, a measure-based approach was used in this analysis.

- **Cost-Effectiveness Assessment**

  Cost-effectiveness was assessed using five different perspectives. Smith & Lehmann Consulting provided cost-effectiveness inputs to Cadmus, who performed the calculations of Benefit/Cost Ratio and Levelized Cost for each of the program years and for the total evaluation period.

Conclusions and Major Findings

- Rocky Mountain Power's program exemplifies a utility best practice in that it is coordinated with USDOE, USDHHS, and WYDFS. This provides leverage to each utility dollar provided in this joint effort to serve low-income customers. Rocky Mountain Power's decision to coordinate its weatherization efforts with Wyoming's subgrantee agencies provides leverage to each utility dollar and should be continued. Coordination with the Wyoming WAP is a best practice.
- Overall, this evaluation demonstrates that the program is operating as planned within the design parameters outlined in Rocky Mountain Power Schedule No. 118, State of Wyoming.
- Evaluated savings are 116,578 kWh and 107,146 kWh for the CFL Kit and Weatherization programs, respectively. For the mailing of CFL Kits, this amounts to 81% of Rocky Mountain Power's reported energy savings of 143,991 kWh for kits mailing during the 2011-2012 program years (see Table 1). For the weatherization program, evaluated savings amounts to 104% of Rocky Mountain Power reported energy savings of 103,412 kWh, across the 2012-2013 program years. The mailing of CFL Kits was discontinued in 2012 because the Wyoming WAP began direct installation of energy saving measures. Therefore, the relevant net realization rate for the weatherization program is 104%. A breakdown of the program savings by year and the respective realization rates are provided below.

Table 1. Net Program Savings (at Site) 2011-2013

Program Year	Measure	Reported Savings (kWh)	Evaluated Savings (kWh)*	Net Realization Rate
2011	CFL Kits	84,919	68,732	81%
2012	CFL Kits	59,072	47,846	81%
Total (2011-2012)	**CFL Kits**	**143,991**	**116,578**	**81%**
2012	Weatherization	20,625	32,266	156%
2013	Weatherization	82,787	74,880	90%
Total (2012-2013)	**Weatherization**	**103,412**	**107,146**	**104%**

*Evaluated savings are the results of the billing and engineering analyses and are discussed in detail in the *Impact Evaluation* section of this report.

- Due to a low number of electrically heated homes throughout the State of Wyoming, agencies are weatherizing a limited number of homes under Rocky Mountain Power funding. This translates into a limited number of cases available for assessing evaluated savings. While the evaluation produced a good estimate of savings, Rocky Mountain Power should look to other state evaluations to validate Wyoming reported UES values based on program installation.

- The program was found to be cost-effective under all tests except the Ratepayer Impact Measure (RIM) Test. The Participant Cost Test (PCT) was "Not Applicable" for the purpose of evaluating a low-income program with a zero cost to the participant. Further description of the individual tests and respective results can be found in the *Cost-Effectiveness Analysis* section of this report.

Table 2. 2011-2013 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0438	$86,601	$187,933	$101,332	2.17
Total Resource Cost Test (TRC) No Adder	$0.0438	$86,601	$170,848	$84,247	1.97
Utility Cost Test (UCT)	$0.0438	$86,601	$170,848	$84,247	1.97
Ratepayer Impact Measure (RIM) Test		$281,671	$170,848	($110,823)	0.61
Participant Cost Test (PCT)		$0	$242,236	$242,236	N/A
Lifecycle Revenue Impacts ($/kWh)			0.00000078		
Discounted Participant Payback (years)			N/A		

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness

**Cadmus is responsible for results of the cost-effectiveness summary

Table 3. 2011 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0600	$23,053	$32,275	$9,223	1.40
Total Resource Cost Test (TRC) No Adder	$0.0600	$23,053	$29,341	$6,288	1.27
Utility Cost Test (UCT)	$0.0600	$23,053	$29,341	$6,288	1.27
Ratepayer Impact Measure (RIM) Test		$54,756	$29,341	($25,415)	0.54
Participant Cost Test (PCT)		$0	$41,810	$41,810	N/A
Lifecycle Revenue Impacts ($/kWh)			0.00000058		
Discounted Participant Payback (years)			N/A		

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness
**Cadmus is responsible for results of the cost-effectiveness summary

Table 4. 2012 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0420	$30,056	$71,951	$41,895	2.39
Total Resource Cost Test (TRC) No Adder	$0.0420	$30,056	$65,410	$35,354	2.18
Utility Cost Test (UCT)	$0.0420	$30,056	$65,410	$35,354	2.18
Ratepayer Impact Measure (RIM) Test		$94,193	$65,410	($28,783)	0.69
Participant Cost Test (PCT)		$0	$74,747	$74,747	N/A
Lifecycle Revenue Impacts ($/kWh)			0.00000020		
Discounted Participant Payback (years)			N/A		

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness
**Cadmus is responsible for results of the cost-effectiveness summary

Table 5. 2013 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0384	$40,558	$101,123	$60,566	2.49
Total Resource Cost Test (TRC) No Adder	$0.0384	$40,558	$91,930	$51,373	2.27
Utility Cost Test (UCT)	$0.0384	$40,558	$91,930	$51,373	2.27
Ratepayer Impact Measure (RIM) Test		$158,818	$91,930	($66,887)	0.58
Participant Cost Test (PCT)		$0	$149,286	$149,286	N/A
Lifecycle Revenue Impacts ($/kWh)			0.00000047		
Discounted Participant Payback (years)			N/A		

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness
**Cadmus is responsible for results of the cost-effectiveness summary

Recommendations

- **Client Surveys**

  A gap of two years between measure installation and client survey has reduced the reliability of client survey responses. It is not possible to verify whether clients are referring to Rocky Mountain Power services when responding to survey questions. In the future, conducting surveys within six to eight months of receiving weatherization services can enable Rocky Mountain Power to confidently determine whether services and products meet the utility's standards and to proactively respond to any client concerns that may be identified.

- **Rocky Mountain Power Recognition**

  Client survey results indicate 4% of respondents remember or recognize that Rocky Mountain Power contributed to the weatherization work they received. Rocky Mountain Power should consider whether it is important that customers recognize Rocky Mountain Power's contribution to the weatherization services received. If so, Rocky Mountain Power should continue to provide a branded item concurrently with weatherization services to increase customer recognition.

- **Provision for Health & Safety**

  Agencies report on average a small percentage of all clients that apply to the program are determined "deferrals," primarily due to the need to repair substandard housing so that weatherization measures can be installed. A "deferral" is a classification that means the house could not be served. There is no classification to differentiate homes that can never be served from homes that could be served if certain repairs were made. While some of these clients will return to the program, many will not be able to afford the repairs necessary to move forward with weatherizing the home.

  Smith & Lehmann Consulting recommends Rocky Mountain Power allow for a percentage of available funding to be used for health and safety repairs, which are deemed necessary to installing weatherization measures. In doing so, Rocky Mountain Power will increase the percentage of total rebates claimed for weatherization by allowing agencies to target homes with marginal repair costs, but that are good candidates for energy efficiency upgrades. Rocky Mountain Power should determine an appropriate percentage of funding to be used for repairs, which, based on current performance, allows for the program to remain cost-effective.

IMPACT EVALUATION

Rocky Mountain Power's Low-Income Program in Wyoming is implemented by two weatherization agencies: CCS and WWS; however, CCS did not complete any Rocky Mountain Power homes during the 2012-2013 program years. Both agencies administer the program in Rocky Mountain Power's service territory, with administrative oversight from WYDFS. WYDFS is the link between the weatherization agencies and the federal funding system (USDOE and USDHHS). Energy saving improvements and measure installations are provided at no cost to qualifying low-income households.

Rocky Mountain Power contracted with Smith & Lehmann Consulting to conduct a process and impact evaluation for program years 2011, 2012 and 2013. The impact evaluation assesses energy impacts and inputs to calculating program cost-effectiveness. This section describes the approach used to develop reported and adjusted energy savings, based on utility electric billing, program data, and measure based analysis.

Methodology

An energy usage analysis (regression analysis) was conducted by Smith & Lehmann Consulting to determine net kWh savings and realization rates for the 2012 and 2013 weatherization program. Smith & Lehmann Consulting performed a separate measure-based energy savings analysis for CFL kits that were mailed to low-income customers during the 2011-2012 program years. The analysis of CFL-specific energy savings is provided at the end of the *Impact Evaluation* section. WWS began installing weatherization measures in 2012, signaling that mailed kits were no longer necessary. Measures most frequently installed from 2012-2013 include: CFLs, insulation, windows, and weather stripping around doors/windows.

The weatherization savings estimate was determined from a pooled CSA regression model. This model included data from a group of nonparticipant homes (homes weatherized in future years), which served as the baseline (comparison group). Impact evaluation data were obtained from a number of different sources, including:

- **Program Database:** Rocky Mountain Power provided information regarding the program's participants and installed measures. Specifically, these data included participant contact information and lists of measures installed per home, as well as associated reported energy savings. Rocky Mountain Power also provided a list of all customers who received a CFL kit. Recipient data also included contact information as well as the month and year the kit was mailed.
- **Billing and Payment Records:** Rocky Mountain Power provided participant and nonparticipant account records from December 2009 through January 2015. The comparison population was identified based on their eventual receipt of weatherization services post-evaluation timeframe. For example, in analyzing homes weatherized in 2012 (treatment group), Smith & Lehmann Consulting was provided data on homes weatherized in 2014 for comparison. To be considered

"nonparticipants" for the comparison group, the homes could not have received weatherization with Rocky Mountain Power funds during the program period 2012-2013.

- **Weather Data:** Smith & Lehmann Consulting collected weather data from eight representative weather stations for the corresponding time period from Weather Data Depot.[3] Weather stations were selected based on proximity to Rocky Mountain Power service territory. Smith & Lehmann Consulting also considered relative topological elevations and local weather patterns when matching zip codes to their respective weather stations.

The evaluation team first matched participant accounts from program accounting data to billing records. This separated billing records into treatment and comparison groups. Monthly heating and cooling degree days were then matched by zip code to each of the respective calendar months in the billing data for use in a weather-adjusted CSA model.

Data and Document Review

The following data and information was reviewed to determine the average savings and participation levels as well as the distribution of measures over the 2011-2013 program years.

- **Participant Data**

  Rocky Mountain Power provided the initial program-accounting database for participants weatherized in 2011-2015. The database was comprehensive and included participant contact information, participant identifiers, measures installed, kWh savings per measure, year of installation, and agency and cost information. Data were summarized by measure and year.

  The initial data extract from Rocky Mountain Power included program participant information and account numbers that did not always match corresponding billing and payment information. The evaluation team relied on site-ID to match the participants with the billing and payment data.

- **Invoice Data**

  The program data provided by Rocky Mountain Power did not track invoice or project completion dates and only included the dates the completed weatherized homes were entered into the database. Delays between completion dates, invoice dates, and the date the job was entered into the system made it difficult to determine which program year each job was completed. It was determined that Rocky Mountain Power's protocol is to enter projects into the tracking system during the same month they were invoiced and so this information was used to assign homes to completion years.

[3] Weather data was pulled from Weather Data Depot available at: http://www.weatherdatadepot.com

- **Quantity and Cost Data Collection**
  Rocky Mountain Power's program database tracks measure codes, measure names, and total measure costs per home. For the analysis of Wyoming home weatherization, reported savings are based off of Rocky Mountain Power annual report information and are calculated at the program level.

- **Primary Heating Fuel Flag**
  The primary heating fuel for each customer was tracked in the Rocky Mountain Power program database. The fuel type can be entered in the database as a specific electric (e.g., electric baseboard or electric forced air) or as a non-electric heat-type.

- **Measure Tracking**
  Measures installed were matched with annual numbers reported by Rocky Mountain Power and were consistent with the 2012 and 2013 annual reports. Smith & Lehmann Consulting also matched the number of CFL recipients with annual numbers reported by Rocky Mountain Power for 2011 and 2012 program years.

Program Participation and Reported Savings

Smith & Lehmann Consulting reviewed program data and annual reports to determine average annual savings, participation levels, and the distribution of measures installed over the program years 2012-2013. Recall that in 2011, CFL's mailed to low income customers was a feasible promotion of energy efficiency by Rocky Mountain Power. Table 6 displays the average savings and participation in weatherization over the evaluation period, as well as for each program year, while Table 7 separates out reported savings for CFL Kit recipients.

Average savings per participant reported by Rocky Mountain Power were used as a benchmark to check results of the energy savings analyses and to calculate the net realization rate for each of the program years and for the total evaluation period.

Table 6. Annual Reported Ex-Ante Savings and Participant Levels for Weatherization

Program Year	Participation*	Reported (at Site) Weatherization Energy Savings* (kWh/year)	Average Savings per Participant** (kWh/year)
2012	13	20,625	1,587
2013	36	82,787	2,300
Total	**49**	**103,412**	**2,110**

*Deemed savings and program participation was derived from Rocky Mountain Power's program database and matched those reported in Rocky Mountain Power's Annual Report for 2013. A minor discrepancy was found in the 2012 program database, which contained only 12 cases. The evaluation team selected participation as reported in Rocky Mountain Power's Annual Report for 2012.
**Average savings per participant were derived from Rocky Mountain Power's program database using the above participation information.

Table 7. Annual Reported Ex-Ante Savings and Recipient Levels for CFL Kits

Program Year	Recipients	Reported at Site Energy Savings (kWh)	Average Savings per Recipient* (kWh)
2011	747	84,919	113.68
2012	520	59,072	113.6
Total	**1267**	**143,991**	**113.647**

*Average savings per recipient was derived Rocky Mountain Power's Annual Reports for 2011 and 2012, and matched evaluated savings reported in the previous Wyoming low-income evaluation.[4]

Annual participation and reported program savings were calculated using Rocky Mountain Power's program database and annual report information. Frequencies of the measures installed are tracked for each participant in Rocky Mountain Power's program accounting database. Table 8 reports the frequency of homes receiving different measures, as reported in Rocky Mountain Power's program accounting database. Note that the frequency reflects the number of homes that received a specific type of measure and not the total number of individual measures installed. Approximately 88% of the 49 homes weatherized with Rocky Mountain Power funding between 2012-2013 are electrically heated and received installations consisting of some type of insulation, in addition to CFLs. and other measures.

Table 8. Frequency of Measure Installations 2012-2013

Measure Type	2012	2013	Grand Total
Weather Strip Windows	3	18	**21**
Weather Strip Doors	7	26	**33**
Wall Insulation	0	2	**2**
Ceiling Insulation	7	21	**28**
Attic Ventilation	0	1	**1**
Floor Insulation	6	22	**28**
Water Pipe Insulation	5	21	**26**
Air Sealed/Infiltration	0	1	**1**
Low Flow Showerhead	3	10	**13**
CFLs	11	28	**39**
Thermal Doors	0	6	**6**
Double Glass Replacement	0	6	**6**
Ground Cover	1	5	**6**
Duct Sealing	1	3	**4**
Refrigerator Replacement	3	6	**9**

[4] The Cadmus Group. October 18, 2011. "Rocky Mountain Power Low-Income Weatherization Program Evaluation."

Energy Savings Analysis

Smith & Lehmann Consulting analyzed monthly billing data, provided by Rocky Mountain Power, for all residential customers from December 2009 through January 2015. This data included customer information that contained a list of customers who had received weatherization services through Rocky Mountain Power's WAP over the 2011-2015 program years. This timeframe included the evaluation period for weatherized homes, 2012-2013, as well as the most recent program years 2014 through May 2015 that were used for a comparison sample. Methods for the analysis included:

- **Data Screening**

  To ensure a clean and reliable dataset for the billing analysis, the evaluation team screened the billing data for treatment group and comparison group usage. First, the evaluation team summarized monthly kWh usage and the respective number of billing days per usage-month for each account. These periods were then adjusted to represent usage per calendar month to prevent bias if more or fewer days occurred in each time usage-month determined by the meter-read dates. Treatment and comparison group sites were then removed from analysis if any of the following criteria applied:

  - Duplicate cases (duplicate site-ID, total kWh, and meter-read date)
  - Fewer than 350 days of data or more than 370 days were available in each year

  These criteria are commonly used in billing analyses and were selected to ensure sufficient data were available. This process also helps to reduce the risk of including sites where significant changes occurred outside of weatherization that could affect energy consumption. After application of the above criteria, the original 49 participants remained in the analysis. The number of participants available for analysis in each individual year is further limited by the partitioning of the 49 screened participants by year weatherized and by requiring case level data match between the baseline and post year. These participants were used as the treatment group(s) in this analysis.

- **Comparison Group Selection**

  Smith & Lehmann Consulting used a quasi-experimental research design, which consists of comparing the change in pre- to post-energy consumption between participants and a comparison group of eligible nonparticipants, who are assumed to be eligible for the program but did not yet participate. The comparison group in this case was selected from weatherization participants who entered the program during 2014-2015, post-evaluation timeframe. By effectively accounting for non-program related factors effecting energy use during the pre- to the post-program periods, Smith & Lehmann Consulting can provide an estimate of "net" impacts of the program.

  The final nonparticipant comparison group consisted of 30 participants. Average daily treatment group consumption in the baseline year was 38.7 kWh and average daily comparison group consumption was 45.0 kWh. Through this method and the proximity of these consumption

estimates, we maximized comparability between the comparison group and the treatment group.

Once the screened treatment group of 49 participants and matching comparison groups were selected, accounts were matched back to billing data to obtain final, screened, monthly modeling billing data.

Energy Savings Analysis Results

The analytic approach used a CSA model. The final CSA regression model specification below was used to estimate energy savings from insulation measures:

$$ADC_{it} = \alpha = + B1ANNUALPRE_i + B2POST_t + B3PARTPOST_{it} + B4CDD_{it} + B5HDD_{it} + \varepsilon_{it}$$

Where for customer (i) and month (t):

- ADC_{it} = average daily kWh consumption
- $ANNUALPRE_i$= the total annual pre- period kWh usage.
- $POST_t$= indicator variable that is 1 in the post- period for both the treatment and comparison groups, 0 otherwise.
- $PARTPOST_{it}$= indicator variable that is 1 in the post- period for the treatment group, 0 otherwise.
- HDD_{it} = average daily heating degree-days (base 65)
- CDD_{it} = average daily cooling degree-days (base 65)

The key coefficient determining average program savings was B3. This coefficient represents the average daily savings per program participant, after accounting for nonparticipant trends. The inclusion of the ANNUALPRE variable was used to ensure level of energy use among participants and nonparticipants had no undue influence over the final savings estimate, resulting in a more robust model.

The model was run on each individual program year and these results were combined using a weighted average to develop the estimated savings for the combined 2012-2013 years. To increase the accuracy of the CSA model, treatment and comparison cases were restricted to include Single-Family Dwelling (SD) and Mobile Home (MH) housing types, while Apartment Complex (AC) cases were removed. An analysis of measure-specific savings would be needed to predict meaningful AC savings estimates.

Table 9 summarizes overall adjusted net kWh model savings results for the program. The table compares average expected savings with the average per participant modeled savings to obtain an adjusted net realization rate of 104% for the evaluation timeframe for weatherization 2012-2013. The relative precision at the 90% confidence level for the total program savings estimate for 2012 is 11.4% and for 2013 is 14.1%.[5] For 2012-2013, the relative precision is calculated as a weighted average at

[5] A common measure of model reliability is the relative precision of an estimate. In calculating relative precision of an estimate (B3 in the equation above), a normal distribution is assumed. Knowing the shape of the theoretical distribution of estimates permits us to use the appropriate z-value from the normal curve. For a 90% confidence interval, the z-value is 1.645. Relative precision is calculated by multiplying the z-value from the normal distribution by the standard error of the regression coefficient developed from the regression analysis and dividing by the value developed for the regression coefficient (here B3) from the regression analysis.

13.4%.

The two-year modeled estimate of savings is constructed by calculating a weighted average of the two individual results for 2012 and 2013 based on the number of cases treated in each year. This result is reported along with individual regression results and associated relative precisions in Table 9.

Table 9. Model Adjusted Net Savings and Realization Rate Summary (kWh/year at Site)

Program Year	Reported Savings per Participant	Evaluated Savings per Participant	Net Realization Rate	Total Participants	Relative Precision at 90% Conf. Level
2012	1,587	2,482	156%	13	11.37%
2013	2,300	2,080	90%	36	14.09%
Total (2012-2013)	**2,110**	**2,186**	**104%**	**49**	**13.4%**

Payments and Arrearages

Monthly energy bills and payment histories were used to quantify program impacts on payment patterns and customer arrearages. Changes between pre- and post-periods were compared between treatment and comparison groups to measure the net effects of Rocky Mountain Power's weatherization program on participant payment patterns.

Methodology

Rocky Mountain Power provided monthly payment data for the low-income customer sample from December 2009 to January 2015. The sample included all treatment and comparison group participants. As discussed previously, the comparison group in this case was selected from weatherization participants whom entered the program during 2014-2015, post-evaluation timeframe. Rocky Mountain Power payment datasets included the following information:

- Payment transaction date (monthly)
- Actual billed amount
- Actual paid amount
- Source of payment (direct customer payment, customer assistance payment, and collections actions)
- Arrearage amount (customer's monthly unpaid ending account balance)

In this analysis, two specific measurements were analyzed:[6]

[6] Analysis of average number of payments per year was also considered, however, since some low-income customers make several small partial payments during parts of the year while others make regular payments in-full and still others come on and off the system, the interpretation of "number of payments" is ambiguous. Therefore, the analysis is limited to dollars, which are a more direct indicator of payment performance.

1. Total payment amounts made by individuals during the pre- and post-periods
2. Proportion of payments to amount billed during the pre- and post-periods

- **Data Screening**

  To ensure a clean and reliable dataset, Smith & Lehmann Consulting screened treatment and comparison group payment data. Payment data and the total number of billing days were summarized for the pre- and post- periods for each account (treatment and comparison) weatherized from 2012-2015. Pre- and post-period payment information, as well as the number of bills per year, was summed on an annual basis for each site. Treatment and comparison group sites were removed from the analysis if any of the following conditions applied:

  - Removal of sites with fewer than 11 bills or more than 13 bills in the pre- and post-periods.
  - Removal of sites where total payment amount exceeded 150% of billed amount in either the pre- or post-periods.

  These criteria were employed to ensure sufficient data and to reduce chances of including sites where extraneous changes occurring in the home affected payments. The combined application of these two screening rules also removed any remaining extreme values from the treatment and comparison datasets. After applying the screening criteria, 37 treatment group participants and 24 comparison group participants remained from the original counts of 49 and 32, respectively, for the combined (2012 & 2013) analysis.

Payment Analysis Results

Payment Amounts

Table 10 shows the change in payment amounts from the pre-weatherization calendar year to the post-weatherization calendar year and summarizes data for weatherization years 2012 and 2013. The first three columns in the table report on treatment homes and the second three columns report on comparison homes. The model was constructed as if all weatherization took place in a single year. Results shown in this Table 10 can be characterized as follows:

- Participant bills in the treatment group are generally lower than bills for nonparticipants in the comparison group. The first row of Table 10 shows that treatment group bills are, on average, lower than comparison group bills in both the baseline year ($1,451 for treatment group divided by $1,726 for comparison group = 84%) and post-year ($1,748 for treatment group divided by $2,242 for comparison group = 78%).

- Bills increased less for the treatment group than for the comparison group. As shown in Table 10, bills went up for the comparison group by an average of $516 or about 29.9%. However, bills for the treatment group only increased by an average of $297 or about 20.5% for a net decrease of $219 .[7] This means the average bill increase for the treatment group was $219 less than for the comparison group. This pattern is expected because weatherization can serve as a general buffer for other bill increases because it reduces required energy use.

- Customer payments also increased, on average, for both treatment and comparison groups. The Customer Payment row in Table 10 shows customer payments went up for both groups, but increased significantly for the comparison group. The treatment group paid, on average, $199 or about 12.8% more in the post-year than in the baseline year, while the comparison group paid on average $413 more or 22.1%.[8] Overall, the comparison group paid a net of $214 more than the treatment group.

- As noted above, the average treatment group participant bill increase was $219 less than the average increase in comparison group bills. The other part of bill payment is external agency payment. Unfortunately, the number of treatment and comparison cases that received an external agency payment during the timeframe 2012-2015 were so minimal that no definitive conclusions could be drawn from analysis of this variable.

Putting these results together, both the treatment and comparison groups received larger bills in post-year than in the baseline year, and both groups paid more; however the treatment group showed slightly smaller increases in bills and payments. In each of these comparisons, the treatment group performed better than the comparison group. Overall, there are likely not enough cases to complete a robust analysis with significant results.

[7] Bills and payments are only approximately related. They do not match exactly due to timing of meter read dates and bill dates, and the beginning and end of each year. In addition, shifting balances forward (arrearage) for many low-income customers also means that bills and payments do not match.

[8] The absolute size of large swings in bills and payments is likely due, in part, to the necessary data cleaning case exclusion rules for low-income data analysis, which result in a smaller than desired number of cases. It is reasonable to rely on the direction of the change, but the size is best considered an indicator rather than taken as an exact numerical value. However, the math has been checked and is correct and the size of the swing in payments is consistent with the change in billing amounts. With a much larger dataset, this size might remain the same or it might be damped down by inclusion of additional cases.

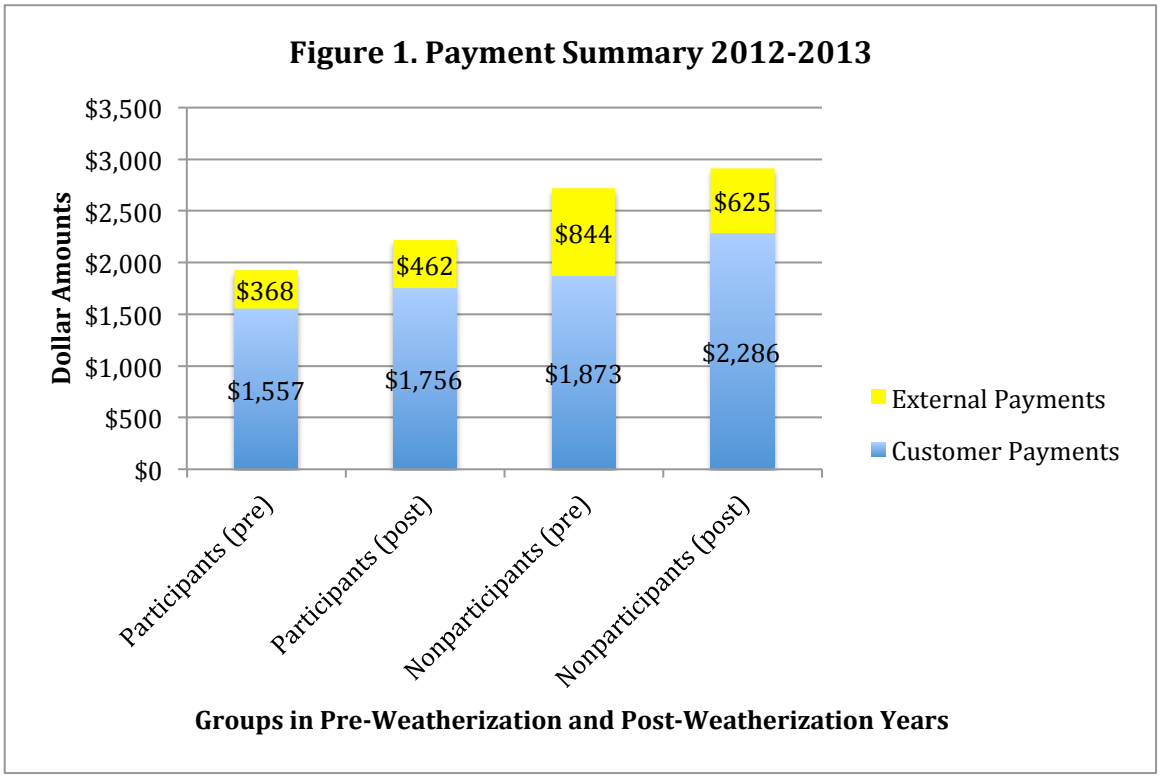
Table 10. Payment Amounts Summary 2012-2013 Weatherization

Payment Type	Treatment Group				Comparison Group				Net Difference
	Pre-	Post-	Change	% Change	Pre-	Post-	Change	% Change	Dollar Amount
Total Billed	$1,451	$1,748	$297*	20.47%	$1,726	$2,242	$516**	29.90%	-$219
Customer Payment	$1,557	$1,756	$199	12.78%	$1,873	$2,286	$413*	22.05%	-$214
External Payment	$368	$462	$94	25.54%	$844	$625	-$219	-25.95%	$313

*Significant at the 0.001 level
**Significant at the 0.0001 level

Payment Amounts Summary

Figure 1 (below) depicts the change in the yearly customer payments compared to the amount of external agency payment assistance between the pre- and post-years for participants and nonparticipants. This figure is based on a two-year summary in which each year is calculated separately and results are then modeled in the form of a single year.



The values associated with Figure 1 are provided in Table 9. The treatment group made 81% of the total annual payment amount in the pre-weatherization year and 79% of the total annual payment amount in the post-weatherization year. The comparison group paid about 69% of the total annual payment amount in the pre-weatherization year and about 78% in the post-weatherization year. Due to the small number of cases in each year and the overall increasing trend in total energy usage demonstrated by both treatment and comparison groups, no significant conclusions can be drawn from this analysis.

Change in Arrearages

Arrearage is that portion of a customer's bill they do not pay in a given month, or the unpaid ending balance. Table 11 shows the program impact on customer average arrearage amounts.

Table 11. Arrearage Summary 2012-2013 Weatherization

	Treatment Group Annual Arrearage				Comparison Group Annual Arrearage				Net Difference
	Pre-	Post-	Change	% Change	Pre-	Post-	Change	% Change	Change
Average Arrearage	$43	$77	$34	79.1%	$57	$137	$80	140.4%	-$46

The average customer arrearage represents their ending or outstanding balance amount averaged across a 12-month period. The arrearage value also takes into account the existing arrearage for each customer prior to the pre- and post- periods. Across the 2012-2013 program years, the treatment group average monthly balance forward amount increased about 79.1% (from $43 to $77), while the comparison group average monthly balance forward amount increased 140.4% (from $57 to $137). The net difference between the two groups was a $46 decrease in the arrearage of participants versus nonparticipants (non-participants showed a higher dollar value of arrearage than participants) and this change was not statistically significant.

Assessment of CFL-Specific Savings

During program year 2011, Rocky Mountain Power determined agencies would be unable to immediately provide weatherization services with Company funding. This was due to agency focus on ARRA funding. Until ARRA funds were depleted, the utility continued their prior year's practice of providing direct distribution of energy saving measures. Niagara Conservation mailed CFL kits to eligible low-income customers in the Wyoming service territory through the 2011 and 2012 program years. The kits contained four 13-Watt CFLs, and were directly distributed to all known low-income customers, which are those receiving LIEAP assistance.

Evaluation Approach

An engineering equation was used to estimate total kWh savings associated with CFL installations. This equation is shown below. Use of this equation required developing the following inputs: number of CFLs installed over the evaluation timeline, average hours of use per bulb, average wattage per CFL installed, waste-heat factor, and the In-Service Ratio (ISR). All factors are explained in greater detail in this section, through a discussion of the evaluation of CFL-specific energy savings.

Unitary Energy Savings Calculation

$$\text{First-Year Unitary Savings [kWh/yr.]} = \frac{(AWI - AWC)}{1000\ W/kW} \times ISR \times (HOU \times 365) \times WHF = \frac{kWh}{year}$$

Where:

- AWI = average equivalent power (wattage) for the incandescent bulbs replaced
- AWC = average wattage of CFLs directly distributed by the program
- ISR = the percentage of units that remained in-service or in-service rate
- HOU = daily hours of operation per bulb
- WHF = waste-heat factor accounts for the interactive effects with the home's heating and cooling systems

It was determined that Rocky Mountain Power's database contained the number of CFL kit recipients for 2011 and 2012 program years. The total number of CFLs received each program year was determined, based on confirmation from Rocky Mountain Power, by multiplying the number of recipients by four bulbs per kit. As a check, the quantities of recipients were matched with Rocky Mountain Power's annual reports for 2011 and 2012.

Calculation of Delta Watts

Smith & Lehmann used the lumens equivalence method to determine delta watts, which is consistent with UMP prescribed methodologies. Delta watts represents the difference between the Average Wattage of CFLs (AWC) installed and the baseline Average Wattage of Incandescent bulbs (AWI) replaced by the program. Based on information provided by Rocky Mountain Power, the AWC distributed by the program was 13-watts. Following common equivalency values and standard practices for developing the baseline wattage, the average equivalent power (wattage) for the incandescent bulbs replaced by the program was 60-watts. Results of the CFL-recipient survey indicated the majority of clients installed some or all of their CFLs in bedrooms, the living room, or the kitchen. Presumably these bulbs likely replaced 60-watt incandescent bulbs. Due to the direct delivery of the 13-watt CFLs, Smith & Lehmann felt the baseline of 60-watts was a good estimate of actual installation.

The Energy Independence and Security Act of 2007 (EISA) defined new energy-efficiency standards intended to gradually phase out incandescent light bulbs. EISA began with Phase I on January 1, 2012, and bans the manufacture and import of 100-watt incandescent bulbs.[9] Due to EISA, the baseline

[9] Rocky Mountain Power Final Report: 2011-2012 Utah Residential Home Energy Savings Evaluation. *Cadmus, January 2014.*

wattages began to change in 2012, and subsequent phase-outs of the 75, 60, and 40-watt bulbs were completed by 2014.[10] The final round of CFL kits were distributed prior to implementation of EISA, in June 2012; therefore baseline wattages in this case were not affected.

Following the lumens equivalency assumption that 13-watt CFLs replaced 60-watt incandescent bulbs, we find the average lighting delta (displaced wattage) to be 47 watts for the 2011 and 2012 program years.

Hours-of-Use (HOU)

Hours-of-operation/use (HOU) was estimated to be two hours per day per bulb; a value that is consistent with the hours of use required for CFL installation by the Rocky Mountain Power Low Income Weatherization Optional Schedule 118, 2012.[11] To bound this value, the Uniform Methods Project reports a range of observed hours-of-use (HOU), indicated by a variety of studies, from 1.5 to a high of 2.98 hours per day.[12]

Waste-Heat Factor (WHF)

The Waste-Heat Factor (WHF) was determined using recommendations from Universal Methods Protocol. The influence of climate zone on interactive effects depends on a variety of house-specific factors. Taking all of these factors into account, the net impact on lighting energy cost savings could be positive, negative, or neutral.[13,14] In cooling-dominated climates, the interactive effects are positive, resulting in additional savings due to decreased cooling load. However, in heating-dominated climates, the interactive effects are negative, with decreased savings due to increased heating load.

Due to the potential impacts of interactive effects, the Residential Lighting Evaluation Protocol recommends these effects be included in evaluations of residential lighting programs. Smith & Lehmann Consulting used the value estimated in the recent 2011-2012 Rocky Mountain Power Residential Home Energy Savings Evaluation (0.906) for Wyoming's Waste-Heat-Factor.[15] This results in a 9.6% reduction in energy savings due to increased heating loads.

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[10] Energy Independence and Security Act of 2007 – EPA FAQs. Available at: http://www.energystar.gov/ia/products/lighting/cfls/downloads/EISA_Backgrounder_FINAL_4-11_EPA.pdf

[11] Rocky Mountain Power Low Income Weatherization Optional for Income Qualifying Customers Schedule No. 118 State of Wyoming, pg 5. The use of two hours is very conservative – bulbs are only available for sockets typically in operation for two or more hours.

[12] Dimetrosky, Scott. April 2013. "Uniform Methods Project, Chapter 6: Residential Lighting Evaluation Protocol." National Renewables Energy Laboratory. pg 6-12 and pg 6-20.

[13] Parekh, A.; Swinton, M.C.; Szadkowski, F.; Manning, M. (2005). "Benchmarking of Energy Savings Associated with Energy Efficient Lighting in Houses." National Research Council Canada. NRCC-50874.

[14] Parekh, A (2008). "Do CFLs Save Whole - House Energy?" Home Energy Magazine, November/December 2008, pp. 20-22.

[15] For complete calculation of WHF, see Appendix L of 2009-2010 Rocky Mountain Power Home Energy Savings Evaluation Report.

In-Service Rate (ISR)

The In-Service Rate (ISR) was based on the program delivery mechanism, and was determined by the evaluation team using recommendations from Uniform Methods Project. The ISR represents the percentage of residential lighting products (CFLs) that are ultimately installed by program participants. The Uniform Methods Project for Residential Lighting indicates ISRs are extremely important in "giveaway or upstream programs" where the customer is responsible for installation and did not directly request the energy-efficient measures.

"For ***giveaway or coupon programs***, conduct verification when customer contact information is available [to assess installation]…If customer information is not available, rely on either secondary data (such as for a similar program where customer information was collected) or, if necessary, on the in-home audit approach."[16]

Smith & Lehmann developed a specific series of survey questions pertaining to CFL kits, which addressed installation and verified whether bulbs were removed and why. Data results from questions 4-10 in the CFL recipient survey (Appendix) were used to determine the percentage of respondents who replaced their CFLs and on average the total percentage of self-installed CFLs bulbs replaced. Smith & Lehmann used the following calculation for a conservative estimate of actual ISR, evaluating bulbs removed or replaced.

In-Service Rate Calculation

$$\text{CFL In-Service Rate [ISR \%]} = \frac{\text{CFLs Installed – Removed or Replaced}}{\text{Reported}}$$

Each household received a CFL kit containing four 13-watt CFLs. Twenty-four participants in the Smith & Lehmann CFL recipient survey reported installation. Most participants (57%) installed all four light bulbs, while the average over all respondents was 3.3 CFLs installed in each home. This translated into an estimated 79.2 CFLs installed by those customers. Seventeen percent (4 out of 24) of respondents replaced an average of 2 CFLs per household. This results in a replacement estimate of 8 (or about 11%) of the 79.2 CFLs installed. In applying the above calculation, the ISR is estimated to be 74%. Table 13 provides a breakdown of the reported and evaluated CFL-specific savings for program years 2011-2012, as well as calculated realization rates.

Table 13. CFL-Specific Savings (at Site) and Realization Rates for 2011-2012 CFL Kits

Program Year	2011	2012	Total 2011-2012*
Reported kWh Savings	84,919	59,072	**143,991**
Evaluated kWh Savings	68,732	47,846	**116,578**
Realization Rate	81%	81%	**81%**

*Totals may not represent summation of column values due to rounding.

[16] Dimetrosky, Scott. April 2013. "Uniform Methods Project, Chapter 6: Residential Lighting Evaluation Protocol." National Renewables Energy Laboratory. pg 6-18.

Impact Evaluation Conclusions

- ### Unitary Energy Savings (UES)

  Due to a low number of electrically heated homes throughout the State of Wyoming, agencies are weatherizing a limited number of homes under Rocky Mountain Power funding. This translates into a limited number of cases available for assessing evaluated savings. While the evaluation produced a good estimate of savings, Rocky Mountain Power should look to other State evaluations to validate Wyoming reported UES values based on program installation.

PROCESS EVALUATION

Rocky Mountain Power's contracts for weatherization services are held by two weatherization agencies: CCS and WWS; however, CCS did not complete any Rocky Mountain Power homes during the 2012-2013 program years. Both agencies are contracted to implement the program in Rocky Mountain Power's Wyoming service territory, with monitoring oversight from WYDFS.

CCS, WWS, and WYDFS are the most important entities in this system because the two agencies directly deliver the weatherization services to residential low-income customers and WYDFS provides policy direction, administration, and quality control. WYDFS is also the link upwards to USDOE and USDHHS, which provide basic funding and guidance. From a utility perspective, coordination of utility support for low-income weatherization with Wyoming's WAP is a *best practice* because the substantial federal and state contributions are viewed as leverage.[17]

Agencies coordinate services by providing weatherization specialists and crews to deliver the direct services. Each agency leverages funding from Rocky Mountain Power, USDOE, USDHHS, and other sources to achieve comprehensive weatherization of the homes of Wyoming low-income customers.

Program Measures

Rocky Mountain Power's WAP focuses on the installation of energy-saving and cost-effective measures, and is intended to maximize the efficient use of residential electricity by customers who meet income guidelines.[18] Measures are categorized as either major or supplemental. Major measures are defined by the Rocky Mountain Power tariff to include ceiling insulation, wall insulation, and floor insulation applicable in dwellings with permanently installed operable electric space heating systems in at least 51% of the home. Supplemental measures are not required under the tariff, but may qualify for a reimbursement (e.g., replacement windows, attic ventilation, ground cover, weather stripping, thermal doors, and thermostats) and can only be installed in homes with an electric heating system. Additional supplemental measures targeting other electrical end uses, and additional measures intended to reduce electric consumption and not related to heating can be installed in all homes (e.g., energy efficient showerheads, CFLs, refrigerators, and window air conditioning units).

Program Operations

Agencies employ energy auditors to evaluate a home's energy performance based on certain efficiency indicators. The auditor uses an energy audit software tool chosen from a list of USDOE approved software, identifying energy-saving opportunities and determining the energy-saving measures to install in each home. All agencies follow USDOE WAP guidelines for installation, which require measures to achieve a Savings-to-Investment Ratio (SIR) of 1.0 or greater when funded by USDOE or Rocky Mountain Power sources.

[17] Coordinating utility and public program low-income weatherization program efforts can provide the most cost-effective low-income weatherization programs. Hill, Lawrence J. & Marilyn A. Brown, "Estimating the Cost Effectiveness of Coordinated DSM Programs." *Evaluation Review*, Vol. 19, No. 2, April 1995, Pp. 181-196.

[18] Rocky Mountain Power Schedule No. 118, Low Income Weatherization Option for Income Qualifying Customers, October 5, 2012.

Auditors address the health and safety of the home, for example, by adjusting for proper ventilation (e.g., duct sealing and insulation repairs) and providing other necessary health and safety improvements and by completing certain home repairs that are necessary to install weatherization measures. Health, safety and repair work is simply a practical reality – a necessary activity when working with the low-income portion of the state housing stock. It extends the life of the housing stock and keeps homes habitable. This part of the work contributes to project costs but generally not directly to the energy savings goals of each weatherization project.[19]

After completing work on a home, the agency submits invoices and documentation to Rocky Mountain Power directly and to USDOE through WYDFS. Rocky Mountain Power pays a rebate of 50% of the installed cost of all major measures and supplemental measures, as required by the Rocky Mountain Power Schedule No.118. Rocky Mountain Power also pays a reimbursement for administrative costs based on 10% of Rocky Mountain Power's rebate on installed measures, but not to exceed the following total administrative payment per building (Table 14).

Table 14. Rocky Mountain Power's Maximum Administrative Payment

Dwelling Units per Building	Maximum Administrative Payment
1 to 4	$ 350
5 to 10	$ 800
11 to 15	$1,200
16 to 20	$1,400
21 to 25	$1,600
26 to 30	$1,800
31+	$2,100

The annual Rocky Mountain Power funding cap is $225,000. Measures most frequently installed include: windows, insulation, furnace repair, and CFLs. Rocky Mountain Power does not reimburse for improvements related to health and safety of the home, which are frequently necessary to completing weatherization.

Methodology

For the process evaluation, data collection consisted of two separate telephone surveys: one of a sample of weatherization program participants, and another of a sample of CFL Kit recipients. Smith & Lehmann Consulting performed separate telephone surveys to assess weatherization services separately

[19] In some cases, for example very old homes, the health and safety and repair costs may be too great, resulting in not treating a home (this is termed a "walkaway" or a "deferral").

from the CFL distribution program. Stakeholder telephone interviews were also conducted with the Weatherization Program Manager at WYDFS, and with the Directors of both weatherization agencies.

- **Weatherization Participant Survey**

  For the weatherization participant group surveys, Smith & Lehmann Consulting sampled Wyoming residents who received WAP services for which Rocky Mountain Power provided partial payment. The purpose of this telephone survey was to obtain data documenting and aiding in measurement of customer satisfaction, verification of program services, and opinions on various program issues and perceived improvements.

- **CFL Kit Recipient Survey**

  For the CFL Kit recipient group surveys, Smith & Lehmann Consulting sampled customers who received mailed CFL Kits between January 2011 and December 2012. The purpose of this telephone survey was to obtain data documenting and aiding in measurement of customer satisfaction and verification of services.

- **Weatherization Sample Selection**

  The evaluation team completed 24 participant telephone surveys, achieving 11% precision and 90% confidence. Due to a limited number of weatherization cases, the sample for client surveys was randomly obtained from homes with measures installed during program years 2012 and 2013. Typically Smith & Lehmann Consulting would limit sample selection to the most recent program year to reduce recall concerns. However, due to the low number of participants weatherized during this timeframe, Smith & Lehmann included all viable clients. Smith & Lehmann Consulting attempted to sample all clients whose homes had been weatherized in 2012 or 2013.

- **CFL Kit Sample Selection**

  The evaluation team completed 24 participant telephone surveys, achieving 17% precision and 90% confidence. The sample for client surveys was randomly obtained from homes that were mailed a CFL Kit during the most recent program year, 2012. The sample was limited to those who had received CFLs in the most recent year in order to reduce concerns regarding client recall. Sampling was completed with replacement, that is, if one household in the sample did not respond we substituted the next household in the sample to reach the planned size for the sample.

  Low-income clients who received CFL kits in 2011 were expected to have lower recall accuracy than those who received services in 2012. Recall problems are typically exacerbated among the elderly, who usually constitute at least one-third of low-income energy assistance recipients. There is a slight risk that the clients who received services in 2012 will not be fully representative of the clients who received services in 2011. However, this risk is mitigated by increased recall accuracy when sampling is restricted to CFL recipients in 2012.

- **Stakeholder Interviews**

  Stakeholder interviews were conducted to provide qualitative data documenting processes, funding sources, and issues related to Wyoming's WAP. These interviews addressed evaluation questions regarding program participation and wait listing. Program Directors were interviewed from each of the following agencies, as well as with the Weatherization Program Manager at WYDFS.

Process Evaluation Findings

Results of the separate participant and recipient telephone surveys are presented in the following sections. Smith & Lehmann Consulting conducted the weatherization participant survey in November 2014, followed by the CFL kit recipient survey in January 2015.

Weatherization Participant Survey

The client survey achieved 24 completed participant surveys and one incomplete out of 41 attempted client contacts, yielding a 96% cooperation rate among those reached. Table 15 reports the target and achieved survey samples as compared to the total population. Twelve respondents were not at home at the time the interviewer called or refused to participate. Out of the 41 phone numbers called, 4 were invalid, disconnected or the wrong number. This is typical due to the more transient nature of the low-income population, the general shift away from landline phones with a fixed phone number to cellular phones, and more frequent changes of phone numbers. For reference, the weatherization participant survey protocol can be found in the Appendix of this report.

Table 15. Target and Achieved Survey Samples for Wyoming's Weatherization Participant Survey

Total 2013 Population	Viable Population	Target Completes	Desired Precision at 90% Conf.	Achieved Completes	Achieved Precision at 90% Conf.
41	37	26	10%	24	11%

Survey response rates and cooperation rates were calculated according to the American Association for Public Opinion Research (AAPOR) standard definitions. For the purpose of this evaluation, Smith & Lehmann Consulting calculated Response Rates (RR) following RR1 and RR2 AAPOR calculations[20] (Table 16). These response rates consider all customers attempted, whether or not they could be reached. RR1 is the minimum response rate, while RR2 counts partial interviews as respondents. Cooperation Rates (COOP) represent the proportion of all cases interviewed based on all eligible customers who could be contacted. These are household-level cooperation rates based on all households that could be

[20] American Association for Public Opinion Research provided calculations for Response Rates (RR1 and RR2) and Cooperation Rates (COOP1 and COOP2). The American Association for Public Opinion Research. 2011. *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. 7th edition.* AAPOR. Pg. 44.

contacted.[21] COOP1 is the minimum cooperation rate, while COOP2 counts partial interviews as respondents.

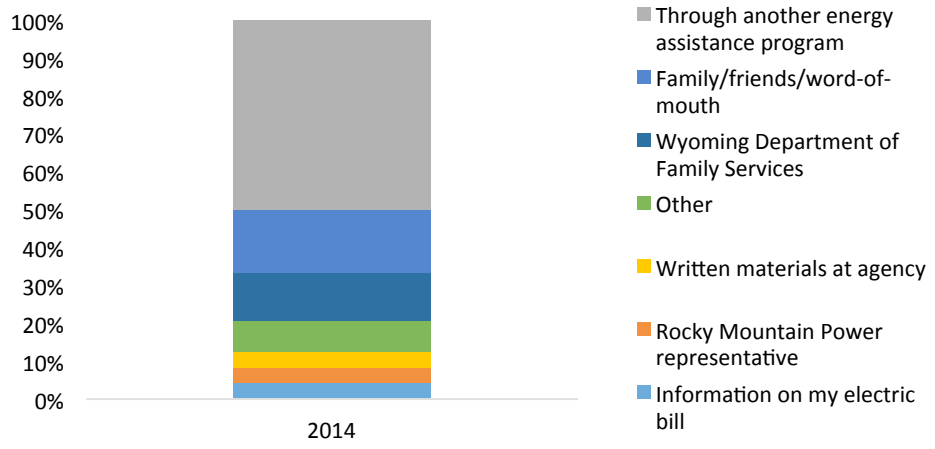
Table 16. AAPOR Response and Cooperation Rates

RR1	RR2	COOP1	COOP2
44.44%	**46.3%**	**96%**	**100%**

Program Awareness

Interviewers asked respondents how they heard about the program. Half of respondents, or 12 out of 24, said that they heard about the program through another energy assistance program. Four respondents heard about the program from family, friends, or word-of-mouth and three respondents heard about it through the WYDFS. Two respondents indicated that they heard about the program directly from Rocky Mountain Power, either through a Rocky Mountain Power representative (1 respondent) or from information on their electricity bill (1 respondent). Figure 2 demonstrates that "other" (2 respondents) was the fourth most common response to the question. For recording purposes, Smith & Lehmann Consulting asked interviewees to specify an "other" response. Respondent answers ranged from the senior citizen center and Community Action Program (CAP). No "other" responses were duplicated among the six respondents.

Firgure 2. How Rocky Mountain Power clients heard about the program



While 50% of respondents heard about the program from other energy assistance programs, there was less awareness of the program's funding source: 29% (7 out of 24) of respondents had no knowledge of funding sources and 21% (5 out of 24) indicated they simply did not remember. Some respondents mentioned other weatherization assistance programs (21% or 5 out of 24). Others indicated the agency

that provided the services to their home (13% or 3 out of 24), but only one respondent (4%) identified Rocky Mountain Power or the "power company" as the funding source.

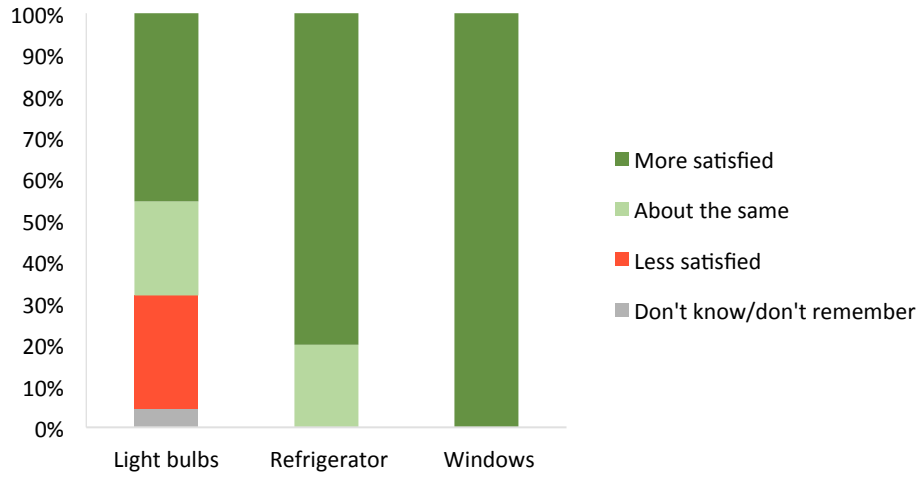
Installation Verification

All respondents (100%) verified that they received the services indicated in Rocky Mountain Power's records. Considerable effort was made by Smith & Lehmann Consulting to screen respondents for accuracy of responses and level of engagement in the program/survey.

Measure Satisfaction

Clients were asked about their satisfaction with the lighting in their home, their new windows, and/or their new refrigerator, depending on which measure or mix of measures they received. Figure 3 indicates that the majority of respondents were more satisfied with their new refrigerators and/or new windows (80% or 4 out of 5 for refrigerators, 100% or 5 out of 5 for windows). There were slightly fewer clients who were more satisfied with their new lighting (45% or 10 out of 22), while another 23% (5 out of 22) clients said the lighting was about the same. For Figure 3, the color green indicates a positive result, red as negative, and light gray as neutral.

Figure 3. Client Satisfaction with Services



Light Bulbs

Seventy-seven percent of respondents indicated that agency staff installed light bulbs directly into their fixtures (17 out of 22). Four respondents (18%) said that they have replaced some of their light bulbs, averaging about three bulbs each. Of those who replaced light bulbs, two respondents (50%) reported installing new CFLs, one (25%) replaced the CFLs with traditional incandescent bulbs, and one (25%) did not remember what light bulb they used. The respondents who replaced bulbs indicated that they did so because the CFLs provided by the program burned out (50% or 2 out of 4 respondents who replaced CFLs). This result is typical as most bulbs are eventually replaced when burned-out and not for other non-necessity reasons. Smith & Lehmann Consulting was unable to verify whether the bulbs that failed were those installed by the agencies.

Respondents were also asked whether they have purchased and installed any additional energy-efficient light bulbs after receiving the CFLs from the agency. Under half (48% or 10 out of 22) indicated that they did purchase and install additional light bulbs. Nine of these respondents indicated that they purchased CFLs (90%) while one (10%) purchased LED light bulbs. This may indicate a change in behavior due to exposure and education of the program. However, more research on customer behavior would be needed to confidently report a significant change.

Refrigerators

Clients were asked about their satisfaction with their new refrigerator. Out of the five sampled clients who received this measure, four of them were more satisfied with their new refrigerator while the remaining client indicated that it was about the same.

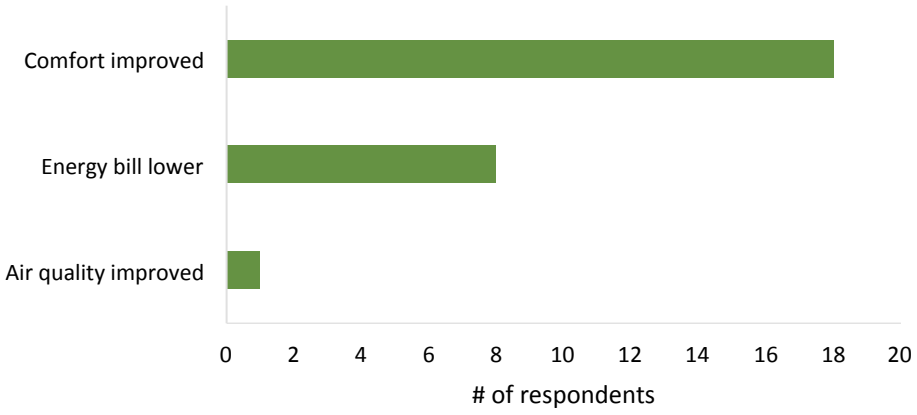
Shell Measures: Windows and Insulation

Five respondents (21%) verified that they had work done to the windows in their home. Most respondents either had three to four windows replaced (67% or 4 out of 6). Insulation was installed for four of the five clients (80%) who received windows. The insulation was most commonly installed in the floor (50% or 2 out of 4), the ceiling (25% or 1 out of 4), or other areas of the home such as the basement and attic (25% or 1 out of 4).

Energy Information

After weatherization was completed, 20 respondents (83%) voluntarily indicated that they noticed changes in their home. A majority (90%) reported improved comfort (i.e. cooler in the summer, warmer in the winter) (Figure 4). Eight respondents (40%) indicated their energy bill is more affordable after the completion of weatherization. One respondent (5%) noted that the air quality improved in his/her home. As shown in Figure 4, everything that was self-reported by respondents was positive.

Figure 4. Self-reported changes in clients' homes after weatherization measures completed



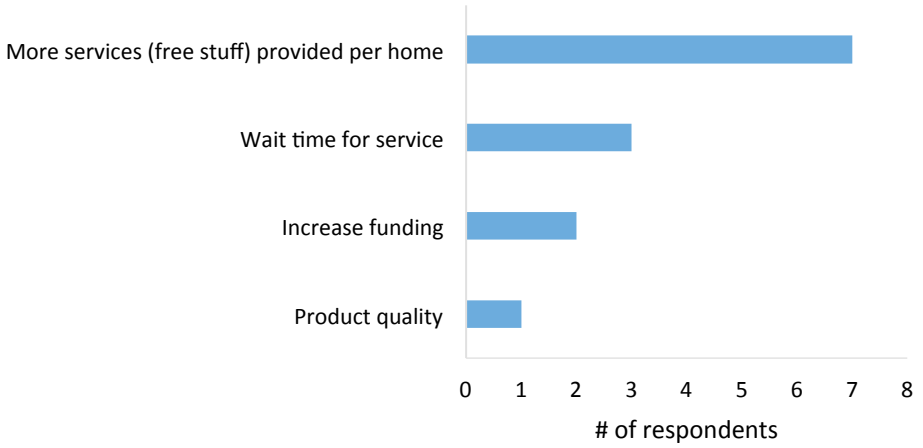
Respondents were asked their opinions on energy usage and efficiency. When asked whether it was important or unimportant to save energy by reducing usage in the home, 92% of respondents believed it

was very important to save energy. Additionally, most respondents (83%) strongly agreed that most people have things that could be done to improve the energy efficiency of their home.

Program Delivery and Satisfaction

All clients surveyed (100%) would recommend the weatherization program to friends and family. Ten clients (42%) believed that there could be improvements to the program. Most of these respondents indicated providing more free services (7 out of 10) as a crucial program improvement, in addition to decreasing wait times to receive the services (3 out of 10), increasing funding (2 out of 10) and improving product quality (1 out of 10) (Figure 5).

Figure 5. Customer suggested program improvements



CFL Kit Recipient Survey

The CFL kit recipient survey achieved 24 completed participant surveys out of 37 households reached, yielding a 60% cooperation rate. Table 17 reports the target and achieved survey samples as compared to the total population. Sixteen respondents refused to participate or were not home at the time the interviewer called. Out of the 521 phone numbers called, 202 were invalid, disconnected or the wrong number. This is typical due to the more transient nature of the low-income population, the general shift away from landline phones with a fixed phone number to cellular phones, and more frequent changes of phone numbers. The CFL kit recipient survey protocol can be found in the Appendix of this report.

Table 17. Target and Achieved Survey Samples for CFL Kit Recipient Survey

Total 2012 Population	Viable Population	Target Completes	Desired Precision at 90% Conf.	Achieved Completes	Achieved Precision at 90% Conf.
521	313	39	13%	24	17%

Survey response rates and cooperation rates were calculated according to the American Association for Public Opinion Research (AAPOR) standard definitions. For the purpose of this evaluation, Smith &

Lehmann Consulting calculated Response Rates (RR) following RR1 and RR2 AAPOR calculations[22] (Table 18). These response rates consider all customers attempted, whether or not they could be reached. RR1 is the minimum response rate, while RR2 counts partial interviews as respondents. Cooperation Rates (COOP) represent the proportion of all cases interviewed based on all eligible customers who could be contacted. These are household-level cooperation rates based on all households that could be contacted.[23] COOP1 is the minimum cooperation rate, while COOP2 counts partial interviews as respondents.

Table 18. AAPOR Response and Cooperation Rates

RR1	RR2	COOP1	COOP2
4.61%	**5.18%**	**60.0%**	**67.5%**

Installation Verification

All respondents verified they received the mail kit of four CFLs (100% or 24 out of 24). All respondents also indicated they had installed the CFLs. Most respondents installed all four CFLs (57% or 13 out of 23), while seven respondents installed two of CFLs (30%) and two installed only three bulbs (9%).[24] However, there were a significant number of clients whose interviews were terminated because they reported not receiving any light bulbs in the mail from Rocky Mountain Power (55% or 29 out of 53). It is likely that respondents who were available for participation in the survey were not the same household members whom received the CFL Kit. Due to this discrepancy and a time-lapse of two years (or more) between receiving the CFL kits and participating in the survey, Smith & Lehmann Consulting determined it would inappropriate to include this data in the calculation of an In-Service Rate (ISR).

Respondents were asked in what rooms light bulbs were installed and how many were installed in each room (Table 19). With a total of 73 light bulbs installed, an average of 3.3 CFLs were installed in each household. The majority of respondents responded that light bulbs were installed in bedrooms (52%), the living room (48%), or the kitchen (43%).

[22] American Association for Public Opinion Research provided calculations for Response Rates (RR1 and RR2) and Cooperation Rates (COOP1 and COOP2). The American Association for Public Opinion Research. 2011. *Standard Definitions: Final Dispositions of Case Codes and Outcome Rates for Surveys. 7th edition.* AAPOR. Pg. 44.

[23] These are good Cooperation Rates and probably reflect the extensive nature of the weatherization work performed in many of the weatherized homes.

[24] One client who received the mail kit of four CFLs was accidentally surveyed among the whole home clients and has incomplete data in the CFL survey.

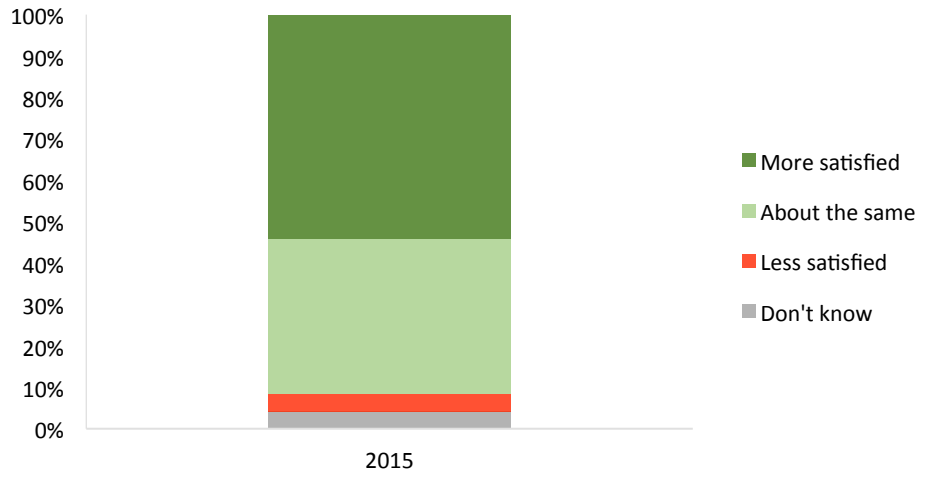
Table 19. Rooms Where CFLs Were Installed

Rooms	Number of clients who installed CFLs	Total number of CFLs installed	Average number of CFLs installed
Bedroom(s)	12	22	1.8
Living room	11	13	1.2
Kitchen	10	12	1.2
Bathroom	9	12	1.3
Front room/den	3	3	1
Hallways	2	2	1
Outside (porch light)	2	2	1
Other (ex. Laundry room, lamps)	2	5	2.5
Closets	1	1	1
Storage	1	1	1
Total	**23**	**73**	**3.3**

CFL Satisfaction

Clients were asked about their satisfaction with the lighting in their home. Figure 6 shows that over half of respondents were more satisfied with their new lights (54% or 13 out of 24 for lighting). For Figure 6, the color green indicates a positive result, red as negative, and light gray as neutral.

Figure 6. Client satisfaction with lighting



Four respondents (17%) said that they have replaced some of their light bulbs, averaging two bulbs each. Three bulb recipients (75%) installed new CFLs, and one (25%) replaced with the CFLs with incandescent bulbs. The majority of respondents who replaced bulbs indicated that they did so because the CFLs were not bright enough (75%), with one of these respondents citing health issues (i.e. the lights gave her bad migraines).

Respondents were also asked whether they have purchased and installed any additional energy-efficient light bulbs after receiving the CFLs in the mail. Most of the respondents (68% or 15 out of 22) indicated

purchasing and installing additional light bulbs. All fifteen of these respondents purchased CFLs. This may indicate a change in behavior due to exposure and education of the program. However, more in-depth research on the customer's behavior prior to weatherization would be necessary to confidently report a significant change in behavior due to program participation.

Additionally, respondents were asked their opinions on energy usage and efficiency. When asked whether it was important or unimportant to save energy by reducing usage in the home, 88% of respondents believed it was very important to save energy. Additionally, over half of the respondents (54%) strongly agreed that most people could do more to improve the energy efficiency of their home.

Stakeholder and Agency Interviews

Representatives from both Wyoming agencies were interviewed for the evaluation. The two agency interviews followed a common protocol, while the interview with the Weatherization Program Manager at WYDFS followed a similar, yet shortened, pattern of questions. The agency interview protocol can be found in the Appendix. Interviews addressed the following topics, but allowed for conversation to flow in different directions when other subjects of interest arose.

- **Program Consistency**

  Both agency administrators agreed the program's primary goals are to save energy and help reduce participants' utility bills through providing superior quality weatherization services. Due to the regulatory structure in Wyoming, agencies operate under oversight from WYDFS, which is the agency responsible for contract compliance and administrative assistance. WYDFS reports directly to USDOE, serving as the link between the State and federal funding sources. This structure is meant to streamline processes and align agency practices across the State. WYDFS contracts with agencies through a 4-year bid cycle. Every four years agencies must re-submit their proposals to provide weatherization and no-heat services. This bid-cycle can pose an obstacle for the two agencies carrying Rocky Mountain Power contracts, due to the lag-time created by WYDFS award process.

- **Link Between WAP and LIEAP**

  Both Wyoming agencies are partnering with LIEAP, administered by WYDFS, to bring in clients and streamline their qualification process. All Wyoming weatherization clients are deemed eligible by first being screened through Wyoming LIEAP income eligibility guidelines (Table 20), which are set at approximately 60% of Wyoming's median income.[25] Rocky Mountain Power's Low Income Weatherization Optional Schedule 118 determines income eligibility based on participant's qualification for energy assistance in the current LIEAP year. Using LIEAP qualification as proof of eligibility reduces program costs considerably and allows for easier access to the program, as participants can qualify for multiple services under LIEAP.

[25] Low Income Energy Assistance Program (LIEAP) http://www.dfsweb.wyo.gov/economic-assistance/lieap

Table 20. LIEAP/WAP INCOME GUIDELINES FOR 2014/2015

FAMILY SIZE	MONTHLY	ANNUAL	FAMILY SIZE	MONTHLY	ANNUAL
1	$1,990	$23,876	9	$5,395	$64,742
2	$2,602	$31,223	10	$5,510	$66,119
3	$3,214	$38,569	11	$5,625	$67,497
4	$3,826	$45,916	12	$5,778	$69,333
5	$4,439	$53,263	13	$5,893	$70,711
6	$5,051	$60,609	14	$6,007	$72,088
7	$5,166	$61,987	15	$6,160	$73,925
8	$5,280	$63,364			

- **Impact and Adequacy of Rocky Mountain Power Funding**

  Agencies reported that Rocky Mountain Power funding supplemented the other funding sources and allowed for more homes to be weatherized per year. The Rocky Mountain Power Low Income Weatherization Optional Schedule 118 sets a maximum for reimbursements at $225,000 per calendar year.

- **Impact of American Recovery and Reinvestment Act**

  An enormous effort was made in Wyoming to properly plan and ramp-up processes for American Recovery and Reinvestment Act (ARRA) funding that inflated the program from 2010-2012. As the Rocky Mountain Power weatherization program was only beginning to install major measures during the 2012 program year, ARRA did not greatly affect any program processes; however, prioritization of ARRA funding made it difficult for Rocky Mountain Power to initiate a contract with local agencies.

- **Provision of Energy Education**

  Both agencies are focused on direct client energy education in the home and tailor their interactions with each individual client based on the specific energy usage of the home. This individualized education creates customer engagement in the learning process and ensures that each client receives valuable information, which is pertinent to his or her individual energy use.

- **Prioritization and Wait-Listing**

  Both agencies determine their own priority for each customer; however, they are following USDOE priority list guidelines. Points are assigned to weatherization participants in typical need-base categories such as elderly, disabled, and presence of children in the home.

  It is standard practice to place customers on the wait-list as soon as they are determined to beincome eligible. Both Wyoming agencies manage individual wait-lists, and set their own timeline for updating applicant priority among the participants on the wait-list. WWS maintains different lists for the applicants depending on the stage of their application, such as approved applications, applications that are waiting to be audited, and applications with a completed

audit waiting to be weatherized. WWS breaks the multiple lists down into a separate list for each of their 8 field offices, and are updated when new applications come in. Participants are only removed if they update their application or if they are contacted for weatherization and do not respond after multiple attempts by WWS to initiate the process. CCS follows a similar process, but divides their wait list into separate owner and renter lists, before breaking the lists down for each of the five county offices. WWS report that the number of applicants on each separate list varies greatly depending on the time of year, but is typically around 100 applicants during the colder season. CCS does not currently have any Rocky Mountain Power customers on their waitlist. This is due to the limited amount of Rocky Mountain Power service territory covered by CCS.

Due to the large volume of potential participants on the different wait-lists, WWS and CCS report a timeframe of approximately two years to weatherize all the homes on the wait-list. However, since agencies compile all weatherization participants into large waitlists, it is difficult to determine the relative wait times for service experienced by Rocky Mountain Power customers, specifically. Many of the participants with lower priority status may take longer to weatherize due to newer applicants joining the list with higher priority points. CCS did not weatherize any Rocky Mountain Power customers during the evaluation timeframe, 2012-2013.

- **Deferrals and Health & Safety Policy**

  During the pre-assessment process, the auditor may issue a "deferral notice" if the homeowner needs to address any repairs in the home before continuing with the audit process. Agencies report on average a small percentage of applicants are determined "deferrals," and of those potential participants very few can complete the repairs necessary to receiving weatherization services. Due to the financial state of many low-income households, clients are routinely forced to choose between competing needs while facing a limited budget; therefore, they are making a conscious decision not to fix their home. Both agencies work with local funding sources to cover health and safety repairs; however this remains a program delivery obstacle.

  Smith & Lehmann Consulting strongly recommends Rocky Mountain Power allow for a percentage of available funding to be used for health and safety repairs, which are deemed necessary to installing weatherization measures. In doing so, Rocky Mountain Power will increase the percentage of total rebates claimed for weatherization by allowing agencies to target homes with marginally higher repair costs, but that are good candidates for energy efficiency upgrades. This will also allow agencies to service more of the homes they interact with, thus increasing the efficiency of funding already utilized by the program. Rocky Mountain Power should determine an appropriate percentage of funding to be used for repairs, which, based on current performance, allows for the program to remain cost-effective.

- **Invoicing and Payments**

  In order to receive payments, Wyoming agencies submit monthly invoices directly to Rocky Mountain Power. Agencies receive payments from Rocky Mountain Power based on their

monthly invoices. Neither agency reports any issues in receiving payments from Rocky Mountain Power. WYDFS is not involved with the invoicing or payment process.

Reporting and Monitoring

Agency reporting occurs in conjunction with invoicing. Agencies are required to submit a one-page addendum to Rocky Mountain Power for each completed home. Agencies submit a cover invoice along with the addenda for each completed home, which includes:

- Customer name and address (and owner's name and address in case of rental)
- Account number
- Home occupant (owner versus renter)
- Dwelling type (single-family, multifamily, manufactured home)
- Measures installed
- Total cost per measure including material and labor
- Rocky Mountain Power rebate for each measure
- Agency administrative fee billed to Rocky Mountain Power
- Total reimbursement requested
- kWh savings estimated for total job
- Total cost of all measures.

As the grantee for federal funding, WDFS reviews and submits reports to USDOE. Reports submitted to USDOE include the following:

- Number of completions
- Number of leveraged units
- British Thermal Units (BTUs) saved
- Housing types
- Occupancy status (owner/renter)
- Household and individual demographics

The State of Wyoming's quality control process requires reviewing a minimum of 5% of homes to verify compliance with USDOE; however, WYDFS typically exceeds this requirement by verifying between 11% and 17% of homes per year. New regulations, after federal assessment of ARRA, will require all homes weatherized with federal funds after July 1, 2015 to be inspected by a Quality Control Specialist, a position to be housed at the agency level.

Program Achievements and Lessons Learned

The most notable change during the evaluation period was the closeout of ARRA support in 2012. Due to the decrease in funding levels, beginning in fiscal year 2011, agencies were forced to lay off many of the staff hired to handle the increased capacity brought about by temporary ARRA funding. Despite management challenges post-ARRA, the weatherization program in

Wyoming continued to serve Rocky Mountain Power homes, while improving its process, outreach, and operations. During 2013-2014, WWS adopted service territories of two other Wyoming agencies, which helped to streamline service delivery and ensure a standard level of quality weatherization measures were installed in each home.

Process Evaluation Conclusions

- **Coordination with Wyoming's WAP**

  Rocky Mountain Power's decision to coordinate its weatherization efforts with Wyoming's subgrantee agencies is a best practice and provides leverage to each utility dollar and should be continued.

- **Aligning WAP with LIEAP**

  The partnership between LIEAP payment assistance and WAP is beneficial to both programs: LIEAP certification streamlines the application process and WAP helps clients to decrease their energy burden by weatherizing their home. This decreases not only the energy burden to the client but also the burden placed on LIEAP to help the client over future heating seasons.

Process Evaluation Recommendations

- **Client Surveys**

  A gap of two years between measure installation and client survey has reduced the reliability of client survey responses. It is not possible to verify whether clients are referring to Rocky Mountain Power services when responding to survey questions. In the future, conducting surveys within six to eight months of receiving weatherization services will enable Rocky Mountain Power to confidently determine whether services and products meet the utility's standards and to proactively respond to any client concerns that may be identified.

- **Rocky Mountain Power Recognition**

  Client survey results indicate 4% of respondents remember or recognize that Rocky Mountain Power contributed to the weatherization work they received. Rocky Mountain Power should consider whether it is important that customers recognize Rocky Mountain Power's contribution to the weatherization services received. If so, Rocky Mountain Power should continue to provide a branded item concurrently with weatherization services to increase customer recognition.

- **Provision for Health & Safety**

  Smith & Lehmann Consulting strongly recommends Rocky Mountain Power allow for a percentage of available funding to be used for health and safety repairs, which are deemed necessary to installing weatherization measures. In doing so, Rocky Mountain Power will increase the percentage of total rebates claimed for weatherization by allowing agencies to target homes with marginally higher repair costs, but that are good candidates for energy efficiency upgrades. Rocky Mountain Power should determine an appropriate percentage of

funding to be used for repairs, which, based on current performance, allows for the program to remain cost-effective.

COST EFFECTIVENESS ANALYSIS

The impact evaluation produced the energy impacts and inputs used to calculate program cost-effectiveness.

Cost-effectiveness was assessed using five different perspectives. Smith & Lehmann Consulting provided inputs to the cost-effectiveness calculations to Cadmus, who performed the calculations of the Benefit/Cost Ratio and Levelized Cost for each of the program years and for the total evaluation period.

Cost Tests

Cost-Benefit analysis was conducted by Cadmus using the five specified tests: PacifiCorp Total Resource Cost (PTRC) test, Total Resource Cost (TRC) test, Utility Cost Test (UCT), Ratepayer Impact Measure (RIM), and the Participant Cost Test (PCT). The inputs necessary to evaluating cost-effectiveness were provided by Smith & Lehmann Consulting.

Cost-effectiveness perspectives of the five tests include:

- **PTRC:** This test incorporates program costs and benefits from the perspectives of both Rocky Mountain Power and its customers combined. Benefit measures include the present value of avoided energy, capacity costs, and line losses, plus a 10% adder to represent non-qualified benefits. Cost measures include both the costs to the participant and the utility.
- **TRC:** This test also approaches program costs and benefits from the perspectives of both Rocky Mountain Power and its customers combined. Benefit measures include the present value of avoided energy, capacity costs, and line losses. Cost measures include both the costs to the participant and the utility. In this case, the cost to the participant is zero. Utility costs are all program costs including all administration, implementation, and incentive costs associated with funding the program.
- **UCT:** This test approaches costs and benefits from Rocky Mountain Power's perspective. Benefits included avoided energy and capacity costs as well as line losses. Costs included all administration, implementation, and incentives costs associated with funding the program.
- **RIM:** This test measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates or bills will go up to cover lost revenue. This test indicates the direction and magnitude of the expected change in customer bills or rate levels. Benefits include all avoided energy and capacity costs, as well as line losses. Costs included all Rocky Mountain Power program costs as well as lost revenues.
- **PCT:** This test approaches costs and benefits from the participant's perspective. In this case, the cost to the participant is zero. While benefits would include bill reductions, the result of the test would be undefined due to zero costs. Therefore, the result of the PCT was determined "Not Applicable."

Table 21. Benefits and Costs Included in Various Tests

Test	Benefits	Costs
PTRC	Present value of avoided energy and capacity costs with 10% adder for non-quantified benefits	Program costs including administration and marketing
TRC	Present value of avoided energy and capacity costs	Program costs including administration and marketing
UCT	Present value of avoided energy and capacity costs	Program costs including administration and marketing; and incentive costs
RIM	Present value of avoided energy and capacity costs	Program costs including administration and marketing; plus the present value of lost revenues
PCT	Present value of bill savings	Participant share of measure costs (zero)

Note 1: The present value of avoided energy and capacity costs includes avoided line losses from reduced energy use by program participants.
Note 2: Federal and state coordinated contributions to project costs are treated as external to the calculation.
Note 3: Any avoided capital and/or operating cost resulting from measures are included as a participant benefit.

Assumptions

Cost-effectiveness was tested using the East Residential Lighting 48% (2011 medium) load factor decrement for 2011, the East Residential Lighting 48% (2011 medium) and the East Residential Whole House 35% (2011 medium) load factor decrement for 2012, and the East Residential Whole House 35% (2013 IRP medium) load factor decrement for 2013. Tables 22 and 23 include a breakdown of the agency and utility costs, as well as the discount rate, line loss, inflation rate, and residential energy rate. Table 24 lists the annual energy savings for each program year. The discount rate was provided by Rocky Mountain Power as reported in Wyoming Annual Reports for each of the program years: 2011, 2012, and 2013. The Annual Reports also provided the line loss and program cost inputs.

Table 22. WY Low-Income Weatherization Financial Inputs

Parameter	2011 Value	2012 Value	2013 Value
Discount Rate	7.17%	7.17%	6.88%
Line Loss	7.959%	9.51%	9.51%
Residential Energy Rate ($/kWh)	$0.0910	$0.1002	$0.1042
Inflation Rate	1.80%	1.80%	1.90%

Table 23. WY Low-Income Weatherization Program Costs

Program	Year	Utility Admin	Program Admin	Incentives	Total Utility Costs
Low Income Weatherization	2011	$11,526	$1,420	$10,107	$23,053
Low Income Weatherization	2012	$12,005	$7,441	$10,610	$30,056
Low Income Weatherization	2013	$6,323	$3,209	$31,026	$40,558
Low Income Weatherization	2011-2013	$29,854	$12,070	$51,742	$93,666

Table 24. WY Low-Income Weatherization Annual Savings

Program	Year	Gross kWh Savings	Realization Rate	Adjusted Gross Savings	Net to Gross Percentage	Net kWh Savings	Measure Life
Low Income Weatherization	2011	84,919	81%	68,732	100%	68,732	6.2
Low Income Weatherization	2012	79,697	101%	80,112	100%	80,112	14.4
Low Income Weatherization	2013	82,787	90%	74,880	100%	74,880	26.6
Low Income Weatherization	2011-2013	247,403	90%	223,724	100%	223,724	16.0

Energy savings were drawn from the evaluated kWh savings portion of this analysis. Cost-effectiveness analysis incorporated a weighted average Measure Life for each of the different program years to reflect the transition from mailed CFL kits to the installation of whole-home weatherization measure from 2012 to 2013. Table 25 provides a comparative summary of the benefit/cost ratios from all five test perspectives by year and for the evaluation timeframe 2011-2013.

Table 25. WY Low-Income Weatherization Benefit/Cost Ratios

Measure	PTRC	TRC	UCT	RIM	PCT
Low Income Weatherization 2011	1.40	1.27	1.27	0.54	N/A
Low Income Weatherization 2012	2.39	2.18	2.18	0.69	N/A
Low Income Weatherization 2013	2.49	2.27	2.27	0.58	N/A
Low Income Weatherization 2011-2013	2.17	1.97	1.97	0.61	N/A

Cost-Effectiveness Results

Tables 26-29 present the results of the program cost-effectiveness tests for each of the program years and for the evaluation period 2012-2013. The 2011, 2012 and 2013 programs and portfolio are cost-effective from all test perspectives except the RIM test.

Table 26. 2011-2013 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0438	$86,601	$187,933	$101,332	2.17
Total Resource Cost Test (TRC) No Adder	$0.0438	$86,601	$170,848	$84,247	1.97
Utility Cost Test (UCT)	$0.0438	$86,601	$170,848	$84,247	1.97
Ratepayer Impact Measure (RIM) Test		$281,671	$170,848	($110,823)	0.61
Participant Cost Test (PCT)		$0	$242,236	$242,236	N/A
Lifecycle Revenue Impacts ($/kWh)	0.00000078				
Discounted Participant Payback (years)	N/A				

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness

**Cadmus is responsible for results of the cost-effectiveness summary

Table 27. 2011 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0600	$23,053	$32,275	$9,223	1.40
Total Resource Cost Test (TRC) No Adder	$0.0600	$23,053	$29,341	$6,288	1.27
Utility Cost Test (UCT)	$0.0600	$23,053	$29,341	$6,288	1.27
Ratepayer Impact Measure (RIM) Test		$54,756	$29,341	($25,415)	0.54
Participant Cost Test (PCT)		$0	$41,810	$41,810	N/A
Lifecycle Revenue Impacts ($/kWh)			0.00000058		
Discounted Participant Payback (years)			N/A		

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness
**Cadmus is responsible for results of the cost-effectiveness summary

Table 28. 2012 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0420	$30,056	$71,951	$41,895	2.39
Total Resource Cost Test (TRC) No Adder	$0.0420	$30,056	$65,410	$35,354	2.18
Utility Cost Test (UCT)	$0.0420	$30,056	$65,410	$35,354	2.18
Ratepayer Impact Measure (RIM) Test		$94,193	$65,410	($28,783)	0.69
Participant Cost Test (PCT)		$0	$74,747	$74,747	N/A
Lifecycle Revenue Impacts ($/kWh)			0.00000020		
Discounted Participant Payback (years)			N/A		

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness
**Cadmus is responsible for results of the cost-effectiveness summary

Table 29. 2013 Low-Income Weatherization – Cost-Effectiveness

Cost-Effectiveness Test	Levelized $/kWh	Costs*	Benefits*	Net Benefits	Benefit/ Cost Ratio**
PacifiCorp Total Resource Cost Test (PTRC)	$0.0384	$40,558	$101,123	$60,566	2.49
Total Resource Cost Test (TRC) No Adder	$0.0384	$40,558	$91,930	$51,373	2.27
Utility Cost Test (UCT)	$0.0384	$40,558	$91,930	$51,373	2.27
Ratepayer Impact Measure (RIM) Test		$158,818	$91,930	($66,887)	0.58
Participant Cost Test (PCT)		$0	$149,286	$149,286	N/A
Lifecycle Revenue Impacts ($/kWh)			0.00000047		
Discounted Participant Payback (years)			N/A		

*Smith & Lehmann provided evaluated costs and benefits necessary to calculating cost-effectiveness
**Cadmus is responsible for results of the cost-effectiveness summary

CONCLUSIONS

Due to a low number of electrically heated homes throughout the State of Wyoming, agencies are weatherizing a limited number of homes under Rocky Mountain Power funding. This translates into a limited number of cases available for assessing evaluated savings. While the evaluation produced a good estimate of savings, Rocky Mountain Power should look to other state evaluations to validate Wyoming reported UES values based on program installation.

This evaluation demonstrates that Rocky Mountain Power's coordination of its weatherization efforts with the Wyoming agencies and with USDOE and USDHHS is cost effective on all perspectives for the evaluation period except RIM test. The RIM test result is not unusual since RIM test normally shows a less than cost effective result for energy saving programs. Coordination of this kind is a utility best practice because it provides significant leverage for every utility dollar.

The partnership between LIEAP payment assistance and WAP is beneficial to both programs: LIEAP certification streamlines the application process and WAP helps clients to decrease their energy burden by weatherizing their home. This decreases not only the energy burden to the client but also the burden placed on LIEAP to help the client over future heating seasons. Overall, this evaluation demonstrates that the program is operating as planned within the design parameters outlined in Rocky Mountain Power's Schedule No. 118, Low Income Weatherization Optional for Income Qualifying Customers, State of Wyoming.

RECOMMENDATIONS

- **Client Surveys**

  A gap of two years between measure installation and client survey has reduced the reliability of client survey responses. It is not possible to verify whether clients are referring to Rocky Mountain Power services when responding to survey questions. In the future, conducting surveys within six to eight months of receiving weatherization services will enable Rocky Mountain Power to confidently determine whether services and products meet the utility's standards and to proactively respond to any client concerns that may be identified.

- **Rocky Mountain Power Recognition**

  Client survey results indicate 4% of respondents remember or recognize that Rocky Mountain Power contributed to the weatherization work they received. Rocky Mountain Power should consider whether it is important that customers recognize Rocky Mountain Power's contribution to the weatherization services received. If so, Rocky Mountain Power should continue to provide a branded item concurrently with weatherization services to increase customer recognition.

- **Provision for Health & Safety**

  Agencies report on average a small percentage of all clients that apply to the program are determined "deferrals," primarily due to the need to repair substandard housing so that weatherization measures can be installed. While some of these clients will return to the program, most will not be able to afford the repairs necessary to move forward with weatherizing the home.

  Smith & Lehmann Consulting recommends Rocky Mountain Power allow for a percentage of available funding to be used for health and safety repairs, which are deemed necessary to installing weatherization measures. In doing so, Rocky Mountain Power will increase the percentage of total rebates claimed for weatherization by allowing agencies to target homes with marginally higher repair costs, but that are good candidates for energy efficiency upgrades. Rocky Mountain Power should determine an appropriate percentage of funding to be used for repairs, which, based on current performance, allows for the program to remain cost-effective.

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APPENDIX: Interview Protocols

Client Survey: CFL-Recipient Survey

Participants: Wyoming residents who received a package of 4 CFL light bulbs from Rocky Mountain Power.

Purpose: To provide qualitative data documenting and aiding in measurement of cost-effectiveness, customer satisfaction, and verification of the receipt and installation of CFLs.

Introductory Protocol

Hello, my name is [FIRST AND LAST NAME] from Smith & Lehmann Consulting and I am calling on behalf of Rocky Mountain Power. We are talking with people who received energy-saving light bulbs in the mail from 2011-2012.

May I speak with _____, or the person who remembers receiving energy efficient light bulbs from Rocky Mountain Power? This is a short survey and will take approximately 5 minutes.

- Agreed to participate
- Refused to participate
- Refused, person not home

[Background]

The survey is voluntary. You may decline to answer any of the questions, and may terminate the survey at any time. If you have questions regarding this survey, I can provide you with contact information for someone at Rocky Mountain Power [provide contact information if Respondent requests it]:

Shawn Grant, Project Manager
P: 801-220-4196
E: Shawn.Grant@rockymountainpower-pacificpower.net

Potential Research Questions:

1. Our records indicate that you received a package of four CFLs or energy efficient light bulbs in the mail, is this correct?
    - Yes [SKIP TO QUESTION 3]
    - No
    - Don't know/don't remember
    - Refused

2. Do you remember receiving new energy-efficient light bulbs [or CFLs] in the mail? [Duplicate of #1]?
    - Yes
    - No [PROBE WITH SUPPLEMENTAL SCRIPT]
        - Supplement: Our records indicate that your home received a mailing of CFLs from Rocky Mountain Power. Do you remember receiving a mailing-kit with energy-efficient light bulbs in it during [Year]?
            - [If Yes:] SKIP to Q3
            - [If NO:] Is there someone else in your home who remembers this?
                - [If Yes:] May I speak with that person? [If yes, continue interview with other person]
                - [If No:] [Skip to interview termination script][Do not count this as completed interview]
    - Don't know/don't remember
    - Refused

3. Are you still living in the same home where you received the energy efficient light bulbs?
    - Yes
    - No
    - Don't know/don't remember
    - Refused

4. Did you install these energy-efficient light bulbs directly into your fixtures?
    - Yes, the new light bulbs were installed directly into the light fixture. [CONTINUE TO QUESTION 5]
    - No, I did not install the new light bulbs. [SKIP TO interviewer data entry point before Q12]

- Don’t know/don’t remember receiving light bulbs [SKIP TO interviewer data entry point before Q12]
- Refused

5. If yes, then how many of the new energy-efficient light bulbs did you install?
   - 0
   - 1
   - 2
   - 3
   - 4
   - Other: [SPECIFY]
   - Don’t know/remember

6. In what rooms did you install the energy-efficient light bulbs, and how many where installed in each room? [Indicate room type and number installed in each type]

Room Type:	**Number Installed:**
Front room/den	
Kitchen	
Bathroom	
Living-room	
Bedroom	
Hallways	
Closets	
Outside (porch-light)	
Storage	
Other: [SPECIFY]	

7. Did you replace any of the new energy-efficient light bulbs with different ones? [For interviewer: did Client remove any of the CFL light bulbs that he/she installed]?
   - Yes
   - No [SKIP TO QUESTION 11]
   - Don’t know/remember [SKIP TO Data Entry Point before QUESTION 11]
   - Refused [SKIP TO Data Entry Point before QUESTION 11]

8. How many energy-efficient light bulbs did you replace?
   Record Number:

9. What type of bulb did you replace it with? [DO NOT READ THROUGH LIST – PROBE TO IDENTIFY TYPE OF LIGHT BULB]
    - Incandescent (the old kind of light bulb)
    - Halogen (looks like old type but isn't)
    - Energy-saving (CFL) (the curly expensive type)
    - Energy-saving (LED)
    - Other: [SPECIFY]
    - Don't know/remember

10. Why did you replace it/them?
    - Not bright enough
    - Bulb(s) failed
    - Didn't like the quality
    - Didn't like the light color
    - Other: [SPECIFY]
    - Don't know/remember

11. After receiving the new energy-efficient light bulbs from Rocky Mountain Power, have you purchased and installed additional energy-efficient light bulbs?
    - Yes [SPECIFY TYPE]
        - Incandescent
        - Halogen (looks like old type but isn't)
        - Energy-saving (CFL) (the curly expensive type)
        - Energy-saving (LED)
    - No
    - Don't know/remember
    - Refused

Data Entry Point (for Interviewer):

How confident are you that the respondent answered questions 4-11 to the best of their ability?

- 1 = very concerned
- 2 = somewhat concerned
- 3 = neither concerned or confident
- 4 = somewhat confident
- 5 = very confident

12. Since Rocky Mountain Power provided you with the new energy-efficient light bulbs, are you more satisfied or less satisfied with the lighting in your home compared to the old bulbs?
    - More satisfied
    - About the same
    - Less satisfied
    - Don't know/remember
    - Refused

13. I would like to ask you if you agree or disagree with the following statement: Do you think it is important or unimportant to save energy by reducing the energy usage in the home? Do you think it is very [important/unimportant] or somewhat [important/unimportant]?
    - Very Important
    - Somewhat Important
    - Neither important nor unimportant
    - Somewhat Unimportant
    - Very Unimportant Don't know/remember
    - Refused

14. I would like to ask you if you agree or disagree with the following statement: Most people probably have things that could be done to improve the energy efficiency of their home. Do you strongly [agree/disagree] or somewhat [agree/disagree]?
    - Agree strongly
    - Agree somewhat
    - Neither agree nor disagree
    - Disagree somewhat
    - Disagree strongly
    - Don't know/remember
    - Refused

15. What type of residence do you live in?
    - Single family home
    - Duplex
    - Condominium
    - Mobile or Manufactured Home
    - Apartment
    - Refused
    - Other [SPECIFY]

16. Do you own or rent your residence?
    - Own
    - Rent
    - Don't know
    - Refused

17. Do you have an air conditioner in your home?
    - Yes
    - No [SKIP TO QUESTION 19]
    - Don't know
    - Refused

18. [If yes to 17] Is it a swamp cooler, window AC unit, or central AC?
    - Swamp Cooler
    - Window AC [SPECIFY UNITS]
    - Central AC
    - Other [SPECIFY]
    - Don't know
    - Refused

19. Do you know which organization provided the funding for the energy efficient light bulbs [CFLs]?
    - Yes, Rocky Mountain Power or "power company"
    - Yes, Other [SPECIFY]
    - No
    - Don't know/remember
    - Refused

That is the end of our survey. We would like to thank you for taking your time to participate; your responses are very valuable to our process.

Have a wonderful rest of your day, goodbye.

Data Entry Point (for Interviewer):

Last 5 digits of phone number:

How well did the respondent understand the questions? (Did the respondent need you to repeat a lot of questions, seem confused by the questions, or give answers that didn't seem like they really answered the question, or were the answers linked well to the questions?)

- 1 = respondent misunderstood the questions
- 2 = respondent somewhat misunderstood the questions
- 3 = respondent neither misunderstood or understood
- 4 = respondent somewhat understood the questions
- 5 = respondent understood the questions well

How confident are you that the respondent answered the questions to the best of their ability? (i.e. was respondent rushing through the interview and not appearing to think very much about their responses, or do you think the respondent was trying to answer as accurately as possible?

- 1 = very concerned
- 2 = somewhat concerned
- 3 = neither concerned or confident
- 4 = somewhat confident
- 5 = very confident

How confident was the respondent in recalling events accurately? (i.e. did respondent seem confused, have trouble with memory, seem to be "guessing" with responses, or did respondent seem to recall events fairly easily?

- 1 = very concerned with respondent's memory of event
- 2 = somewhat concerned with respondent's memory of events
- 3 = neither concerned or confident
- 4 = somewhat confident in respondent's recall
- 5 = very confident in respondent's recall

Client Survey: Whole Home Weatherization

Participants: Wyoming residents who received Weatherization Assistance Program (WAP) services for which Rocky Mountain Power provided full or partial payment.

Purpose: To provide qualitative data documenting and aiding in measurement of cost-effectiveness, customer satisfaction, verification of program services, and opinions on various program issues and perceived improvements.

Introductory Protocol

Hello, my name is [FIRST AND LAST NAME] from Smith & Lehmann Consulting and I am calling on behalf of Rocky Mountain Power. We are talking with people who received energy-saving or weatherization services from **(The Agency)** *over the past few years.*

Agency Selection: [It will be indicated which program participant applied through]

- Wyoming Weatherization Services (WWS) (Big Horn, Converse, Fremont, Goshen, Hot Springs, Lincoln, Natrona, Park, Platte, Sublette, Sweetwater, Teton, Uinta and Washakie counties)
- Wyoming Energy Council, Laramie (Albany and Carbon counties)
- Council of Community Services, Gillette (Johnson County)

May I speak with _____, or the person who remembers receiving energy efficiency services through [insert Agency]? This is a short survey and will take approximately 10 minutes.

- Agreed to participate
- Refused to participate
- Refused, person not home

[Background]

The survey is voluntary. You may decline to answer any of the questions, and may terminate the survey at any time. If you have questions regarding this survey, I can provide you with contact information for someone at Rocky Mountain Power [provide contact information if Respondent requests it]:

Shawn Grant, Project Manager
P: 801-220-4196
E: Shawn.Grant@rockymountainpower-pacificpower.net

Potential Research Questions:

20. Our records indicate that you have participated in **(The Agency's)** weatherization/energy efficiency program, is this correct? [Note: use "weatherization", "energy efficiency", or "services" throughout, whichever the client understands better]
    - Yes
    - No [CONTINUE TO QUESTION 2]
    - Don't know/don't remember
    - Refused

21. Do you remember receiving [insert service/measure received by customer]? [This will be provided].
    - Yes
    - No [PROBE WITH SUPPLEMENTAL SCRIPT]
        - Supplement: Our records indicate that your home received [insert service] from [Agency]. Do you remember someone coming to your home in [month, year of service] and installing [insert service].
            - [If Yes:] SKIP to Q3
            - [If NO:] Is there someone else in your home who remembers this?
                - [If Yes:] May I speak with that person? [If yes, continue interview with other person]
                - [If No:] [Skip to interview termination script][Do not count this as completed interview]
    - Don't know/don't remember
    - Refused

22. Are you still living in the same home where you received the services?
    - Yes
    - No
    - Don't know/don't remember
    - Refused

23. How did you hear about this program/services provided by [Agency]? [DO NOT READ THROUGH LIST]
    - Agency staff
    - Information on my electric bill
    - Rocky Mountain Power representative
    - Rocky Mountain Power website

- Other website [SPECIFY]
- Through another energy assistance program
- Written materials at (Agency)
- Family/friends/word-of-mouth
- Other [SPECIFY]
- Don't know/remember
- Refused

24. When you applied for this program, did you find it easy, difficult, or in-between?
    - Easy
    - Difficult
    - In-between
    - Don't know/remember
    - Refused

25. How long did you wait to receive weatherization/energy efficiency services [Clarify: from the time you applied for the program until service delivery]? [Don't read choices if a timeframe is volunteered]
    - Less than one month
    - At least one month but less than three months
    - At least three months but less than six months
    - At least six months but less than a year
    - More than a year
    - Don't know/remember
    - Refused

26. [Ask question if light bulbs in record] Our records indicate that you received several new energy-efficient light bulbs. Did the agency staff install these directly into your fixtures?
    - Yes, the new light bulbs were installed directly into the light fixture. [SKIP TO QUESTION 9]
    - No, the agency staff left the light bulbs for me to install. [CONTINUE TO QUESTION 8]
    - No, I didn't receive any new light bulbs.
    - Don't know/don't remember
    - Refused

27. Did you install these energy-efficient light bulbs?
    - Yes

- No [SKIP TO QUESTION 13]
- Don't know/remember
- Refused

28. Did you replace any of the new energy-efficient light bulbs with different ones? [For interviewer: did Client remove any of the CFL light bulbs that were installed by the Agency, or any of the CFL light bulbs from the agency that he/she installed his/herself]?
    - Yes
    - No [SKIP TO QUESTION 13]
    - Don't know/remember [SKIP TO QUESTION 13]
    - Refused [SKIP TO QUESTION 13]

29. How many energy-efficient light bulbs did you replace?
    Record Number:

30. What type of bulb did you replace it with? [DO NOT READ THROUGH LIST – PROBE TO IDENTIFY TYPE OF LIGHT BULB]
    - Incandescent
    - Halogen (looks like old type but isn't)
    - Energy-saving (CFL) (the curly expensive type)
    - Energy-saving (LED)
    - Other: [SPECIFY]
    - Don't know/remember

31. Why did you replace it/them?
    - Not bright enough
    - Bulb(s) failed
    - Didn't like the quality
    - Didn't like the light color
    - Other: [SPECIFY]
    - Don't know/remember

32. After receiving the new energy-efficient light bulbs from the [Agency], have you purchased and installed additional energy-efficient light bulbs?
    - Yes [SPECIFY TYPE]
        - Incandescent
        - Halogen (looks like old type but isn't)

        - Energy-saving (CFL) (the curly expensive type)
        - Energy-saving (LED)
    - No
    - Don't know/remember
    - Refused

Data Entry Point (for Interviewer):

How confident are you that the respondent answered questions 7-13 to the best of their ability?

- 1 = very concerned
- 2 = somewhat concerned
- 3 = neither concerned or confident
- 4 = somewhat confident
- 5 = very confident

33. [Ask specifically based on records] Since the [Agency] performed this work in your home, are you more satisfied or less satisfied with the lighting in your home compared to the old bulbs? [SKIP QUESTION IF DON'T REMEMBER RECEIVING LIGHT BULBS OR SAYS THEY DIDN'T RECEIVE LIGHT BULBS]
    - More satisfied
    - About the same
    - Less satisfied
    - Don't know/remember
    - Refused

34. [Ask specifically based on records] Our records show you received a new refrigerator from [Agency]. Since the [Agency] performed this work in your home, are you more satisfied or less satisfied with the refrigerator in your home compared to the old model?
    - More satisfied
    - About the same
    - Less satisfied
    - Don't know/remember
    - Refused

35. [Ask specifically based on records] Our records show you received a new window(s) from [Agency]. Since the [Agency] performed this work in your home,

are you more satisfied or less satisfied with the windows in your home compared to the old ones?

- More satisfied
- About the same
- Less satisfied
- Don't know/remember
- Refused

36. [Ask question if window replacement on record] Our records indicate that you received a new window(s). How many windows were replaced with new ones?
    - 1
    - 2
    - 3-4
    - All the windows were replaced
    - I didn't receive new windows [SKIP TO QUESTION 20]
    - Don't know/remember [SKIP TO QUESTION 20]
    - Refused [SKIP TO QUESTION 20]

37. [Ask question if participant remembers receiving new windows] When the [Agency] installed new windows, did they also install new insulation?
    - Yes
    - No [SKIP TO QUESTION 20]
    - Don't know/remember [SKIP TO QUESTION 20]
    - Refused [SKIP TO QUESTION 20]

38. Where was the insulation installed? [DO NOT READ THROUGH LIST – PROBE TO IDENTIFY AREA]
    - Ceiling
    - Wall
    - Floor
    - Combination
    - Other
    - Don't know/remember
    - Refused

39. Now I have some questions about the impact of weatherization on your home. Did you notice any changes in your home after the Weatherization was completed? [PROMPT: change in comfort, change in appearance, change in air quality, change in energy bill]

[IF Yes: could you tell me what changed?]
[DO NOT READ OPTIONS – CHECK ALL THAT APPLY]

- No change noticed
- Comfort improved
- Comfort worse
- Appearance improved
- Appearance worse
- Air quality improved
- Air quality worse
- Energy bill lower
- Energy bill higher
- Other [SPECIFY]

40. Since the [Agency] performed this work in your home, do you believe that your electric bill is more affordable or less affordable? [Do not ask if volunteered in #20, just choose answer]?
    - More affordable
    - About the same
    - Less affordable
    - Don't know/remember
    - Refused

41. I would like to ask you if you agree or disagree with the following statement: Do you think it is important or unimportant to save energy by reducing the energy usage in the home? Do you think it is very [important/unimportant] or somewhat [important/unimportant]?
    - Very Important
    - Somewhat Important
    - Neither important nor unimportant
    - Somewhat Unimportant
    - Very Unimportant
    - Don't know/remember
    - Refused

42. I would like to ask you if you agree or disagree with the following statement: Most people probably have things that could be done to improve the energy efficiency of their home. Do you strongly [agree/disagree] or somewhat [agree/disagree]?
    - Agree strongly
    - Agree somewhat

- Neither agree nor disagree
- Disagree somewhat
- Disagree strongly
- Don't know/remember
- Refused

43. Would you recommend this weatherization/energy efficiency program to family and friends?
    - Yes
    - No
    - Don't know
    - Refused

44. Is there anything about the program that needs to be improved?
    - Yes
    - No [SKIP TO QUESTION 27]
    - Don't know [SKIP TO QUESTION 27]
    - Refused [SKIP TO QUESTION 27]

45. [If yes to 25] In what ways do you think the program can be improved? (Check all that apply)
    - Customer Service Quality
    - Product Quality
    - Professionalism of the Installers
    - Level of services provided
    - More services (free stuff) provided per home

46. When the [Agency] performed this work on your home, were the agency staff courteous, and respectful towards you, your family, and your home?
    - Yes
    - No
    - Don't know/remember
    - Refused

47. Did the work crew work carefully to protect your home, or was there damage to your home from the work crew?
    - Home protected
    - Home damaged

- Don’t know/remember
- Refused

48. Was there any work left uncompleted, or that was not fully completed?
    - Yes [SPECIFY]
    - No
    - Don’t know/remember
    - Refused

49. What type of residence do you live in?
    - Single family home
    - Duplex
    - Condominium
    - Mobile or Manufactured Home
    - Apartment
    - Refused
    - Other [SPECIFY]

50. Do you own or rent your residence?
    - Own
    - Rent
    - Don’t know
    - Refused

51. Do you have an air conditioner in your home?
    - Yes
    - No [SKIP TO QUESTION 34]
    - Don’t know
    - Refused

52. [If yes to 32] Is it a swamp cooler, window AC unit, or central AC?
    - Swamp Cooler
    - Window AC [SPECIFY UNITS]
    - Central AC
    - Other [SPECIFY]
    - Don’t know
    - Refused

53. Do you know which organization provided the funding for the [Insert: measure received: CFLs, new refrigerator]?
    - Yes, Rocky Mountain Power or “power company”
    - Yes, Agency [SPECIFY]
    - Yes, Other [SPECIFY]
    - No
    - Don’t know/remember
    - Refused

That is the end of our survey. We would like to thank you for taking your time to participate; your responses are very valuable to our process.

Have a wonderful rest of your day, goodbye.

Data Entry Point (for Interviewer):

Last 5 digits of phone number:

How well did the respondent understand the questions? (Did the respondent need you to repeat a lot of questions, seem confused by the questions, or give answers that didn’t seem like they really answered the question, or were the answers linked well to the questions?)

- 1 = respondent misunderstood the questions
- 2 = respondent somewhat misunderstood the questions
- 3 = respondent neither misunderstood or understood
- 4 = respondent somewhat understood the questions
- 5 = respondent understood the questions well

How confident are you that the respondent answered the questions to the best of their ability? (i.e. was respondent rushing through the interview and not appearing to think very much about their responses, or do you think the respondent was trying to answer as accurately as possible?

- 1 = very concerned
- 2 = somewhat concerned
- 3 = neither concerned or confident
- 4 = somewhat confident
- 5 = very confident

How confident was the respondent in recalling events accurately? (i.e. did respondent seem confused, have trouble with memory, seem to be "guessing" with responses, or did respondent seem to recall events fairly easily?

- 1 = very concerned with respondent's memory of event
- 2 = somewhat concerned with respondent's memory of events
- 3 = neither concerned or confident
- 4 = somewhat confident in respondent's recall
- 5 = very confident in respondent's recall

Agency Interviews

Participants: Program managers will be selected from each of the following agencies; Wyoming Weatherization Services (WWS) (Big Horn, Converse, Fremont, Goshen, Hot Springs, Lincoln, Natrona, Park, Platte, Sublette, Sweetwater, Teton, Uinta and Washakie counties), Wyoming Energy Council, Laramie (Albany and Carbon counties), and the Council of Community Services, Gillette (Johnson County).

Purpose: To provide qualitative data documenting processes, funding sources, and issues related to Wyoming's Weatherization Assistance Program. These interviews will address PacifiCorp's evaluation questions regarding program participation and wait listing

Introductory Protocol

Thank you for speaking with me today. I am from [Smith & Lehmann Consulting or H. Gil Peach & Associates] and am working with Rocky Mountain Power (a division of PacifiCorp), to find out more about how Weatherization Assistance Programs (WAPs) operate in Wyoming. Our evaluation focuses on the 2011, 2012, and 2013 program years. The purpose of our evaluation is to measure the cost-effectiveness and general impacts of the program during those years, as well as assess program operations.

You were recommended as someone who plays an important role in administering WAP services provided by [Agency]. I have some questions that should take about 20 minutes to answer, is this still a good time to talk?

Do you mind if I record our call? This is just for note taking purposes; I will not share the recording or your individual answers with anyone outside of the project. None of the comments you share today will be attributed to you as an individual. They may, instead, be attributed to your organization.

Do you have any questions before we begin?

Potential Research Questions:

1. Please tell us your title and role in the weatherization program?
2. What were [your Agency's] biggest accomplishments during each of the program years: 2011, 2012, and 2013?
3. What were the major challenges [your Agency's] faced in each year: 2011, 2012, and 2013?
4. Were any significant changes made to the WAP during each of the program years: 2011, 2012, and 2013?

5. Does your agency use a priority list in determining who gets services? If yes, how are priorities determined? (i.e. is there a point system, what is it, who is prioritized?)

6. Does [your Agency] have any data sources with participant income or poverty level information?
    - What is the format of this data – excel, paper records?
    - Can we get copies of electronic files?
    - Would those files include the customer ID for Rocky Mountain Power?

7. Please explain how your weatherization participant wait list is compiled. At what point in the process is s a household moved to the wait list?
    - When they first call in.
    - After they are qualified by telephone or by interview
    - After the home is audited and found to be eligible
    - Other: _____

8. How many customers are now on your wait list?

9. How many PacifiCorp (Rocky Mountain Power) customers are currently on the waiting list?

10. How far out in time does your wait list go (in other words, if you were to weatherize all of the homes currently on your wait list, about when would the last home be finished? Year: _____ Month: _____

11. Does your agency have a time goal for weatherizing a home, once it is on the wait list?

12. Is this time target usually met?

13. Are there any points in the process where [Agency] routinely observes a backlog of participants/clients? [DO NOT READ THROUGH LIST]
    - Application processing
    - Home audits
    - Scheduling
    - Measure/Job completion

14. Does your agency use a priority list in determining measures for each house or does it use a software package?

- If a list, how are priorities determined? (i.e. is there a point system, what is it, how are measures prioritized?)
- If software, which USDOE approved software package do you use?
- If software, do you typically enter in twelve months of prior usages data for the home?
    - Yes
    - No

15. How can we determine which houses that receive their electricity form Rocky Mountain Power were funded by other sources (ex: ARRA funding)?
    - Is this information available electronically for each Rocky Mountain Power customer?
    - If not, how are the records of weatherization services maintained, and how could we access this information?

16. How have barriers to coordination with other funding sources been addressed since 2010?
    - What steps did Rocky Mountain Power (and Agency) take to expand the weatherization program beyond CFLs?
    - What solutions were attempted?
    - What successes were identified?

17. Where Savings to Investment Ratios (SIR Ratios) are being relied upon, are they reflecting total cost of each measure no matter which funding source or combination of funding sources are used, or are they calculated according to the USDOE approved optional discounted method (which permit the agency to disregard the non-federal portion of costs)?

18. What BWR information is reported, and is this information accessible?

19. What kinds of barriers limit participation in the program? [If any]

20. How is the [Agency] addressing any program participation barriers?
    - What challenges has the [Agency] faced with these strategies to address barriers?
    - What strategies have worked?

21. What are the problems from the perspective of the [Agency] and how might these be solved?