



FINAL REPORT

THE
CADMUS
GROUP, INC.

Rocky Mountain Power ENERGY STAR® New Homes Impact Evaluation for 2009–2010

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Glossary of Terms

Billing Analysis

Statistical modeling methods that compare weather normalized pre- and post- participation energy consumption from billing data in a population to identify savings due to installation and usage of energy efficient measures. Regression analysis is a frequently used technique for verifying savings.

Conditioned Space

Area within a building that is climate-controlled (includes heating and cooling). This space is generally defined by the building's thermal envelope such that space within the envelope is conditioned and space outside of the thermal barrier can be described as unconditioned.

Energy Intensity

Metric that represents annual consumption for a standard area. Values for electric energy are expressed in terms of kWh per year per square foot which is usually shown as kWh/square foot. Intensity is useful for comparing energy usage across a range of home sizes.

Freeridership

Freeridership in energy-efficiency programs is defined as participants that would have caused energy to be conserved in the program's absence. This is often expressed as the freeridership rate, or the proportion of evaluated gross savings that can be classified as freeridership.

Net Savings

Net savings are the gross savings "net" of what would have occurred in the program's absence.

Realization Rate

Realization rate is calculated by comparing evaluated net savings to the reported gross savings.

Spillover

Spillover savings are reductions in energy consumption or demand caused by an energy-efficiency program's presence, but not directly funded by the program. As with freeridership, this is often expressed as a proportion of evaluated gross savings (or the *spillover rate*).

Executive Summary

Program Summary

Rocky Mountain Power offers the ENERGY STAR® New Homes program in Utah. The program promotes construction of energy-efficient homes that save money and energy, and that conserve natural resources. ENERGY STAR-qualified homes have been independently verified to be at least 15 percent more efficient than state energy code, with savings that are based on heating, cooling, and hot water energy use, and typically achieved through a combination of measures, such as building envelope upgrades, high-efficiency windows, upgraded HVAC, and weatherization.

The program provides incentives to builders constructing ENERGY STAR homes, with the incentive amount varying, depending on specific efficiency tiers and installation of additional efficiency measures (such as appliances). The program has separate requirements for single-family and multifamily homes.

Ecos (the program administrator) implemented the program on Rocky Mountain Power's behalf from 2009–2010. KEMA, a subcontractor for The Cadmus Group, Inc., (Cadmus) and Cadmus performed the program's impact evaluation for program years 2009 and 2010.

Evaluation data included:

- Customer billing data from January 1, 2008, through October 31, 2011, for 1,191 participant households.
- Customer billing data from January 1, 2008, through October 31, 2011, for 5,526 nonparticipant households.
- Telephone surveys with:
 - 21 participating home builders;
 - 20 nonparticipant home builders;
 - 73 homeowners of ENERGY STAR homes (program homes); and
 - 70 homeowners of non-program homes, built during 2009 or 2010.
- In-depth interviews with program management and program administration staff.

Summary of Key Findings

Key Impact Findings

The evaluation resulted in the following key findings:

- Cadmus verified that the number of homes and measures documented in the participant tracking data were very close to the quantities included in annual reports. In all cases, the evaluated quantities—total homes and total Plus Measures—from the tracking data were greater than the reported quantities with variances between 0.2 percent and 1.3 percent.

- Evaluated participant-level, single-family home savings were 1,634 kWh and 1,224 kWh for program years 2009 and 2010, respectively. Savings in 2010 declined due to improvements in energy (usage) intensity for nonparticipants, while energy intensity for participants remained nearly unchanged.
- Evaluated participant-level, multifamily home savings were 327 kWh and 411 kWh for program years 2009 and 2010, respectively.
- Overall realization rates were 74 percent and 37 percent in program years 2009 and 2010, respectively. The large realization rate differences between years was a factor of large quantities of lighting type Plus Measures in 2010, which increased expected annual saving. Cadmus also found reduced energy savings per home in 2010.
- Telephone surveys revealed both participant and nonparticipant square footage estimates were understated in the Rocky Mountain Power database¹ (by 26 and 14 percent respectively). This survey also shows participant homes are on average 9 percent larger than nonparticipant homes². The presence of basements (and the methods used to account for these) appears to be the bias source for participants and nonparticipants.

Table 1 and Table 2 show reported and evaluated participation counts for homes and Plus Measures for 2009 and 2010 program years.

Table 1. 2009 Reported and Evaluated Participation

Participant Home Type	Reported	Evaluated
	Number of Homes	
2007 Tariff (schedule 110:Feb 2007)	6	4
Tier 1	914	930
Tier 2	415	416
Tier 3	8	8
Tier 4	48	48
Multifamily	686	687
Home Total	2,077	2,093
Plus Measures	Number of Measures	
14 SEER HVAC	20	20
Duct Placement	784	787
Whole House Fan System	5	6
ENERGY STAR Dishwasher	1,313	1,330
Lighting CFLs and Fixtures	510	511
Ground Source Heat Pumps	1	1
Measure Total	2,633	2,655

¹ Information in the Rocky Mountain Power database is collected at the time that the account is initiated. Square footage estimates are provided by the person requesting the account.

² Square footage values found through the telephone survey were, on average, within 5% of the values reported by ECOS in the program database for program participants as shown in Table 13 below.

Table 2. 2010 Reported and Evaluated Participation

Participant Home Type	Reported	Evaluated
	Number of Homes	
Tier 1	1,349	1,351
Tier 2	168	171
Tier 3	3	3
Multifamily Tier 1	408	408
Multifamily Tier 2	347	347
Home Total	2,275	2,280
Plus Measures		Number of Measures
14 SEER HVAC	107	107
CFL Lighting Upgrade	799	804
Duct Placement	953	950
ENERGY STAR Dishwasher	1,373	1,379
ENERGY STAR Ceiling Fan	6	6
Whole House Fan System	5	5
Ground Source Heat Pumps	24	24
ENERGY STAR Light fixtures	10,056	10,221
Single Vent Evaporative Coolers	2	2
High Efficiency Evaporative Coolers	7	7
Multifamily CFL Lighting Upgrade	439	440
Measure Total	13,771	13,945

Table 3 summarizes program net savings (reported and evaluated) for 2009–2010.

Table 3. Program Energy Savings

Savings Type	Home Type	2009	2010	Two-Year Total
Reported Savings (kWh)	Single-Family	3,060,023	5,084,216	8,144,239
	Multifamily	302,092	847,741	1,149,833
	Total	3,362,115	5,931,957	9,294,072
Evaluated Savings (kWh)	Single-Family	2,296,670	1,866,207	4,162,877
	Multifamily	224,640	310,151	534,791
	Total	2,521,310	2,176,358	4,697,668
Total Savings Realization Rate		75%	37%	51%

Cost-Effectiveness Results

Table 4 presents program cost-effectiveness analysis results using evaluated net savings for all program measures during the evaluation period (2009–2010), though not accounting for non-energy benefits (except those represented by the 10 percent conservation adder included in the PTRC).

The program was cost-effective for four of the five primary cost tests: the PacifiCorp total resource cost test (PTRC); the total resource cost test (TRC); the utility cost test (UCT); and the participant cost test (PCT). The program did not prove cost-effective from the rate impact measure (RIM) perspective, which measures impacts of programs on customer rates. Most programs do not pass the RIM test due to the adverse impact of lost revenue.

Table 4. 2009–2010 Evaluated Net Program Cost-Effectiveness Summary

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.078	\$4,555,558	\$6,389,175	\$1,833,617	1.40
Total Resource No Adder (TRC)	\$0.078	\$4,555,558	\$5,808,341	\$1,252,783	1.28
Utility (UCT)	\$0.066	\$3,880,329	\$5,808,341	\$1,928,011	1.50
Ratepayer Impact (RIM)	\$0.158	\$9,268,953	\$5,808,341	(\$3,460,612)	0.63
Participant (PCT)	\$0.044	\$2,583,623	\$7,297,018	\$4,713,395	2.82
Lifecycle Revenue Impact	0.000009463				
Discounted Participant Payback (yrs)	2.20				

Table 5 shows the program's cost-effectiveness in 2009.

Table 5. 2009 Evaluated Net Program Cost-Effectiveness Summary

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.051	\$1,689,453	\$3,515,388	\$1,825,934	2.08
Total Resource No Adder (TRC)	\$0.051	\$1,689,453	\$3,195,807	\$1,506,354	1.89
Utility (UCT)	\$0.044	\$1,451,779	\$3,195,807	\$1,744,027	2.20
Ratepayer Impact (RIM)	\$0.136	\$4,473,746	\$3,195,807	(\$1,277,939)	0.71
Participant (PCT)	\$0.027	\$899,438	\$3,683,731	\$2,784,292	4.10
Lifecycle Revenue Impact	0.000003495				
Discounted Participant Payback (yrs)	1.10				

Table 6 shows the program's cost effectiveness in 2010.

Table 6. 2010 Evaluated Net Program Cost-Effectiveness Summary

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.112	\$3,078,196	\$3,086,448	\$8,252	1.00
Total Resource No Adder (TRC)	\$0.112	\$3,078,196	\$2,805,862	(\$272,335)	0.91
Utility (UCT)	\$0.095	\$2,608,263	\$2,805,862	\$197,599	1.08
Ratepayer Impact (RIM)	\$0.187	\$5,150,053	\$2,805,862	(\$2,344,191)	0.54
Participant (PCT)	\$0.066	\$1,808,814	\$3,880,671	\$2,071,856	2.15
Lifecycle Revenue Impact	0.000006585				
Discounted Participant Payback (yrs)	2.56				

In 2010, the program was cost-effective for the PacifiCorp total resource cost test (PTRC) as benefits slightly exceeded costs. It was also cost-effective for the utility cost test (UCT) and the participant cost test (PCT). However, the program was not cost-effective for the total resource cost test (TRC) or for the ratepayer impact measure (RIM). Two factors reduced the program's cost-effectiveness in 2010: lower per-home savings than in 2009, and significantly higher program costs.

Summary and Recommendations

In 2009 and 2010, the program produced savings at a lower-than-expected level, with lower savings and realization rates driven by:

- Lower savings per square foot in 2010; and
- Increased expected savings for 2009 and 2010 (148 percent and 216 percent of 2008, respectively).

Cadmus offers the following recommendations (understanding the first two recommendations already are in process for the present program year):

- For homes built in 2012, ENERGY STAR New Homes requirements should be revised to the ENERGY STAR for Homes Version 3.0 standard, thus improving program home performance, relative to nonparticipant homes.
- For homes built before 2012, expected savings for single-family homes (built to ENERGY STAR requirements in place before Version 3.0) and Plus Measures should be revised to reflect these findings. Rocky Mountain Power should work with its program administrator to determine whether discounted savings for homes built in 2011 are warranted for reporting and filing purposes.
- Evaluation methodology of multifamily homes should be revisited during the next evaluation cycle, as homes in this category increased from 13 percent of the program in 2008 to 33 percent in 2009 and 2010.

To address the data issues encountered during this evaluation, Cadmus offers the following recommendations:

- Include verification of participant and nonparticipant home size in future evaluations. Continue telephone surveys and consider site audits, especially for nonparticipant homes to check values recorded by other processes.
- To improve matching participants to utility billing data, require the program administrator to include the utility Site ID in the participant database. (Cadmus understands this step is in progress, as of Quarter 1, 2012.)
- To improve identification of single-family and multifamily customers, add a “home type” field to the utility account information collected from residential customers.

Program Description

Rocky Mountain Power offers the ENERGY STAR New Homes program in Utah. The program promotes construction of energy-efficient homes that save money and energy, and that conserve natural resources. To earn the ENERGY STAR, a home must meet strict energy-efficiency guidelines set by the U.S. Environmental Protection Agency. Savings are typically achieved through a combination of measures, such as building envelope upgrades, high-efficiency windows, upgraded HVAC, and weatherization.

The program provides incentives to builders constructing ENERGY STAR homes, with incentive amount varying, depending on specific efficiency tiers and installation of additional efficiency measures. The program has separate requirements for single-family and multifamily homes.

Ecos (the program administrator) implemented the program on Rocky Mountain Power's behalf from 2009–2010. KEMA, a subcontractor for Cadmus, worked with Cadmus staff on the program's impact evaluation for program years 2009 and 2010.

Eligibility Requirements and Incentives

The program applies to all residential new construction of five stories or less within the utility's service territory, and billed on Schedules 1, 2, and 3.

Measures and Incentives

Program measures and incentives, which have evolved to reflect building code and market changes, have been designed using a whole-house approach to energy savings. For each program year, homes must meet current year ENERGY STAR specifications for their Tier, including combinations of the following:

- Performance-based duct sealing;
- Air conditioner equipment minimum standards;
- Air conditioning performance testing;
- Equipment correct sizing;
- Best practice installations;
- Thermal bypass checklist;
- Installation of compact fluorescent lamps (CFLs).

Builders can also apply additional energy-efficient measures (Plus Measures), including incentives for measures such as:

- Ground source heat pumps;
- Duct placement inside of conditioned space;
- Single vent evaporative cooling systems;
- Ducted high-efficiency evaporative cooling systems;
- Whole house fan systems; and
- ENERGY STAR dishwashers, ceiling fans, and lighting upgrades.

Table 7 lists all measures and incentives the program offered in 2009 and 2010.

Table 7. Program Measures and Incentives in 2009 and 2010

Single-Family	2009	2010
Tier 1	\$200	\$250
Tier 2	\$300	\$300
Tier 3	\$500	\$800
Tier 4	\$700	NA
GSHP Option	\$2,000	\$2,000
14 SEER HVAC	\$100	\$100
ENERGY STAR Dishwasher	\$10	\$10
Duct within Conditioned Space	\$100	\$100
Ducted Evaporative Cooling	NA	\$750
ENERGY STAR ceiling fan	NA	\$75
Duct Placement	\$100	\$100
ENERGY STAR Light fixtures	\$20 \$50	\$50
Single Vent Evaporative Coolers	NA	\$400
90% ENERGY STAR CFLs	\$50	\$50
Whole House Fan System	\$100	\$200
Multifamily	2009	2010
Tier 1	\$250 \$300	\$300
Tier 2	NA	\$200
Exterior Lighting	\$20	\$20
Interior Lighting	\$20	\$20
Lighting ENERGY STAR CFLs	\$40	\$40

Program Assumptions and Participation

As noted, program participation is based on construction of qualifying single-family or multifamily homes. Builders can then incorporate additional Plus Measures to receive the corresponding additional incentive dollars. The evaluation defined reported participation and savings (kWh) as the values Rocky Mountain Power reported in its 2009 and 2010 annual program reports (provided to Cadmus).

Table 8 and Table 9 show reported participation and reported savings for all ENERGY STAR homes and Plus Measures for the program in 2009 and 2010, respectively.

Table 8. 2009 Reported Participation and Energy Savings*

Participant Home Type	Savings Per Home (kWh/year)	Number of Homes	Total Reported Savings (kWh/Year)
2007 Tariff (Schedule 110: Feb 2007)	1,623.0	6	9,738
Tier 1**	1,523.0	914	1,392,122
Tier 2**	2,009.0	415	833,731
Tier 3	2,496.0	8	19,968
Tier 4	3,003.0	48	144,144
Multifamily**	440.4	686	302,092
Home Total	NA	2,077	2,701,795
Plus Measure Savings	Savings Per Measure (kWh/year)	Number of Measures	Total Reported Savings (kWh/year)
14 SEER HVAC	178.5	20	3,570
Duct Placement	559.6	784	438,718
Whole House Fan System	360.0	5	1,800
ENERGY STAR Dishwasher	30.0	1,313	39,390
Lighting CFLs and Fixtures	316.2	510	161,274
Ground Source Heat Pumps	15,568.0	1	15,568
Measure Total	NA	2,633	660,320
2009 Total			3,362,115

* Number of homes and total savings from annual reports (Rocky Mountain Power Demand-Side Management Annual Report for 2009—Utah, 3/31/2010; and Savings per home calculated.

** Additional digits (not shown) are required to exactly equal the total values shown at right

Table 9. 2010 Reported Participation and Energy Savings*

Participant Home Type	Savings Per Home (kWh/year)	Number of Homes	Total Reported Savings (kWh/Year)
Tier 1	1,753	1,349	2,364,797
Tier 2	2,309	168	387,912
Tier 3	3,233	3	9,699
Multifamily Tier 1	1,002	408	408,816
Multifamily Tier 2	645	347	223,815
Home Total	NA	2,275	3,395,039
Plus Measure s	Savings Per Measure (kWh/year)	Number of Measures	Total Reported Savings (kWh/year)
14 SEER HVAC	120	107	12,840
CFL Lighting Upgrade	984	799	786,216
Duct Placement	76	953	72,428
ENERGY STAR Dishwasher	30	1,373	41,190
ENERGY STAR Ceiling Fan	85	6	510
Whole House Fan System	360	5	1,800
Ground Source Heat Pumps	15,568	24	373,632
ENERGY STAR Light fixtures	102	10,056	1,025,712
Single Vent Evaporative Coolers	520	2	1,040
High Efficiency Evaporative Coolers	920	7	6,440
Multifamily CFL Lighting Upgrade	490	439	215,110
Measure Total	NA	13,771	2,536,918
2010 Total			5,931,957

* Number of homes and total savings from annual reports (Rocky Mountain Power 2010 Annual Energy Efficiency and Peak Reduction Report—Utah). Savings per home calculated.

In addition to the line-item detail shown in the tables above, Cadmus calculated average savings for single-family and multifamily homes each year, as these values will be used in the impact evaluation. As shown in Table 10, these average values include the homes' reported savings and the plus measures' reported savings.

Saving estimates per home had noticeably higher values in 2010 than in 2009. For single-family homes, this largely resulted from participation in two lighting measures: CFL lighting upgrade, and ENERGY STAR light fixtures. Together, these measures added nearly 1,200 kWh per year to reported savings for each single-family home. For multifamily homes, the increase resulted from a combination of higher savings for the base home measure (where the average rose from 440 kWh/year to 838 kWh/year), and from the inclusion of the CFL lighting upgrade MF plus measure, which added another 285 kWh per year to reported savings for each home.

Table 10. Reported Participation and Energy Savings By Year and Home Type

Program Year	Total Savings	Total Reported Savings (kWh/year)		Number of Homes		Savings Per Home*	
		SF	MF	SF	MF	SF	MF
2009	3,362,115	3,060,023	302,092	1,391	686	2,200	440
2010	5,931,957	5,084,216	847,741	1,520	755	3,345	1,123

* Savings per home values have been rounded to whole numbers.

Impact Evaluation

Impact Evaluation Methodology

The impact analysis sought to determine the program’s savings and cost-effectiveness, using billing analysis and an energy intensity model to determine savings per home. The evaluation team also conducted interviews with homeowners of program homes and non-program homes. The interview results were used to adjust square footage values used in the energy intensity model. The evaluation team also conducted interviews with participating and nonparticipating home builders, using these to inform freeridership and spillover. Each of these activities is discussed in detail below.

Using the methods described above, Cadmus determined total energy savings for single-family homes for each program year. The analysis focused on single-family homes for two reasons: 1) savings from single-family homes represented 88 percent of the reported savings during the evaluation period; and 2) energy consumption for single-family homes has been well-defined and documented in billing records. Energy consumption for multifamily homes has not been as clearly defined or documented.³

Total energy savings for single-family homes includes savings resulting from all program measures. Reported savings were calculated as the sum of savings from home (envelope) measures and savings from any Plus Measures builders incorporated into their homes. The evaluation could not quantify energy savings from specific measures.

Once savings for single-family homes were determined, Cadmus calculated a realization rate for each program year, which was used to calculate savings for multifamily homes.

To determine evaluated net savings, Cadmus applied the five steps shown in Table 11.

Table 11. Impact Evaluation Steps

Step	Action
1	Verify accuracy of participant database
2	Verify that participant / nonparticipant samples include appropriate data
3	Perform billing analysis to determine Normalized Annual Consumption
4	Verify square footage for participant and nonparticipant homes
5	Use energy intensity models to determine savings

Verify Accuracy of Participant Database

Step one consisted of a review of the program tracking database to ensure documented participation and reported savings matched the 2009 and 2010 annual reports.

Cadmus found that the participant database provided initially did not include records for many of the participant homes and Plus Measures. Rocky Mountain Power provided a second participant database and requested support from Ecos, the program administrator in 2009 and 2010. With

³ Energy consumption was not as clearly-defined due to the possible presence of shared resources, including shared walls, water heaters, laundry facilities, external lighting, and so on. Energy consumption also may not have been as well-documented if homes were not separately metered.

assistance from Ecos, Cadmus was able to identify the appropriate data table in the database. When this table was compared to the reported participation, Cadmus found that the quantities and participant records matched to within 0.8 percent for homes and 1.3 percent for Plus Measures.

Verify That Participant / Nonparticipant Samples Include Appropriate Data

The second step was to verify database characteristics. This step was administered in the following three ways.

Home Sample Selection and Data Collection

The participant database included characteristics data for each participant home incented during the 2009–2010 period, with measure data including measures incented through the program, home addresses, occupant names and contact information, floor areas, housing types (single- or multifamily), numbers of floors, and space and water heating energy sources.

Rocky Mountain Power provided billing data and account data from Rocky Mountain Power databases for all new residential hookups, beginning in 2009 and ending in October 2011. Many characteristics listed above were available for most new residential hookups. However, square footage information was missing for one third of the account data records. Occupancy dates were determined for all new hookups, using information from the participant and billing data set. The participant tracking data set was used to identify participant homes from among the population of new hookups. Once these participating residential homes were identified, remaining homes were assigned to the nonparticipating sample frame.

The analysis initially used available Rocky Mountain Power customers square footage estimates for participant and nonparticipant homes. When the Rocky Mountain square footage was missing, less than 800 square feet, or over 7,000 square feet, the Zillow real estate database was used as a source of square footage data.⁴ As approximately 37 percent of square footage data were missing from the Zillow database, Cadmus did not conduct missing value imputation, and homes with missing square footage were excluded from analysis. Otherwise, the analysis included all homes with square footage estimates.

Manual Review of Samples

Preliminary analysis found that savings per home had dropped in both 2009 and 2010. Following review of these findings, Rocky Mountain Power identified home square footage as a parameter to be examined in more depth since conflicting values for home square footage existed in various databases. Cadmus then reviewed square footage data from four distinct sources. These four sources of square footage data include

- ECOS participant database where the value is recorded by the HERS rating company;
- Rocky Mountain Power records where the information is self-reported by the home owner as part of the application for a new account;

⁴ Square footage data from the Zillow database were used for less than 10 percent of homes included in the analysis.

- Zillow, “a home and real estate marketplace” according to the company’s Website;⁵
- Construction Monitor, “the industry source for accurate, timely and complete building permit information in the United States” (according to the company’s Website).⁶

Data from these four sources fell into two general groupings where two sets of numbers were similar from the other two. One group includes self-reported data from Rocky Mountain utility customers and Zillow. These two square footage sources values tend to report very similar square footage estimates. The second group that includes ECOS and Construction Monitor tend to have square footage that is on average 700-800 square feet higher than the self-reported and Zillow square footage.

It is not clear why the values are different between the two groups. Possible reasons include differences in the treatment of some parts of a residential structure. Unfinished basements for example are not included in most real estate industry definitions of square footage but may be included in the HERS rater estimates since they qualify as conditioned space. Treatment of garages and porches may also be a factor since these are unconditioned space but are part of the structure. Square footages were compared for homes with available ECOS square footage data (n=2,450). The average ECOS square footage for all these cases was 2,775 square feet.

Below are comparisons of average square footage to the other square footage sources, where the ECOS square footage was available as a comparison. For 25 percent of the homes (612 of the 2,450) there was no alternate square footage source: only ECOS square footage was available.

The ECOS square footage was not used to fill in additional participant records, because the ECOS square footage is much higher than the self-reported and Zillow square footages, and the ECOS square footage is not available for nonparticipants.

Only 50 homes had square footage data from all four square footage sources. These are the average square footages:

- Rocky Mountain Power: 2,126
- Zillow: 2,025
- Construction Monitor: 2,690
- ECOS: 2,721

Slightly more had ECOS, Rocky Mountain Power, and Zillow square footage data (n=261):

- Rocky Mountain Power: 2,069
- Zillow: 1,929
- ECOS: 2,720

A larger group had ECOS and Rocky Mountain Power square footage data (n=873):

- Rocky Mountain Power: 2,080
- ECOS: 2,718

⁵ <http://www.zillow.com/corp/About.htm>

⁶ <https://www.constructionmonitor.com/>

And a similar number had ECOS and Zillow square footage data (n=926):

- Zillow: 2,067
- ECOS: 2,812

There were also about 900 that had ECOS and Construction Monitor square footage data (n=905)

- Construction Monitor: 2,968
- ECOS: 2,915

When results were reviewed with Rocky Mountain Power, it was agreed the evaluation should conduct additional research into square footage as no consistent and reliable source of square footage data could be identified for both participants and nonparticipants. This process and findings is outlined later in this report.

Correct Classification of Home Type

The detailed review of sample records during the square footage analysis also identified the presence of 1,242 multifamily homes in the original nonparticipant sample of approximately 5,500 homes. Targeted searches for addresses with apartment and unit number suffixes identified many of these homes and manual review of all homes less than 1,200 square feet identified the rest.

One possible solution to this issue in the future might be the addition of a “home type” field to the utility (billing) records for each account.⁷ Cadmus has used home type fields present in some utility records with success in other, similar evaluations.

Perform Billing Analysis to Determine Normalized Annual Consumption

Step three (performing a billing analysis review to evaluate home-level savings calculations) involved reviewing reported program savings by comparing them to energy savings observed through a site-level billing analysis. The billing analysis included a comparison group (nonparticipant homes built in 2009 and 2010). The evaluated savings resulted as the delta between participant and nonparticipant electric energy intensity.

Evaluated savings were considered net savings, as they were based on differences between homes built by participant builders and those built by nonparticipant builders. In many evaluations, gross savings are adjusted to account for freeriders and spillover. In this case, the homes built by the nonparticipant builders reflected both factors, and no additional adjustment was required.

Billing Data Weather Matching and Data Screening (Single-Family)

The ZIP Code associated with each new-residential hookup Rocky Mountain Power provided was used to map the home to the nearest weather station. Cadmus then obtained historical weather data from 2009 through October 2011 for all associated Utah weather stations. From the average daily temperature, Cadmus obtained base 65 heating degree days (HDD) and cooling degree days (CDD), and for each billing period record, matched associated HDDs and CDDs.

⁷ For participants, home type is recorded in the program tracking data. For nonparticipants, Cadmus had only the utility records which do not include home type.

The screening process removed nonresidential and non-single-family homes. Program participation dates were then used to assign program years to participants. In many cases, however, billing data associated with these participant homes initially were listed under builder account names. To ensure only customer billing data were used, billing data were selected only after the first occupant moved into the home.

Cadmus then examined each year of billing data after the household's occupancy. Any year with fewer than nine months (270 days) of billing data was removed from analysis as it would not provide sufficient data to run the PRISM-equivalent modeling approach.

Energy Analysis PRISM Modeling

For each participant and nonparticipant home, a PRISM-like heating and cooling model was estimated for each year after construction, weather-normalizing raw billing data usage. The model used the following specification:

$$ADC_{it} = \alpha_i + \beta_{1i} \text{AVGCDD}_{it} + \beta_{2i} \text{AVGHDD}_{it} + \varepsilon_{it}$$

For each customer i and month t ,

α_i is the intercept for the participant (or nonparticipant), representing the base load.

β_{1i} is the model cooling slope.

β_{2i} is the model space heating slope.

ADC_{it} is average daily consumption during the program period.

AVGCDD_{it} is average daily CDDs for the specific location.

AVGHDD_{it} is average daily HDDs for the specific location.

ε_{it} is the error term.

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

$$NAC_i = \alpha_i * 365 + \beta_{1i} * \text{LRCDD}_i + \beta_{2i} * \text{LRHDD}_i$$

Where, for each customer i ,

α_i is the intercept representing the average daily or base load for each participant (or nonparticipant); this also represents the average daily base load from the model.

NAC_i is the normalized annual consumption.

LRCDD_i is the annual, long-run CDDs, based on home location.

LRHDD_i is the annual, long run HDDs, based on home location.

$\alpha_i * 365$ is the annual base load usage.

Further, a heating-only model (AVGHDD term only), a cooling-only model (AVGCDD term only), and a baseload-only model were estimated; models with negative parameters were excluded. These best models allowed NAC to be estimated.

Verify Square Footage for Participant and Nonparticipant Homes

As discussed in the above Manual Review of Samples section, the square footage parameter presented considerable uncertainty. To address this uncertainty, Cadmus surveyed homeowners, seeking the following objectives:

- Verify square footage for program homes (participants) and a comparison group (nonparticipants); and
- Investigate the presence of (unreported) conditioned space and basements.

To deliver results with at least 90 percent confidence and 10 percent precision, the survey sought to complete interviews with 70 participants and 70 nonparticipants. The actual survey instrument can be found in Appendix D: Square Foot Survey.

Table 12 shows selected survey results.

Table 12. Homeowner Survey Results

Question	Nonparticipants (n=73)		Participants (n=70)	
	n	%	n	%
Single-Family	56	77%	59	84%
Townhouse	17	23%	11	16%
Additions	6	8%	1	1%
Source of square footage				
Realtor	3	4%	7	10%
Builder/Architect	31	42%	32	46%
Homeowner Calculation	31	42%	22	31%
Other/Don't Know	8	11%	9	13%
Presence of Basements	46	63%	57	81%
Percent of Basements Finished	19	41%	9	16%
Percent of Basements Unfinished	27	59%	48	84%
Percent of Unfinished Basements with Insulation	24	89%	47	98%
Percent of Unfinished Basements with Ducts/Vents	8	33%	14	30%

Significant findings include the following:

- 81 percent of participants' ENERGY STAR homes had basements, while only 63 percent of nonparticipant homes had this space.
- A larger percentage (84 percent) of participants' basements were unfinished, compared to those of nonparticipants (59 percent).
- Whether finished or unfinished, nearly all basements reported were insulated, and appeared to be conditioned spaces.

To better understand the relationship between the presence of basements and reported square footage, Cadmus compared the survey responses to Rocky Mountain Power square footage and ECOS square footage (only available for participants), as shown in Table 13. When basements were not present, square footage numbers from all sources were nearly in agreement. However, upon adding basements, larger differences occurred between values in the Rocky Mountain Power database and the survey results. For participants, survey results notably found participants

with basements closer to the ECOS value, recorded by a HERS Rater, than to values recorded in the utility database.

Table 13. Square Footage by Presence of Basements

Group	Basements	Square Footage			
		n	RMP *	Survey	ECOS
Participants	Overall	70	2,054	2,588	2,698
	Basements	57	2,097	2,724	2,847
	No Basements	13	1,866	1,992	2,048
Nonparticipants	Overall	73	2,037	2,330	NA
	Basements	46	2,263	2,748	NA
	No Basements	27	1,651	1,618	NA

* Square footage reported to Rocky Mountain Power.

The survey results support the hypothesis that, in terms of conditioned space, participant homes are larger than nonparticipant homes. Cadmus used the survey results to determine adjustment factors, based on the Rocky Mountain Power square footage values available for both participants and nonparticipants. Table 14 shows these adjustment factors. The survey found nonparticipant homes were 14 percent larger than values recorded in the utility database, while participant homes were 26 percent larger.

Table 14. Square Footage Adjustment Factors

Group	n	Square Footage				
		RMP *	Survey	Change from RMP	ECOS	Change from RMP
Participants	70	2,054	2,588	26%	2,698	31%
Nonparticipants	73	2,037	2,330	14%	NA	NA

* Square footage reported to Rocky Mountain Power.

Use Energy Intensity Models to Determine Savings

Cadmus calculated program savings using normalized annual consumption (NAC) values determined through billing analysis for participants and nonparticipants. When these values were divided by square footage values reported by Rocky Mountain Power, resulting savings were: 934 kWh/year for 2009; and 877 kWh/year for 2010. When using square footage adjustment factors, savings were somewhat higher, at 1,634 kWh/year in 2009 and 1,224 kWh/year in 2010 (also shown in Table 15).

Table 15. Energy Savings for Single-Family Homes

Description	Square Footage		NAC		Energy Intensity		
	2009	2010	2009	2010	2009	2010	
Participants	Before Survey Adjustment	1,992	2,002	8,312	8,285	4.385	4.416
	After Survey Adjustment	2,510	2,522			3.312	3.285
Non-Participants	Before Survey Adjustment	2,061	2,166	9,343	9,341	4.854	4.854
	After Survey Adjustment	2,358	2,478			3.963	3.770
Savings	Before Survey Adjustment	NA	NA	1,031	1,056	934.0	877.0
	After Survey Adjustment	NA	NA			1,634	1,224

Multifamily Savings

For this evaluation, Cadmus used the same approach used in previous evaluations. The savings realization rate established for single-family homes was applied to reported savings for multifamily homes. Table 16 shows the resulting annual values for multifamily homes.

Table 16. Multifamily Per Home Savings

Description	Home Type	2009	2010
Reported Savings (kWh/year)	Single-Family	2,200	3,345
	Multifamily	440	1,123
Evaluated Savings (kWh/year)	Single-Family	1,634	1,224
	Multifamily	327	411
Realization Rate	Single-Family	74.3%	36.6%
	Multifamily		

Freeridership and Net-to-Gross

Freeridership, the portion of savings that would have occurred in the program's absence, provides an important but challenging aspect in most impact evaluations. A common approach uses survey questions to estimate percentages of energy-efficient improvements participants would have made in the program's absence.. Cadmus used this approach for the 2006-2008 evaluation.

The evaluation's billing analysis and energy intensity model approach resulted in a net savings estimate that did not require application of an additional freeridership adjustment. Excluding a freeridership adjustment can be considered appropriate if the comparison group includes nonparticipating builders (used as the baseline) building with natural energy-efficiency actions. In this case, differences in consumptions between participants and comparison group households were already reduced due to energy-efficient actions by nonparticipants in the comparison group.

To maintain consistency with the previous evaluation, KEMA produced a percentage-based freeridership estimate for this evaluation, using the same approach utilized previously. This indicated how participant freeridership may have changed since the last evaluation. The percentage was not applied, however, due to the new perspective on billing analysis results using a comparison group.

KEMA calculated the freeridership percentage through surveys with program participants. KEMA conducted telephone surveys with 21 builders, representing 21 companies responsible for over 3,000 homes incented through the program in years 2009 and 2010. Participant builders were ranked by the number of homes built, and separated into four strata each, with approximately the same number of homes built in each strata. Builders were randomly selected from within these strata, with a target of five completes in each strata. When aggregating the results, each strata received the same weight, reflecting the underlying number of homes built. This approach allowed bigger builders to be targeted, and certainty that the final sample would represent the full spectrum of Utah builders. A single freeridership value was calculated for the two-year evaluation period. Results from this analysis can be found in Appendix A.

Spillover

Spillover represents additional energy-efficiency measures installed, motivated but not incentivized by the program. Billing analysis results produced for the evaluation captured participant spillover. To the extent participants installed additional measures, related savings lowered participant consumption, and increased savings relative to the comparison group.

Cadmus also conducted telephone interviews with nonparticipating builders to check for nonparticipant spillover, defined as energy-efficient installations by nonparticipants motivated by the program. Nonparticipant spillover can be difficult to distinguish from natural, non-program related energy-efficiency behaviors. For this evaluation, spillover was reported on a qualitative basis, to maintain consistency with the previous evaluation.

The spillover survey sample was randomly generated from a list of builders maintained by the Home Builders' Associations in Utah. Activity levels for particular builders were not known prior to creating the sample. Consequently, the nonparticipant sample required simple, random sampling. This made it difficult to avoid collecting a sample including relatively few larger builders. Thus, builders in the nonparticipant sample built only an average of six houses, while participants built just over 100. This meant the nonparticipant builder sample group could be considered primarily comparable to the participant builder sample's "very small" strata.

Impact Evaluation Results

To estimate 2009 and 2010 program energy savings, KEMA analyzed billing data for participant and nonparticipant homes to capture weather-adjusted (normalized), annual energy consumption values for participants and nonparticipants. As described in the Impact Evaluation Methodology section, the PRISM-like methodology used explicitly included actual weather data, represented by HDDs and CDDs provided for the nearest weather station. To address concerns regarding the accuracy of available square footage data, Cadmus used survey results to develop adjustment factors. These factors were combined in an energy intensity model to produce the final per-home energy savings.

Verification

Cadmus reviewed the program tracking data to evaluate program participation in terms of the number of homes and Plus Measures that were documented in each program year. Table 17 and Table 18 provide a comparison of the quantities reported in the Rocky Mountain Power annual reports⁸ to the quantities documented in the program tracking data (also referred to as the participant database) for the 2009 and 2010 program years, respectively. The quantities supported by the tracking data are referred to as evaluated quantities in the tables.

Evaluation counts were found to be very close to the reported quantities. In all cases, the evaluated quantities—total homes and Plus Measures—were greater than the reported quantities. Variances ranged from 0.2 percent to 1.3 percent.

⁸ Demand-Side Management Annual Report for 2009 - Utah, Rocky Mountain Power Demand Side Management Team, 3/31/2010 and 2010 Annual Energy Efficiency and Peak Reduction Report - Utah, Rocky Mountain Power, 2011

Table 17. 2009 Reported and Evaluated Participation

Participant Home Type	Reported	Evaluated
	Number of Homes	
2007 Tariff (schedule 110:Feb 2007)	6	4
Tier 1	914	930
Tier 2	415	416
Tier 3	8	8
Tier 4	48	48
Multifamily	686	687
Home Total	2,077	2,093
Plus Measures		Number of Measures
14 SEER HVAC	20	20
Duct Placement	784	787
Whole House Fan System	5	6
ENERGY STAR Dishwasher	1,313	1,330
Lighting CFLs and Fixtures	510	511
Ground Source Heat Pumps	1	1
Measure Total	2,633	2,655

Table 18. 2010 Reported and Evaluated Participation

Participant Home Type	Reported	Evaluated
	Number of Homes	
Tier 1	1,349	1,351
Tier 2	168	171
Tier 3	3	3
Multifamily Tier 1	408	408
Multifamily Tier 2	347	347
Home Total	2,275	2,280
Plus Measures		Number of Measures
14 SEER HVAC	107	107
CFL Lighting Upgrade	799	804
Duct Placement	953	950
ENERGY STAR Dishwasher	1,373	1,379
ENERGY STAR Ceiling Fan	6	6
Whole House Fan System	5	5
Ground Source Heat Pumps	24	24
ENERGY STAR Light fixtures	10,056	10,221
Single Vent Evaporative Coolers	2	2
High Efficiency Evaporative Coolers	7	7
Multifamily CFL Lighting Upgrade	439	440
Measure Total	13,771	13,945

Program Savings

Table 19 presents evaluated savings by home type for each program year as well as savings the program administrator reported to the utility. Multifamily savings estimates were derived by applying the realization rate estimated for single-family homes to reported savings for multifamily homes in each program year.

Table 19 Program Energy Savings

Savings Type	Home Type	2009	2010	Two-Year Total
Reported Savings (kWh)	Single-Family	3,060,023	5,084,216	8,144,239
	Multifamily	302,092	847,741	1,149,833
	Total	3,362,115	5,931,957	9,294,072
Evaluated Savings (kWh)	Single-Family	2,296,670	1,866,207	4,162,877
	Multifamily	224,640	310,151	534,791
	Total	2,521,310	2,176,358	4,697,668
Total Savings Realization Rate		75%	37%	51%

Summary of Impact Findings

Analysis of home square footage data showed differences between values recorded. Cadmus conducted additional research into the square footage data, verifying participant homes are, on average, larger than nonparticipant homes due to higher incidence of basements.

The billing analysis indicated the program reduced energy consumption in homes incented through the program during 2009 and 2010.

Programs such as the ENERGY STAR New Homes program face challenges in keeping ahead of improved energy-efficiency standards and building practices. Evaluation results indicate that general building practices are closer to ENERGY STAR efficiency levels than expected. Interviews with nonparticipating builders supported this conclusion, as they reported extensive lists of energy-efficiency measures they installed without program incentives. They also clearly indicated buyers generally determine energy-efficiency levels. Given the current, difficult housing market, homebuyers who can afford to buy homes may recognize the value of increasing a home's energy efficiency, whether or not part of a program.

Expected savings levels also may be set high for some measures. For example, a large portion of 2010's savings increase resulted from a dramatic increase in light fixtures, with expected annual savings of 102 kWh per fixture (assumed three sockets per fixture) and a high number of installations per home.

Cost-Effectiveness

In assessing cost-effectiveness, Cadmus analyzed program costs and benefits from five different perspectives, using Cadmus' DSM Portfolio Pro⁹ model (as used for recent evaluations of Rocky Mountain Power's residential portfolio). Benefit-to-cost ratios conducted for these tests were based on methods described in the California Standard Practice Manual for assessing DSM programs' cost-effectiveness. Tests utilized included the following:

- a. **PacifiCorp Total Resource Cost Test (PTRC):** This test examined program benefits and costs from Rocky Mountain Power participants' perspectives, combined. On the benefit side, it included avoided energy costs, capacity costs, and avoided line losses, plus a 10 percent adder to reflect non-quantified benefits. On the cost side, it included costs incurred by both the utility and participants.
- b. **Total Resource Cost Test (TRC):** This test examined program benefits and costs from Rocky Mountain Power participants' perspectives, combined. On the benefit side, it included avoided energy costs, capacity costs, and avoided line losses. On the cost side, it included costs incurred by both the utility and participants.
- c. **Utility Cost Test (UCT):** From Rocky Mountain Power's perspective, benefits included avoided energy, capacity costs, and avoided line losses. Costs included program administration, implementation, or incentive costs associated with program funding.
- d. **Ratepayer Impact (RIM):** From all ratepayers (participants and nonparticipants) perspectives, this test included all Rocky Mountain Power program costs as well as lost revenues. Benefits included avoided energy costs, capacity costs, and avoided line losses.
- e. **Participant Cost Test (PCT):** From this perspective, program benefits included bill reductions and incentives received. Costs included a measure's incremental cost (compared to the baseline measures), plus installation costs incurred by the customer.

Table 20 summarizes the five tests' components.

Table 20. Benefits and Costs Included in Various Tests

Test	Benefits	Costs
PTRC	Present value of avoided energy and capacity costs,* with 10 percent adder for non-quantified benefits	Program administrative and marketing cost
TRC	Present value of avoided energy and capacity costs*	Program administrative and marketing cost
UCT	Present value of avoided energy and capacity costs*	Program administrative, marketing, and incentive cost
RIM	Present value of avoided energy and capacity costs*	Program administrative, marketing, and incentive cost + present value of lost revenues
PCT	Present value of bill savings and incentives received	Incremental measure cost and installation cost

*Present value of avoided energy and capacity costs includes avoided line losses occurring from reductions in customer electric use.

⁹ DSM Portfolio Pro has been independently reviewed by various utilities, their consultants, and a number of regulatory bodies, including the Iowa Utility Board, the Public Service Commission of New York, the Colorado Public Utilities Commission, and the Nevada Public Utilities Commission.

Table 21 provides selected cost analysis inputs, including: evaluated energy savings for each year, discount rate, line loss, and program costs. Rocky Mountain Power provided all these values, except energy savings. The discount rate derived from Rocky Mountain Power’s 2008 Integrated Resource Plan. Rocky Mountain Power also provided values for line loss and program costs.

Table 21. Selected Cost Analysis Inputs*

Input Description	2009	2010	Total
Program Net Savings (kWh/year)	2,766,381	2,390,169	5,156,551
Discount Rate	7.40%	7.40%	7.40%
Line Loss	9.72%	9.85%	NA
Inflation Rate	1.90%	1.90%	1.90%
Total Program Costs (non-incentives)	\$790,015	\$1,269,382	\$2,059,397

*Savings reflect impacts at generation and have been increased for line losses. Since per-unit savings and adjustments for spillover and freeridership are modeled as rounded values, the total savings shown here may differ from the total savings reported elsewhere by approximately 1%. However, the minor variation caused by rounding in the cost-effectiveness model does not have an appreciable effect on benefit-cost ratios.

Program benefits included energy savings and their associated avoided costs. The cost-effectiveness analysis used energy savings derived from this study’s evaluated kWh. Analysis used a weighted average measure life of 23.1 years, based on measure lifetimes, and weighted by savings and frequency of installations. All analyses used avoided costs associated with Rocky Mountain Power’s 2008 *IRP 46 Percent Load Factor Eastside Residential Whole Home Decrement*.¹⁰

Table 22 presents program cost-effectiveness analysis results using evaluated net savings for all program measures during the evaluation period (2009–2010), though not accounting for non-energy benefits (except those represented by the 10 percent conservation adder included in the PTRC). The program was cost-effective for four of the five primary cost tests: the PacifiCorp total resource cost test (PTRC); the total resource cost test (TRC); the utility cost test (UCT); and the participant cost test (PCT). The program did not prove cost-effective from the rate impact measure (RIM) perspective, which measures impacts of programs on customer rates. Most programs do not pass the RIM test due to the adverse impact of lost revenue.

Table 22. Program Cost-Effectiveness Summary for 2009–2010

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.078	\$4,555,558	\$6,389,175	\$1,833,617	1.40
Total Resource No Adder (TRC)	\$0.078	\$4,555,558	\$5,808,341	\$1,252,783	1.28
Utility (UCT)	\$0.066	\$3,880,329	\$5,808,341	\$1,928,011	1.50
Ratepayer Impact (RIM)	\$0.158	\$9,268,953	\$5,808,341	(\$3,460,612)	0.63
Participant (PCT)	\$0.044	\$2,583,623	\$7,297,018	\$4,713,395	2.82
Lifecycle Revenue Impact			0.000009463		
Discounted Participant Payback (yrs)			2.20		

¹⁰ IRP decrements are detailed in Appendix G of PacifiCorp’s 2008 Integrated Resource Plan, Vol. II Appendices: http://www.pacificorp.com/content/dam/pacificorp/doc/Environment/Environmental_Concerns/Integrated_Resource_Planning_6.pdf

Table 23 shows the program's cost-effectiveness in 2009.

Table 23. Program Cost-Effectiveness Summary for 2009

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.051	\$1,689,453	\$3,515,388	\$1,825,934	2.08
Total Resource No Adder (TRC)	\$0.051	\$1,689,453	\$3,195,807	\$1,506,354	1.89
Utility (UCT)	\$0.044	\$1,451,779	\$3,195,807	\$1,744,027	2.20
Ratepayer Impact (RIM)	\$0.136	\$4,473,746	\$3,195,807	(\$1,277,939)	0.71
Participant (PCT)	\$0.027	\$899,438	\$3,683,731	\$2,784,292	4.10
Lifecycle Revenue Impact			0.000003495		
Discounted Participant Payback (yrs)			1.10		

Table 24 shows the program's cost-effectiveness in 2010.

Table 24. Program Cost-Effectiveness Summary for 2010

Cost Effectiveness Test	Levelized \$ / kWh	Costs	Benefits	Net Benefits	Benefit / Cost Ratio
Total Resource + Conservation Adder (PTRC)	\$0.112	\$3,078,196	\$3,086,448	\$8,252	1.00
Total Resource No Adder (TRC)	\$0.112	\$3,078,196	\$2,805,862	(\$272,335)	0.91
Utility (UCT)	\$0.095	\$2,608,263	\$2,805,862	\$197,599	1.08
Ratepayer Impact (RIM)	\$0.187	\$5,150,053	\$2,805,862	(\$2,344,191)	0.54
Participant (PCT)	\$0.066	\$1,808,814	\$3,880,671	\$2,071,856	2.15
Lifecycle Revenue Impact			0.000006585		
Discounted Participant Payback (yrs)			2.56		

In 2010, the program was cost-effective for the PacifiCorp total resource cost test (PTRC) as benefits slightly exceeded costs. It was also cost-effective for the utility cost test (UCT) and the participant cost test (PCT). However, the program was not cost-effective for the total resource cost test (TRC) or for the ratepayer impact measure (RIM). Two factors reduced the program's cost-effectiveness in 2010: lower per-home savings than in 2009, and significantly higher program costs.

Appendix A: Freeridership and Spillover

Freeridership Results

Freeridership results for the 2009–2010 program years dropped to 20 percent from the 26 percent level found for the previous evaluation. The ENERGY STAR New Homes program changed substantially in mid-2008 for how energy savings were accounted for. The previous evaluation primarily covered the time period prior to these changes; so this drop in freeridership could reflect the newer program design, which began in 2008.

The final 20 percent freeridership estimate percent provides a result based on the three combined survey questions. Examining the questions separately produces more nuanced results. Most survey respondents clearly indicated that, prior to the program, they installed less-efficient equipment than through the program, a result driving the final freeridership determination. Almost all builders, however, reported budgeting for some higher-efficiency equipment prior to entering the program. Further, they said they would have completed some efficient measures without the program. The freeridership calculation reflected the percentage of builders exhibiting consistent freeridership behaviors across all three questions.

As discussed in the methodology section, the freeridership adjustment was not applied to the 2009–2010 evaluation billing analysis results.

Spillover Results

To qualitatively assess spillover potential among participant builders, surveys asked participants whether, since participating in the Rocky Mountain Power program, they installed any additional energy-efficiency technologies in their new homes, for which they not receive incentives. If answering affirmatively, respondents were asked: “How influential was the program in your decision to install these additional measures?”

For 2009 and 2010, 13 respondents, representing 66 percent of homes built, indicated they installed additional energy-efficient measures in participating homes without an incentive. Only four of the 2009–2010 survey respondents indicated the program proved “influential” or “very influential” in their decisions to install these additional measures. Importantly, two of the four builders crediting the program’s influence were in the large builder category, and one was the biggest builder interviewed.

For 2009 and 2010, seven respondents, representing 31 percent of homes built, indicated they installed additional energy-efficient measures in nonparticipating homes without an incentive, a 48 percent decrease from the previous evaluation.

Though difficult to measure, nonparticipant spillover presents another possible savings source for a program. To the extent a program creates knowledge and expectation of energy efficiency in a market, it generates energy efficiency-related consumption reductions.

The nonparticipant survey provided information on measures nonparticipating builders installed in homes during 2009 and 2010. The majority of nonparticipating builders reported offering clients a range of options, from standard to energy efficient. Clients made decisions regarding which efficiency measures would be included in the house. The range of measures installed

appeared to encompass the full range of measures supported by the program. Some builders even performed duct testing.

Though a causal link could not be established between the program and nonparticipant savings, almost all were familiar with the program. Perhaps more importantly, half of nonparticipant builders reported participating in Questar's Thermwise Builder Program. This illustrates the challenge of assigning attribution to any one program. Interestingly, few past Questar participants offered additional comments at the survey's close. In contrast, the majority of builders without previous experience with other energy-efficiency program expressed substantial interest in energy-efficiency in general and the ENERGY STAR New Homes program, specifically.

Appendix B: Participant Survey

BUILDER [MARKET ACTOR] PARTICIPANT SURVEY – ENERGY STAR NEW HOMES PROGRAM

Hello, my name is _____ from KEMA, and I'm calling on behalf of Rocky Mountain Power. I was wondering if it would be possible to speak with the owner or someone who is knowledgeable about your company's construction practices or the Rocky Mountain Power ENERGY STAR® ENERGY STAR New Homes program. Is that person available?

[If right person]: I have some questions about Rocky Mountain Power's ENERGY STAR ENERGY STAR New Homes Program. As a Thank You for your assistance, at the end of the survey you will be offered a \$50 VISA gift card which will be mailed to you. Do you have some time available to answer them?

[If "No – Not a convenient time," ask if Respondent would like to 1. Start now and do part of the survey, or 2. Arrange a more convenient time we can call back. Emphasize that]:

"It is important for Rocky Mountain Power to include your opinions in this study so they can serve your needs better."

[If needed]: This survey is for research purposes only and this is not a marketing call. Your responses will remain confidential.

[Reintroduce if necessary]: Rocky Mountain Power is gathering information regarding customers' opinions about the ENERGY STAR New Homes Program. As a Thank You for your assistance, at the end of the survey you will be offered a \$50 VISA gift card which will be mailed to you. Do you have some time to answer some questions?

-

- **SCREENING QUESTIONS**

1. Rocky Mountain Power records show that you have participated in the ENERGY STAR New Homes Program?

Is that correct?

1. Yes
2. No, did not receive an incentive[**Terminate**]
98. Don't Know [**Terminate**]
99. Refused [**Terminate**]

2. When did you participate in the program?

Years _____ [**Terminate if not 2009 or 2010**]

98. Don't Know
99. Refused

3. I'm going to read you a list of possible incentives you may have received for building ENERGY STAR homes and/or installing efficient equipment and services. Please specify which incentives you recall receiving? **[READ LIST] [Multiple responses possible]**
1. Single Family ENERGY STAR whole home certification – Tier 1
 2. Single Family ENERGY STAR whole home certification – Tier 2
 3. Single Family ENERGY STAR whole home certification – Tier 3
 4. Multi Family ENERGY STAR whole home certification – Tier 1
 5. Multi Family ENERGY STAR whole home certification – Tier 2
 6. 14 SEER HVAC equipment **[Commissioned, w/correct sizing]**
 7. Lighting Upgrade
 8. Duct placement
 9. Single vent evaporative cooling system
 10. Ducted premium evaporative cooling system
 11. Installation of whole house fan system
 12. ENERGY STAR ceiling fan with “Gossamer” blade design
 13. ENERGY STAR lighting fixtures
 14. ENERGY STAR dishwasher
 15. Ground Source Heat Pump
 98. Don't Know –**[Ask if there is someone else to speak with_____]**
 99. Refused **[Terminate]**

AWARENESS AND PARTICIPATION INFORMATION

4. How did you learn about the program? **[Do not read. Multiple responses ok]**
1. Program contact/outreach specialist called or met with me
 2. Marketing package from ENERGY STAR New Homes Program
 3. From Rocky Mountain Power
 4. Rocky Mountain Power Website
 5. Newspaper Ad
 6. At an event
 7. What event? **[Record verbatim]** _____
 8. From another builder
 9. From a vendor or contractor
 10. Other _____
 98. Don't Know
 99. Refused
5. What was the main reason you decided to become an ENERGY STAR program builder? **[Do Not Read]**
1. Interest in building a better home
 2. For the incentives
 3. Integrity of home
 4. Already using many of the measures or practices
 5. Wanted to market energy efficiency
 6. Wanted to separate myself from other builders
 7. The people involved in the program are good/knowledgeable people
 8. Like to keep up with new techniques/try new things
 9. Homeowner requested it
 10. House sells better if it's an ENERGY STAR home

- 11. Environmental reasons
 - 12. Other _____
 - 98. Don't Know
 - 99. Refused
6. Were there other reasons you installed energy efficient measures? **[Do Not Read. Multiple responses possible]**
- 1. Interest in building a better home
 - 2. For the incentive
 - 3. Integrity of home
 - 4. Already using many of the measures or practices
 - 5. To market energy efficiency
 - 6. Wanted to separate myself from other builders
 - 7. The people involved in the program are good/knowledgeable people
 - 8. Like to keep up with new techniques/try new things
 - 9. Homeowner requested it
 - 10. House sells better if it's an ENERGY STAR home
 - 11. Environmental reasons
 - 12. Other _____
 - 13. No other reasons
 - 98. Don't Know
 - 99. Refused

BUILDING PRACTICES AND FREERIDERSHIP

“Thank you. Now I’m going to ask you some questions regarding number of homes built and your typical business practices. I’m most interested in the homes you built in 2009 through 2010, so please answer questions thinking back to those two years.”

7. How many homes did you build in Utah in 2009?
- 1. _____ [Record number of homes]
 - 98. Don't Know
 - 99. Refused
8. How many homes did you build in Utah in 2010?
- 1. _____ [Record number of homes]
 - 98. Don't Know
 - 99. Refused
9. What percentage of your homes received incentives through the program in 2009?
- 1. **[Record percent]** _____ **[if 100% Go To 14]**
 - 98. Don't Know
 - 99. Refused

10. And in 2010?
1. **[Record percent]** _____ **[if 100% Go To 14]**
 98. Don't Know
 99. Refused
11. In 2009, what percentage of these homes were built in sub-divisions that had ENERGY STAR requirements?
1. **[Record percent]** _____
 98. Don't know
 99. Refused
12. And in 2010?
1. **[Record percent]** _____
 98. Don't know
 99. Refused
13. What are some reasons why you built non-ENERGY STAR homes?
1. Customer did not want ENERGY STAR home
 2. Wanted to see how they sell first
 3. Too time consuming/need to meet deadlines
 4. Cost
 5. Not in eligible area
 6. Other Specify _____
 98. Don't Know
 99. Refused
14. For the equipment or materials you installed prior to learning about the program, would they have had the same level of efficiency, be more efficient or less efficient as the equipment and materials you currently install?
1. Same
 2. More
 3. Less
 98. Don't Know
 99. Refused
15. Prior to participating in the program, had the purchase and installation of the qualifying measures and materials been budgeted for in your short or long-term plan or budget?
1. Yes
 2. No
 3. Partially (**Ask to clarify, Record Verbatim**) _____
 98. Don't Know
 99. Refused
16. Thinking back to your participation in the program, if the incentive had not been available, would you have installed all of the qualifying measures, some of the qualifying measures, or none of them?
1. All
 2. None
 3. Some (**Ask to clarify which type of equipment/services would not have been included**)

98. Don't Know
99. Refused
17. If you remember, this program offered monetary incentives ranging from \$10 to \$2,000 for single family homes that installed additional energy efficiency equipment called plus measures. How important were these additional measures to your decision to participate?
1. Scale of 1 to 5 with 5 being the very important
98. Don't Know
99. Refused
19. Would you have participated if the plus measures were not offered?
1. Yes
 2. No
98. Don't Know
99. Refused
20. Would you have participated if GSHP and ducted evaporative cooling had not been available?
1. Yes
 2. No
98. Don't Know
99. Refused
18. Would you have built and installed the exact same energy efficient measures if the amount of the program incentive was less?
1. Yes
 2. No **[Go To22]**
98. Don't Know
99. Refused
19. How much less? Would you say...
1. 10 percent less
 2. 25 percent less
 3. 50 percent less
 4. 75 percent less
98. Don't Know
99. Refused
20. Would you have built and installed the exact same energy efficient measures if the program did not provide technical outreach, educational and marketing materials?
1. Yes
 2. No **[Go To21]**

98. Don't Know

99. Refused

SPILLOVER

“The next couple of questions relate to which energy efficient products you actually install in new homes.”

21. Did you install additional energy efficiency measures or technologies in some of your other new construction projects in 2009 and 2010, but without an incentive?

1. Yes [**Specify**] _____

2. No [**Go To 25**]

98. Don't Know

22. Overall, how influential was the program and its incentives in your decision to install these additional measures? Would you say it was...

1. Not very influential

2. Somewhat influential

3. Neither / neutral

4. Influential

5. Very influential

98. Don't Know

99. Refused

23. Have you built homes or installed energy efficient measures that exceed ENERGY STAR requirements?

1. Yes

2. No [**skip to 26**]

98. Don't Know

99. Refused

24. If yes, approximately what percentage of the homes have you built that exceeded the ENERGY STAR requirements?

1. [**Specify**] _____

98. Don't Know

99. Refused

25. Do you have any other comments or concerns? [**Record verbatim**]

“We're almost done, I just need to get some information for your gift card.”

26. What is the exact name and address to which we should send this gift card?

1. **[Verbatim]** _____

That's all the questions I have, thank you for your time.

Appendix C: Nonparticipant Survey

BUILDER [MARKET ACTOR] NONPARTICIPANT SURVEY – ENERGY STAR® NEW HOMES PROGRAM

Hello, my name is _____ from KEMA, calling on behalf of Rocky Mountain Power. Rocky Mountain Power is conducting a survey on energy use and construction practices. I was wondering if I could speak with the owner or someone who is knowledgeable about your company's construction practices. Is that person available?

[If “No – Not a convenient time,” ask if Respondent would like to 1. Start now and do part of the survey, or 2. Arrange a more convenient time we can call back. Emphasize that]:

“It is important for Rocky Mountain Power to include your opinions in this study so they can serve your needs better. As a Thank You for your assistance, at the end of the survey you will be able to choose from a selection of \$50 gift cards, one of which will be mailed to you.”

[If needed]: Your input will help energy efficiency program development and improvement. This survey is for research purposes only and this is not a marketing call. Your responses will remain confidential. As a Thank You for your assistance, at the end of the survey you will be offered a \$50 VISA gift cards, which will be mailed to you.

[Reintroduce if necessary]: Rocky Mountain Power is gathering information regarding residential construction practices and energy use. As a Thank You for your assistance, at the end of the survey you will be offered a \$50 VISA gift cards, which will be mailed to you.

SCREENING QUESTIONS

1. I have one confirmation question to start. Does your company build single family or multifamily homes in Utah?
 1. Single Family
 2. Multifamily
 3. Both
 4. None [**Terminate**]
98. Don't Know [**Terminate**]
99. Refused [**Terminate**]

AWARENESS

2. Is your company familiar with Rocky Mountain Power's ENERGY STAR New Homes program? This program offers a range of monetary incentives for ENERGY STAR certified homes, and energy efficient space and water heating.
 1. Yes
 2. No [**Go To 6**]
98. Don't Know [**Go To 6**]
99. Refused [**Go To 6**]

3. How did you learn about Rocky Mountain Power's incentive program?

[Do not read. Multiple responses ok]

1. Program contact/outreach specialist called or met with me
2. Marketing package from ENERGY STAR New Homes Program staff
3. From Rocky Mountain Power
4. Rocky Mountain Power Website
5. Newspaper Ad
6. At an event
 - a. What event? **[Record verbatim]** _____
7. From another builder
8. From a vendor or contractor
9. Other **[Specify]** _____
98. Don't Know
99. Refused

4. Has your company ever received an incentive through the ENERGY STAR New Homes program?

1. Yes **[Ask when. If sometime in 2009 or 2010 terminate and conduct PARTICIPANT BUILDER PAPER SURVEY. If before or after Terminate survey]**
2. No
98. Don't Know
99. Refused

5. Why did you decide not to participate in the rebate program?

[Do not read. Multiple answers ok]

1. Too much hassle
2. No customer demand
3. Geographic limits – build in non-Rocky Mountain Power areas
4. Too busy
5. Customer did not want to build ENERGY STAR Home specifications
6. Paperwork is too time consuming/have deadlines to meet
7. Cost, Adds to price
8. Not really sure what we were getting into
9. Bad experience with prior programs
10. Incentives were not high enough
11. Other **[Specify]** _____
98. Don't Know
99. Refused

ENERGY EFFICIENT BUILDING PRACTICES

“Great. Now I’m going to ask you some questions about your thoughts about ENERGY STAR building practices in general.”

6. Back in 2009 and 2010, how well known were the ENERGY STAR building practices? Would you say they were ...
1. Very well known
 2. Well known
 3. Neither well known or known [**do not read**]
 4. Not well known
 5. Not at all well known
 98. Don’t Know
 99. Refused
7. What percentage of the new homes in your building territory would you estimate were ENERGY STAR certified in 2009?
1. _____%
 98. Don’t Know
 99. Refused
8. And in 2010?
1. _____%
 98. Don’t Know
 99. Refused

CURRENT BUILDING PRACTICES

“Next I want to ask you about some of your building practices regarding specific home features. I would like for you to recall your building practices in 2009 and 2010. Please let me know if there are any differences or changes between 2009 and 2010”

9. First, can you describe how you presented high efficiency options to your customers during the construction planning process? [**If necessary, prompt**]: **“For example, do you focus on energy efficient options in your proposals, or do you prefer to propose standard options unless a specific request has been made by the customer?”**
1. _____
 98. Don’t Know
 99. Refused

Heating and Cooling

“The first questions refer to high efficiency heating and cooling equipment.”

10. Which of the following types of heating systems did you typically install in the homes you built back in 2009 and 2010? **[Read list. Multiple answers ok.]**

1. Forced air furnace
2. Standard efficiency gas
3. High efficiency gas with an AFUE 90 or higher
4. Electric Resistance
5. Standard Efficiency Heat Pump
6. High Efficiency Heat Pump with an HSPF of 8.0 or higher
7. Standard hot water heating
8. High efficiency hot water heating or tankless system
9. Gas/oil fired boiler
10. Wood burning stove
11. Other **[Specify]** _____
98. Don't Know
99. Refused

11. Which of the following types of cooling systems did you install in the homes you built back in 2009 and 2010? **[Read list. Multiple answers ok]**

1. Standard Efficiency Heat Pump
2. High Efficiency Heat Pump with SEER 14.0 or higher
3. Standard Efficiency air conditioner
4. High efficiency air conditioner with SEER of 14.0 or higher
5. Swamp/evaporative cooler
6. No cooling system
7. Other **[Specify]** _____
98. Don't Know
99. Refused

Lighting

“The next set of questions refers to high efficiency lighting. This includes various types of compact fluorescent lamps (CFLs), dedicated CFL fixtures, LEDs, and any fixtures and lamps with the ENERGY STAR label.”

12. Back in 2009 and 2010, how did you typically decide on the type of lighting that went into a home? **[Do not read. Prompt if necessary]**

1. Buyer has lighting budget, they choose lighting features within the budget
2. Buyer chooses everything, no preset budget or lighting packages
3. Builder has different lighting package options, buyer chooses one
4. Builder installs all standard efficiency fixtures
5. Builders installs all fixtures but uses CFLs in some or all sockets
6. Builder gives general instructions, electrician pick specifics
7. Other **[Specify]** _____
98. Don't Know
99. Refused

13. Which of the following types of lighting, if any, did you install in the homes you built in 2009 and 2010? **[Read list if necessary. Multiple answers ok]**

1. Compact fluorescent lamps [CFLs]
2. Dedicated compact fluorescent fixtures
3. Halogen light
4. T-5's [Long slender fluorescent tubes]
5. T-8's [Long slender fluorescent tubes]
6. LEDs [Light Emitting Diode]
7. None of these
8. Other [Specify] _____
98. Don't Know
99. Refused

[Ask if Q13 = 7]

14. What are the reasons you don't install the lighting options I just read to you? **[Do not read. Multiple answers ok]**

1. Adds too much to home price
2. Lamps burn out
3. Can't find fixtures
4. Poor light quality / weak light
5. Customers don't request it
6. Equipment problems with fixtures
7. Energy savings not high enough to justify extra cost
8. Other [Specify] _____
98. Don't Know
99. Refused

Appliances

The following questions are about appliances.

15. Which of the following ENERGY STAR appliances did you install in the homes you built in 2009 and 2010? **[Read list]**

1. ENERGY STAR dishwasher
2. ENERGY STAR refrigerator
3. ENERGY STAR clothes washer
4. ENERGY STAR clothes dryer
5. Install all ENERGY STAR appliances **[Go To 17]**
6. Other [Specify] _____
7. None _____
98. Don't Know
99. Refused

16. **[IF Builder does not install any ENERGY STAR appliances]** What are the reasons for not installing ENERGY STAR appliances in the homes that you build? **[Do not read. Multiple answers ok]**

1. Poor quality
2. Adds too much to home price
3. Can't find qualifying appliances

4. Customers don't request it
5. Energy savings not high enough to justify extra cost
6. Other [**Specify**] _____
98. Don't Know
99. Refused

Windows

“The next set of questions relate to high efficiency windows. These are defined as ENERGY STAR-certified and have a U-value of 0.30 or better.”

17. Which type of windows did you install in the homes that you built in 2009 and 2010? [**READ. Multiple answers ok**]

1. Windows with a **u-value of .30 or lower** [**High efficient window**][Go to Q19]
2. Windows with a **u-value of .30 or greater** [**Standard efficient window**]
3. Both types of u-values
4. Other [**Specify**]_____ [**Go to Q19**]
98. Don't Know[Go to Q19]
99. Refused[Go to Q19]

18. Are there any reasons why you didn't install high efficiency windows in the homes you built in 2009 and 2010? [**Do not read. Multiple answers ok**]

1. Adds too much to home price
2. Can't find windows
3. Poor quality
4. Customers don't request it
5. Energy savings not high enough to justify extra cost
6. Good double pane windows are as good as ENERGY STAR windows
7. Other [**Specify**]_____]
98. Don't Know
99. Refused

Duct Testing and Sealing

19. Are you familiar with duct testing and duct sealing protocols for ducted heating and cooling systems?

1. Yes
2. No [**Go To Q22**]
98. Don't Know
99. Refused

20. Did you have duct tests performed for the homes you built in 2009 and 2010?

1. Yes [**Go To Q22**]
2. No
3. Sometimes
98. Don't Know
99. Refused

21. What are the reasons you didn't have the ducts tested in (some of/all) the homes you built? **[Do not read.**

Multiple answers ok]

1. Time consuming
2. Tests inaccurate, do not reflect actual equipment performance
3. Too expensive
4. Not worth hassle
5. Customers do not consider testing valuable
6. Delays in scheduling testers
7. Certified testers not available
8. Lack of competence among testers
9. Don't know who to call
10. Not familiar enough with duct testing
11. Ducted systems as installed are tight enough
12. Other [Specify] _____
98. Don't Know
99. Refused

“I have just a couple more questions.”

22. Has your firm participated in any other Rocky Mountain Power or other utility energy efficiency programs?

1. Yes
2. No **[Go To Q24]**
98. Don't Know
99. Refused

23. Which ones? **[Do not read]**

1. Questar's Thermwise Builder Program
2. Other **[Specify]** _____
98. Don't Know
99. Refused

24. Do you have any other comments or concerns? **[Verbatim]** _____

25. What is the exact name and address to which we should send this gift card?

- a. **[Verbatim]** _____

Thank you for your time.

Appendix D: Square Foot Survey

Hi, My name is _____ and I'm calling on behalf of your Utility company Rocky Mountain Power. We are conducting a study regarding Energy consumption of our customers. May I please speak to the head of house hold?

IF NEEDED: This is a part of an energy efficiency evaluation and it helps Rocky Mountain Power plan their future programs better. They will use the collected data to design energy efficiency programs.

IF NEED CONTACT TO VERIFY SURVEY: **Shawn Grant** at Rocky Mountain Power

Tel.: (801) 220-4196

S1 May I please speak to the head of household

1. Yes, Continue [
2. No, not available at this time (**schedule callback**)]
3. **No, Refused (thank and terminate)**

As I mentioned we are contacting customers to ask them about energy consumption. According to our records your home was built in 2009 or 2010, is that correct?

1. Yes
2. No [**Thank and Terminate**]
98. Don't Know [**Is there someone that would know this answer? If yes, ask to speak with that person. If no, thank and terminate**]
99. Refused [**Thank and Terminate**]

1. What is the current square footage of your home? **Probe:** your best guess is fine

1. Record square footage _____
98. Don't Know [**Is there someone that would know this answer? If yes, ask to speak with that person. If no, thank and terminate**]
99. Refused [**Thank and Terminate**]

2. Which of the following best describes your house? [**Read List**]

1. Single-family home
2. Townhouse or duplex
3. Mobile home or trailer [**Thank and Terminate**]
4. Apartment building with 4 or more units [**Thank and Terminate**]
5. Other [**Record**] terminate
98. [**DO NOT READ**] Don't Know terminate
99. [**DO NOT READ**] Refused terminate

3. Was any additional square footage added after the home was built?

[EXPLAIN THAT THAT THIS WOULD INCLUDE AN ADDITION OR WORK DONE TO FINISH A PREVIOUSLY UNFINISHED BASEMENT]

1. Yes
2. No
98. Don't Know
99. Refused

4. [IF 3 = YES] About how much square footage was added?
 1. Record square footage _____
 98. Don't Know
 99. Refused

5. [IF 3 = YES] When was the work on the addition completed?
 1. Record month and year _____ [YEAR IS MOST IMPORTANT, MONTH IS OPTIONAL]
 98. Don't Know
 99. Refused

6. [IF 3 = YES] And was this square footage included in your previous answer of [REFERENCE NUMBER GIVEN IN 2 ABOVE]?
 1. Yes
 2. No
 98. Don't Know
 99. Refused

7. Do you recall where the square footage number you just gave me came from? [DO NOT READ LIST] [THERE COULD BE MORE THAN ONE SOURCE SINCE WE ASKED FOR OVERALL AREA AND ADDITION AREA, OK TO RECORD MORE THAN ONE RESPONSE]
 1. Realtor
 2. Builder/Architect
 3. Tax Assessment
 4. ENERGY STAR Home documentation
 5. Homeowner calculation from floor plan
 6. Homeowner measurement
 7. Other. Record _____
 98. Don't Know
 99. Refused

8. Does your home have a basement?
 1. Yes
 2. No [**That's all the questions I have. We appreciate you taking the time to answer our questions.**]
 98. Don't Know [**Thank and Terminate**]
 99. Refused [**Thank and Terminate**]

9. [IF 8 = YES] Is the basement finished? That is does it have drywall, a finished ceiling, insulation, and a finished floor?
 1. Yes, it is finished space
 2. No, it is not finished space
 98. Don't Know
 99. Refused

10. [IF 9 = YES] Ok, so did the square footage number [REFERENCE NUMBER GIVEN IN 1 ABOVE] you gave earlier include the basement?
 1. Yes
 2. No
 98. Don't Know
 99. Refused

11. [IF 10 = NO] What would you estimate is the square footage of the basement?
1. Record square footage of basement _____
 98. Don't Know
 99. Refused
12. [IF 9 = NO] Ok, does the basement have insulation on the foundation walls?
1. Yes
 2. No
 98. Don't Know
 99. Refused
13. [IF 12 = Yes] Ok, is your basement ducted to cool and heat the space? Are there air-conditioning or furnace vents (or registers) present in the basement?
1. Yes
 2. No
 98. Don't Know
 99. Refused

That's all the questions I have. We appreciate you taking the time to answer our questions.