Final Report

An Evaluation of the Residential Central Air Conditioning Program

Results of Process and Impact Evaluations

Prepared for
Empire District Electric Co.

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Executive Summary

About This Report

This report presents the results of process and impact evaluations of Empire Electric's Residential Central Air Conditioning (CAC) Program. This program's primary goal is to provide financial incentives to Empire District Electric's customers through a rebate for high efficiency central air conditioning systems. The incentives provided are expected to lower participant's utility bills by replacing an inefficient CAC unit with a high efficiency unit. This evaluation focuses on participants that received a rebate between June 2007 and May 2009.

Summary of Findings

1. The Residential CAC Program operates efficiently and smoothly with high levels of satisfaction from the contractors.

2. The training sessions are working for most of the contractors. They report high levels of satisfaction (9.6 on a 10-point scale) with the knowledge of the instructor, and the lowest (7.8 out of 10) with the convenience of attending the session.

3. Of the contractors surveyed, 92% of them are very satisfied with the communications they have had with Empire.

4. Contractors report that increased sales and profits is the primary benefit of their participation in the program, and that their business has improved through increased sales, profits, and exposure. Some of them have added other energy efficiency equipment to their offerings, such as high-efficiency water heaters and programmable thermostats.

5. The savings from the Residential CAC Program are summarized in the table below. More details can be found in Impact Analysis Results.

	kWh savings	Non-coincident kW savings	Coincident kW savings
Gross program savings	568,339	518	389

Recommendations

TecMarket Works and Building Metrics have the following recommendations for the Residential CAC Program:

1. Empire should make it so that information about the Residential CAC program (and other efficiency programs) easier to find on the company's web site. The web site serves as the primary source of energy efficiency program information for its customers, and the program managers are fielding calls about where to find program information online. The addition of a more meaningful phrase in place of the "Smart Energy Solutions" tab, or placing a link on the left pane of the page for energy efficiency information may help

guide customers to the information more easily and decrease the number of calls that the program managers have to field.

2. When the contractors were asked for suggestions for improving the program, the most common suggestion was that they would like to submit the applications online. This can be provided as an option, even if manual J calculations are required to be submitted via pdf file submissions.

3. Contractors are doing a good job of informing their customers of the program, as most of them indicated that they inform their customers about the rebates offered by Empire for choosing a higher efficiency unit. However, they need to be more informed about what systems are covered, and would like to have printed materials to share with their customers.

4. The Residential Central Air Conditioning (CAC) Program is a rebate program for home AC units that are SEER 15 or greater. However, the program also provides rebates for heat pumps and geo-thermal heat pumps. There are contractors that are not aware that geothermal heat pumps are covered by the program, so an effort should to be made to inform contactors on the equipment that is covered by the program. Including both SEER and EER levels and the corresponding rebate amount in program materials will allow customers and contractors interested in the program to make their choice with all of the rebate options available.

5. The SEER-based rebate structure as it currently is set is working well for Empire.

6. Promote the program to all contractors in the Empire service territory. After over two years of program operations, there are still contractors that are not aware of the program and therefore are not informing their customers of the rebate opportunity. A direct mailing to all contractor businesses in the service territory should be considered.

7. Empire should consider adding AC tune-up rebates to program offerings.

8. Empire should consider adding duct testing and sealing training and rebates to program offerings.

9. Empire should consider establishing a documentation path for contractors to demonstrate expertise and experience conducting manual J calculations and exempt those contactors from the training if they demonstrate skill in this area.

10. Empire should also consider incenting attendance at the workshop so that the experienced manual J contactors do not feel it is a waste of their time and a drain on profits.

11. Empire needs to clearly state that inclusion on the list is not an endorsement of the performance of the contactor or their work and state that inclusion is only an indication that the contractor has demonstrated the ability to properly size program covered units to the conditions of the home.

12. Empire may want to consider increasing the rebate level for geo-thermal systems. Empire's practice is to rebate geo-thermal systems at the highest ($500) level, which only covers a small portion of the costs associated with these systems. However, cost effectiveness of these systems is marginal at best. Empire might want to be careful promoting something that is not cost effective for the customer.

13. Empire has sent program materials to all known contractors; however, there is no registration point for them. TecMarket Works suggests that Empire should consider purchasing a list of contractors to work from.

Introduction

This report presents the results of a process and impact evaluation of the Residential Central Air Conditioning (CAC) Program. The evaluation examined participants that received a rebate for purchasing a high efficiency central AC system between June 2007 and May 2009.

Program Description

The Residential High Efficiency CAC Program encourages residential customers to purchase and install energy-efficient central air conditioning and heat pumps by providing financial incentives to offset a portion of the equipment's higher initial cost. The program's long-range goal is to encourage contractors/distributors to use energy efficiency as a marketing tool, thereby stocking and selling more efficient units and moving the entire CAC and heat pump market toward greater energy efficiency.

Incentives are set at approximately 50% of incremental cost. Incentives are available for systems that meet the following criteria:

Split Central Air Conditioner
SEER greater than or equal to 15[1]
EER greater than or equal to 12.5
Air Source Heat Pump
SEER greater than or equal to 15
HSPF greater than or equal to 8.5

The rebates are as follows:

- SEER of 15 to 15.9 = $400 rebate
- SEER of 16 to 16.9 = $450 rebate
- SEER of 17 or higher = $500 rebate

An additional feature of the program is to offer training in Manual D and Manual J calculations and System Charging and Airflow for HVAC contractors. Manual J is the industry standard residential load calculation method. The training offers step-by-step examples of properly sizing equipment and also addresses principles of heat transfer. The training teaches HVAC contractors to accurately perform and document cooling load calculations and reduces over-sizing. Manual D training provides instruction on the impact of duct design on heating and cooling load while the System Charging and Airflow segment of the course addresses airflow and charging procedures and standards.

Estimated participation is 520 for year 1, 650 for year 2, and 780 annually thereafter. The program began June 4, 2007; 167 units were rebated in year 1, and 181 units were rebated in year 2.

[1] SEER = Seasonal Energy Efficiency Ratio. The higher the SEER rating of a unit, the more energy efficient it is. The SEER rating is the Btu of cooling output during a typical cooling-season divided by the total electric energy input in watt-hours during the same period.

Evaluation Methodology

The study methodology consisted of three parts. These are:

1. A process evaluation consisting of in-depth interviews with the program management.
2. A contractor survey.
3. An energy impacts analysis using engineering algorithms.

Process Evaluation Methodology
The process evaluation included a design and operations review via management interviews to discuss various aspects of the program, such as the level of the rebates and types and models of equipment offered. The interview instrument for the management interview can be found in Appendix A: Management Interview Protocol.

Participant Survey Methodology
TecMarket Works was provided with the contact information for 72 contractors that partner with Empire District Electric for the CAC program. We contacted each of them a maximum of 7 times in order to maximize our response rate for this study, and were able to complete surveys with 41 contractors for a 57% response rate.

We spoke with them about a variety of topics, including but not limited to:

- Their understanding of the program's objectives and goals
- The technologies that are covered by the program
- Their satisfaction with the program and its training services
- Communication with Empire staff
- Satisfaction of their customers with the high efficiency options

The survey employed can be found in Appendix B: Residential CAC Program: Contractor Interview Instrument.

Energy Savings Analysis Methodology
The impact evaluation used an engineering-based approach to estimate program savings. The impact evaluation effort consisted of the following steps:

1. Analysis of program participation tracking system data
2. Development and calibration of prototypical building energy simulation models
3. Simulation of measure energy savings
4. Calculation of gross program energy and demand savings

Program Tracking System Analysis
Program participation records covering the period from June 2007 to May 2009 were obtained from Empire District Electric. The data, delivered as a Microsoft Excel workbook, contained customer name and address, installing vendor contact information, system type and efficiency, unit make and model number, rebate amounts, etc. These data were examined to identify the number and types of customers and HVAC systems that participated in the program.

The distribution of equipment type listed in the program tracking database is shown in Figure 1 below.

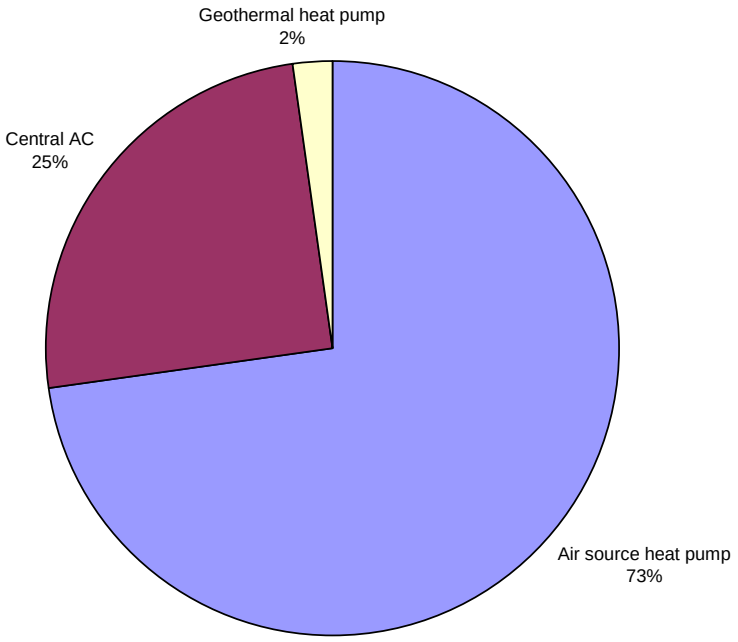

Figure 1. Equipment Distribution

Note the majority of the units rebated were air source heat pumps. Central air conditioners accounted for about a quarter of the applications. Geothermal heat pumps were a minor part of the program.

The distribution of central air conditioner unit efficiency is shown below in Figure 2.

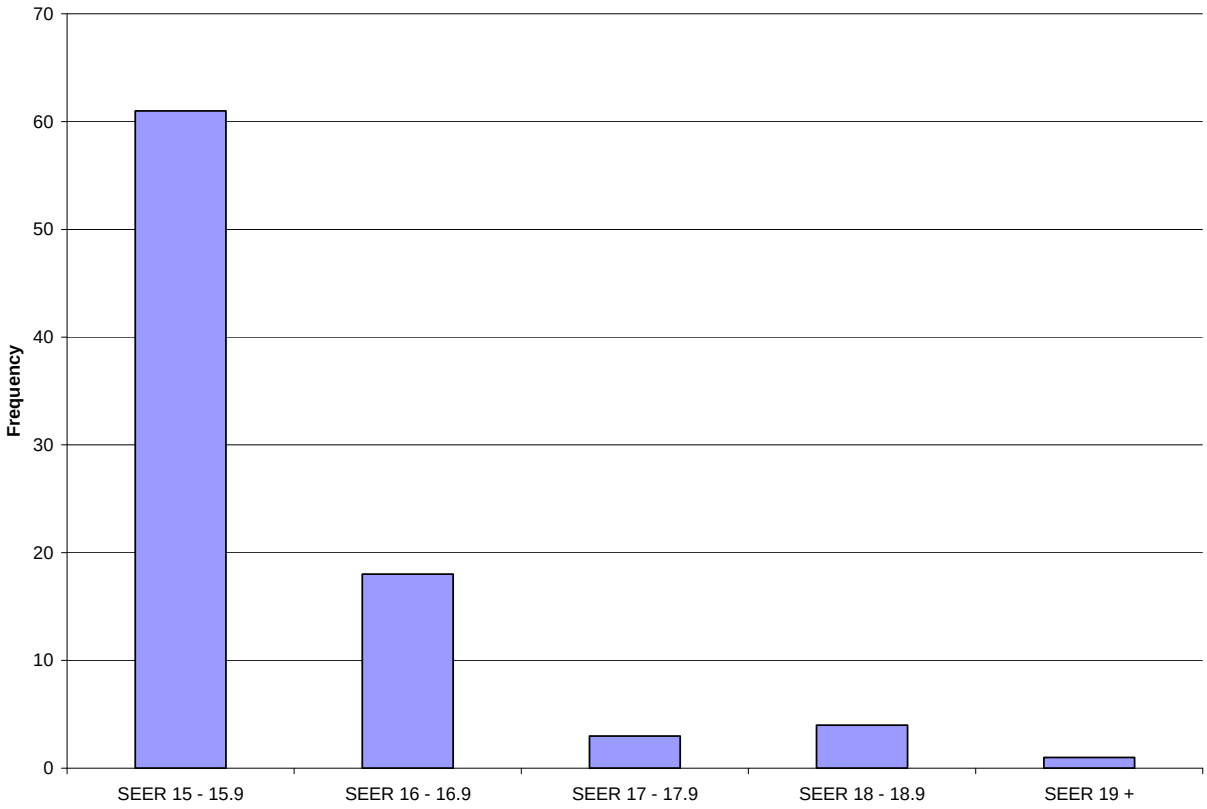

Figure 2. SEER Distribution for Central Air Conditioners

Note, most of the applications were in the range of SEER 15-16. The distribution of the air source heat pump efficiency is shown in Figure 3 below.

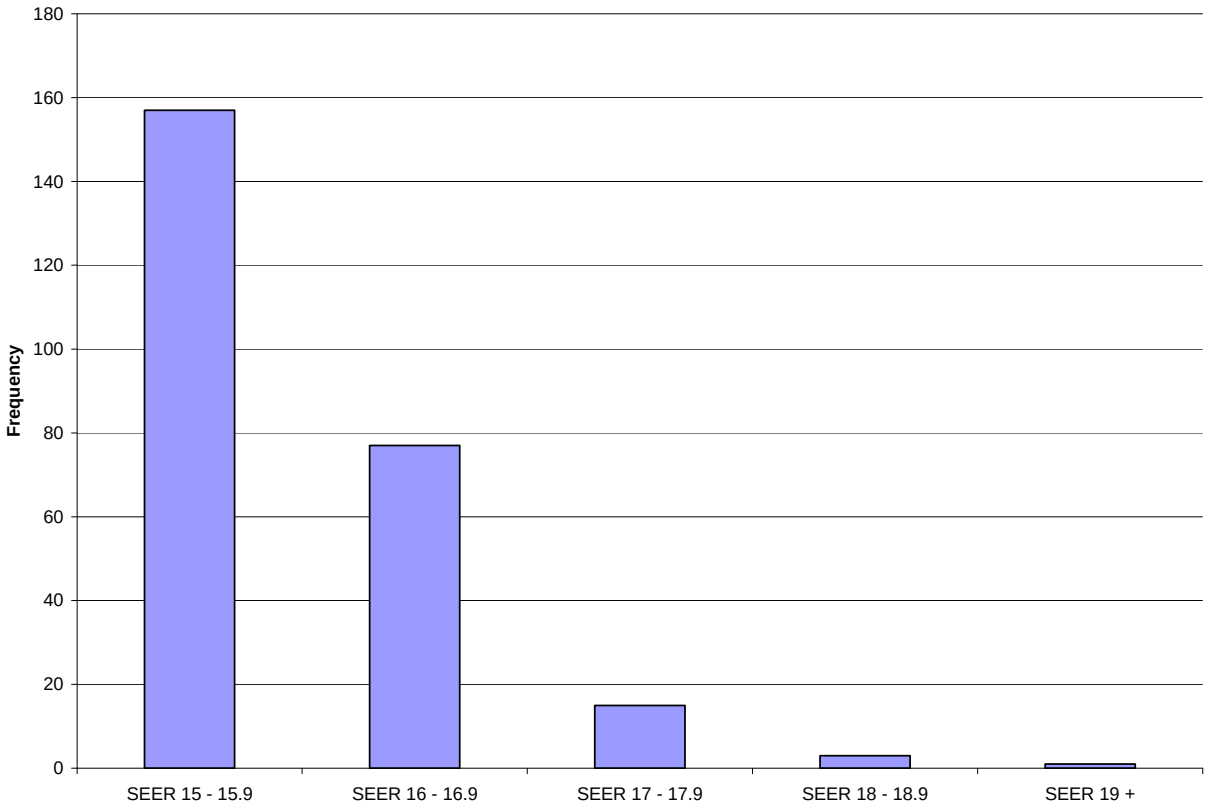

Figure 3. SEER Distribution of Air Source Heat Pumps

As with central air conditioners, the majority of the applications were for SEER 15-16 units, though a higher fraction of SEER 16-17 units were received for air source heat pumps relative to central air conditioners.

The size distribution of all units is shown in Figure 4.

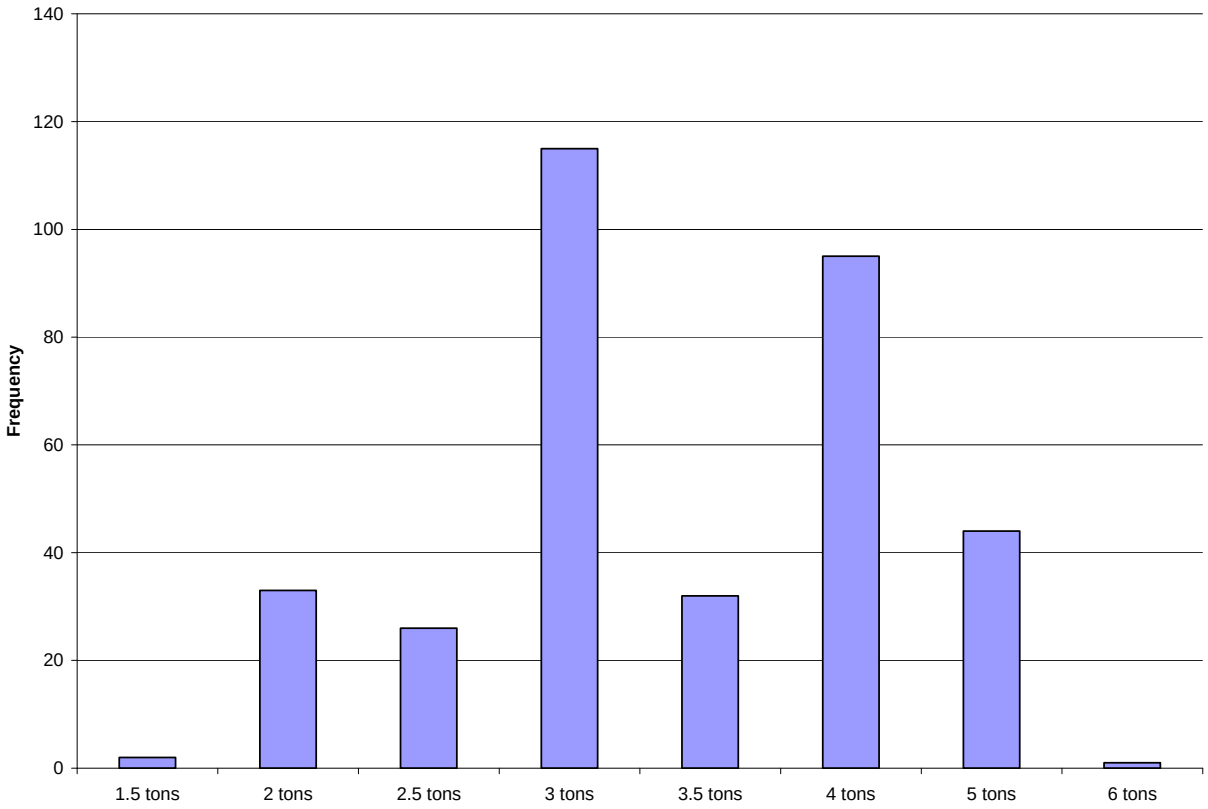

Figure 4. Unit Cooling Capacity Distribution

Note, three ton units were the most popular unit size, followed closely by 4 ton units. There were a significant number of 5 ton units also in the population.

Prototypical Building Model Development

The impact analysis for the Residential CAC program is based on DOE-2.2 simulations of a set of prototypical residential buildings. The prototypical simulation models were derived from the residential building prototypes used in the California Database for Energy Efficiency Resources (DEER) study, with adjustments made for local building practices and climate. The prototype "model" in fact contains 4 separate residential buildings; 2 one-story and 2 two-story buildings. Each version of the 1 story and 2 story buildings are identical except for the orientation, which is shifted by 90 degrees. The selection of these 4 buildings is designed to give a reasonable average response of buildings of different design and orientation to the impact of energy efficiency measures. A sketch of the residential prototype buildings is shown in Figure 5.

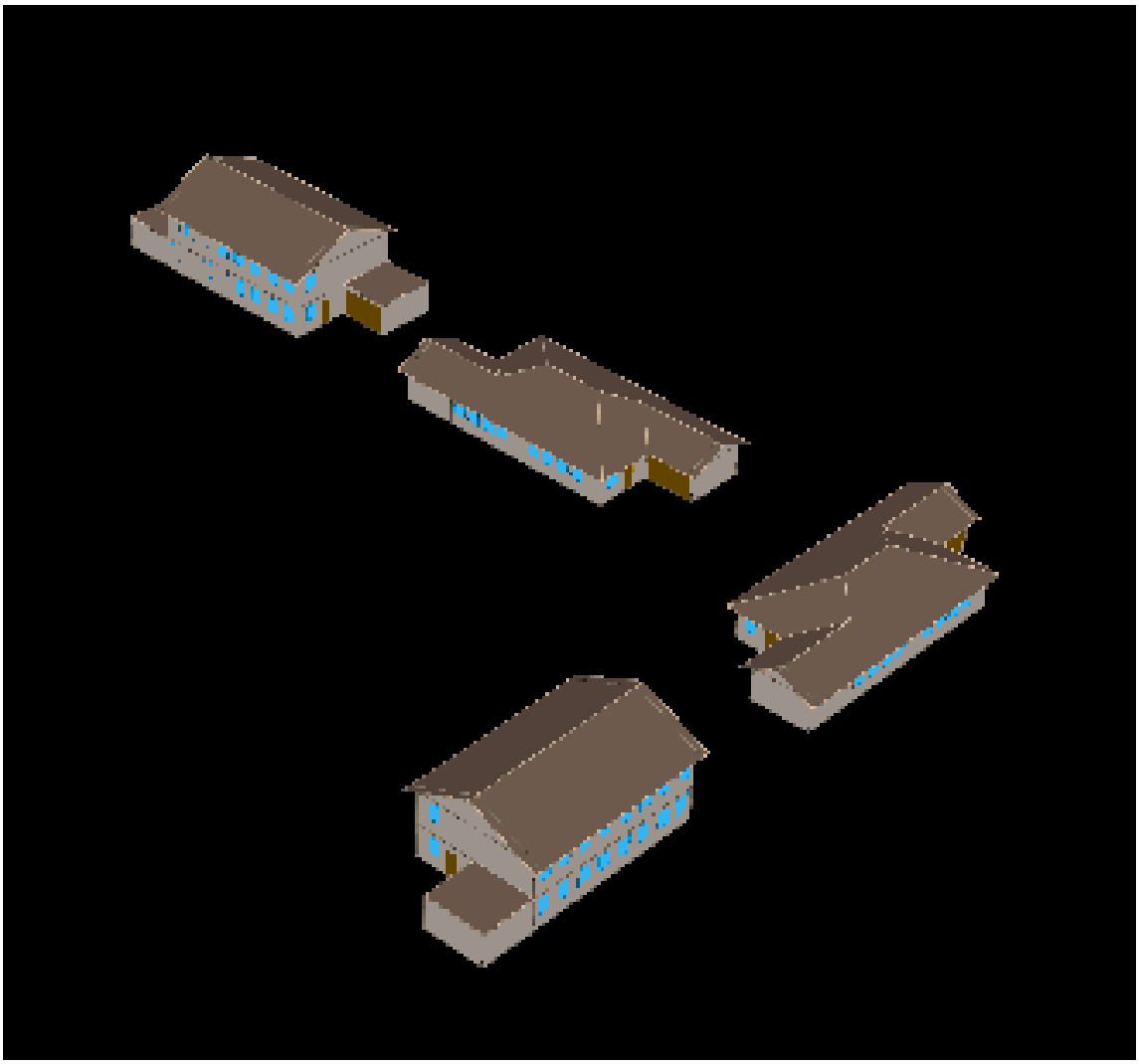

Figure 5. Computer Rendering of Residential Building Prototype Model

We also added a basement to each building to create another set of 4 buildings, allowing us to simulate the impact of the energy efficiency measures on buildings with and without basements.

Data from the US Energy Information Agency (EIA) Residential Energy Consumption Survey (RECS)[2] and the 2002 International Energy Conservation Code (IECC) were used to define the prototype models. The general characteristics of the residential building prototype model are summarized in Table 1.

[2] See http://www.eia.doe.gov/emeu/recs/contents.html

Table 1. Residential Building Prototype Description

Characteristic	Value
Vintage	Three vintages simulated – Old (pre 1980), Average (1980 -2000) and New
Conditioned floor area	1 story house: 1465 SF (not including basement) 2 story house: 2930 SF (not including basement)
Wall construction and R-value	Wood frame with siding, R-value varies by system type and vintage
Roof construction and R-value	Wood frame with asphalt shingles, R-value varies by system type and vintage
Glazing type	Average of single and double pane; properties vary by system type and vintage
Lighting and appliance power density	0.51 W/SF average
HVAC system type	Packaged single zone AC or heat pump
HVAC system size	Based on peak load with 20% oversizing.
HVAC system efficiency	Baseline SEER = 13 Furnace efficiency = 0.78 AFUE
Thermostat setpoints	Heating setpoint = 70, cooling setpoint =75. Night setback/setup of 5 degrees in runs with setback thermostats.
Duct location	Buildings without basement: attic Buildings with basement: basement
Duct surface area	Single story house: 390 SF supply, 72 SF return Two story house: 505 SF supply, 290 SF return
Duct insulation	Uninsulated
Duct leakage	20% total, evenly distributed between supply and return
Cooling season	April 27th – Oct 8th
Natural ventilation	Allowed during cooling season when cooling setpoint exceeded and outdoor temperature < 65°F. 3 air changes per hour

Wall, Floor and Ceiling Insulation Levels

The assumed values for wall, floor and ceiling insulation and the assumed average R-value by vintage and HVAC system type is shown in Table 2.

Table 2. Wall, Floor and Ceiling Insulation R-Value Assumptions by Vintage

Vintage	Assumed R-value of exterior wall	Assumed R-value of ceiling	Assumed R-value of floor (buildings without basements)	Assumed R-value of basement wall
Old	3.5	17.5	uninsulated	uninsulated
Average	11	19	11	uninsulated
New	13	38	19	uninsulated

Windows

Table 3. Glazing Property Assumptions by Vintage and HVAC System Type

Vintage	U-value	SHGC
Old	0.9	0.80
Average	0.65	0.75
New	0.35	0.55

Measure Savings Analysis

The prototype model was simulated with a variety of efficiency measures to develop a series of savings estimates. Air conditioning systems were simulated with a baseline SEER 13 air conditioner and with a series of high efficiency air conditioners ranging from SEER 14 to SEER 17. Heat pump systems were simulated with a baseline SEER 13 heat pump and with a series of high efficiency heat pumps ranging from SEER 14 to SEER 18. Standard heat pumps were simulated with electric resistance backup, while dual fuel heat pumps were simulated with a gas furnace backup.

The basic efficiency assumptions for each of the air conditioner and heat pump measures are shown in Table 4. These data were taken from an extensive study of residential air conditioners and heat pumps conducted for the California DEER update study.[3] Besides these basic efficiency parameters, an extensive set of performance curves were developed representing mean performance of production units in each SEER category. These performance curves describe unit efficiency as a function of outdoor temperature, part-load efficiency, and so on. These curves were also applied to air conditioner and heat pump measures in each SEER category.

[3] Itron, 2005. "2004-2005 Database for Energy Efficiency Resources (DEER) Update Study, Final Report," Itron, Inc., J.J. Hirsch and Associates, Synergy Consulting, and Quantum Consulting. December, 2005. Available at http://eega.cpuc.ca.gov/deer

Table 4. Baseline and Measure Performance Assumptions

Type	Efficiency	Fan Type	EER	Sensible Heat Ratio	Air flow (CFM/ton)	Heating COP
Air conditioner	SEER 13	Std 1-speed	11.1	0.75	376	
	SEER 14	EC motor	12.2	0.78	395	
	SEER 15	EC motor	12.7	0.7	319	
	SEER 16	EC motor	11.6	0.81	409	
	SEER 17	EC motor	12.3	0.8	422	
Heat pump	SEER 13	Std 1-speed	11.1	0.725	337	3.28
	SEER 14	EC motor	12.2	0.73	352	3.52
	SEER 15	EC motor	12.7	0.81	436	3.74
	SEER 16	EC motor	12.1	0.78	400	3.48
	SEER 17	EC motor	12.5	0.81	430	3.26
	SEER 18	EC motor	12.9	0.8	428	3.66
Geothermal Heat Pump	EER 13.4	Std 1-speed	13.4	0.73	337	3.1
	EER 17	Std 1-speed	17	0.73	337	3.8
	EER 19	Std 1-speed	19	0.73	337	4.1

Influence of Right Sizing and Refrigerant Charge and Airflow Testing

Contractors participating in the Residential CAC program are expected to attend training in proper HVAC system sizing (Manual J) and refrigerant charge and airflow testing. Evidence of Manual J (or equivalent) sizing is required as an attachment to the rebate application. The analysis assumes that the rebated systems were oversized by 20% of the Manual J load, and were adjusted for proper charge and air flow during installation. The baseline system is assumed to be a standard-efficiency (SEER 13) unit that has not been properly sized or installed. The baseline system is assumed to be oversized by 50% of the Manual J load; with the unit efficiency and capacity adjusted to account for average installation practices.

To account for average installation practices, the analysis follows the procedure used by the 2005 DEER[4] study to estimate the energy savings from refrigerant charge and air flow testing. The baseline unit compressor cooling efficiency is reduced by 13%, the total cooling capacity is reduced by 11% and the sensible cooling capacity is reduced by 7%. These factors were applied to the baseline SEER 13 system, while the efficiency of the rebated unit is assumed to conform to the manufacturer's data.

Run Matrix

This set of measures resulted in a simulation run matrix as follows in Table 5:

[4] The DEER study references a paper by Mowris, et al., *Field Measurements of Air Conditioners with and without TXVs,* Proc. 2004 ACEEE Summer Study on Energy Efficiency in Buildings. American Council for an Energy-Efficient Economy, Washington, D.C.

Table 5. Set of Measures

Category	Number	Description
Building Vintage	3	Old Average New
Foundation type	2	With and without basement
HVAC systems	3	Air conditioner with gas furnace Standard heat pump with electric backup Geothermal heat pump
Air conditioner efficiency levels	5	Base and 4 measures
Standard heat pump efficiency levels	6	Base and 5 measures
Geothermal heat pump efficiency levels	3	Base and 2 measures

The set of simulations described above were conducted for Joplin, Missouri using TMY3[5] long term average weather data from the National Renewable Energy Laboratory. The results for each of the vintages were weighted according to the relative frequency of each vintage in the overall population. The weights used in the analysis were derived from the RECS[6] data, showing number of units by year of construction and foundation type by climate characteristics, as shown in Table 6 below:

Table 6. Weights Used by Building Characteristics

Category	Value	Weight
Vintage	Old	0.66
	Existing	0.34
Foundation Type	No Basement	0.77
	Basement	0.23

The simulated savings were normalized per ton of cooling capacity and applied to the unit sizes in the tracking system.

[5] Typical Meteorological Year (TMY) dataset version 3 (2008) produced by the National Renewable Energy Laboratory (NREL). See http://www.nrel.gov/docs/fy08osti/43156.pdf
[6] Residential Energy Consumption Survey (RECS). See http://www.eia.doe.gov/emeu/recs/contents.html

Evaluation Findings

Process Evaluation

This section presents the results from the in-depth management interviews performed with Sherry McCormack and Kelly Chenoweth.

Program Objectives

Both of the program managers have a clear vision of the objectives of the Residential CAC Program; to increase the energy efficiency of Central Air Conditioners among Empire's residential electric customers in a way that delivers a peak load reduction on the system during the summer peak consumption periods.

The program has not achieved the estimated demand reductions described in the original program plan, however, the program managers believe the program has been beneficial for gaining programmatic experience, for understanding the operations of the residential AC markets, and has helped establish an operational foundation and programmatic frameworks for achieving greater savings as the program progresses. Managers noted that there are additional applications coming in "almost every day", increasing the program's energy impacts and boosting participation rates.

The SEER threshold requirements for a rebate through the Residential CAC program (15 SEER or greater) are moving people to purchase units that are at or above the minimum federal standard for Energy Star units, however, if the federal standards change, Empire feels that they will need to increase the SEER threshold and the rebate levels in order to offset the additional incremental costs associated with the higher efficiency units.

Program Design

Empire District, working with Applied Energy Group (AEG), designed the program and established its operational conditions. Empire held multiple focus groups with contractors to obtain feedback on the training portion of the program. Focus group participants consisted of contractors through whom the program was to be offered. The contactors were recruited by personal invitation from Empire personnel. Sherry McCormack called a selection of contractors operating within the Empire service territory and invited a diverse group of contractors who agreed to participate. The focus group focused on obtaining contactor advice on market baseline conditions and targeted levels of efficiency required to make the program cost effectively achieve the needed energy savings. The focus group also addressed different operational approaches for gaining contactor support and for moving the higher efficiency units into the market.

Technologies and Efficiency Levels

Central Air Conditioners

The focus groups were used to help determine the baseline threshold SEER rating for setting rebate levels that move sales above the threshold. AEG helped Empire conduct the focus groups. Following the focus groups, AEG recommended that the program focus on incenting units with a

15 or greater SEER. The program managers agreed that SEER 15 could meet the objective of the program if enough units could be installed. The focus group also determined that SEER 13 and 14 models should be considered the baseline standard level of efficiency and that if the program covered the SEER 15 (or higher) units the program would make a difference to the customers who are looking to obtain added value in their purchase decision.

Heat Pumps

Empire provides rebates to customers for installing heat pumps if applications are submitted for a rebate on a high efficiency heat pump. The heat pumps that are rebated through the program must have an efficiency rating of at least 15 SEER, 12.5 EER and 8.5 HSPF.

To document that the program is not promoting fuel-switching, Empire sends a survey to a portion of the customers that have purchased a heat pump and submitted an application for a rebate through the CAC program. The customer indicates on the survey that the program did not influence their decision to install a heat pump and that the rebate did not make them change their mind about which technology to purchase, but that the program did influence their purchase of a higher efficiency model of a heat pump. With these survey results, Empire can provide a rebate and demonstrate that the customer elected on their own to install a heat pump and document that Empire is not encouraging fuel switching by promoting energy efficient technologies.

The program provides rebates for but does not promote energy efficient geo-thermal heat pump systems. One of the program managers suggested that this could and should be promoted by the program and included in program materials because installing a geo-thermal heat pump should not be considered fuel-switching if the original system was a heat pump. For geo-thermal systems, Empire's practice is to rebate geo-thermal systems at the highest ($500) level, which only covers a small portion of the costs associated with these systems. Empire may want to consider increasing the rebate level for geo-thermal systems.

If Empire can offer rebates for geo-thermal systems that result in energy savings and these systems are not considered fuel-switching, TMW recommends that the program materials be changed to include geo-thermal heat pumps in their marketing and outreach material and in the program's decision support materials to customers and contactors.

Other Technologies

Empire program managers have considered expanding the Residential CAC program to include other technologies as a means of increasing both program participation and energy savings. In addition to heat pumps (discussed above) other cooling technologies including room and window AC units and programmable thermostats have been considered. However, the program managers believe that these technologies may more appropriately fit in different Empire program, such as an appliance rebate program.

Program Operations

Sherry McCormack led the development and implementation of the Residential CAC program. On a day-to-day basis, she fields calls from customers and contractors and responds to questions from contractors regarding how they can be placed on the approved contractors list. She also fields calls from customers who would like to view the approved contractors list or learn how

they can apply for and receive a rebate for an AC unit. In her capacity as one of the program managers, Sherry McCormack also coordinates the contractor training efforts by establishing the dates and locations for the training workshops and acquiring the trainers to teach the workshops. She also conducts outreach efforts to reach new contractors and enroll them in the training workshop. After the training session is completed, Empire staff creates and mails certificates of completion to the contractors that successfully complete the training. These contractors are then placed on the approved vendor list.

The other CAC program manager, Kelly Chenoweth, receives the applications, reviews them for content and accuracy and approves or rejects them. According to Mr. Chenoweth, he approves about 95% of the applications submitted. Once the applications are approved they are given to Sherry McCormack for rebate processing. Sherry McCormack enters the information into the tracking database and sends the rebate check to customer. According to the program managers, the examination, approval and processing of applications is completed in 10 to 14 days. The program managers have noted that few applications are rejected, and that most of rejections occurred during the early stages of the program when there was some level of confusion because of unclear technology and rebate application guidelines. In the early stages of the program, some of the contractors were installing equipment that did not meet the program's SEER requirements. For example, in a few cases customers thought that they had installed a SEER 15 AC unit. However, Empire would declare it a 14.5 SEER after an examination of the make and model number. This condition occurs because some manufacturers are inaccurate in the labeling of their units. For example, a unit is labeled by the manufacturer as an "Elite 15 Series" unit, suggesting an SEER of 15. However, these units perform at a 14.5 SEER level rating unless they are installed with an EC motor which increases the operational efficiency by one-half a point to 15.0. This issue was discussed with the contractors who were instructed to make sure that 14.5 SEER units were not included in the program applications. This issue was both identified and resolved during the early start-up months of the program's operations.

Contractor Training

In order for HVAC contractors to be placed on the approved contractor's list, they must complete ACCA Manual J training. Contractors can meet this requirement by either completing Empire's training workshop or by providing documentation of ACCA Manual J calculation training obtained from another training provider.

Empire offers free one-day training sessions covering both ACCA Manual J and Manual D calculations in early spring (March) prior to the cooling season, and also during the mid-to-late winter months (when contractors are typically not as busy). To maximize participation, training is offered in five cities: Joplin, Springfield, Webb City, Republic, and Aurora. The scheduling of the training sessions are informed by contractor advice pertaining to the best times and locations for their industry. During the training Empire provides food, beverages and full-color brochures describing the program and the program's requirements.

The training offered by Empire is not software based; rather the manual's calculations are taught so that the attendees understand the math behind it and can conduct the calculations without a computer and the associated software. Empire's goal for offering the training is to have contractors become more aware of the calculation approach and understand the importance of

performing proper load calculations. The program managers feel that the contractors need to know how the calculations are actually done, even though dealers usually use software to do these calculations. For the contractors with calculation experience, the training sessions serve as a refresher course and helps assure calculation accuracy. For the contractors that don't know how to do the Manual J load calculations, the training helps them understand the calculation approach and be able to conduct those calculations.

The contractors' primary benefit for completing the training session is that they are listed by Empire as an "approved contractor", which enhances their standing in the market. The program becomes not only an approach for assuring the reliability of the contractors' recommendations, but also allows contractors to up-sell a better product to their customers at a better price than what could be provided without the program.

According to one of the program managers, only one contractor has complained that Empire is "implying that he needs training". This particular contractor was offended by the training requirement because he has been in business for 30 years and has a deep knowledge of the equipment and industry. There are others that have expressed that they don't feel that they need to attend the training, but they are willing to attend in order to be listed as an approved contractor. Because the contractors are typically small businesses that must be both profitable and focused to succeed in the market, asking contractors who are already experts at manual J calculations, to complete a training course may not be necessary. Empire should consider establishing a documentation path for contractors to demonstrate expertise and experience conducting manual J calculations and exempt those contactors from the training if they demonstrate skill in this area. Empire should also consider incenting attendance at the workshop so that the experienced manual J contactors do not feel it is a waste of their time and a drain on profits. However, even contactors who already knew how to do manual J calculations have reported to TecMarket Works that they were happy to attend and that they learned something from the training despite their reservations. Additional information about the contractors' thoughts on the training sessions can be found in the section: Contractor Survey Results.

Approved Contractor List

The CAC program's approved contractor list is available on Empire's web site and allows residential customers to select an approved contractor for selecting and installing a high-efficiency air conditioner. However, having this list of approved contractors presents a challenge for the program managers because there are three levels of dealers that can be placed on the approved contractor list. These are:

1. Contractors that attended a training session who are automatically added to the approved contractor list.
2. Contractors with previous load calculation training. These contractors provide documentation of training they received elsewhere. Empire reviews their documentation, and places them on the approved contractor list.
3. Contractors waiting to attend a training session. If a contractor has a current customer that wants to do business with them and also wants to receive the program rebate, the contractor can verbally commit to attend the next training session. These contractors can be provisionally placed on the approved list if they send a copy of the

load calculation and it passes a review by the program manager. This is done to maintain good relationships with the contractors and allow them to do business with their customers who want to receive the program's rebate.

The problem with this approach is that the program managers don't always know what the contractor has done to be put on the list. A contractor can be provisionally placed on the list but not yet be documented on manual J calculations. Because being on the list can be considered an endorsement by Empire and the list suggests to the customers that the contractor is qualified it is possible to be on the list and not yet be training certified. Empire is concerned that being on the list can suggest that Empire is essentially endorsing an untrained contactor for AC equipment sizing calculations. However, TecMarket Works suggests that this problem may not be significant in that once placed on the provisional list the contractor is obligated to obtain the training or demonstrate past training. If the contactor can follow a path by which they can be certified by demonstrating manual J calculation skills, this issue can be addressed. In addition we have found that most contactors who are not able to conduct manual J calculations tend to follow rules of thumb pertaining to sizing decisions. There is also evidence within the evaluation community that the energy savings from units not sized via a manual J calculation also provide energy savings approximately equal to the saving achieved via the manual J calculations. That is to not excessively over-size the units and to allow enough operational time to dehumidify the air that is in the home. Having the ability to document manual J calculation expertise instead of requiring attendance at a training event may serve the same purpose and reduce performance uncertainty regarding contractors who do not complete the training. This can be done by having the contractors not wanting to attend the training send a manual J calculation to the program manager that, if accurate, allows the contractor to be listed, but rejects the contractor if the calculations are in error or exclude key calculation components.

Another issue with the approved contractor list is that one of the program managers believes that there are contractors on the list that should not be endorsed by Empire due to their having poor work histories in the area. This manager thinks that Empire should remove contactors from the list if there are documented cases of poor performance. TecMarket Works agrees, but suggests that removal from the list must be for a performance cause demonstrating repetitive poor performance for program-covered installations. In addition, Empire needs to clearly state that inclusion on the list is not an endorsement of the performance of the contactor or their work and state that inclusion is only an indication that the contractor has demonstrated the ability to properly size program covered units to the conditions of the home. The list should also clearly state that Empire assumes no responsibility for the performance of the contactor or the equipment installed by the contactor and that contractor selection is up to the customer. The program managers also noted that exclusion from the list may only be as a result of the contactor's lack of knowledge about the program, rather than exclusion for cause. The list needs to clearly state that exclusion from the list does not indicate a lack of knowledge, skills or professional performance. Allowing contactors to demonstrate manual J calculation ability would help add contractors to the list as they learn about the program and submit documentation of manual J skills.

The program manager occasionally has contractors calling to inquire about the programs and to understand why they are not included on the list. The unlisted contactors are upset that they are

not on the approved list of contractors, and that this condition leads to awkward conversations and less pleasant relationships with area businesses. Empire strives to maintain positive relationships with the contractors, because they are important trade allies and they support and promote energy efficient equipment. This program manager would rather not have an approved contractor list and have all area contractors qualified to submit the applications with the summary of the load calculation attached to the application. This seems like a reasonable approach in view that the manual J calculations have to be reviewed and approved prior to a rebate being sent. However, if Empire wants to continue with the list, these contactors can be asked to provide manual J documentation and then added to the list. In addition, TecMarket Works recommends that a mailing be sent to all registered HVAC contractors after Empire purchases a list of contractors in the service area that presents the program to each contractor and asks for documentation of manual J calculation ability to be added to the list if they are not currently listed. In addition, Empire can provide correspondence to equipment manufacturers, distributors, wholesalers and dealers asking them to inform their installation contractors about the program and encouraging them to ask their contractors to provide manual J calculation documentation.

A third issue with the approved contractor list is that after the contractors are on the approved list, they only have to send in a form stating that they performed the calculations; they do not have to submit the actual calculations that were performed. Therefore, the approved contractors may be simply signing the form and skipping the calculations, or altering numbers to get a desired (rebate-qualifying) result. However, this issue is not deemed significant by TecMarket Works as long as they have demonstrated the skill needed to perform the calculation. It is unlikely that experienced contractors are improperly sizing covered units to a significant degree, and the energy savings are still being achieved. That is, the savings are provided because of the efficiency difference between the same sized units that would have been installed.

However, TecMarket Works agrees that if a load calculation is required (and we are not suggesting that it be required) to qualify for the rebate then the actual calculations should be provided with the application to ensure that they are being completed.

Program Participation

Both of the program managers feel that participation levels and subsequent energy savings from the program could improve.

The CAC program is marketed through newspaper advertising, bill stuffers, bill messaging, and through the contractors. One manager believes that the contractors do a good job of promoting the program, while another believes that Empire could do a better job getting program information out to the contractors for them to promote the program with. After more than two years of program operations, there are still contractors calling Empire each week stating that they had just heard about the program and would like more information about how they and their customers can participate. A mailing to all contractors, distributors, dealers and wholesalers would go a long way to solving this problem.

A program manager explained that 35% of the central air conditioning units in use in Empire's service territory are at least 10 years old. As these units are replaced the potential for achieving

savings is provided in the market. If Empire were to capture the majority of these units though the program the program could meet its energy savings goals. However, there are challenges in getting the word out to the contractors that they need to enroll in the program and explain to their customers that energy efficient improvements are worth the extra cost. A mailing to all contractors in and around the territory can help reach this objective. Other methods of promoting the program and increasing participation are discussed below.

Web Site Promotion

Empire relies heavily on the company's web site for promotion of the CAC program. The Empire web site allows contractors and customers to access program information, application forms, and the approved contractor list. However this information can be difficult for many people to find, especially when equipment changes are typically made while working with their selected contractors. Typically when a unit needs to be replaced, customers discuss the options with their contractors who must install the equipment. It is important for the contractors to be allied with the program. The marketing efforts need to focus on the contractors and trade allies, as well as, but to a lesser degree, the customer making the purchase decisions. This is not to suggest that improvements to customer marketing cannot be achieved. For example, the program may be able to increase participation by making the information easier to find on the Empire web site. The program information on the Empire web site is under a tab called "Smart Energy Solutions", which may be difficult for people to associate with energy efficiency program offerings. While Empire's energy efficiency programs do indeed offer "smart energy solutions", the phrase does not indicate that there are programs and financial incentives for energy efficiency improvements to Empire's customers.

TecMarket Works agrees that using the web is the fastest and most cost-effective way to provide current program information to a wide audience. In addition changes to the approved contractor list or other program changes can be made almost immediately available to the customer that uses the web to inform purchase and installation decisions.

However, the program information needs to be easier for the average customer to find. TecMarket Works asked two of its staff members to measure the amount of time it took to find the program information on Empire's web site. It took one employee 25 minutes to find the CAC program information on Empire's web site. Another employee needed 4 minutes to find the information. TecMarket Works suggests that web pages for energy programs be designed so that inexperienced searchers can find the information they need by spending no more than 5 seconds on each page leading to the information needed by that customer. Searches that take 10 seconds per page or more by a new visitor should be considered improperly designed. The path to the information needed should be readily available and apparent to customers within a few seconds per page and take no more than a minute or two for the new visitor to reach the information needed after first clicking on the Empire website link.

The "Smart Energy Solutions" tab on Empire's web site should be changed to a more descriptive tab name such as "Energy Efficiency Solutions" or "Customer Options for Saving Energy" or similar descriptive link. Empire has space across the web page's tab view for better wording. Empire should consider more descriptive headings for these tabs. Alternatively, there could be a

direct link to all program offerings through a new logo or mascot for all of Empire's energy efficiency programs housed on the main web page or via a clear and convenient link.

Other Ideas for Increasing Participation

Another suggestion offered by the program managers for increasing program participation is to include an AC tune-up component. The service could be offered to all customers, not just those that purchased their AC unit through the CAC program. This service would allow customers to improve the efficiency of their central air units when their systems need repair or service. TecMarket works agrees. Evaluation reports indicate that tune-ups can increase the energy efficiency of the units that are not routinely well serviced if they are conducted by a well trained tune-up contractor that uses specialized sensors and pressure gages and that are careful not to damage pressure valves, lines and seals. However, tune-ups provided by unskilled, semi-skilled or untrained contactors can increase consumption. As a result this option needs to be carefully considered and planned.

New HVAC systems installed under the program may be able to qualify for the ACCA Quality Installation (QI) program[7]. The QI program addresses system sizing, proper refrigerant charge and air flow, and duct leakage sealing. The current contractor training addresses the first two issues; adding a duct leakage sealing component could produce installations that meet the QI spec. Duct leakage sealing in homes with ductwork located in unconditioned attics and crawl spaces can bring additional energy savings and comfort improvements. An additional incentive could be offered for installations that are QI compliant. Simulation modeling conducted for this evaluation indicated that sealing ducts in unconditioned spaces can increase energy savings by about 9% in air conditioner installations and about 20% in air source heat pump installations.

[7] See http://www.acca.org/quality/

Contractor Survey Results

TecMarket Works surveyed 41 out of 72 contractors that are on the approved contractor list for a 57% response rate. The responses and analyses are presented below, and the survey instrument used for this evaluation can be found in Appendix B: Residential CAC Program: Contractor Interview Instrument.

The contractors surveyed by TMW had an average of almost 20 months of experience with the Residential CAC program, as displayed in the table below. The program has been operating since June of 2007 (about 26 months at the time of the survey).

	Duration of Experience
Average	19.75 months
Minimum	8 months
Maximum	24 months

Contractor Involvement with the Program

At the start of the survey, TMW asked the contractors how they were involved with the Residential CAC program in order to hear their explanation of how they participate and utilize the program. Below is a bulleted list of their responses. The first statement is in bold and serves as a summary statement for contractors' involvement, and the statements below are each of the unique statements provided by the contractors during the interview.

- **We do a load calculation and then tell the customer about the program and how to qualify for a rebate:**
  1. We evaluate what the customers' needs are and what their desires are, then use a computer program to analyze loads to size the equipment.
  2. We get calls from clients and we go out to evaluate their home and current system, then we do calculations and advise them on what to purchase.
  3. We do load calculations and tell them about the minimum efficiency needed to qualify for the Empire rebate.
  4. First we make sure they're Empire customers, and then we calculate heat loss and gain on their home, evaluate their equipment needs, and let them know how they can receive the application forms to fill out.
  5. When we get a call from someone to replace equipment, we do a load calculation to see what equipment they need and tell them about program.
  6. We ask our customers if they have Empire service, and if they do we tell them about the rebate, we do heat load calculations and look up the numbers.
  7. We do load calculations, measure dimensions, and size units appropriately.
  8. First we determine if the customer is with Empire, then we perform measurements of the house and Manual J calculations, and then make recommendations for a system that qualifies for the rebate.
  9. We gather material to inform our customers of programs and who offers them, then we size up their house, do a load calculation, and let them know what SEER rating is best for them.

10. We normally do a load calculation, survey their current equipment, and then walk them through the process. We let them know what's available at what cost and the rebates and tax credits that they qualify for.
11. I size the equipment, do a load setting on the home, and then get the customer whatever paperwork they need to send in.
12. When we get a call, we go out to do a load calculation or see what the problem is and make recommendations from there. If applicable, we tell the customers what rebates are out there.
13. We go measure the customer's house and tell them about the rebate to see if they are interested and then do a heat load calculation.
14. I provide them with ARI certs and load calculations and then inform them of the program.

- **We just let the customer know that the rebate exists and how to qualify.**
  1. We just tell the customer what needs to happen if they want to take advantage of the program.
  2. We look at equipment that's included in the program, and then let the customers know what they have to purchase to get the rebate.
  3. We let our customers know that there is a rebate for more efficient units.
  4. We inform our customers of the program's rebate and the government tax credit.
  5. We inform our customers of the rebate and then make sure they will qualify.
  6. We educate our customers about the federal government requiring 13 SEER or better, and the numbers required to get the rebate.
  7. We inform our customers about the federal credits and other incentives. Most of them don't know there are such offers out there.
  8. We inform them about the rebate when they are looking to buy new equipment.
  9. We make sure they are aware of the rebate and offer them equipment that is covered by it.
  10. Our people are qualified for the Manual J load calculations and we push for the best equipment so we inform the customers about the qualifying products.
  11. We inform our customers about the rebate if they are looking to replace old equipment or are building new homes.
  12. Basically, we quote higher efficient equipment and bring up the rebate. If a customer is interested, we continue to talk to them about it. Often people are looking for efficient equipment to begin with and the rebate is just an extra bonus.

- **We use the rebate as a selling point.**
  1. We push the high efficiency options to our customers, but we use the rebate program to help sell them.
  2. If the customer lives in Empire's territory, we get the application form and use it as part of our proposal.
  3. It seems that all of our customers want to make sure they're getting the rebate through the program, so it really helps us sell the high efficiency equipment.
  4. We try to get our customers to purchase a unit that qualifies for the rebate if they have Empire service.

- **We don't try to push them into anything. We just tell them their options**
  1. We always present our customers with all of the options. We don't push people into things, we just give them all the information they need and show them the energy savings chart.
  2. We don't take any steps or push anything unless we're asked by the customer.

- **Miscellaneous**
  1. We sell high efficiency units and like to help our customers save a little money. We try to stay educated ourselves so that we can educate our customers.
  2. After going out and checking out what they need or what the problem is, if a rebated item fits the criteria, I let them know.
  3. I'm a wholesaler, but I provide my dealers with information regarding the rebates and that allows them to push it to their customers.
  4. We give them a bid, do a Manual J on the house, and then see what they are interested in.
  5. We teach customers about the requirements and load calculations and the importance of the SEER rating.

Eight of the surveyed contractors (20%) offered suggestions for streamlining the process for program participation, and most of them suggested that it be more convenient if the forms could be filled out online.

1. The rebate could be filled out over the internet instead of requiring people to print them out. (n= 6)
2. Make the program requirements clearer; people sometimes don't understand the program.
3. It's a hassle to do the paperwork and heat load calculations, but they seem necessary.

Reasons for Participation

All but one contractor surveyed provided TMW with a comment summarizing their reasons for participation. The first statement is in bold and serves as a summary statement for contractors' involvement, and the statements below are each of the unique statements provided by the contractors during the interview.

- **It's a selling incentive; it saves the customer money.**
  1. It's another selling incentive and it helps the customers get some money back.
  2. To inform and help customers. It also helps close deals.
  3. People like the rebates and it helps me make the sale.
  4. It's a good selling point.
  5. It generates sales.
  6. It allows us to sell more high efficiency units and give something back to the customers.
  7. I can offer the customer a better value and they get a better unit that saves more money.
  8. It increases sales and helps my customers.
  9. It helps us sell more units and it helps us get the customers better equipment.
  10. It helps increase sales, and customers have asked for it.

- **It allows the customer to upgrade to better equipment and higher efficiency.**
  1. It gives the customers a chance to get an upgrade.

2. We do it for the benefit of the customers, to help them get better equipment and higher efficiency.
3. It upgrades people's equipment. They like the idea of getting something for nothing.
4. We sensed that it was a good program to induce the customer to upgrade equipment.
5. To help customers get more efficient equipment. It also helps sell higher-end equipment.
6. It gets our customers away from the "bottom of the line," cheap units, and towards more efficient units.
7. So we can sell our customers a better product.

- **We participate to get the most for our customers. Our clients wanted us to participate.**
  1. We were asked to participate. Our clients want it.
  2. It is easy to work with and the customers like to save money and energy.
  3. We like to be personal with the customers and get them the best deal possible.
  4. It is a good service for the customer. We don't work on commission; customer service is our driving force.
  5. We want customers to have lower utility bills and reduce their carbon footprint.
  6. To be able to save people money.
  7. The rebates help my customers save money.
  8. To keep our customers happy.
  9. One of our customers found out about the program and introduced us to it.
  10. We do it for the rebates, and for our customers
  11. To get the best options for our customers.
  12. Most generally, we do it for our customers and their happiness.
  13. We participate for the customers' sake.

- **We want to stay competitive.**
  1. We want to build a service department and keep up with what everyone else has to offer.
  2. We're in it to make money, to sell high-end equipment, and to take care of the customer.
  3. We want to be on the cutting edge and also give our customers an extra hand.
  4. To sell more units, especially high efficiency equipment. I've been pushing it for about 5 years.
  5. To give customers the best possible prices and options for equipment.

- **Miscellaneous**
  1. It gives customers extra benefits to become more efficient and we get to have our name on the list of certified dealers.
  2. It helps my high-end customers.
  3. It offers people another option to look at.

Many of the contractors had suggestions for increasing the participation levels in the program. The majority of the suggestions (8 out of 23, or 35%) involve increased advertising. Their comments are as follows:

- **Increase program promotion and advertising.**
  1. Put something in the bills that they send to customers, or something else to advertise. Dealers shouldn't have to push the program, Empire could be more proactive.

2. Empire should send out more letters promoting the program to its customers.
3. Get the word out about the program. Some of the smaller contractors may not even know about it.
4. Get the word out to people, maybe through a flier in the mail.
5. Let people know about the program. Get them more informed.
6. Advertise. Get some form of ad out on the news about the training workshops for contractors. Print ads and place them in supply houses.
7. Send customers and contractors more information about the program.
8. Advertise it more.

- **Make it easier to get qualified and participate.**
  1. Offer the training class more often.
  2. Make it easier to participate. Buying a program for load calculations and distributing it would be a big help. Such programs are expensive.
  3. Make it easier to get qualification.
  4. Manual J requirements might be part of why some contractors don't want to participate.
  5. The main thing is the paper work, getting it started can be tough, but then it's fine.

- **Offer some type of incentive to the contractors.**
  1. Maybe Empire should give an incentive to the dealer or contractor.
  2. Offer something to the contractors in exchange for pushing the rebated items.
  3. It would be nice to not have to do all the legwork, such as the heat load and the paperwork. Contractors don't get any compensation for that.
  4. Maybe offer some kind of incentive to the contractors.

- **Educate contractors (and public) on the benefits of participation.**
  1. It's hard to do because many contractors are set in their ways, perhaps more education would help.
  2. Provide education, many contractors aren't aware of the program.
  3. Convince contractors that it will create more business.
  4. Educate the public on why they should switch to high efficiency HVAC and help the HVAC companies out a bit more.

- **Increase the incentive amount.**
  1. The incentives aren't high enough.
  2. Increase the incentives.

Benefits of Participation

Contractors reported that they receive many benefits from participation in the program, but most of them (23 out of 37, or 62%) report that the main benefit of participation is the benefit of increased sales and profits, but they also cite being recognized as an approved vendor, and increased satisfaction with their customers. All of the contractors said that their customers generally respond positively when they are told about the program's rebate.

- **By participating in the program, we get more business and it makes us more money.**

1. We get a bigger client base.
2. We get more business.
3. We are able to charge a higher price per job.
4. We get more business.
5. We might wind up selling a little more.
6. We get more sales, especially from higher efficiency units.
7. We get more money in the bank.
8. Selling more high efficiency equipment equals more money.
9. It opens the door to new customers.
10. We maintain a higher profit margin.
11. We get a small improvement in sales, especially with the federal tax return.
12. We get increased sales and better profitability.
13. We get more sales.
14. It drives the cost of the equipment sales up, increasing general revenues.
15. It helps the customer and we see an increase in sales.
16. We can sell more units and make customers happy about a rebate.
17. We are selling higher priced equipment.
18. We get the satisfaction of selling better equipment.
19. We get increased sales and good publicity.
20. We get nothing directly, just a job from the customer.
21. We sell more equipment and I feel we sell more high efficiency equipment. Also, I get to do what's right.
22. We get increased sales.
23. We get an increase in customers.

- **Empire publishes our name saying that we are certified to sell the equipment.**
  1. Empire publishes our name indicating that we're certified and qualified.
  2. My customers can go on the website and see that we are certified with Empire.
  3. We are distinguished from those companies that are not involved.

- **It allows us to offer our customers the best equipment available.**
  1. The biggest benefit is being able to offer customers even more competitive options.
  2. We get to offer customers everything that's available for them.
  3. We can provide better quality equipment.
  4. Customers are able to upgrade to higher efficiency units.
  5. I am getting a better deal for my customers.
  6. We get to sell higher efficiency equipment.

- **We are able to have a better relationship with our customers.**
  1. We are able to provide better customer service.
  2. We are able to have a better relationship with our customers.
  3. We are able to have a better relationship with the customer and sell more high efficiency units.
  4. We are able to help the customer out more.
  5. We get higher customer satisfaction.

We also asked the contractors about the benefits that their customers received through this program. They most often cited that the customers would have lower energy bills in the long run when they opt for the rebated units. All of the contractors surveyed said that their customers are very satisfied with their rebated equipment. Their responses are as follows:

- **The customer gets the money back and a higher efficiency unit.**
  1. They get cash back and more efficiency.
  2. They are getting the rebate and have a better system.
  3. They get a more efficient piece of equipment.
  4. Along with upgraded equipment, they spend less money upfront, and get more savings and a better warranty.
  5. The units are more efficient.
  6. They are getting a more energy efficient unit.
  7. They get better equipment for less money.
  8. They get the rebate money and lowered utility costs.
  9. They have the chance to buy a higher quality piece of equipment.
  10. The rebate encourages them to buy higher efficiency equipment, leading to lower utility bills.

- **The customer is going to save money on their energy bills in the long run.**
  1. Over the long haul, they're going to save money.
  2. They get lower utility cost, lower installation cost, and more comfort.
  3. They lower their energy bills for the long term.
  4. They get a utility cost reduction.
  5. They save money in the long run.
  6. They are getting a break on equipment cost and saving money in the long run.
  7. They will have lower monthly bills.
  8. The rebate allows them to get a little better equipment than they would have otherwise and they will save on bills from now on.
  9. The new unit will pay for itself in about two years through savings on the electric bill.
  10. They get the initial rebate and long term savings.
  11. They save money now and in the long run.
  12. They will have lower utility bills.
  13. They save money in the long run and get a little back now.
  14. They will see energy savings for a long time.
  15. It saves them money in the long run and it’s a quieter unit.
  16. They save money.
  17. Their efficiency goes up and they save money in the long haul.
  18. They get lower utility bills.

- **Miscellaneous**
  1. They get a new warranty, a rebate, and more home selling options.
  2. In the short term, they get the rebate. Long term, they have a better warranty.
  3. They get piece of mind. They know they're getting the best technology that's out there.
  4. Half the price of the upgrade is covered.
  5. They save money and help the electric company.

6. They save money and get a quieter unit.
7. They save money and get more comfort and a quieter machine.
8. They get a much better product, their home is better taken care of, they get long term energy savings, and better quality control.
9. Their power usage goes down, and they get a better warranty.
10. They save money and can make their home more comfortable.
11. They get more comfort and savings.

We asked the contractors if customer callbacks have increased or decreased with the rebated equipment. Four out of 38 (11%) said that customer callbacks have increased, and when asked why, they provided the following responses:

1. We get more calls because there are some issues with the thermal expansion valves on the indoor coils. We have had to do many replacements.
2. A little bit more because sometimes different thermostats are necessary or we get folks that don't understand. The problem is usually the homeowner, not the equipment.
3. Higher efficiency units can be a bit quirky, therefore calls increase a little, but once the systems are set up properly, the calls stop.
4. We get more calls because many older homes have older thermostats that must be upgraded to be programmable with the new units.

Changes to Contractors' Business as a Result of Participation

Over half of the surveyed contractors indicated that their participation in the Residential CAC program has resulted in changes to their business, and that the changes are positive.

Table 7. Has your participation in the program made a change in your business?

	Percent Responding
Yes	54%
Maybe a little	21%
No	26%

Comments about changes to the contractors' businesses as a result of their participation:

- **Yes, our business has improved.**
  1. Yes, all the coops have improved.
  2. Yes, all the rebate programs work together.
  3. There is probably some. People may upgrade to a little higher efficiency and that improves our business through higher sales.
  4. Yes, I get more sales overall.
  5. Yes, I make more profit the more expensive the equipment is.
  6. Yes, it has helped some. It helps close some deals.
  7. Yes, we have gotten more jobs.
  8. Not a whole lot, it has been steady, about the same as last year. There was no drop-off due to the economy though, so that could be attributed to the program.
  9. Yes, people are trying to be more cost effective.
  10. Yes, it sets us above the lower rung of service providers.

11. Yes, we get better referrals.
12. Yes, especially last winter. It promoted a lot of work.
13. Yes, it allows for more sales of higher efficiency units.
14. Not as much as I had hoped, but it has helped.
15. Yes, it has enabled us to sell higher efficiency models.
16. Yes, it has allowed us to sell more high efficiency units.
17. We think so, we have started doing a lot more ground source than we used to.
18. I'm sure it has helped sell higher efficient equipment.

- **No, our business has not improved.**
  1. I run such a small business that this probably hasn't changed anything.
  2. No, I don't think so.
  3. No, because we don't push it.
  4. Not particularly, we've been able to sell more high efficiency though.
  5. It really hasn't, we've always give the option of higher efficiency.
  6. I only cover a small portion of Empire's district, so not a noticeable difference.

- **Maybe, it's hard to say.**
  1. Not enough to say definitely.

Table 8. Do you market equipment differently?

Do you market equipment differently in general?	Percent Responding
Yes	31%
No	69%
Do you market CAC-rebated equipment differently?	
Yes	39%
No	61%

Comments provided about how they market AC units differently:

1. Yes, we sell more efficient equipment.
2. We more aggressively try to sell a higher SEER piece of equipment.
3. We present more options to the customer.
4. There is more emphasis on comfort for the home and energy cost.
5. If units have rebates, I'll push those a bit more.
6. Yes, we lean more toward specific units than before.
7. I bid high efficiency every time. I bid unless they say otherwise.
8. We always push high efficiency.
9. I push high efficiency units more than I did before the program.

In addition, four of the contractors indicated that they have added other energy efficient equipment to their inventory such as high-efficiency water heaters and programmable thermostats as a result of increased customer interest in more efficient products that may be related to the program's rebate.

The contractors we spoke to estimate that their sales of high-efficiency heat pump and AC units have increased by about an average of 38% since the program started, and they estimate that about 70% of the sales of high efficiency AC units occurred with the help of the program rebate. All but one of the contractors interviewed believe that the Residential CAC program should continue and provide the incentive for customers to opt for the higher efficiency units.

Reported Problems

Very few contractors reported any problems with the Residential CAC program. Of the 41 surveyed, 9 (22%) indicated that they had issues with the program.

1. It's the lowest rebate out there, but it's a simple process.
2. I have had trouble finding the forms to print out.
3. It seems tailored to the wealthy consumers. Also, manufacturers have semi-efficient equipment that is hard to sell now.
4. To get to the required efficiencies is a pretty good cost increase.
5. People didn't see why they had to go to such a high efficiency unit, some can't afford it.
6. The first problem was having to go to the classes.
7. The required SEER rating is a bit high.
8. I've had issues arise with timeliness. A quick online access would be much better than the way it is now. Simplify the form so the customer can fill them out online as well.
9. Twice I filled out the papers and they came back saying that the customer wasn't qualified.

Only 4 (10%) of the contractors surveyed indicated that they received customer complaints regarding the program. The complaints received were explained as follows:

1. They didn't get the money, not sure about the particulars.
2. People with old units, 150,000 BTU for example, don't want to downsize according to load calculations.
3. It is hard to qualify for.
4. The paperwork can be confusing.

Fifteen percent (n=6) of the contractors said that customer call-backs have increased due to the equipment installed through the program, and that these issues usually stemmed from issues with variable speed drives, or with programmable thermostats not matching properly with the new equipment.

Only two (5%) of the contractors surveyed indicated that they had complaints about the program:

1. Many people don't run a load before they bid a job and don't know how to read their loads.
2. It can be difficult to attend the training sessions to become an approved contractor.

Technologies Covered by the Program

The contractors mostly agree that the proper technologies are covered by the program. Out of the 41 contractors surveyed, only seven felt that there should be changes made to the equipment that's rebated. Their comments are below:

1. Other providers are being more aggressive with geothermal.
2. Perhaps 14 SEER should be included, and the rebate should scale with tonnage.
3. Offering hybrid dual fuel system would be better than just going off of SEER ratings. Possibly lower the requirements.
4. Sometimes we fail to take our victories where we can get them. If a person has a gas furnace, we can put a heat pump on. If there's no variable speed gas furnace, there's no way to put on a heat pump.
5. Maybe lower the minimum SEER.
6. I'd like to see them cover dual fuel systems.
7. If anything, it should fall closer with the federal guidelines so there is some continuity.

Eleven of the surveyed contractors (27%) had some comments about other technologies that Empire should offer through this program:

1. Variable speed air handlers on a total electric system as well as dual fuel systems
2. Geothermal and high efficiency insulated electric water heater
3. Attic ventilators
4. Geothermal and dual fuel systems
5. 14 SEER systems
6. 2-stage compressors
7. Humidifiers
8. Ground source units, if they are not already covered, as well as solar assisted units
9. Hybrid systems and dual fuel systems

None of the contractors thought that any of the equipment included in the program should be removed.

Incentives Offered Through the Program

Over 80% of the interviewed contractors felt that the incentive levels were appropriate. Those that think they should be altered offered the following feedback:

1. I think the incentives should be a little bit higher. Some kickbacks to the dealer that is pushing it would be nice, too, as there's no incentive for the dealer to push the high efficiency items.
2. The rebate is too low, especially for ground source heat pumps.
3. It could maybe drop down to 14 SEER as a starting point.
4. The 16 SEER incentives should be higher, otherwise it's pretty good.
5. We sell Goodman equipment exclusively. Right now the rebate does not cover all of the additional costs.
6. Either the incentives need to be higher or they should start at a lower SEER (14 maybe). Also include higher rebates for ground source.

The contractors that TMW surveyed estimated that about 55% of their customers opt for the more efficient options covered by the rebate, and they offered the following comments:

- **The majority of our customers take advantage of the rebate.**
  1. Nearly everybody takes advantage of it, many people are already aware of the rebate when they come in.
  2. Most customers tend to go with high efficiency.
  3. Most people are already set on an efficient option. The incentive very rarely makes or breaks the deal.
  4. The rebate often pushes people over the fence; they usually take advantage of it.
  5. Most people are well informed and would buy the rebated items anyway.
  6. The Empire and federal incentives push them over the fence and they go with the efficient option.

- **The rebate does not seem to be enough for most of our customers to purchase the more efficient option.**
  1. I'm not sure if my customers would buy the high efficiency units or not without the rebate since the majority of my customers aren't in Empire's service territory.
  2. No, I think that a lot of people repair their old units with the current economy.
  3. The rebate does help some, about 35% go for it, but sales were higher before, when the economy was a bit better.
  4. I don't think the rebate is enough to convince someone who wasn't previously interested in high efficiency, but it helps those on the fence.
  5. Due to the economy, not as many are spending more money upfront for the high efficiency units.
  6. The rebate helps, but usually doesn't make or break the sale.
  7. Most often, the rebate is not enough to push someone over the fence if they are not already looking to get a high efficiency system.

- **The rebate helps to convince customers to go more efficient.**
  1. If the customer can afford the upgrade they take it.
  2. We have sold more high-end equipment this year than ever before.
  3. The rebate helps convince them to buy the higher efficiency units.
  4. The rebate brings them into the ballpark.
  5. For the first time in several years, customers look at spending more money to go more efficient.
  6. The rebate definitely helps, it covers around half of the cost of the upgrade.

Program Operations: Rebates

Most of the contractors (75%) didn't know how long it took for their customers to receive their rebates, but the ten contractors that were able to estimate the length of time indicated that they thought the rebates were received by the customers in about four weeks. The program managers estimate that it takes about 2 weeks for rebates to be delivered to the customers.

Program Operations: Communications and Materials

Almost all (92%) of the surveyed contractors are happy with the communication they have with Empire and program staff. Some of them provided comments about their communications with Empire staff:

- We don't usually need to talk to them, but they are great when we do.
- Anytime we call we get our questions answered.
- We have not had a lot of communication, but our questions have been answered quickly when we have them.
- I would give it a seven or eight out of ten. It has been fairly adequate, and they return calls.
- I don't talk to them often, but they are always very courteous.
- The Empire staff has been wonderful.
- They've always been good to talk to.
- They do a good job.

However, of the 41 contractors surveyed, 18 of them (44%) indicated that they would like some program materials to help encourage their customers to purchase the high efficiency units and apply for the rebate. Fifteen of them suggested that Empire distribute brochures or other printed materials to the contractors for them to share with their customers.

1. We would like pamphlets, fliers or some type of brochure to give to our customers.
2. We could use some brochures.
3. We don't have any brochures at all from Empire.
4. We don't really have much. We could use some materials to help bridge the gap to high efficiency.
5. We could sell better if we had more information that the customer could understand better.
6. It would be handy to have something to give the customers. The only thing I have is a sheet that I printed out. Handouts would be nice, and more professional.
7. I don't have any forms on hand; it would be good to have some.
8. It would help if I could have a guideline for exactly what qualifies for the rebate.
9. It'd be nice if Empire sent us some brochures.
10. Empire should send us out some program materials.
11. Empire doesn’t supply me with any, I think they usually give it to the customers.
12. Everything I have comes from the Internet. I would like some brochures if they become available.
13. All the information is available online, but it would be nice if Empire printed and sent out some things for us.
14. It would be nice to have things sent to us, rather than available online for print.
15. I could use more. Everything has to be printed off the internet; Empire should print and distribute some.

What Works Well

Most of the contractors (90%) had responses when we asked them what they thought worked well in this program.

- **The rebate is a good motivator for customers to become more efficient.**
  1. The rebate is the main incentive for everybody, and they get a more efficient system.
  2. Just having the step-ups from one efficiency to the next is a good incentive to move up.
  3. The incentive for people to upgrade; money is a good motivator.
  4. It gives people more incentive to buy more efficient equipment.
  5. Money is a great motivator for contractors and homeowners.
  6. It is an inducement to buy better equipment.
  7. It gives customers an incentive to get more efficient equipment.
  8. It gives people a little extra reason to upgrade to a more energy efficient unit.
  9. It gives people an incentive to upgrade to an efficient unit.

- **The customer gets money back immediately and in the long run.**
  1. The customer gets a check back.
  2. The kickback to the customer is extra money in their pocket.
  3. The customer gets a quicker return.
  4. The whole process of offering rebates for high efficiency works because it's easy to do and the customer can reduce their utility bills.
  5. It gives the customer an option to go with better equipment that will save everyone money in the long run.
  6. It is a cash rebate and customers get it really quick.
  7. The incentive.
  8. Anytime people get money back they are happy.
  9. They have picked a high enough efficiency rating to make a difference in utility bills.
  10. It helps people save money and increases their comfort level.

- **The customer is able to purchase better equipment.**
  1. The customer sees that they get something back from the utility company. In the long run, they get better quality equipment and reduced utility costs.
  2. It gives the customer another option, saves money, and allows them to get better equipment.
  3. It helps people get better units.

- **It helps all three parties involved: Empire, the contractor, and the customer.**
  1. Everyone gets something out of it.
  2. It benefits all 3 parties involved.
  3. It helps us sell better units and customers save money on something they should ideally buy anyway.
  4. It helps out Empire, it helps contractors sell more units, and it helps the customers save money.

- **Miscellaneous**
  1. It's the right thing to do at the right time.
  2. Customers are geared into energy conservation and Empire is helping.
  3. The heat load helps the customer get the right unit, a proper match for their home.
  4. The fact that it actually helps to decrease the cost of the installation. Also, there is some rebate stacking with the tax credit.

5. It works well as long as the customer knows that the rebate exists.
6. It all works well.
7. Getting the contractors trained and educated is good because customers all go to different contractors.
8. They require model numbers to verify equipment put in which adds accountability.
9. Ultimately, it's up to the contractors whether it works well or not. If they are ill informed, the program won't work.

Suggested Improvements to the Program

About half (51%) of the contractors offered suggestions for improvements to the program. The most common response was about how they would like to see more promotion of the program, either through increased advertising or printed materials for customers.

- **Provide more information to the contractors and advertise more.**
  1. Give out more brochures to contractors to hand out to customers.
  2. Give a little more information to the homeowners, maybe a packet in their bill to make them aware of the rebate program.
  3. Provide literature for the contractors to give out or advertise it more.
  4. Try to get forms out to contractors.
  5. Give it more publicity.
  6. Advertise it in utility bills.
  7. Do more advertising, not many people are aware of it.

- **Lower the SEER rating requirement.**
  1. 15 SEER is pretty high, but maybe that's where it needs to be.
  2. Lower the minimum seer rating.
  3. If it were easier to get people to qualify, it would be a great incentive.
  4. Include SEER 14 units.

- **Increase the rebate.**
  1. Increase the rebate. (n=3)
  4. Increase the rebate on the 16 SEER.

- **Cover dual-fuel systems.**
  1. Not enough equipment is covered, dual fuel for example.
  2. Include dual fuel systems.

- **Miscellaneous**
  1. Give higher incentives and send out flyers to show people the potential savings. Assume that people have a SEER 8 unit and show the savings at SEER 16. From our standpoint, the load calculations are difficult for new houses, and the old houses may not be accurate. Also, the class can be difficult to attend.
  2. Raise the incentives, make ground source rebates larger, and lower the minimum SEER to 14.

Contractor Training

Twenty of the contractors that TMW surveyed had completed the training session offered by Empire. We asked these contractors about their satisfaction with various components of the training sessions. We asked them about the convenience of attending the session, the knowledge of the instructor, the comprehensiveness of the subjects covered, the materials handed out at the session, the length of the session, and the overall value of the training session. We asked them to rank their satisfaction on a 1-10 scale, with a rank of 1 indicating that they were completely dissatisfied and 10 indicating that they were completely satisfied. Figure 6 below presents the mean satisfaction scores provided by the 20 contractors that completed the training and the phone survey.

Figure 6. Mean Satisfaction Scores

Training session attendees were most satisfied with the knowledge of the instructor, providing him with a mean satisfaction score of 9.6 out of 10. The lowest score (7.8) was given to the convenience of attending the session. However, this is still a good score, especially given the geographical area that Empire covers.

If the surveyed contractor provided a score of 7 or lower to any of these components, we asked for a comment about why they provided a lower score, or how the training could improve. These comments are provided below.

Convenience of the Training Session

- I had to get it elsewhere.
- It was in Aurora, which is quite a drive for me. I wish it were local.
- It was a long drive.
- It's tough to find time.
- Make it closer to Springfield.

Comprehensiveness of the Subjects Covered

- Make it a little longer session, so it's not so rushed.
- The instructor deals with a variety of homes.
- It would take more time to be comprehensive.
- The instructor went through the basics for too long and if you don't know the basics you shouldn't be in the class.

Materials Handed Out at the Session

- There could have been more. There wasn't a whole lot of stuff as far as tools to use. We don't want to do load calculations by hand since it can be done with computers. Empire should give people discounts on load calculation software and then teach how to use it.
- Some of the materials seemed old.
- More brochures and literature could have been utilized.

Amount of Time for the Training Session

- It was a bit short.
- I would have liked more time, maybe have it over 2 days.
- They kind of cram through it in the little class; it could have been longer.
- There was not enough time in there, too quick to teach somebody to do heat loss/heat gain calculations or to know how to properly set up a system.
- It needs to be longer and more in depth.
- It needed to be longer.

In addition to the satisfaction questions, we also asked the contractors that attended an Empire training session to tell us the most important thing they learned during the session. Their responses are below.

- **I learned more about heat load calculations.**
  1. I learned how to do load calculations by hand, and now I understand the computer software more.
  2. I got clarifications on load calculations.
  3. I learned more about load calculations.
  4. I learned how to do load calculations. I didn't have any experience with those and have used them a number of times since.
  5. I learned how to do load calculations.
  6. I learned how to interpret data from load studies.
  7. I learned the importance of load calculations.

8. I learned about load calculations.

- **The course was a good memory refresher.**
  1. It was a good memory refresher.
  2. It was a good confirmation, because we had already been doing the things that they talked about.
  3. It went back to the basics, a good refresher.

- **Miscellaneous**
  1. I learned about the technical parts of airflow.
  2. I learned more about heat loss/heat gain calculations.
  3. I learned about the differences on R-values in older homes/newer homes.
  4. It was good general information.
  5. I learned about airflow.
  6. I learned more about zone calculations.
  7. I got some good duct sizing information.
  8. I learned what to look for: windows, filtration.
  9. I learned about making sure efficiencies are right for the size of the home.
  10. I have started putting in larger filters since learning about the benefits.
  11. I learned that there are many people that don't know what they are doing out there.

Difficulty of Subjects Covered

Of the 17 contractors that responded to this question, over 76% of them thought that the difficulty level was about right.

	Percent Responding
About right	76%
Too complex	6%
Too basic	18%

Impact Analysis Results

Unit Energy and Demand Savings

A summary of the simulation results is shown in Table 9. Savings results are shown for each SEER class and air conditioner or heat pump type.

Table 9. Normalized Measure Savings from Prototype Simulations for Old and Existing Vintages

Type	Measure Efficiency	Baseline Efficiency	kWh/ton savings	kW/ton savings
Air conditioner	SEER 14	SEER 13 CAC with 150% oversizing and improper RCA adjustments	331	0.306
	SEER 15		339	0.320
	SEER 16		323	0.317
	SEER 17		416	0.371
Air source heat pump	SEER 14	SEER 13 air source heat pump with 150% oversizing and improper RCA adjustments	342	0.366
	SEER 15		461	0.472
	SEER 16		545	0.450
	SEER 17		585	0.439
	SEER 18		640	0.472
Ground source heat pump	EER 17	SEER 13 air source heat pump with 150% oversizing and improper RCA adjustments	631	0.495
	EER 19		720	0.543

Table 10. Normalized Measure Savings from Prototype Simulations for New Vintage

Type	Measure Efficiency	Baseline Efficiency	kWh/ton savings	kW/ton savings
Air conditioner	SEER 14	SEER 13 CAC with 150% oversizing and improper RCA adjustments	386	0.258
	SEER 15		393	0.287
	SEER 16		386	0.327
	SEER 17		484	0.378
Air source heat pump	SEER 14	SEER 13 air source heat pump with 150% oversizing and improper RCA adjustments	368	0.434
	SEER 15		490	0.491
	SEER 16		529	0.537
	SEER 17		550	0.530
	SEER 18		605	0.558

Note, the peak demand savings are not proportional to the difference in SEER, due to different strategies used by manufacturers to achieve a particular SEER rating and the influence of those strategies on energy efficiency under peak conditions. For example, units using multiple compressors can have high SEER ratings, while having relatively poor efficiency under peak conditions. Heat pumps save energy for both heating and cooling, thus the overall annual energy savings are greater for heat pumps than air conditioners. Also, heat pumps have different performance characteristics than air conditioners, causing differences in the demand savings within each SEER class.

Program Energy and Demand Savings

Gross Energy and Demand Savings

The gross unit energy and demand savings estimates described in the previous section were applied to the program tracking system. The HVAC unit make and model data were used to determine the unit nominal cooling capacity. The unit type and SEER designations were used to assign the appropriate gross savings by SEER category. Simulation results were interpolated for units falling between the SEER class results in the tables above. The simulation results were extrapolated from the highest SEER class savings for the few units with higher SEER than the values shown in the table above.

The savings were totaled across the participants listed in the program tracking system. The program total savings are based on 87 air conditioner applications, 253 air source heat pump applications, and 8 geothermal heat pump applications. The coincident demand savings were estimated using a coincidence factor for central air conditioning of 0.75.

Table 11. Program Gross and Net Savings Estimates

	kWh savings	Non-coincident kW savings	Coincident kW savings
Gross program savings	568,339	518	389

Benefit Cost Test

Table 12. Benefit Cost Test Results for the CAC Rebate Program

Test	Net Present Value	B/C Ratio
Total Resource Cost	+ $325,432	2.16
Societal Cost	+ $352,250	2.25
Participant Cost	+ $703,830	3.69
Utility Cost	+ $273,545	2.64
Ratepayer Impact Measure	- $320,199	0.58

The total resource cost (TRC) test showed a positive net present value (NPV) for the Central Air Conditioner Rebate Program of $325,432. This indicates that, over a 15 year effective useful life, the avoided energy and avoided demand savings will be sufficient to recuperate and exceed the initial program cost, less the incentives, of $19,265 plus the participants' equipment cost of $261,521. A benefit cost ratio greater than one (2.16) indicates that this program can be considered cost effective from the perspective of the utility and the ratepayer. A sensitivity analysis concludes that the program would remain economical until the participants' costs exceeded $613,770.

The societal cost test also produced a positive NPV for the CAC Rebate Program of $352,250. The societal test aims to represent the program from the point of view of the society as a whole, capturing all estimated benefits and costs, including externalities that are documented. In this case, externalities are made up of the avoided environmental damage costs, totaling $33,752. This amount was added to the savings from the TRC test and the benefit cost ratio was recomputed to be 2.25. Again, the ratio is greater than one. Therefore, the program is deemed cost effective from the societal perspective.

To supplement these tests, a participant cost test and a utility cost test were done. The purpose of these tests is to isolate the participants and the utility and assess the program's cost effectiveness from both perspectives. The tests both produced a positive NPV and a benefit cost ratio greater than one for the CAC Rebate Program at $703,830 with a ratio of 3.69 and $273,545 with a ratio of 2.64 respectively. This means that the benefits outweigh the costs for both the participants and the utility. This program is therefore cost effective from both the perspective of the participant and the utility.

Finally, a ratepayer impact measure test was done. This test is a measure of the difference between the change of total revenues paid to a utility and the change in total costs paid by a utility. The test produced a negative NPV and a benefit cost ratio of less than one of -$320,199 and 0.58 respectively. Thus, this program is not cost effective from the perspective of the ratepayer because rate levels will increase as a result of this program. If retail rates are higher than marginal costs, few programs pass this test. This is because the benefit of avoided supply costs will be eclipsed by the revenue losses.

Table 13. Parameter Values and Assumptions for Benefit Cost Tests

Parameter	Value		Assumption	Value
Number of Participants	348		Avoided Energy Cost	$0.03436
Project Life (years)	15		Demand Cost	$51
Project Analysis Year 1	2009		Environmental Externalities	$0.0031
kWh/yr. Saved	568,339		Retail Rate	$0.09459
kW/yr. reduction	398		Escalation Rate	3.00%
Utility Project Cost	$166,315		Societal Discount Rate	3.22%
Incentive Cost	$147,050		Participant Discount Rate	3.22%
Participant Cost	$261,521		Utility Discount Rate	8.44%

Appendix A: Management Interview Protocol

Name: _____

Title: _____

Position description and general responsibilities:

_____

_____

_____

We are conducting this interview to obtain your opinions about and experiences with the Residential Central Air Conditioner Rebate program, which I will refer to as the CAC program. We'll talk about the CAC Program and its objectives, your thoughts on improving the program, and the technologies the program covers. The interview will take about an hour to complete. May we begin?

Program Objectives

1. In your own words, please describe the CAC Program's current objectives. How have these changed over time?

2. In your opinion, which objectives do you think are best being met or will be met?

3. Are there any program objectives that are not being addressed or not being addressed as well as possible or that you think should have more attention focused on them? If yes, which ones? How should these objectives be addressed? What should be changed?

4. Should the program objectives be changed in any way due to technology-based, market-based, or management-based conditions? What objectives would you change? What program changes would you put into place as a result, and how would it affect the operations of the program?

Operational Efficiency

5. Please describe your role and scope of responsibility in detail. What is it that you are responsible for as it relates to this program?

6. Please review with us how the CAC Program operates relative to your duties, that is, please walk us through the processes and procedures and key events that allow you to currently fulfill your duties.

7. Have any recent changes been made to your duties? If so, please tell us what changes were made and why they were made. What are the results of the change?

8. Describe the evolution of the CAC Program. How has the program changed since it was it first started in June of 2007?

9. Do you have suggestions for improvements to the program that would increase participation rates or interest levels?

10. Do you have suggestions for improving or increasing energy impacts?

11. Do you have suggestion for the making the program operate more smoothly or effectively?

Program Design & Implementation

12. *(If not captured earlier)* Please explain how the interactions between the contractors, customers, and CAC's management team work. Do you think these interactions or means of communication should be changed in any way? If so, how and why?

13. How do you determine which heat pumps and air conditioners are included in the program? How do you determine what efficiency levels should be placed in the program for heat pumps and central AC units? What should be changed about this selection process? Do you think this would result in more contractors and/or customers participating in the program?

14. Describe your quality control and tracking process.

15. Are industry experts, trade professionals or peers used for assessing what the technologies or models should be included in the program? If so, how does this work?

16. Are industry experts and trade professionals used in other advisory roles? If so, how does this work and what kinds of support is obtained?

17. Describe CAC's contractor program orientation training and development approach. Are contractors getting adequate program training and program information? What can be done that could help improve contractor effectiveness? Can we obtain training materials that are being used?

18. In your opinion, did the incentives cover enough different kinds of energy efficient products?

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

If no, 18b. What other products or equipment should be included and why?

_____

_____

19. What market information, research or market assessments are you using to determine the best target markets or market segments to focus on?

20. What market information, research or market assessments are you using to identify market barriers, and develop more effective delivery mechanisms?

21. Overall, what about the CAC program works well and why?

22. What doesn't work well and why? Do you think this discourages participation or contractor interests?

23. Can you identify any market, operational or technical barriers that impede a more efficient program operation?

24. In what ways can these operations or operational efficiencies be improved?

25. In what ways can the program attract more participants?

26. How do you make sure that the best information and practices are being used in CAC operations?

27. *(If not collected above)* What market information, research or market assessments are you using to determine the best target markets and program opportunities, market barriers, delivery mechanisms and program approach?

28. If you had a magic wand, what one thing would you change and why?

29. Are there any other issues or topics you think we should know about and discuss for this evaluation?

Appendix B: Residential CAC Program: Contractor Interview Instrument

Name: _____

Title: _____

Position description and general responsibilities:

_____

_____

_____

We are conducting this interview to obtain your opinions about and experiences with the Empire Residential Central Air Conditioner Rebate Program, which I will refer to as the CAC program. We'll talk about your understanding of the CAC Program and its objectives, your thoughts on improving the program, and the technologies the program covers. The interview will take about an hour to complete. May we begin?

Understanding the Program

We would like to ask you about your understanding of the CAC program. We would like to start by first asking you to…

1. Please review for me how you are involved in the program and the steps you take in the participation process. Walk me though the typical steps you take to help a customer become eligible for this program and what you do to receive or help the customer receive the program incentive.

2. What kinds of problems or issues have come up in the CAC program?

3. Have you heard of any customer complaints that are in any way associated with this program?

4. Have callbacks increased due to the program technologies?

Program Design and Design Assistance

4. Do you feel that the proper technologies and equipment are being covered through the program?

5. Are the incentive levels appropriate? How do they impact the choice by the customers of the higher efficient equipment?

6. Are there other technologies or energy efficient systems that you think should be included in the program?

7. Are there components that are now included that you feel should not be included? What are they and why should they not be included?

Reasons for Participation in the Program

We would like to better understand why contractors become partners in the CAC Program.

8. How long have you been a partner in the CAC Program? *(program started in June 2007)*

9. What are your primary reasons for participating in the program? Why do you continue to be a partner?…. *If prompts are needed*… Is this a wise business move for you; is it something you believe in professionally, is it that it provides a service to your customers, or other reasons?

10. Has this program made a difference in your business? How?

11. How do you think Empire Electric can get more contractors to participate in this program?

Program Participation Experiences

The next few questions ask about the process for submitting participation forms and obtaining the incentive payments.

13. Do you think the process could be streamlined in any way? How?

14. How long does it take between the time that you apply for your incentive, to the time that you and your customer receive the payments? Is this a reasonable amount of time? What should it be? Why?

15. Do you have the right amount of materials such as forms, information sheets, brochures or marketing materials that you need to effectively show and sell your CAC heat pumps and air conditioners? What else do you need?

16. Overall, what about the CAC Program do you think works well and why?

17. What changes would you suggest to improve the program?

18. Do you feel that communications between you and Empire's CAC program staff is adequate? How might this be improved?

19. What benefits do you receive as a result of participating in Empire's CAC Program or from selling CAC items?

20. What do you think are the primary benefits to the people who buy a CAC rebated item. Are there other benefits that are important to a potential customer?

Training Participation Experiences – if interviewee attended
The next few questions ask about training session you attended.

I will read a list of items, after I read each item please tell me how satisfied you are with that item. Please indicate on a 0 to 10 scale with a 10 meaning you are very satisfied and a 0 to mean you are very dissatisfied.

How satisfied are you with…

19. **The convenience of attending the training sessions?** _____Score

If 7 or less, **How could this be improved?**_____

_____

20. **The knowledge of the instructor?** _____Score

If 7 or less, **How could this be improved?**_____

_____

21. **The comprehensiveness of the subjects covered?** **_____Score**

If 7 or less, **How could this be improved**?_____

_____

22. **The materials and information handed out at the session**? _____Score

If 7 or less, **How could this be improved**?_____

_____

23**. How about the amount of time for the training session, was it …**

1) ❑ **Too long**,
2) ❑ **About right, or**
3) ❑ **Too short**?

24. **What would you say are the most important things you learned from the training session**?

Response:1 _____

Anything else? *If no, go to Q26.*

Response:2 _____

Anything else? *If no, go to Q26.*

Response:3 _____

25. **If you could change one thing about this session, what would that be?**

Response:1 _____

Anything else? *If no, go to Q27.*

Response:2 _____

26. **Were there topics that were too basic or too advanced, or that you think didn't belong in the session?**

Response:1 _____

Anything else? *If no, go to Q27.*

Response:2 _____

27. **Using a 0 to 10 scale, with 0 meaning not at all valuable and a 10 meaning very valuable, how would you rate the overall value of the training session?**

_____Score

Market Impacts and Effects

28. How do you make customers aware of the Program?

29. Are customers more satisfied with this equipment? Why or why not?

30. Do you have fewer calls or more calls to correct problems with the CAC appliances?

31. Do you market or sell the CAC equipment differently than your other equipment? How?

32. Other than the energy efficient heat pumps and air conditioners, has the program influenced you to carry other energy efficient equipment that is not rebated through the program?

    a. *If yes,* what do you now carry?

Central Air Conditioner Questions

33. Has the program influenced your decision to market or sell more high efficiency air conditioners than you would have without the program?

    a. *If yes,* To what extent?

34. Of those energy efficient central AC units that were rebated through the program, what percent of those customers do you think would have still gone with an energy efficient model if the Empire rebate were not available?

35. What percent of these customers do you think were in some way influenced by the rebate Empire offered?

36. What percent of your total high efficiency central AC sales were rebated through the Empire program last year?

37. In your opinion is the CAC program needed? Why?

Heat Pump Questions

38. Has the program influenced your decision to market or sell more high efficiency heat pumps than you would have without the program?

    a. *If yes,* To what extent?

39. Of those energy efficient heat pumps that were rebated through the program, what percent of those customers do you think would have still gone with an energy efficient model if the Empire rebate were not available?

40. What percent of these customers do you think were in some way influenced by the rebate Empire offered?

41. What percent of your total high efficiency heat pump sales were rebated through the Empire program last year?

We would like to know what your practices were before you became a partner in the program, and what you would offer your customers without the program.

42. Currently there are no plans to terminate the program, but we would like to know how the program affects contractors. If the program were to be discontinued, would you still offer the same energy efficient equipment options?

43. If the program were not offered, how would you structure pricing differently to make up for the program loss?

Recommended Changes from the Participating Contractors

44. Are there any other changes that you would recommend to Empire Electric for their Program not already discussed?

45. If you had a magic wand to make any changes you wanted to these programs, what changes would you make to this program?