Final Report

An Evaluation of the Commercial & Industrial Rebate 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 Commercial & Industrial Rebate (C&I Rebate) Program. This program's primary goal is to save energy by providing financial incentives to Empire District Electric's C&I customers through a rebate for high efficiency improvements. These improvements can be either prescriptive or custom in nature. The program is expected to lower the participants' utility bills and also to reduce peak demand. This evaluation focuses on participants that received a rebate between June 2007 and May 2009.

Summary of Findings

1. The incentive rebate is capped at $20,000 per year, per customer. This means that the customer can do the same measure during the second year of their participation, such as completing a lighting project in another part of the plant. However, it also means that participants who have significant savings potentials may be forced to delay their projects, waiting for Empire's rebate period requirements to pass. This restriction can slow savings for customers with large savings potentials unless all of the portfolio's allocated funds are spent each year. This can result in non-acquisition of cost effective energy resources for Empire's customers that must be provided with higher cost conventional supplier. This rule, while helping to stretch resources over the program period, essentially increases costs to the program and to the customer and slows acquisition of cost effective resources.

2. The majority of the customers that were surveyed learned of the program from their contractors or electricians, or from an Empire employee directly. Only 2 out of 39 customers that we surveyed said that they learned of the program through a direct mailing from Empire.

3. Thirty-three of the customers surveyed (85%) indicated that the rebate was the primary or an important reason for the decision to install the energy efficient option.

4. The customers have a high level of satisfaction (9.08 out of 10) for the program overall.

5. The savings from the C&I Incentive Program are summarized in the table below. More details can be found in Impact Analysis Results.

Program Element	Claimed Savings		Realization Rates		Evaluated Savings	
	kWh	kW	kWh	kW	kWh	kW
Custom lighting	3,514,049	493	1.10	0.97	3,848,013	479
Custom other	436,783	14	0.40	0.85	175,880	12
Prescriptive lighting					142,273	39
Prescriptive HVAC					5,545	3
				Total	4,171,711	532

Recommendations

TecMarket Works and Building Metrics have the following recommendations for the C&I Rebate Program:

1. Empire should consider changes to the energy audit rebate structure to increase the benefits of participation for potential large savers. The rebate levels can be calibrated to achieve cost effective energy resources. At the current time, the program provides a 50% rebate on audit costs, but limits per-customer rebates to $300 (or $500 for customers with space over 20,000 square feet). C&I audits are costly. For many of the participants the rebate does not cover a significant part of the audit's cost. When audit costs are more than $600 ($1,000 for larger facilities), the incentive begins to lose its appeal. For many medium and large facilities the incentive can be less than 5% of the cost of a high quality investment-grade energy audit. Currently only about 5% of the participants utilize the audit rebate. Empire should consider a scaled audit rebate structure calibrated to the square feet of the participating facility or other size metric (kW/kWh). However, increasing the rebate for an audit also means increasing the risk that the expenditures for the audit may not be accompanied by a corresponding increase in energy savings. As a result, Empire should consider rebates for medium and large customers over a specific size (square feet of facility or kW or kWh) that must be accompanied by a financial commitment from the participant to take at least some of the recommended actions over a specific period of time to cost effectively recover the added incentive. This must be well calibrated so that the cost of the rebate for the audit and any installed measures that, as a package, must be cost effective. This would mean that as a customer commits to allocating an increasing budget for energy efficiency actions, the rebate structure can be correspondingly increased up to a maximum level that does not allow the projects to not pass a cost effectiveness test. If done well, the package can be expected to increase participation, increase savings and meet cost effectiveness requirements. This approach should only be considered if there is sufficient room between the measure rebates and the expected savings to allow an increase in the audit rebate levels.

2. Add the Large Power rate class to the list of qualified customers. Currently, the largest customers are not eligible to participate. If they are included, potential participation and energy savings from the program will likely dramatically increase.

3. Develop a technical reference manual to guide energy savings calculations submitted by contractors and applicants. The manual should provide standard values for engineering calculations such as lighting fixture watts, heating and cooling full-load hours by building type, and other reference data to assist customers and contractors in preparing their applications.

4. Add LED lighting to the measures covered by the prescriptive program.

5. Some customers that apply for a rebate don't know how to calculate estimates of the savings. This is something that AEG could likely do.

6. Add contact information for an Empire or AEG staff person on the application so that applicants with questions can easily find this information if they have questions about the program or the application.

7. Add a statement on the application that makes it clear that the rebates are only to cover measures that would not be installed without the rebate to offset the installation/measure cost.

Introduction

This report presents the results of a process and impact evaluation of the Commercial & Industrial Rebate (C&I Rebate) Program. The evaluation also surveyed 39 participants that received a rebate for high efficiency improvements at their facilities that were either prescriptive or custom in nature.

Program Description

Empire Commercial & Industrial Rebate Program provides rebates to customers who purchase high-efficiency equipment for their facilities. An audit is not required to participate in these programs, but is a component of the program. Applications must be pre-approved by Empire (through AEG) before equipment is purchased and installed. There are two rebate programs, custom and prescriptive, each one designed to fit the needs of different types of customers and measure applications.

Custom Rebate for Retrofits
The Custom Rebate Retrofit Program provides customers with financial incentives for installing qualifying electric savings measures including HVAC systems, motors, variable speed drives, lighting, building controls, and pumps. Customers may apply for individual or multiple efficiency measures within the same facility.

Small Commercial Building Service (CB) or Small Commercial Total Electric Service (SH) Customers are first evaluated to determine eligibility for the Prescriptive Rebate Program. If eligible, prescriptive rebates will apply.

All custom rebates are individually analyzed to ensure that they pass the Societal Benefit/Cost Test. Any measure that is pre-qualified (evaluated prior to being installed) must produce a Societal Benefit/Cost test result of 1.05 or higher. In addition, the project's incremental payback must be greater than two years.

A customer can submit multiple rebate applications for different measures. Each individual measure is evaluated on its own merits. Similar measures that are proposed in different facilities or buildings will be evaluated separately. Customers are limited to $20,000 in total incentive payments per year.

Custom rebates are calculated as the lesser of the following:

- A buy down to a two year payback
- 50% of the incremental cost
- 50% of lifecycle avoided demand and energy costs

Prescriptive Rebates
Pre-qualified prescriptive rebates are designed for commercial customers served under Empire's Small Commercial Building Service (CB) or Small Commercial Total Electric Service (SH) rates. Rebates are available for a variety of common energy savings technologies for both new construction projects and retrofits. The specific categories, rebate levels and performance levels

are outlined by end use below. Efficiency measures that do not qualify under the Prescriptive Rebate Program may be submitted to the Custom Rebate Program.

Lighting

Whether for new construction projects or major renovations, fluorescent linear lighting dominates the commercial lighting market, particularly in offices, schools, and some retail applications. The four-foot 32-watt T8 lamp combined with an electronic ballast has essentially become standard practice. As a result, rebates are available for specifying lamps and ballasts that exceed the performance levels of the standard T8 lamp system. Additionally, rebates are offered for reducing lighting power density below the maximum thresholds specified by energy codes.

Existing lighting systems can be eligible for rebates by replacing with new fixtures that exceed current standard practice. The existing market for fluorescent lamps is a mixture of T8 lamps and older T12 lamps. The replacement of these older systems can provide energy savings but requires replacement of both lamps and ballasts. The following rebates are available for early replacement of lamps and ballasts in existing systems.

High Performance T8 Fixtures

High Performance T8 (or “Super T8") lighting is an option that can be used to retrofit T12 or standard T8 lighting in existing facilities, or can be used instead of standard T8 lighting in new facilities. High Performance T8 fixtures must meet specifications set by the Consortium for Energy Efficiency [CEE] including, but not limited to, the following:

- Lamps must have 90 lumens per watt [LPW] or greater
- 88 LPW for programmed start ballasts lamps must have high color rendering index [CRI], greater than or equal to 81
- Electronic ballasts must be instant start or programmed start meeting CEE performance

Rebates are as follows:

- $20 for 2- lamp fixtures
- $30 for 3- lamp fixtures

Standard T8 lamps and ballasts

This option is only available for the replacement of existing T12 systems. Both lamps and ballasts must be replaced to be eligible.

Rebates are as follows:

- $2 per lamp
- $10 per ballast

Lighting Power Density

For common building types where the above prescriptive lighting options do not apply, a prescriptive rebate may be available based on Lighting Power Density. The overall lighting

power must be reduced by at least 25% below the requirements of the local energy code or ASHRAE Std. 90.1

Rebates are as follows:

- $1 per watt per square foot reduction

High Intensity Fluorescent
High Intensity Fluorescent lighting is designed to replace high intensity discharge [HID] fixtures in high bay and other applications such as gymnasiums, warehouses, and parking lots. These fixtures must have the following characteristics: use T5 or T5HO lamps with electronic ballasts use at least 4 lamps per fixture the fixture must be at least 75% efficient

Rebates are as follows:

- $50 per fixture

Pulse Start Metal Halide
For HID applications, rebates are available for lamp and ballast replacements in typical 400-watt high bay applications. The lamp must be rated as pulse start with a pulse start ballast. Lamp wattage must be either 320 or 360 watts as a replacement for 400-watt metal halide or high-pressure sodium.

Rebates are as follows:

- $50 per fixture

Lighting Controls
Rebates are available for occupancy sensors; either switch replacements or remote/ceiling mounted that use ultrasonic or passive infrared technology. Dual technology sensors are also eligible. Rebates for switch replacement sensors are limited to small rooms less that 250 ft^2.

Rebates are as follows:

- $20 for switch replacement sensors
- $50 for ceiling/remote mounted sensors

Air Conditioning
Rebates are available for exceeding the minimum performance requirements of local energy codes [or ASHRAE Std. 90.1] for unitary packaged and split system air conditioners typically found in small commercial applications. The performance levels required vary by type and size but are consistent with the high-efficiency standards set forth by CEE.

Type and Size	Minimum Performance	Rebate
Single Phase Unitary or Split Systems < 5.4 tons	14.0 SEER	$92 per ton
Three Phase Unitary or Split Systems < 5.4 tons	13.0 SEER	$92 per ton

Unitary or Split Systems >5.4 tons and <= 11 tons	11.0 EER	$73 per ton
Unitary or Split Systems >11 tons and <= 20 tons	10.8 EER	$79 per ton
Unitary or Split Systems >tons and <= 30 tons	10.0 EER	$79 per ton

Motors

Rebates are available for installing motors that exceed minimum performance requirements of local energy codes [or ASHRAE Std. 90.1] for typical applications of three phase Design A and Design B motors. Rebates are available for both Open Drip Proof [ODP] and Totally Enclosed Fan Cooled [TEFC] motor types. Motor efficiency must meet or exceed that which is classified as NEMA Premium. These performance levels are provided in the table below.

Motor Size (hp)	ODP	TEFC Incentive ($/Motor)	NEMA Nominal Efficiency
1	85.5	85.5	$50
1.5	86.5	86.5	$50
2	86.5	86.5	$60
3	89.5	89.5	$60
5	89.5	89.5	$60
7.5	91.0	91.7	$90
10	91.7	91.7	$100
15	93.0	92.4	$115
20	93.0	93.0	$125
25	93.6	93.6	$130

Rebates are limited to the most common motor speed, 1800 rpm [nominal]. Larger motors or other motor speeds may be eligible under the Custom Rebate Program. Any efficiency measure not contained in this list may be submitted to the Custom Rebate Program.

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 facility manager survey.
3. An energy impacts analysis using engineering algorithms.

Process Evaluation Methodology

The process evaluation included a design and operations review. This review consisting of five 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: C&I Rebate Program: Management Interview Instrument.

Participant Survey Methodology

TecMarket Works was provided with the contact information for 48 unique C&I customers that participated in the C&I Rebate program. We attempted contacts with each of the facilities a maximum of 7 times before terminating attempts in order to maximize the survey completion

rate for this study. TecMarket Works was, able to achieve a high completion rate by completing surveys with 39 of the 48 facility managers, for an 81% completion rate.

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

- Their intentions in upgrading the equipment and the influence of the program in their decision
- Their satisfaction with various program aspects
- Their ideas for increasing participation

The survey employed can be found in Appendix B: C&I Rebate Program: Facility Manager (Participants) 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 of engineering estimates for lighting measures
3. Development of prototypical building energy simulation models for HVAC measures
4. Simulation of HVAC measure energy savings
5. Calculation of gross program energy and demand savings

An extract from the program tracking database covering paid projects from June 2007 through the end of May 2009 was received from Empire. These data were analyzed to identify the type and numbers of measures installed by participants by program element. These data were used to define the methods used to conduct the impact evaluation.

The analysis was broken down into prescriptive and custom program elements. Within the prescriptive program, lighting and HVAC measures were analyzed[1]. Within the custom element, the projects were segmented into lighting and "other" categories. A sample of lighting and other projects was selected and formed the basis of the analysis.

Prescriptive Lighting. Engineering algorithms were used to estimate the savings for prescriptive lighting measures. The measure description and baseline assumptions were reviewed, and fixture wattage assumptions developed for the base case and measure. Participants were assigned to building types, and standard operating hour assumptions by building type were used to estimate energy savings.

Prescriptive HVAC. Participants were assigned to a standard building type, and building energy simulations using the DOE-2.2 simulation model were used to estimate energy saving according to the equipment efficiency and building type. The unit energy savings from the simulations were applied to the rebated equipment listed in the tracking data.

[1] During the program evaluation period, no applications for motor rebates had been processed.

Custom Lighting. A sample of lighting projects was selected, and the project files and documentation for the projects was received from Empire. Each participant in the sample was contacted by phone to get their lighting system operating hours. The savings for each project in the sample was recalculated using a standard fixture watts table and the revised lighting operating hours from the phone survey.

Custom Other. A sample of remaining custom projects was selected, and project files were obtained from Empire. The selected projects were either HVAC efficiency or HVAC controls measures. Each customer was assigned to a standard building type, and building energy simulations using the DOE-2.2 simulation model were used to develop energy savings estimates for the sampled projects.

Energy savings were added across all of the prescriptive lighting and HVAC measures. For the custom program, the savings estimated for the sampled projects were used to estimate a sample realization rate, defined as the ratio of the evaluated savings to the savings in the tracking database. A separate sample realization rate was estimated for custom lighting and custom other projects. The sample realization rate was applied to the remaining custom projects in the tracking database to estimate the total program saving.

Evaluation Findings

This section of the report presents the detailed evaluation findings for the C&I Rebate Program.

Process Evaluation

This section presents the results from the in-depth management interviews performed with five people who work closely with the program:

1. Sherry McCormack, Energy Efficiency Coordinator, Empire District Electric
2. Kelly Chenoweth, Senior Energy Services Representative, Empire District Electric
3. Ralph Nigro, Vice President, Applied Energy Group
4. Huei Wong, Applied Energy Group – calculates the C&I rebates
5. Carla McMillan, Applied Energy Group – processes C&I applications

Program Objectives
Both of the program managers have a clear vision of the objectives of the C&I Rebate Program. The objectives are to cost effectively provide energy resources by raising awareness of energy efficient opportunities in the C&I sector and to assist Empire's small C&I customers to move to more energy efficient processes or systems so that they can better utilize the energy supplied to them and reduce their operating costs.

Applied Energy Group (AEG) is contracted by Empire to process the applications and calculate the rebates for the program. TMW interviewed three key contacts at AEG about the C&I Rebate Program, and all three of them also have a clear understanding of the program objectives. They indicated that the objective of the C&I Rebate Program is to save energy and move the market towards more energy efficient measures (primarily lighting, HVAC, and motors) and to help Empire's C&I customers reduce the incremental cost between standard and high efficiency equipment. By helping Empire's C&I customers move towards energy efficiency, this helps Empire avoid building capacity and also improves customer relations.

Program Utilization
The most common measure being installed through the program is energy efficient lighting, and managers would like to see more HVAC and motors rebated. In addition, the C&I Rebate program has a facility energy audit component, but most customers are not taking advantage of this service. The C&I Rebate program will rebate 50% of the audit costs if at least one of the recommendations in the audit report is implemented (and the report's recommended actions measures themselves may qualify for rebates as well).

Currently, only about 5% of participating customers are obtaining an audit of their facilities. This may be due to the facility size limits in place for the audit rebate. The C&I Rebate program will rebate 50% of the audit cost up to a cap. The maximum rebate is $300 for facilities under 20,000 square feet in size, and $500 for buildings that are over 20,000 square feet. An audit of a building that has 20,000 square feet would likely cost more than $600. In this case the customer would receive a rebate that is less than50% of the audit cost. For buildings of this size, an audit would cost more than $1,000. While the program managers did not offer suggestions for what the rebated amount should be set at, at least one manager thinks that the audit costs are double

what Empire presumed they are when the rebate amounts were set, and that this under-estimation of audit costs may be a limiting factor to the number of customers that are willing to pay for an audit.

Program Rebates

The managers and key staff all feel that the measure-specific incentives offered are set at the right amount to help move the C&I customers to more energy efficient options. They report that the feedback from the C&I customers regarding the incentives has all been very positive.

The incentive rebate is capped at $20,000 per year, per customer. This means that the customer can do the same measure during the second year of their participation, such as completing a lighting project in another part of the plant. However, it also means that participants who have significant savings potentials may be forced to delay their projects, waiting for Empire's rebate period requirements to pass. This restriction can slow savings for customers with large savings potentials unless all of the portfolio's allocated funds are spent each year. This can result in non-acquisition of cost effective energy resources for Empire's customers that must be provided with higher cost conventional supplier.

In cases where a customer needs to reapply for a second rebate for the same upgrade or project the customer's timeline for their project becomes influenced by the program's rebate rules. While the program's managers do not feel that allowing multiple rebates for the same project or the same technology over subsequent years does not increase freeridership, it can mean that the programs rules are acting to control or influence project timing. If a customer must delay a project, and reapply for the rebates, this means that the program must process another application, increasing program costs and the costs to the customer for the new application. This rule, while helping to stretch resources over the program period, essentially increases costs to the program and to the customer and slows acquisition of cost effective resources.

This condition is experienced because of the low funding levels for the program compared to the savings that can be achieved. Essentially the ability of the program to acquire energy savings is greater than the program budget will allow the savings to be acquired. The incentive budget for the second year of the program was set at $214,000. With this limit on the amount of incentives, the managers need to carefully manage their resources over the budget year. Managers report that there have been times in which the program's operational funds for administration had to be paid to participants who had approved project in excess of the program's incentive budget.

As a result of doing this, the program has been able to request and receive more money for incentives to cover additional allocations. For example, the incentive funds were increased to $264,000 for the third year of program operations.

Even though the funds for the incentives are being exhausted (or surpassed), the number of customers participating is lower than anticipated. Empire had expected more participants leading to a more serious shortfall. However, it may well be the program limits on the audit payments and the cap on incentive payments to individual customers that is limiting participation. It is not unusual for demand for program resources to out-strip the supply of those resources.

Program Technologies

The technologies covered by the C&I Rebate program incorporate a broad-based perspective that allows any energy efficiency improvement that has a payback of over two years to be partially rebated. AEG, who processes the applications and calculates the rebates, has been receptive to analyzing any project that cost effectively saves energy. The most commonly installed technology is lighting. Lighting upgrades are typically easy for the customers to implement, and, likewise, it's easy for them to process the program application. While most energy efficiency programs in the United States focus on lighting measures because they are especially cost effective for the program and the customer, commercial programs are largely dominated by lighting rebates typically covering from 60% to 80% of acquired savings. Moving to measures in addition to lighting will require a substantial push to acquire industrial participants. However, the rebate caps may limit the success of industrial customers who often need to exceed the rebate caps to make energy efficiency projects worth diverting resources from their core business needs to energy saving upgrades.

The prescriptive rebates as they are now structured are well suited for most small C&I customers, while the custom rebates are designed for the larger customers who have projects that do not need large rebates to move forward. The prescriptive portion of the program works well, but there are a few changes that the program managers would like to see. One change is that there is at least one new technology that is being used in the market that should be considered for inclusion in the prescriptive measure lists. That measure is LED lighting. According to the program managers these should be added to the program's prescriptive offerings. At this time, projects that use LEDs are considered custom projects. The second change suggested by the program's managers is that some of the managers would like to see is the eligibility requirements change for larger companies. Currently, the prescriptive portion is only available to two service rates (CB and SH). These are the smaller C&I customers. According to the interviewed managers, extending the prescriptive rebates to all classes would likely increase participation and increase the amount of cost effective energy that could be obtained if there were enough program resources to cover these acquisitions. It is highly possible that the current rebate and participatory rules are limiting the amount of energy savings that can be acquired by Empire's non-residential customers, increasing energy costs for all customers while limiting carbon savings that can be achieved. Because energy efficiency often provides the least-cost energy supplies, program operational rules and funding sources should be matched to the achievable savings that can be acquired within the service territory if customers are to obtain the most cost effective energy supplies.

Program Operations

C&I customers that are interested in receiving a rebate for an energy efficiency upgrade must submit an application before they proceed with the project. This is a reasonable requirement because if they proceed without the rebate, then there is no need for the program's funds to be spent on those projects. The savings are already being acquired. The rebate application and program information can be found on the Empire web site. In addition Empire has a call center whose staff have received training on taking and processing program-related calls regarding energy efficiency. These calls are then transferred to either Sherry McCormack or Kelly Chenoweth who will answer the customer's questions and guide them to the online resources

where they can find the information they need to understand the program and consider participating.

All projects are required to obtain pre-approval from AEG. Most customers understand this requirement and it is well displayed on the application and on the program's web site. However, there have been a few participants who have not understood this requirement and have proceeded on their own. However, Empire does not enforce this rule. All of the applicants that did not receive the required pre-approval were approved by Empire to maintain good customer relations. It is not clear if these customers would have implemented the installed measures if they thought they would not obtain the rebates. However, the fact that these customers took the program recommended actions without getting an assurance of receipt of the rebates suggests that some or most of them would have taken the action without the program, essentially meaning that the program spent resources to acquire savings that were already acquired.

The applications received are sent to AEG for processing. The customers send information to the program administrator detailing what they plan to install, information about their current equipment, and estimated project costs. AEG then assesses the application to see if the project meets the program's participation criteria. If the project is pre-approved, AEG notifies Empire and Sherry McCormack sends the applicant a letter with an estimated rebate amount that is based on the project costs and the estimated savings. If the project plans change, the rebated amount may be adjusted during final calculations by AEG if the participants inform AEG of that change. After project completion, AEG finalizes the process by sending all application materials and rebate calculations to Sherry McCormack, who tracks program participation and expenditures, and requests that a rebate check be sent to the customer.

The rebate application is eight pages long, with most of the text presenting participation terms and conditions. The application is clear and straightforward. However, the paperwork can be daunting for some customers, especially for those running smaller operations. However, the customers can call Empire for assistance with the application process. In some cases participants have their contractors or suppliers complete or help with the application.

Program Participation and Promotion

Empire does the promotion for the program in-house through sending qualifying C&I customers oversized direct-mail post cards (8.5x4") on sturdy stock, and through advertisements in business journals and local newspapers. In addition contactors are also active marketing agents for the program. Contractors and suppliers are also program-marketing agents for the program because they educate customers as well as the installers performing the upgrades about the program, helping to spread program information into the market. The contractors have been very helpful as marketing agents and have helped the program acquire participants.

Empire's program managers also attend trade shows "about four times a year" to talk about the program with a wide range of contactors, customers and other interested parties. Current program staffing levels limit additional market push efforts by the program manager. For print and media promotion, Empire utilizes the services of its communications department and follows their guidelines for promotion. In addition, Empire employs an outside marketing agency for development of corporate communications. While the marketing firm does provide some

recommendations for program marketing efforts, the primary role of the marketing firm is to focus on the company's marketing and customer relations needs. The program is a very small component of the company's operations and at the current size does not merit nor can it afford the concentrated attention of a marketing firm.

Opinions vary about the level of participation compared to the potential participation. AEG's experience is that all programs have ups and downs in participation that depend on interest and economic conditions. There can always be more marketing provided to increase participation, however, AEG considers the marketing efforts of the program manager and the current approaches to be adequate given the program funding levels provided. AEG reports an increase in applications after the program manager holds a marketing event, and AEG does not want to over-subscribe the program and use all of the program's funds up in a few months. As a result, at the current funding level, it is important to throttle the marketing efforts to match the annual budget and operational period so that the demand for the program does not exceed the allocated budget.

According to AEG, "Empire is doing an excellent job of marketing the program". AEG also reports that while additional program marketing can increase participation, that participation will require a program budget to support that participation.

Ideas for Increasing Participation

In order to qualify for the prescriptive C&I program, the customer has to be in a qualifying rate category. The first step in the application review process is for AEG to verify the rate code to confirm eligibility for the prescriptive program component. If the applicant is a large C&I customer, they are automatically placed into the custom measure category even if all measures are prescriptive. AEG feels that the trade allies have gotten used to this and that the program is operating smoothly, however they think it might be best to use prescriptive rebates regardless of the customer's rate code for all lighting projects. Empire program managers agree with this point.

An additional change to the program concerns the rate class for participants. The large power users (classified as "LP") are not currently qualified to participate, limiting energy savings from this important group of customers. Likewise, these large customers have attempted to participate in the program causing Empire to deny their participation. These customers are not happy that their class has been restricted from participating because of a regulatory decision that excludes their participation. Empire's managers would like to see this change. According to regulated stipulations, all Empire programs have to pass the RIM test at a 1.05 level. Large Power users do not pay or participate in Empire's energy efficiency program. This condition was successfully added to the program's operational rules by an intervener representing large power users. However, this condition essentially limits the amount of savings that can be achieved by Empire. Past history in the energy program field indicates that large amounts of very cost effective savings can be achieved by the large customers who participate in energy efficiency programs. To exclude these customers reduces the cost effectiveness of the program and limits the amount of energy that can be saved. This restriction also results in increased carbon emission release by requiring the burning of fossil fuels to provide the power that is not saved.

By not acquiring all cost effective savings all ratepayers are harmed by having to generate additional power supplies or purchase them off the market at market prices.

Freeridership
The level of freeridership for this program is unknown. Discussions with AEG suggest that because the application must be approved before the retrofits are launched, freerider ship is low. However, they have never measured the level of freeridership and there is no participation screening process during the application approval process to weed out freeriders. The evaluation employed engineering approaches for estimating impacts that do not employ a freerider adjustment.

What Works Well
Below are the conditions that the Empire and AEG program managers report working well for the C&I Rebate Program:

- Having the AEG as a third party handling the paperwork and processing the applications works well. They have the technical knowledge and the manpower to process the applications and work with the customers, and they provide a quick application review and approval process. AEG talks to the customers individually in cases to resolve application issues, especially if it looks like the application should be rejected – AEG will call the customer to see if something can be done to the project to capture the energy savings and get the application approved.

- AEG evaluates all applications within two weeks, so there is little delay in energy efficiency upgrades and projects.

- The relationship with the program manager at Empire is really good, with quick responses and good communication.

- The incentive amounts help customers move forward with a project and they are provided with options in the application. They don't need a computer to apply, so "mom & pop" stores can and do apply for rebates.

What Doesn't Work Well
Below are some of the things that the managers report not working well and need to be addressed in the program redesign efforts.

- Some customers are not aware of the pre-approval, even though it is the first thing that they should read when they open the application.

- The rates classes for the program can result in some bad outcomes. There are large power users who want to participate, and their projects could really help to increase the energy savings as a result of the program.

- Almost all of the applications are for lighting. We need to move customers to add more energy efficient HVAC, motors, and other technologies such as VFDs and chillers.

- There have been cases where the volume of information we ask for has discouraged people from pursuing a rebate or possibly even the project. We need to simplify the application process.

- The heft of the paperwork required can be daunting and can be overwhelming for small operations if they are doing it themselves. Some customers don't know how to calculate estimates of the savings. I suggest they go to the vendor for help – they bear some responsibility if they are trying to sell something to that customer.

- Program marketing could be done a little more aggressively – but that depends on internal resources for this program and the marketing efforts at Empire.

- AEG suggests that all lighting measures should be prescriptive, and shouldn't require a custom application and a project assessment process for the larger customers. They believe that the custom projects and incentives should be reserved for things that are unusual. This change would simplify the participatory process for both customers and those processing the applications.

Facility Manager Survey Results

TecMarket Works completed surveys with 39 facility managers for an 81% response rate. The responses and analyses are presented below, and the survey instrument can be found in Appendix B: C&I Rebate Program: Facility Manager (Participants) Interview Instrument.

How C&I Customers Became Aware of the C&I Rebate Program

The majority of the customers that we surveyed learned of the program from their contractors or electricians (n=13), or from an Empire employee directly (n=11). Only 2 customers that we surveyed said that they learned of the program through a direct mailing from Empire. Their comments are below:

- My electrician or contractor told me about the program. (n=13)
    - I heard about it from two sources; Lloyd's Electric and a local electrician.
    - We were informed of the program through Orion Energy Services, contracted by CCE for all of our lighting.
    - I heard about the program from my cousin and son, both of whom are contractors in Joplin.
    - An employee of Ozark Energy Services told us about the program after doing lighting work for us.
    - I had a solar system installed at my home by a contractor, and he told me about the C&I rebate.
    - I learned about the rebate program from both an employee and a local electrician.
    - The gentlemen I work for and his contractors told me about the C&I program.
    - I learned of the program through an agency providing lighting installation.
    - I don't remember exactly how I learned of it, perhaps Ozark Energy?
    - I learned about the rebate through our contractor as well as an energy conference.
    - Ed's Electric told us about the rebates.
    - Allen Electric informed us about the rebates available through Empire's program.
    - We learned about the program through our Grainger sales rep, our maintenance supplier.

- Someone at Empire told me about the program. (n=11)
    - Empire Electric told me about the program
    - I heard about the program from both my utility company and maintenance department.
    - My utility company told me about the C&I Program.
    - An employee of Empire Electric told me about the program.
    - We had Empire conduct and energy audit in 2006. We asked what else could be done and were referred to the program.
    - I contacted empire regarding energy efficiency and was told about the program.
    - I learned of the program through a friend that works for Empire; he led me to a local contractor.
    - We learned about the C&I Program from our electric company.

    - We learned about the C&I Program from Sherry McCormack, Empire's coordinator in Joplin.
    - We learned about the program through an Empire employee that is one of our customers.
    - Our lighting company told us about the rebate program.

- An employee of mine told me about the program. (n=3)
    - I heard about the program from both my utility company and maintenance department.
    - I don't remember exactly how it came to my attention, but I believe one of my employees told me about it.
    - I learned about the rebate program from both an employee and a local electrician.

- I received information in the mail. (n=2)
    - I received a notice in the mail informing me of the C&I rebate program.
    - We heard about the program when we put on an addition and used energy management software. We received a card in the mail about the C&I program.

- I found the information online. (n=2)
    - I learned of the rebate program through the internet.
    - I learned of the rebate program through the internet, either a state department or other government website.

- Other sources (n=8)
    - I heard about the C&I program through our rebate company.
    - I learned about the rebate program from a co-worker.
    - Carl, our representative, made us aware of Empire's C&I program.
    - True Value of Joplin participated in the program and referred their contractor to us.
    - I learned about the rebate program from a consulting firm that searches for incentives and rebates.
    - Extos informed us about the rebate.
    - The owner of the hotel came across the program and suggested it to us.
    - We had participated in the program before and decided to do it again.

When they first heard of the program, 22 out of the 39 surveyed did not have enough information about the program, though this is to be expected when so many of them heard about the program from sources other than Empire. However, after they called Empire or looked on Empire's website, all of them were able to learn what they needed to know about the program and participated.

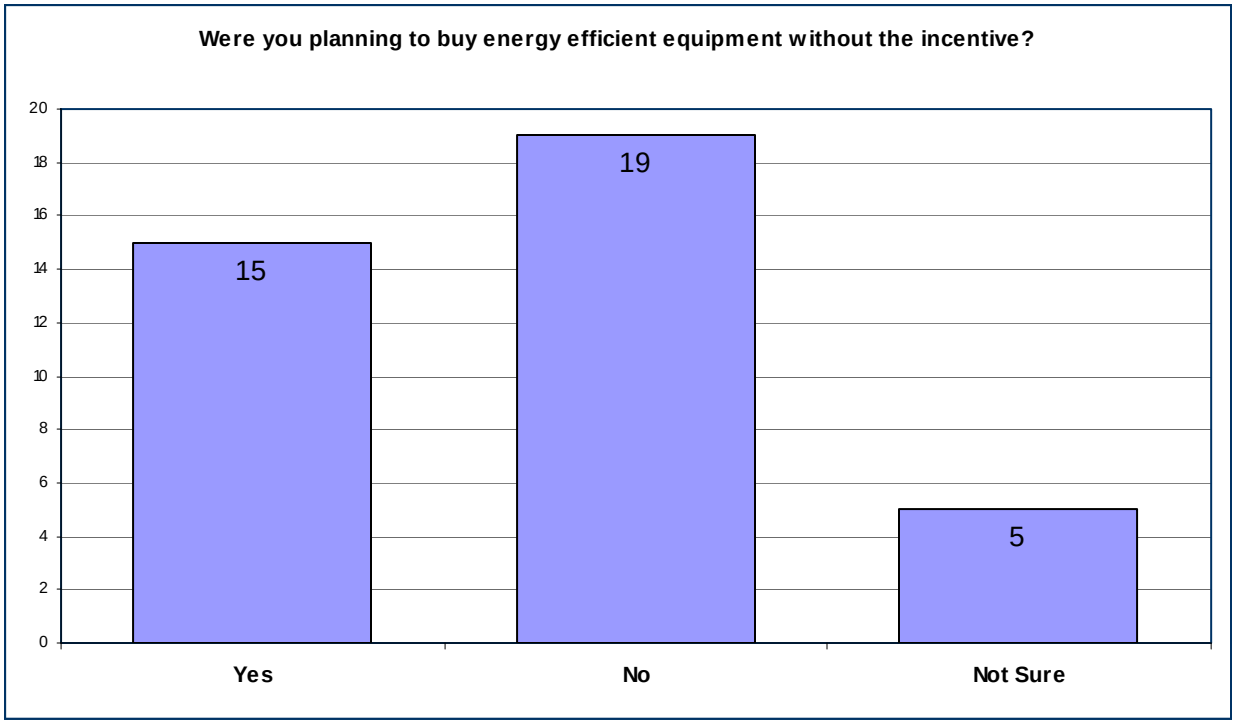
Program Application

Over half (63%) of the participants surveyed filled out the paperwork themselves, while the others had their contractors fill out the forms. Of those that filled out the application themselves, all but one found the application easy to understand. The customer was filling out the

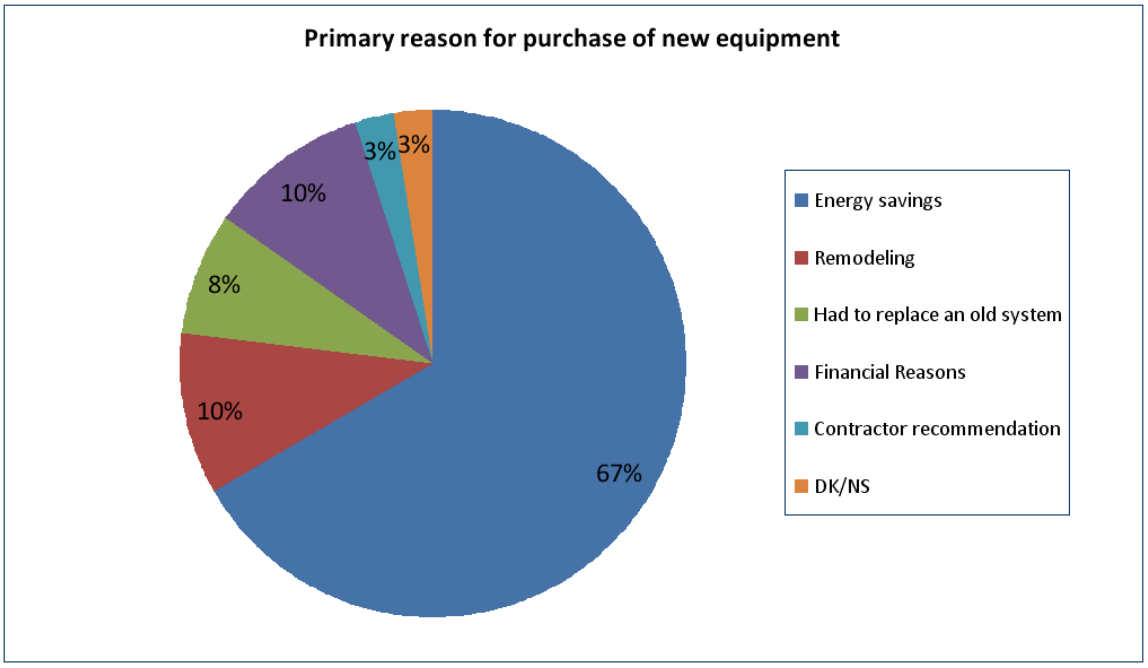
application for a custom project, and found that the form was “deceptively simple, a lot of information on the form and because it was a custom program it was more complicated”. His suggestion was to make it clear who should be called if there are any questions on the application if there is a need for help.

Reasons for Participating

Out of the 39 customers surveyed, over half of them would not have considered the energy efficient option without the rebate. However, 15 (38%) of them would have considered the energy efficient option even without Empire’s rebate.



The most commonly cited reason (67%) for purchasing the new equipment was for the energy savings. The other common reasons were tied to remodeling and the need to replace old equipment.



We asked the customers how important the incentive was in their decision to purchase the more energy efficient option. A very high percentage (85%) indicated that the rebate was the primary or an important reason for the decision to install the energy efficient option, as can be seen in the table below. Twenty-seven out of the 39 we surveyed (69%) said they would have delayed the project if the rebate had not been available. Seven of them said they would have delayed the project indefinitely (until the equipment needed to be replaced because of failure), and those that gave a timeline for delay, the average delay for the project would have been 13 months.

	Count	Percent
Primary reason	15	38.5%
Important reason	18	46.2%
Not so important	2	5.1%
Minor reason	2	5.1%
Not a reason	2	5.1%

Other Reasons for Energy Efficiency

We asked the customers if there were other reasons they decided to go with the more energy efficient option, their responses are below:

- We are trying to “go green” to set a good example for the school district.
- Long-term savings was another reason for purchasing the energy efficient products.
- Another reason I/we chose to buy the energy efficient equipment was to lower the monthly utility bills.
- Increasing the comfort level of our facility was another reason for purchasing the energy efficient equipment.
- We wanted to meet our corporate lighting standard.

- We wanted to reduce the maintenance costs.
- Our old system was troublesome, so improving ease of use/maintenance was also a reason for upgrading to the energy efficient system.
- I/we knew it was better in the long run to go with more efficient equipment.
- I/we decided that since our building was new, it would be more efficient in the long run to use higher efficiency products.
- A green initiative is going on throughout the district; the energy management system is a cornerstone and a great reason to go with high efficiency equipment.
- An additional reason we purchased the energy efficient equipment was to go green and save as much energy as we can.
- Another reason we chose to go with the higher efficiency equipment was because we had energy conservation in mind, and our old system was starting to become problematic.
- Energy savings.
- Utility savings was another reason we purchased the energy efficient equipment.
- I/we knew it was better in the long run to go with more efficient equipment.
- To improve capitol and hold down expenses.
- Cutting costs and lowering bills were two of the other reasons for purchasing the higher efficiency equipment.
- The quality of light is much better, that in itself was a good reason to purchase the higher efficiency equipment.
- Not only was the payback about 2 years, but I am also personally interested in efficiency, so the rebate combined with those additional reasons left me no reason not to purchase the high efficiency equipment.
- Energy savings and quality of light were additional reasons why we purchased the energy efficient equipment.
- Going green was a secondary reason for purchasing the high efficiency equipment.
- The quality of light is much better and was a good reason to purchase the higher efficiency equipment.
- An additional reason we purchased the high efficiency equipment was to add more value to the real estate for the future.

Ten out of the 39 (26%) surveyed customers have made additional energy efficient improvements to their facilities. Here is what they have done:

- We have also replaced an air conditioner with one that is more efficient.
- Other energy efficiency actions we have taken include white roofs, replacing windows, and lighting retrofits.
- We have added insulation and controlling the thermostats more wisely, which has produced a 25% savings in our utility bills, regardless of the rate increase.
- We have also switched to an energy efficient compressed air system and added light sensors, resulting in a 28% increase in savings.
- Another energy efficiency action we have taken includes behind the computer lighting, saving us $2000 per year.
- We've installed lighting and HVAC upgrades.
- We've installed a new roofing system, fans, and weather stripping.

- We installed programmable thermostats. (n=2)
- Additional efficiency measures include motion detectors and on an on-demand hot water heater, saving us 31% on our bill.

Suggestions for Increasing Program Participation

All the suggestions for increasing program participation involved an increase in program promotion or advertising. However, some had more specific suggestions, which are listed below.

- More advertising and promotion. (n=27)
  - Print brochures containing information about lighting and visuals, and distribute them to contractors.
  - Have the hardware stores advertise it.
  - Put out some public service announcements - in print, on the radio or on television.
  - Target non-profit groups, as they may not realize that they qualify.
  - Include advertisements for the program with customers' bills. Residential customers may inform their companies about the program.
  - More advertising, possibly in the bills, and show customers what they could save.

What Works Well

- What really works about the program is that is not only helps out the customers, but the utility company as well. It's a win-win situation.
- The program really works well because they do a good job and do it in a timely fashion.
- The program not only helps out the customers, but also Empire Electric by reducing demand placed on them. It also gives an immediate incentive to the customer.
- It’s simple and effective, and the information is easy to find and accurate.
- It helps customers out immediately and also gives back in the long run.
- The program works because it gives an incentive to upgrade, it’s easy to do, and the incentive comes quickly.
- The C&I program works well because it provides rebates.
- The program works really well because it’s a win for everybody, saves money and helps the environment.
- It is very easy to participate in.
- It works well because it saves money and is based on total consumption, and a customized process is a better way to do the rebates.
- The program works well because it’s simple.
- The program is effective because it helps people afford and embrace energy efficiency.
- It works well due to the simple fact that it helps customers cover the costs.
- It helps people lower their energy usage and adds more to your return on the investment.
- The payback is quick, the incentive is nearly immediate, and it provides significant long-term energy savings.
- It works well because it saves money and energy,

- The program is so simple. It's money for a good cause, and I don't know why anybody wouldn't do it.
- The incentive is a good dollar amount, other programs seem less substantial.
- The program is effective because it allows better and brighter lighting for less money.
- It's very easy to participate.
- It drastically decreases the payback time for these kinds of projects.
- The rebate turnaround is fairly quick and the application is not very difficult to complete.
- The program is quick and effective.
- It promotes energy efficiency by immediately giving customers assistance with the initial costs, and reduces energy consumption and utility bills in the long run.
- Everything is prompt and smooth; it started on time, they worked around our schedule and there is little customer inconvenience.
- It reduces energy usage.
- The program works because it encourages people that aren't necessarily huge energy consumers to become more energy efficient.
- It works because it is straightforward.
- It conserves energy and has a quick pay out time.
- It's a smooth process and the response is quick.
- It makes people more aware of the environment and the incentive provides an extra kick.
- It saves money and pays for itself quickly.
- It saves money and helps people increase their property values and reduce their carbon footprints.

What Doesn't Work Well

Customers also had comments about what doesn't work well.

- Figuring out what to needs to be submitted with the application can be confusing.
- The program does not allow third parties to fill the forms out for the applicant.
- They do not offer it to industrial users; the largest energy users.
- The incentive is a bit low, if it were higher, I would have switched out more fixtures.
- The costs of the upgrade are not always fully identified.
- The approval letter and the invoice didn't arrive at the same time.

Program Satisfaction

This section presents the results of the satisfaction survey. The surveyed customers were asked to rate their satisfaction with various components of the program using a 1 to 10 scale where a 1 indicates that that were very dissatisfied and a 10 indicating that they were very satisfied. Figure 1 below presents the mean satisfaction scores that were reported for the C&I Rebate Program.

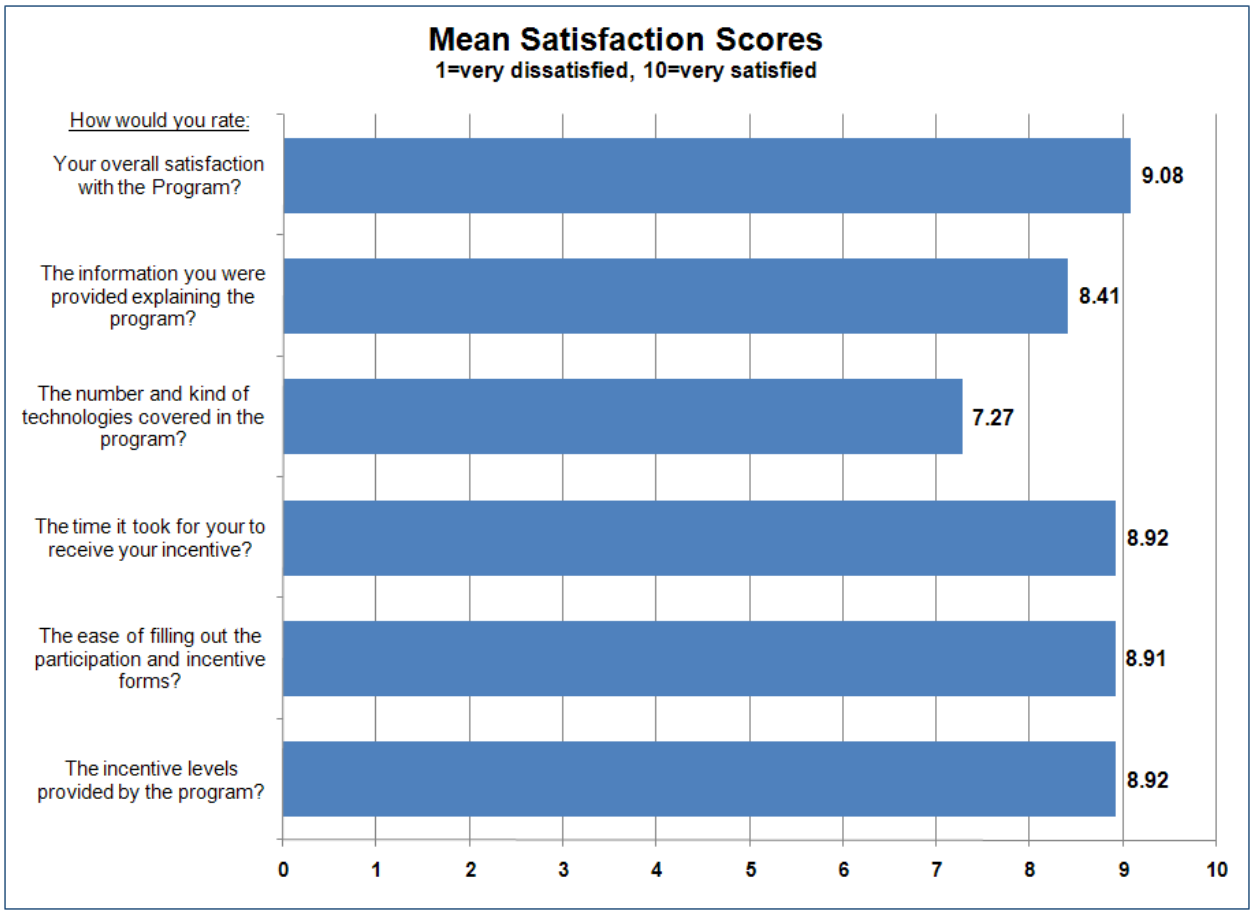


Figure 1. Mean Satisfaction Scores

The highest mean score (9.08/10) was for the program overall, and the lowest was for the number and kinds of technologies covered. This may indicate that there is a lack of awareness among the customers about the custom rebate, which will rebate virtually any energy efficiency project that has a payback of more than two years. All of the other aspects of the program received a mean score of 8.41 – 8.92, which are very high scores that indicate that the program is running well from the perspective of the customers that have participated.

However, there were a few low scores. If a customer gave a satisfaction score of 7 or lower, we followed up with the question asking why they scored that component so low and how that aspect of the program could be improved. These responses are presented below.

Technologies

- They could offer incentives for other improvements, such as roofing, weatherization, and generators.
- The program does not target their biggest users.
- An itemized list of covered technologies would be helpful.

Information about the Program

- Make it a little less technical and maybe provide examples.

- A little more detail about the program, such as covered technologies, would have helped.

Impact Analysis Results

An extract from the program tracking database covering paid projects from June, 2007 through the end of May, 2009 was received from Empire. These data were analyzed to identify the type and numbers of measures installed by participants by program element. These data were used to define the methods used to conduct the impact evaluation.

The analysis was broken down into prescriptive and custom program elements. Within the prescriptive program, lighting and HVAC measures were analyzed[2]. Within the custom element, the projects were segmented into lighting and "other" categories. A sample of lighting and other projects was selected and formed the basis of the analysis.

Prescriptive Lighting

An extract from the program tracking database covering paid projects from June, 2007 through the end of May, 2009 was received from Empire. These data were analyzed to identify the type and numbers of measures installed by participants by program element. These data were used to define the methods used to conduct the impact evaluation.

The lighting program tracking system showed lighting measures installed in sites representing a total of 18 participating customers. The types and quantity of measures installed are shown in Table 1.

Table 1. Lighting Measures Installed Under Program

Measure	Measure Group	Installation counts
High Performance T8 Fixtures - 3 lamps	Linear Fluorescent	97
Retrofit T8 Lamps	Linear Fluorescent	2,309
Retrofit T8 Ballasts	Linear Fluorescent	662
T5/T5HO Fixtures - 4 lamp minimum	High Bay Fluorescent	54
Switch Replacement Sensors	Lighting controls	49
Ceiling/ Remote Sensors	Lighting controls	23

Customers were segmented into four standard building types. The number of participants in each building type category is shown below:

Table 2. Participation by Building Type

Building Type	Number of Participants
Light Industrial	7
Office	1
Retail	2
Warehouse	1
Library	3

[2] During the program evaluation period, no applications for motor rebates had been processed.

The energy and demand savings were estimated for each lighting measure in the program tracking database using the following engineering equations:

$$kW_{savings} = \sum_{i}^{buildings} \sum_{j}^{measures} units_{i,j} \times kWsaved_{j} \times CDF_{i}$$

$$kWh_{savings} = \sum_{i}^{buildings} \sum_{j}^{measures} units_{i,j} \times kWsaved_{j} \times FLH_{i,j}$$

where:

units = quantity of each lighting measure installed in each building type
kWsaved = unit kW savings for each lighting measure
CDF = coincident demand factor by building type
FLH = full load lighting hours by building type

The unit kW savings assigned to each lighting measure are shown in Table 3.

Table 3. Lighting Fixture Wattage Savings Assumptions

Description	Measure Wattage	Baseline Fixture	Baseline Wattage	Watt/fixture savings
High Performance T8 Fixtures - 3 lamps	88	T12- 34W - 4' 3 Lamp - Magnetic	120	32
T5/T5HO Fixtures - 4 lamp minimum	304	400 W metal halide	455	151

For T-8 lamp and electronic ballast measures, an average savings per lamp for 1, 2, 3, and 4 lamp T-8 fixtures was used, as shown below.

Table 4. Savings Assumptions for Lamp and Ballast Replacements

Description	Measure Wattage	Baseline Fixture	Baseline Wattage	Watt/fixture savings	Watts/lamp savings
T8-4 ft 1 lamp	30	T12- 34W - 4' 1 Lamp - Magnetic	44	14	14.0
T8-4 ft 2 lamp	60	T12- 34W - 4' 2 Lamp - Magnetic	77	17	8.5
T8-4 ft 3 lamp	88	T12- 34W - 4' 3 Lamp - Magnetic	120	32	10.7
T8-4 ft 4 lamp	112	T12- 34W - 4' 4 Lamp - Magnetic	150	38	9.5
Average					10.7

The average savings per lamp includes savings for upgrading from magnetic to electronic ballasts. Since the program rules require concurrent lamp and ballast replacement, the per-lamp savings in the Table above was applied to the total number of lamps rebated to account for both

lamp and ballast savings. Note, the reported rebated number of lamps per rebated ballast is 3.5; reflecting a mix of fixture types.

Unit demand and energy savings assumptions for lighting controls are shown in Table 5.

Table 5. Unit Demand and Energy Savings for Lighting Control Measures

Fixture	KWh/unit	KW/unit
Ceiling/Remote Sensors	994	0.27
Switch Replacement Sensors	397	0.11

The lighting coincident demand factor assumption of 0.8 used by Empire for the custom lighting measures was applied to the prescriptive lighting measures. Average lighting operating hour assumptions for each building type were taken from the California Database for Energy Efficiency Resources (DEER) study[3]. These data are shown in the Table below:

Table 6. Annual Full Load Operating Hour Assumptions by Building Type

Building Type	Hours of Operation
Light Industrial	2860
Office	2808
Retail	4368
Warehouse	2860
Library	4248

The lighting unit kW savings and operating hour assumptions across the participant building types were combined using the equation above. The annual energy and demand savings for the prescriptive lighting program was estimated at 142,273 kWh per year, with a coincident demand savings of 39 kW.

Prescriptive HVAC

The prescriptive HVAC program had fairly modest participation, with 6 HVAC units rebated over 5 participating customers. Each customer was assigned to a building type, and a series of prototype building energy simulation models were developed for each of these building types. The list of building types and participants is shown in the Table below:

Table 7. Prescriptive HVAC Program Participants

Building Type	Number of Participants
Small Office	3
Small Retail	1
Warehouse	1

[3] 2004-2005 Database for Energy Efficiency Resources (DEER) Update Study, Final Report, Itron, Inc. Vancouver, WA. December, 2005. Available at http://www.calmac.org/publications/2004-05_DEER_Update_Final_Report-Wo.pdf

The prototypical simulation models were derived from the California Database for Energy Efficiency Resources (DEER) study, with adjustments make for local building practices and climate. A description of each prototype simulation model is shown in Appendix E. The simulations were run with long-term average (TMY-3) weather data for Joplin, MO.

The size and efficiency of the rebated HVAC units are shown in the Table below:

Table 8. Prescriptive HVAC Equipment Efficiency

Unit	Type	Size	SEER	EER
1	Split AC	5	14	12
2	Split HP	4	15	12.5
3	Split HP	5	16	12.5
4	Split AC	5	14.5	11
5	Split AC	5	16	12

Note, since these units are installed in commercial buildings, they are assumed to be 3 phase units. The baseline for a 3 phase unit in this size range is SEER 12 / EER 10. The savings for these units calculated from the simulation model is shown in the Table below:

Table 9. Unit Energy and Demand Savings for Prescriptive HVAC Systems.

Type	Size Category	SEER	EER	Building Type	kWh/ton savings	kW/ton savings
Split AC	< 65 kBtu/hr	14	12	Small Office	150	0.099
Split HP	< 65 kBtu/hr	15	12.5	Small Retail	196	0.118
Split HP	< 65 kBtu/hr	16	12.5	Small Office	262	0.119
Split AC	< 65 kBtu/hr	14.5	11	Small Office	181	0.054
Split AC	< 65 kBtu/hr	16	12	Warehouse	179	0.099

The unit energy and demand savings shown in table above were applied to the inventory of rebated HVAC systems in the program tracking database to estimate the total savings associated with the prescriptive HVAC program. The annual energy and demand savings for the prescriptive HVAC program component was estimated at 5,545 kWh per year, with a coincident demand savings of 3 kW.

Custom Program Component

The custom component of the C&I program covered a variety of lighting, HVAC, building shell and appliance measures. The breakdown of measure types by expected kWh savings is shown in Figure 2.

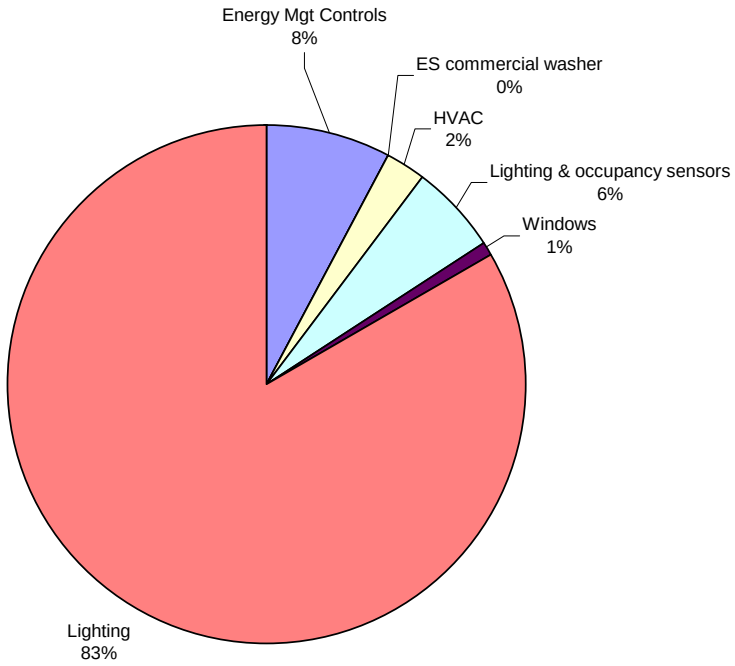


Figure 2. Measure Breakdown in Custom C&I Program

The majority of the savings from the C&I program come from custom lighting and lighting controls projects. From June 2007 through May 2008, a total of 38 custom lighting projects were paid, with an expected total savings of 2.7 GWh. The projects included installation of T-8 linear fluorescent fixtures, high-bay fluorescent fixtures, exit signs, and occupancy sensors controls.

An additional 12 additional custom projects were paid during the program cycle, covering high efficiency rooftop unit replacements, energy management and control systems, high performance windows and commercial washers.

To evaluate the custom projects, the projects were segmented into two categories – lighting and "other." The sampling strategy assumed a lower variability in the lighting projects savings relative to HVAC projects, which comprise the majority of the "other" projects. An *error ratio* was used to define the strength in the relationship between the tracking estimates of savings and the evaluated estimate of savings across the project population. A lower error ratio implies a stronger association between the tracking and evaluated estimates; a higher error ratio implies a weaker association[4]. For the lighting projects, an error ratio of 0.2 was assumed and a sampling precision of 0.1 was selected. For the other projects, an error ratio of 0.5 was assumed and a

[4] For more information about the error ratio, see "The California Evaluation Framework" Chapter 13: Sampling, pg 340. http://www.tecmarket.net/documents/California%20Evaluation%20Framework%20Jan%202006.pdf

relative precision of 0.3 was selected. The sampling assumptions and sample size calculations are summarized below:

Table 10. Custom Program Sample Design

Parameter	Lighting	Other
Error ratio	0.2	0.5
Relative precision	0.1	0.3
Population	38	12
Sample size	8	4
Estimated savings	3,514,049 kWh	436,783 kWh
Sampling error	351,405 kWh	131,035 kWh
Overall sampling error	482,440 kWh	
Overall sampling precision	0.122	

Since the "other" category accounts for a relatively small portion of the total savings, using a more relaxed sampling relative error criterion of 0.3 still provided an overall sampling relative precision of around ±12%.

Custom Lighting

Custom lighting projects were evaluated by taking a simple random sample of participating projects conducting an engineering review on those projects. A sample of 8 of the lighting projects was drawn at random from the list of 38 total projects. Application files for each of the 8 customers plus 4 backup selections were received from Empire. The list of projects reviewed is shown below:

Table 11. Custom Lighting Project Sample

Project	Building Type	Project Description	Claimed kWh savings	Claimed kW savings
1	Retail	T-8 lighting and LED exit signs	21,024	4.9
2	Warehouse/Distribution	High Bay Fluorescent Fixtures	165,744	23.8
3	Manufacturing	T-8 lighting and High Bay Fluorescent Fixtures	6,921	1.5
4	Retail	T-8 lighting	72,293	11.0
5	Retail	T-8 lighting	18,405	5.6
6	Grocery	T-8 lighting	239,797	32.9
7	Warehouse/Distribution	High Bay Fluorescent Fixtures	14,502	2.8
8	Warehouse/Distribution	T-8 lighting and High Bay Fluorescent Fixtures	200,581	19.9

Fixture wattage assumptions were reviewed against a table of standard fixture watts compiled by the California utilities for the Standard Performance Contract (SPC)[5] program. The businesses were contacted by phone to verify lighting system operating hours, and the assumptions used in the applications were updated accordingly. Self reported operating hours by daytype (workday,

[5] See http://www.sce.com/NR/rdonlyres/F7AD732A-BEEA-43FA-A57D-71D8FF0EF8D7/0/090601_SCE_B_Standard_Fixture_Watts.pdf

Saturday, Sunday and Holiday) were projected to annual operating hours. The projected operating hours assumed 5% of the fixtures serve as egress lights and remain on at all times. Revised energy savings estimates were computed using these updated assumptions for each of the sampled projects.

In general, there were minor variations in the wattage assumptions used in the calculations. A plot of the ratio of the total fixture kW assumed in the application to the total evaluated fixture kW is shown in the Figure below:

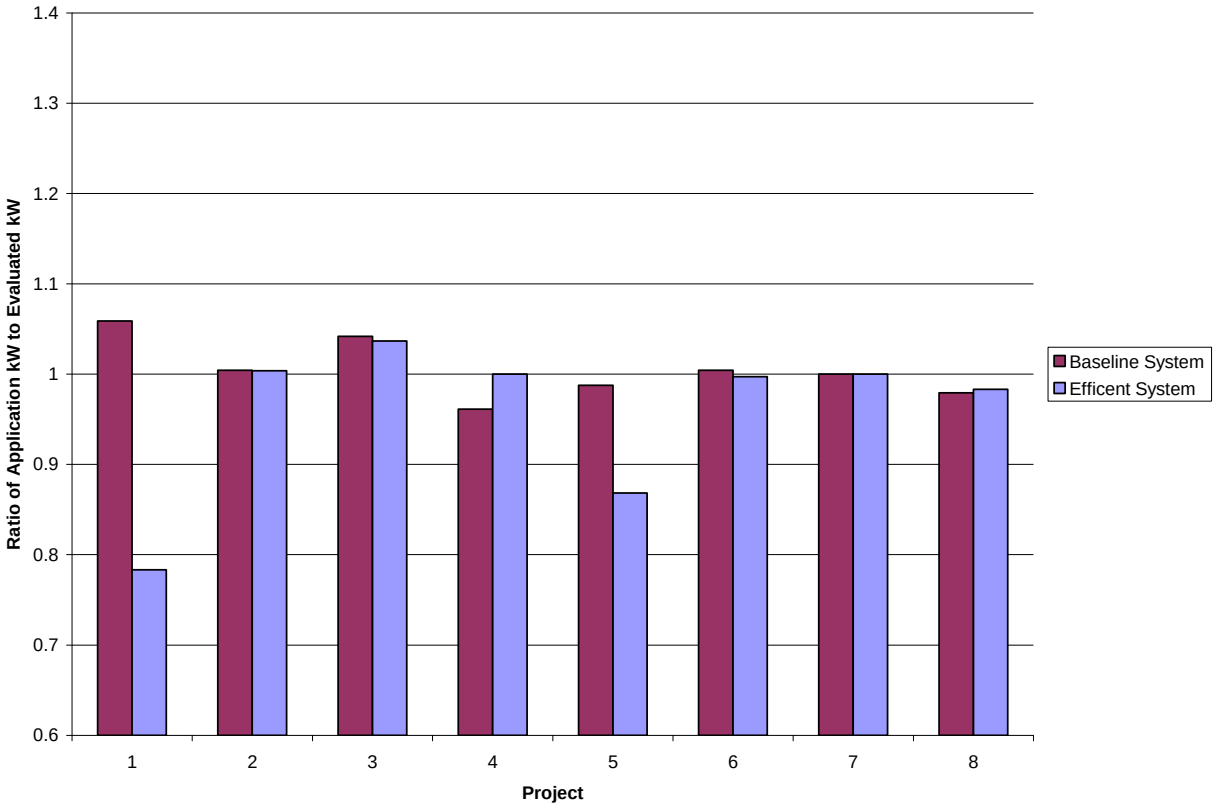


Figure 3. Variability in Lighting Connected Watts Assumptions

Note, values greater than 1 indicate the application used a fixture wattage higher than the assumptions used in this evaluation. Projects 1 and 6 show a situation where the baseline wattage was overestimated and the efficient wattage was underestimated, leading to a decrease in the kW savings relative to the original estimate.

The variation in fixture watts assumptions for popular fixture types relative to the standard values in the SPC table is shown in Table 12.

Table 12. Variation in Fixture Watts Assumptions Across Sampled Projects

Fixture type	SPC Standard Watts	Application Watts Range	Notes
2 lamp 4 ft T-8	60	51 - 76	Average 63.4 W
4 lamp 4 ft T-8	118	58 - 114	Some fixtures identified as 4 lamp T-8 were likely entered as 2 lamp fixtures
400 W Metal Halide	458	455 - 475	Average 460 W
2 lamp 8ft T-12 ES	128	138	Systematic difference across the board

The differences did not significantly affect to the total connected kW calculations, but point out the potential need for standardization in the fixture watts assumptions across contractors.

A similar chart showing the ratio of the operating hours used in the application to the operating hours verified from the phone surveys is shown in Figure 4.

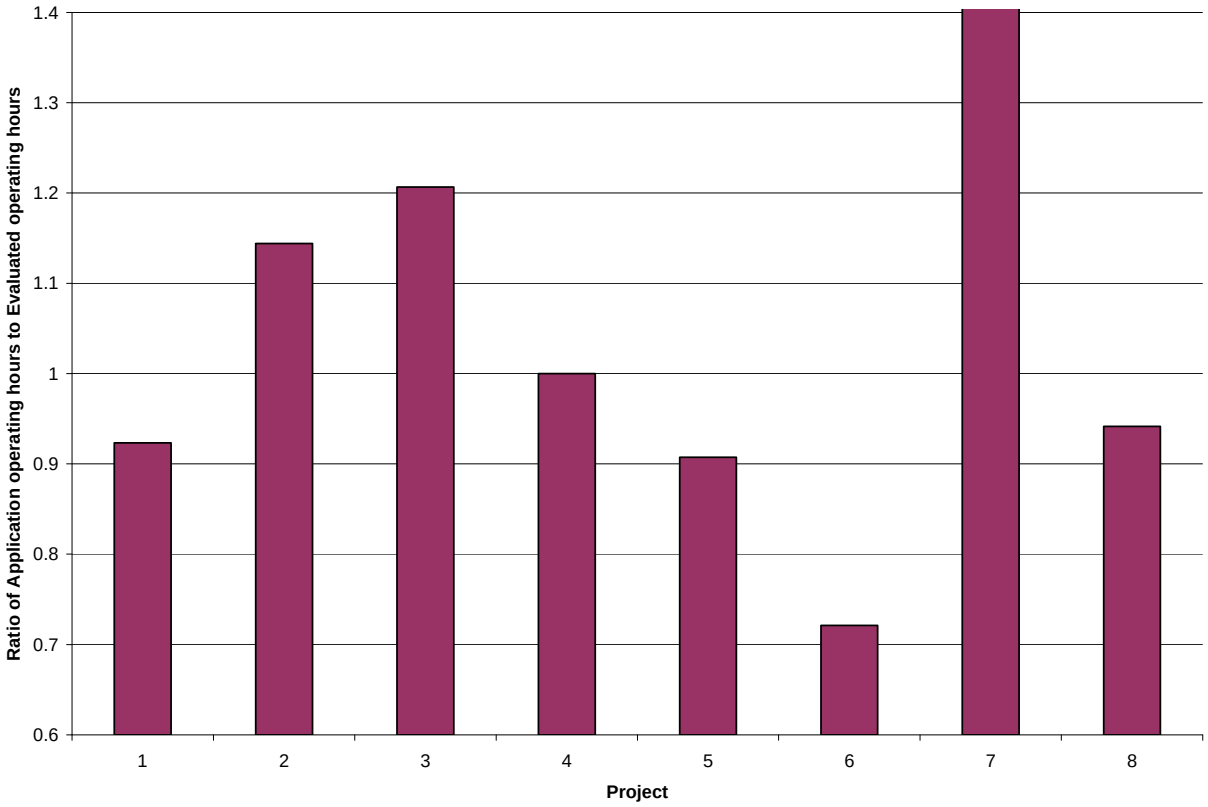


Figure 4. Variation in Application vs. Evaluated Operating Hour Assumptions

There is much more variability in the operating hour assumptions than the fixture watts assumptions. For example, the operating hours for project 6 were underestimated by about 30%, while the operating hours for project 7 were overestimated by about 40%. This is expected, since facility operations can only be surmised during project development.

The overall energy savings results for the custom lighting project sample are summarized in the Table below. The claimed and evaluated savings are shown, along with the project and sample realization rate (RR). Realization rate is defined as the ratio of the evaluated savings to the claimed savings; projects with a realization rate greater than 1 exceeded the expectations, while projects with a realization rate less than 1 performed below expectations.

Table 13. Summary of Custom Lighting Engineering Review

Project	Building Type	Claimed kWh savings	Evaluated kWh savings	RR[6]	Claimed kW savings	Evaluated kW savings	RR
1	Retail	21,024	10,099	0.48	4.9	2.1	0.43
2	Warehouse/Distribution	165,744	144,178	0.87	23.8	23.7	1.00
3	Manufacturing	6,921	6,128	0.89	1.5	1.5	1.00
4	Retail	72,293	80,966	1.12	11.0	12.3	1.12
5	Retail	18,405	16,611	0.90	5.6	4.5	0.80
6	Grocery	239,797	328,895	1.37	32.9	32.6	0.99
7	Warehouse/Distribution	14,502	8,018	0.55	2.8	2.4	0.86
8	Warehouse/Distribution	200,581	214,629	1.07	19.9	20.4	1.03
	Total	739,267	809,524	1.10	102	100	0.97

Although several of the projects came in with realization rates below 1, the largest project in the sample exceeded the claimed savings by about 37%, bringing the overall realization rate for the sample to 1.10 for kWh savings. The overall sample realization rate for kW savings came in near 1.0, reflecting generally good agreement on the fixture watts assumptions.

Custom "Other"

A sample of four projects was selected for engineering review. The projects sampled are summarized below:

Table 14. Custom "Other" Project Sample.

Project	Building Type	Project Description	Claimed kWh savings	Claimed kW savings
1	Big Box Retail	Hi efficiency rooftop air conditioners	23,216	11.7
2	Church	Energy Management Control System	70,545	0.0
3	Hotel	Energy Management Control System [7]	205,232	0.0
4	Primary School	Energy Management Control System	33,423	0.0

Each project was assigned to a standard building type, and a series of DOE-2 building energy simulations was conducted for each building type. The details of the prototypical building models are shown in Appendix C. Prototypical Building Descriptions. The results of the

[6] RR refers to the realization rate, which is the ratio of the evaluated savings to the claimed savings.

[7] This project was carried out in two phases under two different applications. Both phases were evaluated together as a single project.

simulations were compared to the engineering calculations during the engineering review process. A brief description of each of the projects follows:

Project 1. Big Box Retail. The project involved the normal replacement of 7 packaged rooftop units with high efficiency units. A new, standard efficiency unit conforming to ASHRAE Standard 90.1-2004 was used as the baseline. A simulation of the Big Box Retail prototype was conducted using the DOE-2.2 building energy simulation model. Unit energy savings were calculated for packaged rooftop unit replacements of various sizes and efficiencies. The savings estimated for each of the 7 packaged rooftop unit replacements from the DOE-2 simulations are summarized below:

Table 15. Energy Savings Summary for Project 1.

Qty	Unit size (ton)	Baseline		Measure		Unit Savings		Total Savings	
		Efficiency	Units	Efficiency	Units	kWh/ton	kW/ton	kWh	kW
1	5	12	SEER	13	SEER	78	0.056	390	5.0
1	7.5	10.3	EER	11.3	EER	139	0.100	1,042	7.5
4	17	9.7	EER	11.5	EER	242	0.173	16,478	11.8
1	19.2	9.7	EER	11	EER	190	0.136	3,642	2.6
Total								21,551	12.4
Demand savings with 0.8 coincidence factor applied									9.9
Savings from tracking database								23,216	11.7
Realization rate								0.93	0.85

Project 2. Church. The project involved the implementation of a centralized Energy Management Control System to control the thermostat settings of 32 packaged air conditioners located throughout the facility. The combined cooling capacity of the controlled units is 261 tons. The assembly prototype was used to estimate the savings from implementing a temperature setback strategy on each of the units. The baseline assumed constant thermostat setpoints of 70°F for heating and 75°F for cooling. The measure control strategy assumed unoccupied period setpoints of 65°F for heating and 80°F for cooling. The energy savings are summarized in the Table below:

Table 16. Energy Savings Summary for Project 2.

Parameter	Value
Savings per ton from DOE-2 model	203 kWh/ton
Total tons	261
Total savings	52,915
Savings from tracking database	70,546
Realization rate	0.75

No peak demand savings were claimed for this measure.

Project 3. Hotel. Project involved installation of a guest room energy management system in 93 hotel rooms served by packaged terminal heat pumps (PTHP). The system uses occupancy sensors to turn the PTHPs on and off based on room occupancy, and a wall-mounted thermostat

to control the units. Energy savings result from reduced run hours from the occupancy sensor control and tighter room temperature control from the wall-mounted thermostat. The Hotel prototype was used to estimate the annual energy consumption from the PTHP systems serving the guest rooms. An evaluation study literature review was conducted to identify measured energy savings from similar control systems[8]. The results of the analysis are summarized below:

Table 17. Energy Savings Summary for Project 3.

Parameter	Value
Annual energy consumption per ton from DOE-2 model	1,726 kWh/ton
PTHP size	0.75 ton
PTHP quantity	93
Total tons	70 tons
Energy savings (as a fraction of total consumption) from lit review	0.21
Total savings	25,285 kWh
Savings from tracking database	205,232 kWh
Realization rate	0.12

No peak demand savings were claimed for this measure. The engineering calculations supporting the savings claim were conducted by the manufacturer of the control system. The savings calculations overestimated the annual energy consumption of the PTHP system, thereby overestimating the annual savings expected from the controller.

Project 4. Primary School. The project involved the implementation of a centralized Energy Management Control System to control the thermostat settings of 24 packaged air conditioners located throughout the facility. The combined cooling capacity of the controlled units is 98 tons. The primary school prototype was used to estimate the savings from implementing a temperature setback strategy on each of the units. The baseline assumed constant thermostat setpoints of 70°F for heating and 75°F for cooling. The measure control strategy assumed unoccupied period setpoints of 65°F for heating and 80°F for cooling. The energy savings are summarized in the Table below:

Table 18. Energy Savings Summary for Project 4.

Parameter	Value
Savings per ton from DOE-2 model	348 kWh/ton
Total tons	98
Total savings	34,104
Savings from tracking database	33,423
Realization rate	1.02

No peak demand savings were claimed for this measure.

A summary of the results for all projects in the custom "other" sample is shown in Table 19.

[8] Hotel guest room energy management systems were evaluated as a component of the Southern California Edison IDEEA program evaluation. See "Southern California Edison 2004-2005 IDEEA Constituent Program Evaluations, Vol. 1. Prepared for Southern California Edison by Quantec LLC. June, 2008. Available at www.calmac.org.

Table 19. Energy Savings Summary for Custom "Other" Sample.

Project	Building Type	Claimed kWh savings	Evaluated kWh savings	RR	Claimed kW savings	Evaluated kW savings	RR
1	Big Box Retail	23,216	21,551	0.93	11.7	9.9	0.85
2	Church	70,545	52,915	0.75	0.0		
3	Hotel	205,232	25,285	0.12	0.0		
4	Primary School	33,423	34,104	1.02	0.0		
	Total	332,416	133,855	0.40	11.7	9.9	0.85

Note, the realization rates for most projects were within the range of about 0.75 to 1.0, with the exception project 3, which had a poor realization rate. The low realization rate and high expected savings for project 3 pulled the sample realization rate for kWh savings down to 0.4.

Program Energy and Demand Savings

The total program energy and demand savings were estimated separately for prescriptive and custom program elements. The prescriptive measure savings were estimated for all participants as described in the section above. The custom program savings were estimated by applying the sample realization rates calculated above to the total estimated savings for the custom program participants by measure type. The results of these calculations are shown in the Table below:

Table 20. Total Gross Program Energy and Demand Savings

Program Element	Claimed Savings		Realization Rates		Evaluated Savings	
	kWh	kW	kWh	kW	kWh	kW
Custom lighting	3,514,049	493	1.10	0.97	3,848,013	479
Custom other	436,783	14	0.40	0.85	175,880	12
Prescriptive lighting					142,273	39
Prescriptive HVAC					5,545	3
				Total	4,171,711	532

Benefit Cost Test

Table 21. Benefit Cost Test Results for the C&I Rebate Program

	Prescriptive		Custom		Total	
Test	NPV	B/C Ratio	NPV	B/C Ratio	NPV	B/C Ratio
Total Resource Cost	+ $43,484	1.65	+ $1,219,274	1.96	+ $1,261,982	1.95
Societal Cost	+ $50,460	1.76	+ $1,409,161	2.11	+ $1,458,845	2.09
Participant Cost	+ $147,481	3.34	+ $4,319,371	4.59	+ $4,466,852	4.53
Utility Cost	+ $53,831	3.08	+ $1,335,519	3.85	+ $1,388,786	3.81
Ratepayer Impact Measure	- $2,460,983	0.43	- $2,356,908	0.44	- $2,460,983	0.43

The total resource cost test showed a positive net present value (NPV) for the Commercial & Industrial Rebate Program is $1,261,982. 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 $68,043 plus the participants' equipment cost of $1,264,970. A benefit cost ratio greater than one, 1.95, shows that this program can be considered economical from the combined perspective of the utility and the ratepayers. A sensitivity analysis concludes that the program would remain economical unless the participants' costs exceeded $2,526,952.

The societal cost test also produced a positive NPV for the C&I Rebate Program is $1,458,845. The societal test aims to represent the program from the point of view of the society as a whole, capturing all benefits and costs, including externalities. In this case, externalities are made up of the known avoided environmental damage costs, totaling $247,758. This amount was added to the savings from the TRC test and the benefit cost ratio was recomputed to be 2.09. 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 C&I Rebate Program is $4,466,852 with a ratio of 4.53 and $1,388,786 with a ratio of 3.81, 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, -$2,460,983 and 0.43, 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 22. Parameter Values and Assumptions for Benefit Cost Tests

Parameter	Value		Assumption	Value
Number of Participants	67		Avoided Energy Cost	$0.03436
Project Life (years)	15		Demand Cost	$51
Project Analysis Year 1	2009		Environmental Externalities	$0.0031
kWh/yr. Saved	4,171,973		Retail Rate	$0.08355
kW/yr. reduction	532		Escalation Rate	3.00%
Utility Project Cost	$494,094		Societal Discount Rate	3.22%
Incentive Cost	$426,051		Participant Discount Rate	3.22%
Participant Cost	$1,264,970		Utility Discount Rate	8.44%

Appendix A: C&I Rebate Program: Management Interview Instrument

Name: _____

Title: _____

Position description and general responsibilities:

_____

_____

_____

We are conducting this interview to obtain your opinions about and experiences with the Empire Commercial and Industrial Program. We'll talk about the C&I Program and its objectives, your thoughts on improving the program and its participation rates, 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 Small Commercial and Industrial Incentive Program's objectives.

2. In your opinion, which objectives do you think are being met or will be met? How do you think the program's objectives have changed over time?

3. Are there any program objectives that are not being addressed 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? Do you think these changes will increase program participation?

4. Should the program objectives be changed in any way because of market conditions, other external or internal program influences, or any other conditions that have developed since the program objectives were devised? What changes would you put into place, and how would it affect the objectives?

5. Do you think the incentives application process offered through the C&I program is easy to understand and complete?

6. Do you think the incentives offered through the program are large enough to entice the C&I community to purchase the high efficiency items? Why or why not?

7. Do you think the incentives cover the right equipment? Do you think there is equipment that is currently incentivized that should not be, or equipment that is not covered that should be?

8. Which measures have been most used? Why, and why have other measures not been adopted?

9. What kinds of marketing, outreach and customer contact approaches do you use to make your customers aware of the program and its options? Are there any changes to the program marketing that you think would increase participation?

10. How do you inform trade allies and contractors about the program? How effective has this been in getting participation from the contractors?

11. Are there any changes to the incentives or marketing that could possibly increase participation in the program?

12. Thinking about how your program enrolls participants, what do you think your level of freeridership is for this program? (That is, what percent of the equipment rebated through the program would have been purchased and installed without the program's incentive?)

13. What do you think the level of spillover is for this program? (That is, what percent of the participants take similar actions in their businesses that are not rebated through the program?)

Overall Small C&I Incentives Management

14. Describe the use of any advisors, technical groups or organizations that have in the past or are currently helping you think through the program's approach or methods. How often do you use these resources? What do you use them for?

15. Overall, what about the Commercial and Industrial Program works well and why?

16. What doesn't work well and why? Do you think this discourages participation?

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

18. If you had a magic wand and could change any part of the program what would you change and why?

Program Design & Implementation

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. How do you manage and monitor or evaluate contractor involvement or performance? What is the quality control and tracking process? What do you do if contractor performance is exemplary or below expectations?

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

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

If no, 22b. What other products or equipment should be included?

_____

_____

24. In what ways can the Commercial and Industrial Program's operations be improved?

25. Do you have any suggestions for how program participation can be increased?

Appendix B: C&I Rebate Program: Facility Manager (Participants) Interview Instrument

Hello, my name is _____. I am calling on behalf of Empire District Electric to conduct a customer survey about the Commercial and Industrial Program. May I speak with _____ please?

If person talking, proceed. If person is called to the phone reintroduce.
If not home, ask when would be a good time to call and schedule the call-back:

Call back 1:	Date: _____,	Time: _____ ❑AM or ❑PM
Call back 2:	Date: _____,	Time: _____ ❑AM or ❑PM
Call back 3:	Date: _____,	Time: _____ ❑AM or ❑PM
Call back 4:	Date: _____,	Time: _____ ❑AM or ❑PM
Call back 5:	Date: _____,	Time: _____ ❑AM or ❑PM
Call back 6:	Date: _____,	Time: _____ ❑AM or ❑PM
Call back 7:	Date: _____,	Time: _____ ❑AM or ❑PM

❑ Contact dropped after seventh attempt.

We are conducting this survey to obtain your opinions about the Commercial and Industrial Program. We are not selling anything. The survey will take about 10-15 minutes and your answers will be confidential, and will help us to make improvements to the program to better serve others. May we begin the survey?

1. Our records indicate that you participated in the Commercial and Industrial Program in <date> **and that you installed** <technology> **through the program and received an incentive for your purchase. Do you recall participating in this program?**

1. ❑ Yes, *begin* *Skip to Q2.*
2. ❑ No,
99. ❑ DK/NS

1a. **This program was provided through Empire Electric. In this program, you purchased an energy efficient lighting, HVAC, motor, pump, or other energy efficient equipment. In exchange for purchasing the energy efficient option, Empire Electric provided your company with an incentive.**

Do you remember participating in this program?

1. ❑ Yes, *begin* → *Go to Q2.*
2. ❑ No,

99. ❑ DK/NS ——

If No or DK/NS terminate interview and go to next participant.

2. How did you become aware of the C&I Program?

- **a.** ❑ Empire Electric sent me a brochure
- **b.** ❑ Empire Electric called and talked to me about it
- **c.** ❑ Empire Electric website.
- **d.** ❑ A contractor I was working with told me about the program
- **e.** ❑ An equipment supplier
- **f.** ❑ I saw an ad in _____
- **g.** ❑ Other _____
- **h.** ❑ DK/NS

3. When you first heard about the program and considered taking advantage of the incentive, did you do any additional investigation to confirm the program's offering, or was the information you had adequate to make a participation decision?

- **a.**❑ The information was adequate
- b.❑ Didn't need to confirm/Nothing
- **c.**❑ Went to the web site
- **d.** ❑ Called or emailed Empire Electric
- **e.**❑ Called or emailed a contractor
- f.❑ Called or emailed a salesperson
- g.❑ Other: _____
- h.❑ DK/NS

If c, d, e, f, g: **4. How well did this work for you, were you able to acquire a more complete understanding of the program?** *Note: many may have only heard about this through their contractors and thus had minimal involvement, so this question may only apply to a few of them.*

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

5. Did you have additional questions that were not answered? Were there questions that you were unable to answer or information that you were unable to obtain?

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

5a. What were they?

_____

_____

6. **Who filled out the program incentive forms for your company?**
   - **a.** ❑ I did
   - **b.** ❑ Someone from my company did
   - **c.** ❑ The contractor
   - **d.** ❑ The salesperson
   - **e.** ❑ Someone from Empire Electric

7. **Who submitted the forms to Empire Electric?**
   - **a.** ❑ I did
   - **b.** ❑ Someone from my company did
   - **c.** ❑ The contractor
   - **d.** ❑ The salesperson
   - **e.** ❑ Someone from Empire Electric

8. *If they filled it out.* **Was the incentive form easy to understand?**

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

If not, 8b. **Do you remember what it was that was not clear or which part of it was difficult?**

_____

_____

9. **Did you have any problems receiving the incentives?**

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

If yes, 9b. **Please explain the problem and how it was resolved. Was it resolved to your satisfaction?**

_____

_____

10. **Did you originally plan on purchasing the exact same efficiency level in the equipment you purchased before you knew that there was an incentive offered by Empire Electric?**

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

11. In your decision process, did you search for or consider other, less energy efficient equipment that might have cost less?

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

12. **What was the primary reason that you decided to purchase or upgrade your equipment?**

1. ❑ Remodeling
2. ❑ Equipment failure
3. ❑ Contractor recommendation
4. ❑ Energy Savings
5. ❑ Got a good deal
6. ❑ It was an old system
7. ❑ Combination of above: *list*: _____

13. **I would like to ask how important the program incentive was in your decision to buy the more energy efficient model. Would you say the incentive was…** *(read and check the best response).*

a. # **The primary reason why you purchased the high efficiency model,**
b. #**An important reason, along with other reasons,**
c. #**One of the reasons, but it was not the most important,**
d. #**One of the reasons, but it was a minor or unimportant reason, or**
e. #**It was not a reason at all,**
f. **#DK/NS.**

14. If the incentives were not available from the program, would you have delayed your purchase, or would you have made the purchase at the exact same time?

a. # The purchase would have been delayed – **How long do you think you might have waited to make the purchase? _____**
b. # The purchase would have been made at the same time
c. #DK/NS

15. Were there other reasons in addition to the incentive that you went with the high efficiency <technology> **instead of something less expensive to purchase?**

_____

_____

16. When firms have experience with energy efficiency programs or products they sometimes make similar decisions to continue the energy savings in other parts of

their business. Have you taken any other energy efficiency actions that may have been, in some way, influenced by your experiences with the Empire Electric program?

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

a. *If yes,* **What have you done?**
b. *If yes,* **How much money do you think you have saved as a result?**

_____

_____

17. One of the objectives that the program would like to see over the next year is increased participation of businesses like yours. Can you think of things that the program can do to help increase participation or help increase interest from people like yourself?

a. #Increase general advertising
b. #Increase advertising in trade media
c. #Present the program in trade or associated meetings
d. #Offer larger incentives
e. #Offer incentives on other items/include other items
f. #Have program staff call C&I customers
g. #Make the process more streamlined for customers
h. #Make the process more streamlined for contractors
i. #Other: _____

18. **During your participation process, did you need to contact Empire Electric to obtain information about the program?**

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

If yes, 18b. **Were your questions or needs effectively handled by Empire Electric?**

1. ❑ Yes 2. ❑ No 99. ❑ DK/NS

18c. **How might this be improved?**

_____

_____

19. Overall, what about the C&I Program works well and why?

_____

_____

20. What doesn't work well and why?

_____

_____

We would like to ask you a few questions about your satisfaction with the program. For these questions we would like you to rate your satisfaction using a 1 to 10 scale where a 1 means that you are very dissatisfied with the program and a 10 means that you are very satisfied.

21. How would you rate your satisfaction with.

a. The incentive levels provided by the program

1 2 3 4 5 6 7 8 9 10

b. The ease of filling out the participation and incentive forms

1 2 3 4 5 6 7 8 9 10

c. The time it took for your to receive your incentive

1 2 3 4 5 6 7 8 9 10

d. The number and kind of technologies covered in the program

1 2 3 4 5 6 7 8 9 10

e. The information you were provided explaining the program,

1 2 3 4 5 6 7 8 9 10

For each item above that received a score of 8 or less ask:
21a. What could have been done to make this better?

For item a: the incentive levels provided by the program

_____

_____

For item b: the ease of filling out the participation and incentive forms

_____

_____

For item c: the time it took for your to receive your incentive

_____

_____

For item d: the number and kind of technologies covered in the program

_____

_____

For item e: the information you were provided explaining the program

_____

_____

22. Considering all aspects of the program, how would you rate your overall satisfaction with the Program?

1 2 3 4 5 6 7 8 9 10

If score is 8 or less ask: **What could have been done to make your experience better, or have we already covered it?**

_____

_____

Appendix C. Prototypical Building Descriptions

The prototypical simulation models were derived from the California Database for Energy Efficiency Resources (DEER) study, with adjustments make for local building practices and climate. A description of each prototype simulation model follows.

Assembly

A prototypical building energy simulation model for an assembly building was developed using the DOE-2.2 building energy simulation program. The characteristics of the prototype are summarized in Table 23.

Table 23. Assembly Prototype Building Description

Characteristic	Value
Vintage	Existing (1970s) vintage
Size	34,000 square feet Auditorium: 33,240 SF Office: 760 SF
Number of floors	1
Wall construction and R-value	Concrete block, R-5
Roof construction and R-value	Wood frame with built-up roof, R-12
Glazing type	Multipane Shading-coefficient = 0.84 U-value = 0.72
Lighting power density	Auditorium: 1.9 W/SF Office: 1.55 W/SF
Plug load density	Auditorium: 1.2 W/SF Office: 1.7 W/SF
Operating hours	Mon-Sun: 8am – 9pm
HVAC system type	Packaged single zone, no economizer
HVAC system size	Based on ASHRAE design day conditions, 10% oversizing assumed.
Thermostat setpoints	Occupied hours: 75 cooling, 70 heating Unoccupied hours: 80 cooling, 65 heating

A computer-generated sketch of the prototype is shown in Figure 5.

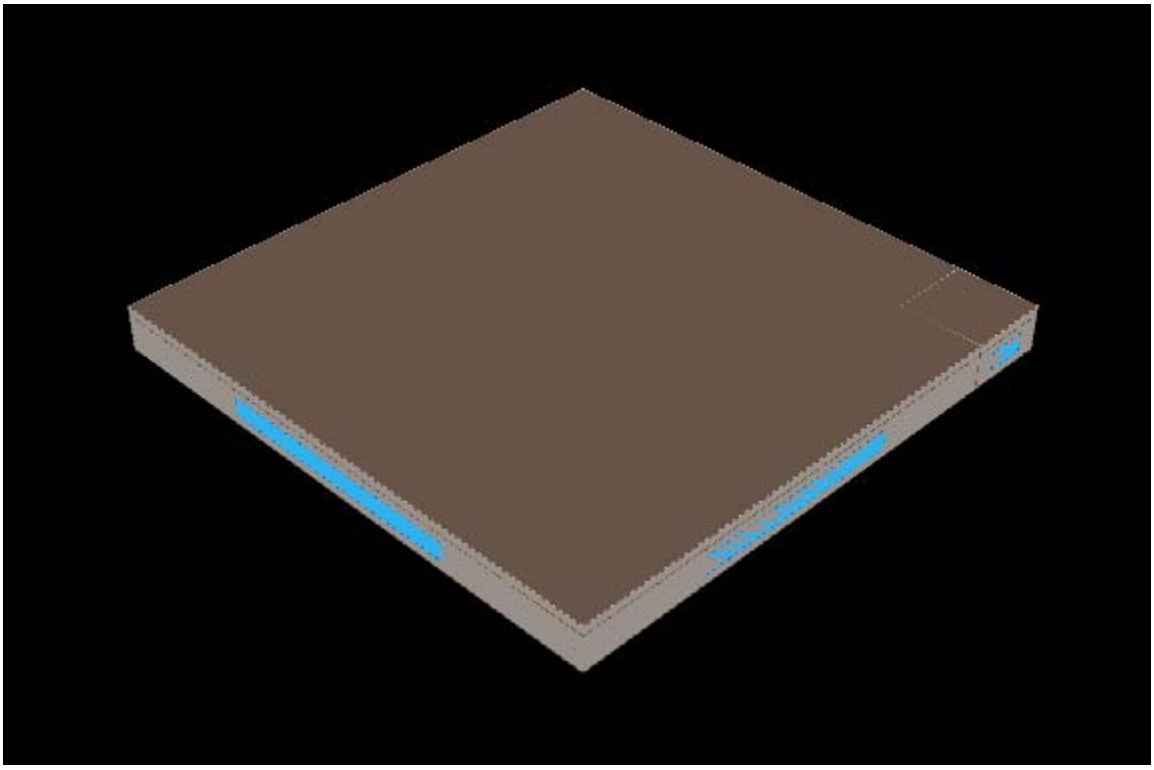


Figure 5. Assembly Building Rendering

Big Box Retail

A prototypical building energy simulation model for a big box retail building was developed using the DOE-2.2 building energy simulation program. The characteristics of the prototype are summarized in Table 24.

Table 24. Big Box Retail Prototype Building Description

Characteristic	Value
Vintage	Existing (1970s) vintage
Size	130,500 square feet Sales: 107,339 SF Storage: 11,870 SF Office: 4,683 SF Auto repair: 5,151 SF Kitchen: 1,459 SF
Number of floors	1
Wall construction and R-value	Concrete block with insulation, R-7.5
Roof construction and R-value	Metal frame with built-up roof, R-13.5
Glazing type	Multipane; Shading-coefficient = 0.84 U-value = 0.72
Lighting power density	Sales: 2.15 W/SF Storage: 0.85 W/SF (Active) 0.45 W/SF (Inactive) Office: 1.55 W/SF Auto repair: 1.7 W/SF Kitchen: 2.2 W/SF
Plug load density	Sales: 1.15 W/SF Storage: 0.23 W/SF Office: 1.73 W/SF Auto repair: 1.15 W/SF Kitchen: 3.23 W/SF
Operating hours	Mon-Sun: 10am – 9pm
HVAC system type	Packaged single zone, no economizer
HVAC system size	Based on ASHRAE design day conditions, 10% oversizing assumed.
Thermostat setpoints	Occupied hours: 75 cooling, 70 heating Unoccupied hours: 80 cooling, 65 heating

A computer-generated sketch of the prototype is shown in Figure 6.

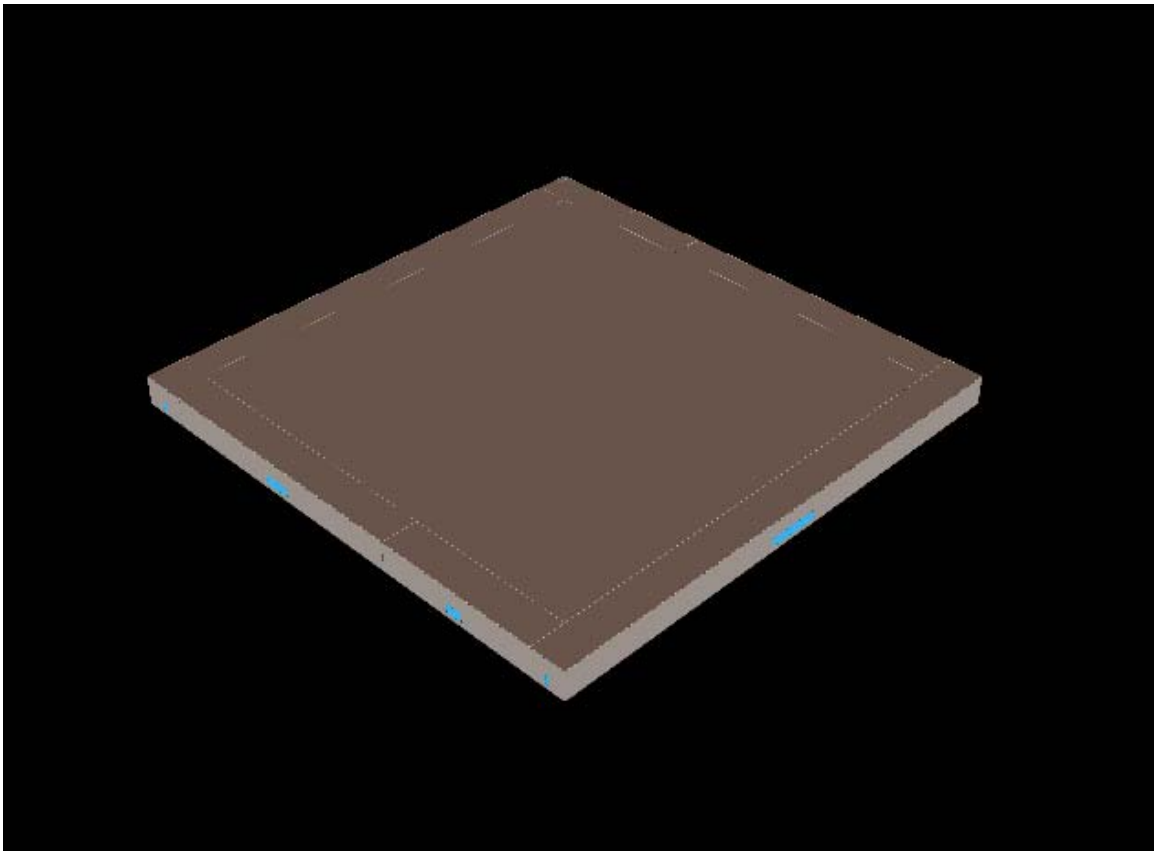


Figure 6. Big Box Retail Building Rendering

Hotel

A prototypical building energy simulation model for a Hotel building was developed using the DOE-2.2 building energy simulation program. The characteristics of the prototype are summarized in Table 25.

Table 25. Hotel Prototype Building Description

Characteristic	Value
Vintage	Existing (1970s) vintage
Size	200,000 square feet total Bar, cocktail lounge – 800 SF Corridor – 20,100 SF Dining Area – 1,250 SF Guest rooms – 160,680 SF Kitchen – 750 SF Laundry – 4,100 SF Lobby – 8,220 Office – 4,100 SF
Number of floors	11
Wall construction and R-value	Block construction, R-7.5
Roof construction and R-value	Wood deck with built-up roof, R-13.5
Glazing type	Multipane; Shading-coefficient = 0.84 U-value = 0.72
Lighting power density	Bar, cocktail lounge – 1.7 W/SF Corridor – 1.0 W/SF Dining Area – 1.7 W/SF Guest rooms – 0.6 W/SF Kitchen – 4.3 W/SF Laundry – 1.8 W/SF Lobby – 3.1 W/SF Office – 2.2 W/SF
Plug load density	Bar, cocktail lounge – 1.2 W/SF Corridor – 0.2 W/SF Dining Area – 0.6 W/SF Guest rooms – 0.6 W/SF Kitchen – 3.0 W/SF Laundry – 3.5 W/SF Lobby – 0.6 W/SF Office – 1.7 W/SF
Operating hours	Rooms: 60% occupied 40% unoccupied All others: 24 hr / day
HVAC system type	Central built-up system: All except corridors and rooms 1. Central constant volume system with perimeter hydronic reheat, without economizer; 2. Central constant volume system with perimeter hydronic reheat, with economizer; 3. Central VAV system with perimeter hydronic reheat, with economizer PTAC : Guest rooms

Characteristic	Value
	PSZ: Corridors
HVAC system size	Based on ASHRAE design day conditions, 10% oversizing assumed.
Chiller type	Water cooled and air cooled
Chilled water system type	Constant volume with 3 way control valves,
Chilled water system control	Constant CHW Temp, 45 deg F setpoint
Boiler type	Hot water, 80% efficiency
Hot water system type	Constant volume with 3 way control valves,
Hot water system control	Constant HW Temp, 180 deg F setpoint
Thermostat setpoints	Occupied hours: 76 cooling, 72 heating Unoccupied hours: 81 cooling, 67 heating

A computer-generated sketch of the prototype is shown in Figure 7. Note, the middle floors, since they thermally equivalent, are simulated as a single floor, and the results are multiplied by 9 to represent the energy consumption of the 9 middle floors.

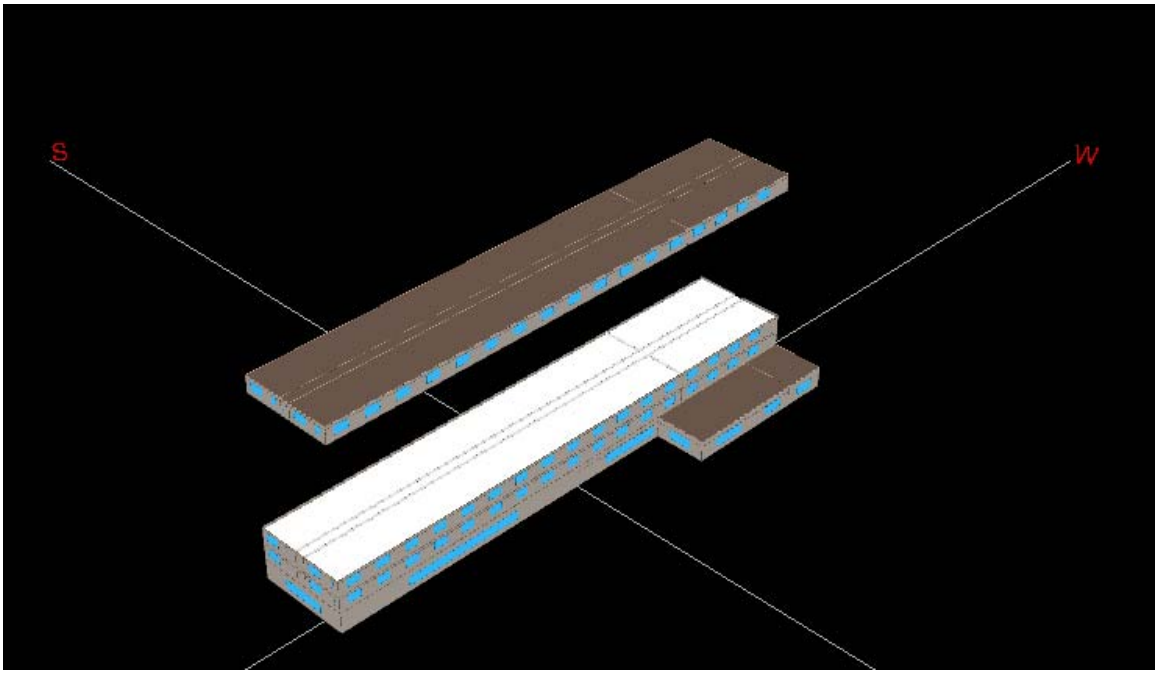


Figure 7. Hotel Building Rendering

Primary School

A prototypical building energy simulation model for an elementary school was developed using the DOE-2.2 building energy simulation program. The model is really of two identical buildings oriented in two different directions. The characteristics of the prototype are summarized in Table B-4.

Table B-4. Elementary School Prototype Building Description

Characteristic	Value
Vintage	Existing (1970s) vintage
Size	2 buildings, 25,000 square feet each; oriented 90° from each other Classroom: 15,750 SF Cafeteria: 3,750 SF Gymnasium: 3,750 SF Kitchen: 1,750 SF
Number of floors	1
Wall construction and R-value	Concrete with brick veneer, R-7.5
Roof construction and R-value	Wood frame with built-up roof, R-13.5
Glazing type	Multipane Shading-coefficient = 0.84 U-value = 0.72
Lighting power density	Classroom: 1.8 W/SF Cafeteria: 1.3 W/SF Gymnasium: 1.7 W/SF Kitchen: 2.2 W/SF
Plug load density	Classroom: 1.2 W/SF Cafeteria: 0.6 W/SF Gymnasium: 0.6 W/SF Kitchen: 4.2 W/SF
Operating hours	Mon-Fri: 8am – 6pm Sun: 8am – 4pm
HVAC system type	Packaged single zone, no economizer
HVAC system size	Based on ASHRAE design day conditions, 10% oversizing assumed.
Thermostat setpoints	Occupied hours: 75 cooling, 70 heating Unoccupied hours: 80 cooling, 65 heating

A computer-generated sketch of the prototype is shown in Figure 8.

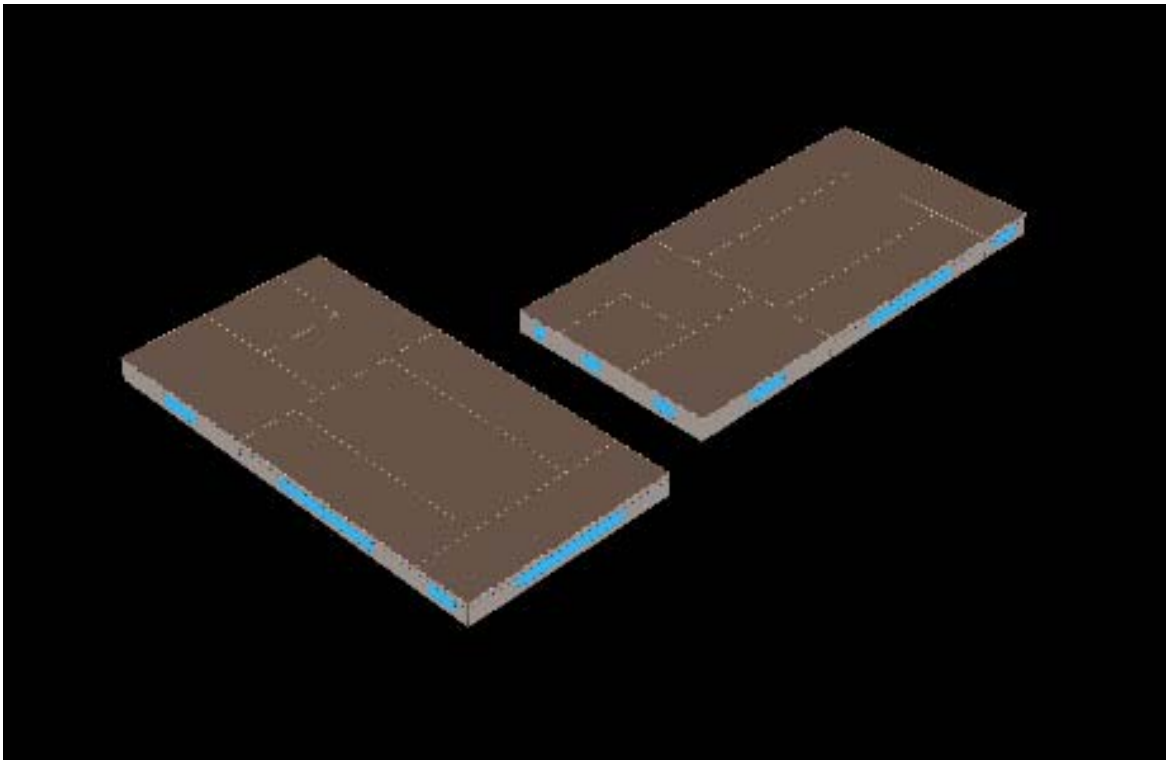


Figure 8. School Building Rendering

Small Office

A prototypical building energy simulation model for a small office was developed using the DOE-2.2 building energy simulation program. The characteristics of the small office prototype are summarized in Table 26.

Table 26. Small Office Prototype Building Description

Characteristic	Value
Vintage	Existing (1970s) vintage
Size	10,000 square feet
Number of floors	2
Wall construction and R-value	Wood frame with brick veneer, R-7.5
Roof construction and R-value	Wood frame with built-up roof, R-13.5
Glazing type	Multipane; Shading-coefficient = 0.84 U-value = 0.72
Lighting power density	Perimeter offices: 1.55 W/SF Core offices: 1.45 W/SF
Plug load density	Perimeter offices: 1.6 W/SF Core offices: 0.7 W/SF
Operating hours	Mon-Sat: 9am – 6pm Sun: Unoccupied
HVAC system type	Packaged single zone, no economizer
HVAC system size	Based on ASHRAE design day conditions, 10% oversizing assumed.
Thermostat setpoints	Occupied hours: 75 cooling, 70 heating Unoccupied hours: 80 cooling, 65 heating

A computer-generated sketch of the small office prototype is shown in Figure 9.

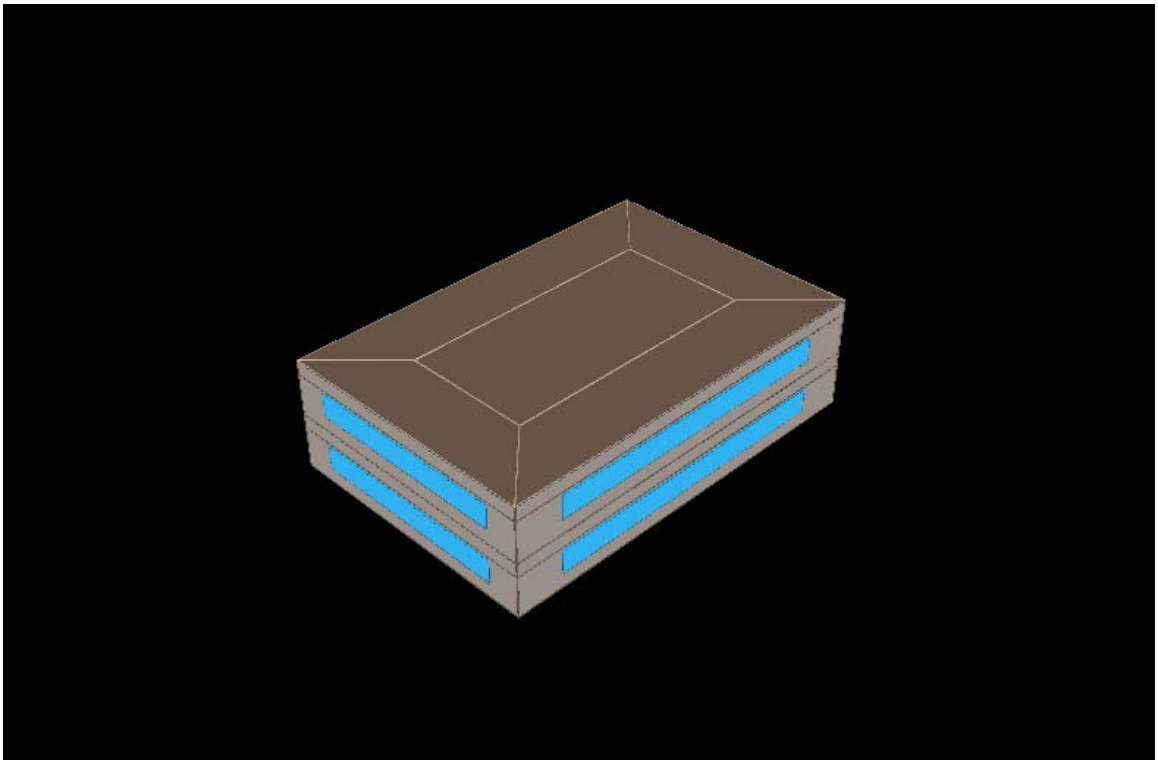


Figure 9. Small Office Prototype Building Rendering

Small Retail

A prototypical building energy simulation model for a small retail building was developed using the DOE-2.2 building energy simulation program. The characteristics of the small retail building prototype are summarized in Table 27.

Table 27. Small Retail Prototype Description

Characteristic	Value
Vintage	Existing (1970s) vintage
Size	6400 square foot sales area 1600 square foot storage area 8000 square feet total
Number of floors	1
Wall construction and R-value	Concrete block with brick veneer, R-7.5
Roof construction and R-value	Wood frame with built-up roof, R-13.5
Glazing type	Multipane; Shading-coefficient = 0.84 U-value = 0.72
Lighting power density	Sales area: 2.15 W/SF Storage area: 0.85 W/SF (Active) 0.45 W/SF (Inactive)
Plug load density	Sales area: 1.2 W/SF Storage area: 0.2 W/SF
Operating hours	10 – 10 Monday-Saturday 10 – 8 Sunday
HVAC system type	Packaged single zone, no economizer
HVAC system size	Based on ASHRAE design day conditions, 10% oversizing assumed.
Thermostat setpoints	Occupied hours: 75 cooling, 70 heating Unoccupied hours: 80 cooling, 65 heating

A computer-generated sketch of the small retail building prototype is shown in Figure 10.

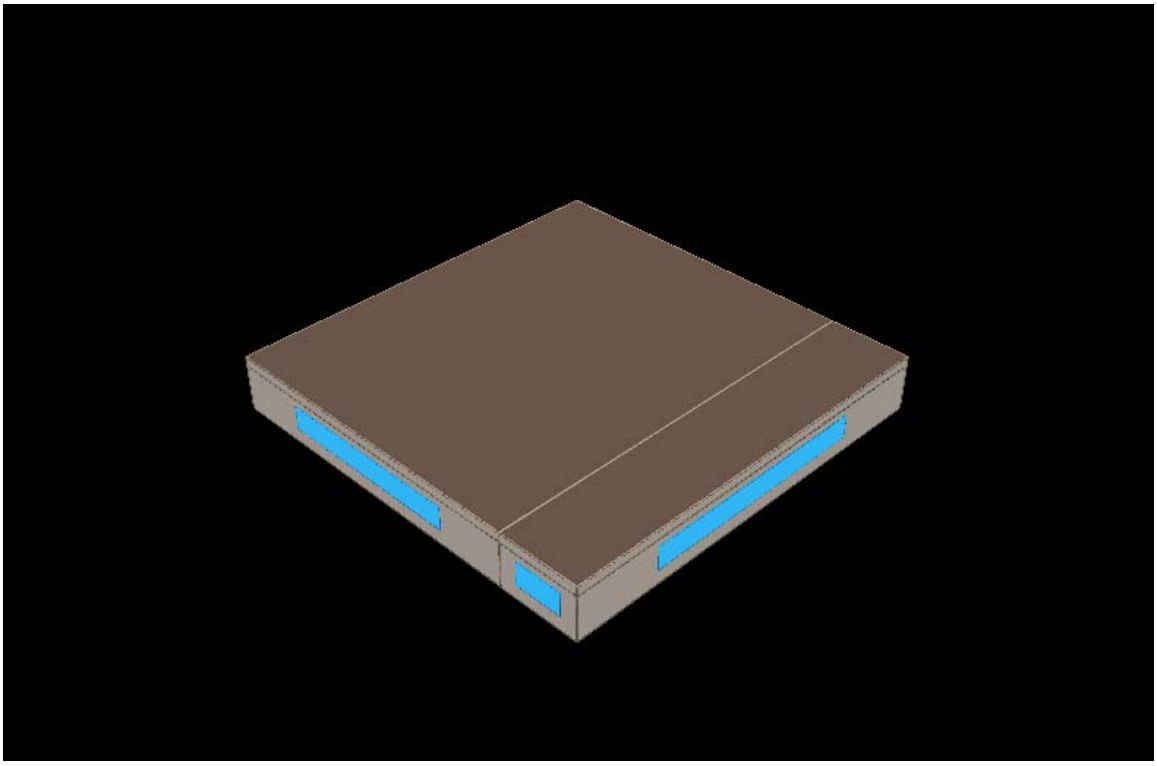


Figure 10. Small Retail Prototype Building Rendering

Warehouse

A prototypical building energy simulation model for a warehouse building was developed using the DOE-2.2 building energy simulation program. The characteristics of the prototype are summarized in Table 28.

Table 28. Warehouse Prototype Building Description

Characteristic	Value
Vintage	Existing (1970s) vintage
Size	500,000
Number of floors	1
Wall construction and insulation R-value	Concrete block, R-5
Roof construction and insulation R-value	Wood deck with built-up roof, R-12
Glazing type	Multipane; Shading-coefficient = 0.84 U-value = 0.72
Lighting power density	0.9 W/SF
Plug load density	0.2 W/SF
Operating hours	Mon-Fri: 7am – 6pm Sat Sun: Unoccupied
HVAC system type	Packaged single zone, no economizer
HVAC system size	Based on ASHRAE design day conditions, 10% oversizing assumed.
Thermostat setpoints	Occupied hours: 80 cooling, 68 heating Unoccupied hours: 85 cooling, 63 heating

A computer-generated sketch of the prototype is shown in Figure 11.

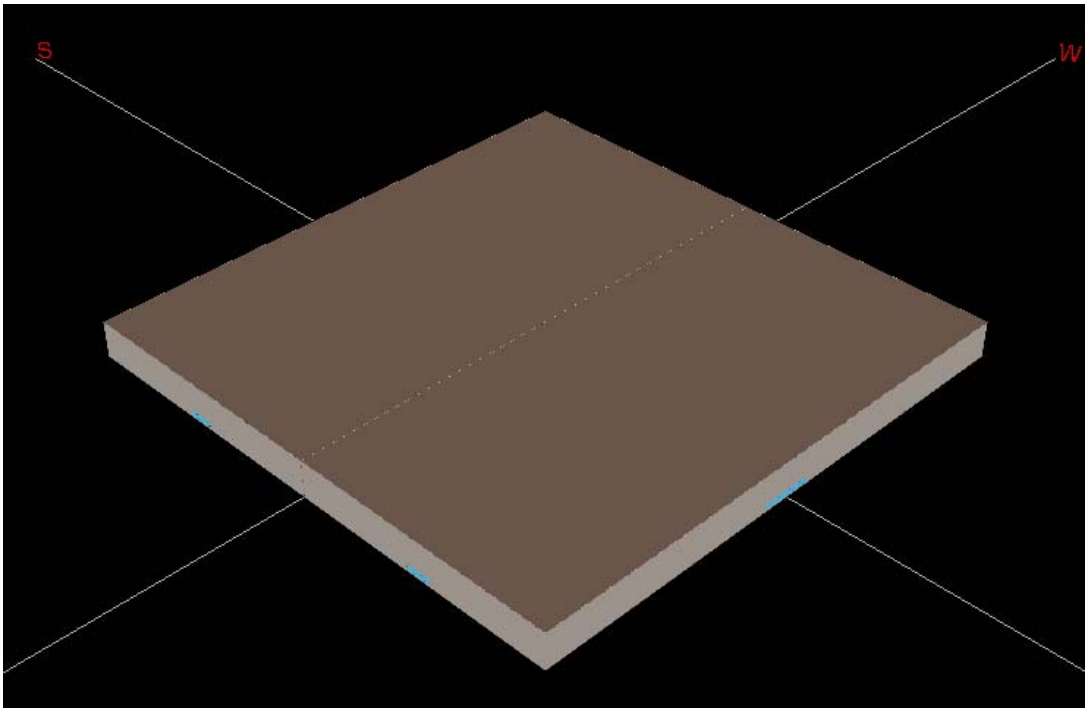


Figure 11. Warehouse Building Rendering

Appendix D. Audit Rebate Considerations

Our first recommendation for the C&I report suggests that the rebate for the audit portion of the C&I Program be structured differently. As this recommendation brought up questions about other methods of rebating audits or current programs that could serve as an example for Empire to help guide a new audit rebate structure, we have included this appendix which provides a list of ideas for consideration.

The following types of mechanisms are designed to increase the chances that customers implement audit recommendations in the C&I sector:

1. Customer is given the audit for 50% of delivery cost as long as they implement at least one of the major recommendations within 12 months of the audit. If they don't implement, they are billed for the remaining 50% of the audit cost.
2. Tie the rebate to the cost of the audit (with an upper limit), and consider targeting the rebate to a specific end use.
3. Customer is given audit for free but must pay a fee per square foot if some percentage of the measures found to be cost effective are not implemented.
4. Customer pays for the entire audit cost up front but gets a check/ rebate for ½ of the cost paid, if they install 50% or some threshold of the measures found to be cost effective.
5. Rebate the cost of the audit into a calculated rebate package that covers all key measures and rebate the package after all installations are completed and inspected.

NYSERDA provides funding for audits, but requires a cost share that is only reimbursed with the installation of measures. The funding for the audits is not likely driven by square footage but has some relative metric. Call Brian Platt at NYSERDA for more details (518) 862-1091, extension 3309.