BPA ENERGYSMART GROCER PROGRAM

PROCESS AND IMPACT EVALUATIONS

Bonneville Power Administration

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SUMMIT BLUE CONSULTING, LLC

FINAL REPORT

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TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

E EXECUTIVE SUMMARY

The EnergySmart Grocer Program provides grocers and other businesses that have refrigeration equipment with energy audits and information about efficient technologies, operations, and maintenance, which illuminate the possibilities and impacts of increasing efficiency in their stores. By helping grocers understand the financial benefits of installing energy-efficient equipment, as well as providing technical assistance, the Program enables grocers to make sound business decisions about energy efficiency. It also assists grocers in making subsequent investments in energy-efficient equipment by providing incentives to reduce up-front costs, and highlight the advantages of energy-efficient lighting, HVAC, and refrigeration systems.

The program is offered to BPA customer utilities (90 are currently participating) and is delivered by the third party implementation contractor Portland Energy Conservation, Inc. (PECI). To date, over 13 GWh has been saved through the program and over 2,000 measures have been installed at over 460 individual sites.

The primary objectives of the evaluation were to:

- Estimate measure and program realization rates
- Assess the strengths and weaknesses of two impact evaluation techniques
    - Billing analysis
    - Engineering analysis
- Assess the barriers and opportunities for effective BPA and utility administration and third-party contractor implementation of the programs through recommended action.

In order to meet these objectives, the evaluation team conducted on-site data collection on refrigeration equipment, engineering analyses of individual energy efficiency measures, billing analysis of participating stores, and in-depth interviews with program implementation staff, contractors and others.

Impact Evaluation Results

Using billing and engineering methodologies, the impact evaluation confirmed that the program is likely achieving its reported energy savings. The evaluation found that the program achieved energy savings slightly higher than the estimated savings with the overall realization rate for measure savings very close (1.02) to the predicted first year energy savings values reported by PECI.

The billing analysis utilized the Statistically Adjusted Engineering (SAE) approach with three measure types (lighting, efficient cases, and floating head controls) providing statistically valid results. The engineering analysis focused on the non-deemed types of measures. Ten sites were included in the engineering analysis with the savings from these sites representing 35% of the total program savings and 50% of the non-deemed program savings. Some measures analyzed had lower than expected savings, such as lighting with a realization rate of 0.77 (based on billing analysis) and others had higher savings than estimated in the program records, including electronically commutated motors in cases (ECMs) at 1.39 (based on engineering analysis). Table E-1 provides a summary of savings by measure category.

The Summit Blue team reviewed the inputs for hours of operation and lamp wattages that were used in the calculations to see if they could explain the low lighting realization rate. However, no significant

discrepancies in the hours of operation or lamp wattage were found. The high realization rate for ECMs in cases is believed to be from existing motors that are running at higher loads than anticipated by the GrocerSmart model. This higher loading would have the impact of achieving higher savings than predicted. A larger sample size to include data from all utilities with lighting measures would increase the reliability of the billing analysis as would utilizing an additional year of post-retrofit billing data.

Table E-1. Pre/Post Estimate of Program Impacts

Measure Category	Measure Savings Category	Total Claimed Savings (kWh)	Measure Realization Rate	Adjusted Savings (kWh)
Floating Head Controls - w/o VFDs	Deemed Calculated	1,687,590	1.19	2,008,233
Energy Efficient Cases	Deemed Calculated	1,622,547	1.27	2,060,635
Floating Head Controls - w/ VFDs	Deemed Calculated	1,502,279	0.84	1,261,914
ECMs - cases	Deemed Calculated	987,659	1.39	1,372,846
Lighting	Deemed	2,856,207	0.77	2,199,280
Unevaluated Measures		4,560,772	na	4,560,772
All Measures		**13,217,055**	**1.02**	**13,463,679**

Engineering and Billing Analyses

The approach of using both the billing analysis and the engineering analysis techniques within an evaluation appears to be an effective strategy. The limitations of the billing analysis technique, particularly of measuring small load impacts compared to total consumption at a site, are not major issues with the engineering analysis approach. However, the difficulty of isolating loads associated with specific measures for engineering analyses, and the cost associated with extensive on-site data collection, can in some cases be overcome with the billing analysis approach. Further, while billing analysis cannot be effectively utilized for many measures, it is a lower cost evaluation alternative for those measures that can be effectively assessed with the technique. The on-site engineering analysis did provide the additional benefit of site verification of measure installation and measure characteristics. Using both techniques within the same study provided opportunities to compare the results from each for some measures. It was found that the two techniques, when results could be directly compared, provided similar results.

Key Impact Evaluation Findings

- In general, we find the GrocerSmart software does an adequate job of predicting savings at the measure level. Some minor changes might be necessary for ECM savings estimates and improved knowledge about actual refrigeration loads could be used to reduce application specific savings overestimates.

- Future acquisition of good pre-installation operating data is key for minimizing uncertainty around savings estimates for key measures such as floating pressure controls, VFDs on refrigeration equipment, ECMs in cases and high-efficiency cases (see below for specific data collection recommendations)

- With the exception of VFDs (84% realization rate), the GrocerSmart software deemed calculated measure savings tend to be slightly conservative, however only ECMs in cases show a substantial difference between predicted and evaluated savings (139% realization rate).

- There was a wide variation in savings realization among sites. This is not surprising as different ambient temperatures, store occupancy, and controls schemes can easily affect savings.

In the future, evaluations should focus on the following:

- The GrocerSmart audits should collect data on maximum loading for refrigeration equipment and adjust analysis inputs to derive more accurate savings estimates.

- Uncertainty in savings estimates for ECM motors in cases stems from sparse information for an accurate baseline. Summit Blue recommends deriving a new standard baseline for shaded pole motor power with a sufficiently large sample of field data

- Evaluation of the effectiveness of *Vending Miser* controls is inconclusive because controllers located in several of the larger savings sites had been disconnected. Future work looking at the *Vending Miser* and its persistence are needed to derive deemed savings for this measure.

Cost Effectiveness

Program cost effectiveness was assessed using a number of different cost effectiveness tests. The most commonly used cost effectiveness test, the Total Resource Cost Test (TRC), produced a benefit/cost ratio of 1.42.

Utilization of Measure Level Realization Rates

The overall impact of the individual measure level realization rates was a modest 1.02, at the program level. Given this modest overall affect, it is recommended that the measure level realization rates not be used to adjust the savings of the program period evaluated.

However, it is uncertain what the mix of measures will be in the future. The individual measure realization rates vary significantly and a change in the current mix of measure implementation would affect the future program level realization rate. Therefore, it is recommended that going forward, the individual measure realization rates for refrigeration measures be used to adjust the current estimates of individual measure impacts, and that additional analyses be conducted on lighting measures before a determination to utilize a different realization rate for these measures is made.

Process Evaluation

The EnergySmart Grocer program is, in many ways, a watershed moment for BPA's energy efficiency program implementation because it is the first large-scale program to be implemented in whole or in part by a third-party. As for many new large-scale program design and implementation efforts, the EnergySmart Grocer program has had its share of challenges—some of which could not have been anticipated—and some of which resulted from common missteps in designing and implementing new programs within large organizations. Despite some obstacles, program stakeholders report that the EnergySmart Grocer program is performing satisfactorily and producing appropriate results.

One of the primary goals of this evaluation was to identify programmatic or organizational barriers to EnergySmart Grocer program implementation, as well as to identify opportunities for potential future third-party program implementation. Barriers and opportunities in large organizations such as the Bonneville Power Administration, as well as its network of member utilities, often revolve around organizational structure and communication channels. Overall, the *Summit Blue team found that the program is highly regarded by the utilities and the grocery store customers.* However, some fine-tuning would improve program delivery in the future. It is a large program with many actors and understanding of roles between the various actors could be improved as outlined below.

Program Findings

Satisfaction of Utilities

Member utilities report being satisfied with the EnergySmart Grocer program overall. Utility representatives gave particularly favorable feedback when interacting with PECI administrative staff. Field Energy Analysts also received positive remarks. The greatest area of concern from utility representatives was the EnergySmart Grocer program's first-year kWh savings and the implications of those savings on the utility's budget planning.

Satisfaction of End-Use Customers

End-Use customers report high satisfaction with the EnergySmart Grocer program overall. End-Use customers report that the Field Energy Analyst and Utility Representative are the most trusted source of their program information. The few end-use customers that did encounter program errors report satisfaction with the resolution of those program errors. Trade allies additionally report favorable experiences working with the EnergySmart Grocer program.

Internal Processes

The EnergySmart Grocer program has improved its internal processes for communication and information sharing since its inception. However, due to the large number of stakeholders involved with this program, additional steps should be taken to continually improve the program's internal processes.

Marketing and Outreach

The EnergySmart Grocer program's one-on-one and in-person visits associated with the Inform to Invest strategy are critical to gaining the trust and confidence of decision-makers in the commercial refrigeration target markets. End-use customers most often identified the Field Energy Analyst and Utility Representative as the most trusted source of their program information. End-use customers report the most valuable document they receive is the Energy Savings Report.

Roles & Responsibilities

Summit Blue found the perception of a lack of defined roles and responsibilities exhibited in both program implementation and administration.

External Market Variations

The economic downturn has had a significant impact on market actors' willingness to invest in energy efficiency upgrades to commercial refrigeration equipment.

Effective Third-Party Program Implementation

BPA's Energy Efficiency group has a long history of collaboration with regional stakeholders to provide energy efficiency programs and services. This history provides opportunities to effectively screen, pilot, and deliver third-party DSM programs in the region. The structure of BPA enables the organization to involve its member utilities in a variety of energy efficiency discussions and program designs. In the stakeholder interviews, BPA member utilities report being "most open" to third-party implementation when a program is developed that fills a gap in the utilities' internal capabilities or provides services to the EE market most effectively addressed in a regional manner.

Overall, the EnergySmart Grocer Program provides strong evidence in support of BPA considering other third-party program implementation opportunities.

Program Recommendations

The EnergySmart Grocer program is successful in its efforts to provide energy efficiency services to grocery stores in most of its member utility service areas and effective in providing these energy efficiency opportunities in a cost-effective manner. Through the course of the stakeholder interviews, opportunities were identified to help fine-tune the program. Among these opportunities are:

- The inclusion of "continuous improvement" provisions in a new iteration of the program's work plan. Although the EnergySmart Performance Work Plan adequately outlines key tasks for the third-party program implementer, the Work Plan omits the need for periodic review and evaluation of the program.

- To help clarify roles and responsibilities, Summit Blue recommends that BPA and PECI meet to discuss an interim draft logic model, which is provided in Chapter 2 of this report. Review of the outputs of specific activities, and who has responsibility for assuring those outputs occur, will help assure that overall program outcomes meet program objectives. After revision of the logic model, a training "webinar" should be developed to explain stakeholder roles and responsibilities.

- To convene an EnergySmart utility advisory group, comprised of participating member utility representatives, to provide a forum to share information about what is working well and what could be improved. The goal would be to provide a member utility roundtable on a regular basis to share stories from the field and discuss best practices for effective implementation.

- Establishing regular lines of communication between the implementing utilities (e.g., BPA, Puget Sound Energy and Avista) and their respective administrative teams at PECI to periodically meet and discuss best practices and share information.

- To consider opportunities to streamline reporting requirements using PECI's newly implemented *Sprocket* real-time reporting and tracking mechanism.

- When conducting customer outreach, FEAs should attempt to leverage the local utility relationship with their customers through: greater recognition of local utility logos, more frequent mention of utility names during outreach presentations, and inviting utility representatives to join a site visit when possible. Additionally, program should invest in FEA training to make their presentations more consistent with scripts, talking points or best practices.

- To develop an electronic information exchange or data storage feature for important information and communications regarding the EnergySmart Grocer program. Creating an information archive with important decisions, rationales and reviews will help ensure that previous knowledge and work is not lost.

- To minimize investments in any website upgrades or new promotional printed materials.

- To expand customer case studies to reach distinct target markets and feature these case studies prominently on the website and in meetings with customers.

Recommendations for Effective Third-Party Program Implementation

- Involve member utilities in the discussion early and provide an ongoing opportunity to have meaningful input into program selection.

- Develop and Implement a New Initiatives Checklist for program development.

- Build in workplan development into contractual mechanisms to help utilize third-party implementer expertise.

- Design programs to be implemented in "pilot phase" with an explicit requirement for assessment and of review and adjustment, prior to open enrollment.

1 INTRODUCTION

The EnergySmart program (referred to as the EnergySmart *Grocer* program in this report to distinguish it from the EnergySmart *Design Office* program) program is, in many ways, a watershed moment for Bonneville Power Administration (BPA) in terms of energy efficiency program implementation as it is the first large-scale BPA program to be implemented largely by a third-party provider. As for many new large-scale DSM program efforts, the EnergySmart Grocer program has encountered its share of challenges—some of which could not have been anticipated—and some of which resulted from common missteps in designing and implementing new programs within large organizations.

This evaluation seeks to provide findings and recommendations for BPA and its member utilities that will both assist them in achieving more efficient and cost-effective energy savings for the EnergySmart Grocer program and in informing the implementation of other DSM programs.

As the energy efficiency needs of BPA's member utilities continue to grow and become more technically complex, third-party program implementers will likely provide an important role in supporting member utility efforts in energy efficiency and expanding technical capacity on their behalf. Therefore, the purpose of this integrated process and impact evaluation is to evaluate not only the successes and challenges of the EnergySmart Grocer program, but also to document valuable lessons learned and best practices for BPA to consider when designing future programs to be implemented through a third-party program implementation model.

1.1 Goals for the Evaluation

The Summit Blue team ("the team") is submitting this evaluation report to the Bonneville Power Administration as part of the Integrated Process and Impact Evaluations of Commercial New Initiatives effort, as described in the work plan.[1]

The Evaluation includes the following goals:

- Reliably estimate the energy savings and cost effectiveness achieved by the programs;
- Fully understand (or create) the logic models of the current programs;
- Benchmark these programs against their peers in North America and identify Best Practices; and
- Assess the barriers and opportunities for effective BPA and utility administration and third-party contractor implementation of the programs through recommended action.

A key *purpose of this evaluation report* is to provide timely information for BPA staff to take into account as they revise the current EnergySmart Grocer program implementation contract for possible program reauthorization after the current contract expires at the end of BPA's fiscal year in September 2009.

[1] *Work Plan for Integrated Process and Impact Evaluations of Commercial New Initiatives*, Summit Blue Consulting, January 6, 2009.

1.2 Key Attributes of the Program

The EnergySmart Grocer program targets eligible customers as those who have a commercial refrigeration load. Potential customers[2] include, but are not limited to:

1) National chain supermarkets
2) Independent groceries
3) Corner groceries
4) Specialty shops (ice cream, butchers, etc)
5) Institutional kitchens (schools, hospitals, prisons, factories, universities, assisted living and nursing care facilities, etc.)
6) Regional chain groceries
7) Food marts
8) Convenience stores
9) Florists
10) Liquor Stores
11) Buffet restaurants
12) Sit-down restaurants

Energy savings for measures offered through the program fall into three categories:

- Deemed savings: The costs and savings for these measures have been deemed by the Regional Technical Forum (RTF).
- GrocerSmart software deemed calculated savings: The RTF has reviewed the EnergySmart Grocer software and determined that given reliable inputs, the software appropriately calculates savings.
- Provisionally deemed savings: This designation means that the RTF has uncertainty in these measures and they require more research before a 'deemed' status can be approved.

Table 1-1 identifies the measure categories offered through the program. The specific measure savings category for each measure category is also provided.

[2] EnergySmart Performance Work Plan (Updated PECI Performance WorkPlan.v8.doc (effective March 1, 2008)

Table 1-1. Program Measure Categories

Measure Category	Measure Savings Category
Auto-Closures	Deemed
Case Lighting	Provisionally Deemed
Energy Efficient Cases	Deemed Calculated
Doors	Deemed Calculated
CFLs	Deemed
Anti Sweat Controls	Provisionally Deemed
Efficient compressor - Low temp	Deemed Calculated
ECM in Cases	Deemed Calculated
Lighting	Deemed
Gaskets	Deemed
Air Cooled Condenser	Deemed Calculated
Floating Head Controls - w/o VFDs	Deemed Calculated
Floating Head Controls - w/ VFDs	Deemed Calculated
Night Covers	Provisionally Deemed
PC Controls	Deemed
Refrigeration - VFD - Motors	Deemed Calculated
Doors for Low-Temp Reach-in	Deemed Calculated
Vending Machine Controls	Provisionally Deemed

Key services of the EnergySmart Grocer program[3] include:

- No-Cost energy audit
- Site-specific energy savings analysis
- Recommendations for energy-efficient upgrades
- Direct installation of quick payback measures
- Contractor participation
- Preferred contractor management
- Technical consultation

[3] This list of services is included on Portland Energy Conservation Inc.'s website http://www.peci.org/ComRetail/Grocery_Programs/overview.html (viewed May 20, 2009).

- Financial rebates and rebate application assistance

The benefit-cost (B/C) cost effectiveness ratios calculated for this program utilized BPAs standard cost effectiveness assessment model. There are both program/measure specific inputs into this model as well as financial assumptions and utility specific inputs. The program/measure specific inputs were obtained from PECI's monthly updates of program accomplishments. From the PECI database, information was obtained by fiscal year and measure category group. This information is summarized in Table 1-2.

Table 1-2. EnergySmart Grocer Program Savings Information by Fiscal Year

	Jan 2007 - Sep 2007	Oct 2007 - Sep 2008	Oct 2008 - March 2009	Total
Participating Utilities	31	72	76	76
Audits Conducted	218	704	155	1,077
Number of Free Measures	62	1,022	580	1,664
Number of Rebated Measures	48	178	190	416
Installed Savings from Free Measures (kWh/year)	137,775	2,417,956	1,249,392	3,805,123
Installed Savings from Rebated Measures (kWh/year)	2,044,227	7,946,050	7,736,950	17,727,227
Total Installed Savings (kWh/year)	2,182,002	10,364,006	8,986,342	21,532,350
Incentive Costs	$132,413	$689,034	$749,441	$1,570,888
Non-Incentive Costs	$999,907	$3,058,575	$2,180,045	$6,238,527

1.3 Program History

The EnergySmart Grocer program is a commercial refrigeration program designed and implemented by Portland Energy Conservation, Inc. (PECI) on behalf of the Bonneville Power Administration (BPA) to address the needs of its member utilities to reach commercial refrigeration markets in BPA member utility territories.

Typical end-use market actors in the commercial refrigeration sector include managers or owners of grocery stores, convenience stores and restaurants; facilities managers of large commercial or institutional facilities and, in some cases such as regional or national supermarket retailers, dedicated energy efficiency representatives working for a third-party contractor or for the supermarket chain. Typical trade allies or contractors servicing these markets include mechanical contractors and refrigeration service contractors.

The nature of commercial refrigeration equipment is relatively technical and requires a good deal of engineering and/or technical expertise in order to properly size, install and maintain. As a result, it is atypical for a BPA member utility to have staff members with commercial refrigeration expertise. In

addition, it is infrequent to find end-use market actors (e.g., managers or owners) with sufficient time and/or expertise to address commercial refrigeration concerns at their workplace. Moreover, only a limited number of qualified contractors are available to replace, install or service such equipment.

Due to the highly technical nature of energy efficiency upgrades in commercial refrigeration markets, a hard-to-reach market and a limited commercial refrigeration technical expertise within BPA, the EnergySmart Grocer program was designed to be implemented in part by a third-party implementer. This decision was made with the support of the Energy Efficiency Management Team and BPA member utilities. After BPA program staff conducted extensive research about commercial refrigeration programs throughout North America and Europe, BPA selected Portland Energy Conservation, Inc. (PECI) as the third-party program implementer, using a sole-source contract mechanism on October 6, 2006. The sole-source contract mechanism standard was met because PECI exhibited superior technical capabilities in the commercial refrigeration market and their program implementation model was approved as state of the art. This determination was made in part due to the success that PECI reported in implementing the EnergySmart Grocer program in the state of California and in Puget Sound Energy territory, among other attributes.

The parties entered into a contract in the fall of 2006 to begin program implementation. The EnergySmart Grocer program recruited an initial class of 30 utilities within its Phase I program implementation. Phase I utilities were the first utilities to receive field audits from PECI staff Field Energy Analysts (FEA)s. Soon after, in May 2007, the EnergySmart Grocer program opened up recruitment to all BPA member utilities (Phase II). Utility recruitment continues as of the writing of this report. There were nearly 90 signed up with the program as of the end of April 2009.

1.4 Notable Program Accomplishments

The EnergySmart Grocer program has achieved several notable accomplishments since its inception. A few metrics regarding the program are included below:

- The program has recruited nearly 90 member utilities from within the BPA network to participate in the EnergySmart Grocer program, making it the largest and widest program in BPA history to be implemented by a third-party implementer.
- The program successfully met its fiscal year 2008 energy savings goals of 8,760,000 first-year kWh [1 aMW].
- The program has conducted 1,077 audits[4] (as of April 2009) with approximately 67% of audited stores agreeing to implement at least one measure offered by the program.
- These audits and projects have saved over 21,500,000 first-year kWh, [2.45aMW] since their inception, for BPA member utilities and have enabled BPA member utilities to distribute customer rebates of $1,570,888.
- Total program non-incentive costs were $6,236,527 as of April 2009.

The EnergySmart Grocer program internal reporting has recently been upgraded to make program reporting more efficient via the SPROCKET web-based portal.

[4] Please note: updated numbers in this report are derived from the EnergySmart Grocer program's April 2009 report, delivered to BPA on May 15, 2009.

Table 1-3. Notable Program Accomplishments

Year	Audits Conducted	First-year kWh	Customer Rebates Distributed	Non-Incentive Costs
FY 2007	218 audits	2,182,002	$132,413	$999,907
FY 2008	704 audits	10,364,006	$689,034	$3,058,575
FY 2009 (through April 2009)	155 audits	8,986,342	$749,441	$2,180,045
Total program to date	1,077 audits	21,532,350	$1,570,888	$6,238,527

1.5 Report Organization

There are three key components of the evaluation of the EnergySmart grocer program. These are the process evaluation, the billing analysis and the engineering analysis. Each of these components is covered within separate sections of this report. The final section of the report summarizes measure and program realization rates and overall program savings and cost effectiveness based on the realization rates. Appendices to the report include interview guides, document list, the new initiatives checklist, and billing analysis model details.

2 PROCESS EVALUATION

2.1 Methodology

The EnergySmart Grocer process evaluation consists of the following elements developed by the Summit Blue team and included in the Integrated Process and Impact Evaluations of Commercial New Initiatives work plan, approved by the Bonneville Power Administration in January 2009:

- Review EnergySmart program materials, including logic model review.[5]
- Interview program stakeholders.
- Review similar (e.g., commercial refrigeration) energy efficiency programs both in the Northwest and other parts of the country for benchmarking and best practices.[6]
- Submit Early Findings Reports to aid BPA program staff in program review and potential program re-design, and contractual negotiations with program implementer.

2.1.1 Review Logic Model & Program Materials

The Summit Blue team met with PECI staff in Portland, Oregon shortly after the evaluation kick-off to review the program's operations, obtain program documentation and data, and discuss the program's logic model. These meetings turned out to be especially useful, not only to enable an early understanding of the inner workings of the program, but because PECI's EnergySmart Grocer program manager left PECI later that fall, and much institutional knowledge regarding the program could have been lost.

The Summit Blue team reviewed EnergySmart Grocer program materials submitted by PECI in September 2008. Summit Blue received additional documents from PECI and BPA during the course of the next few months.

Documents received include:

- All program reports from 2007 and 2008, submitted by PECI in January 2009.
- A program logic model was submitted by PECI in January 2009.
- EnergySmart Grocer work plan, submitted by BPA in January 2009.

As the Summit Blue team received information about the EnergySmart Grocer program, information was cross-referenced through phone conversations or email correspondence with key stakeholders during the stakeholder interview process in February and March 2009. As information was verified, it was incorporated into the Early Findings documents presented to BPA staff in April 2009.

[5] A list of documents reviewed is included in Appendix B.

[6] A list of programs reviewed is included in Appendix B.

2.1.2 Interviews with Market Actors

Summit Blue developed Interview Guides for each of six distinct stakeholder groups involved with the EnergySmart Grocer program. It was necessary and important to create separate discussion guides due to the various issues that the Summit Blue team was investigating as part of its process evaluation.

The six groups of stakeholders interviewed included:

- BPA Staff
- BPA Energy Efficiency Representatives
- Utility Representatives
- PECI Staff
- Trade Allies
- End-Use Owner/Manager

BPA staff approved the interview guides in January 2009. Summit Blue commenced interviews with program stakeholders. Summit Blue interviewed over 40 program stakeholders during the months of February and March 2009.[7] The interview guides were organized according to five research objectives. These objectives are outlined in

[7] Interview guides and list of persons interviewed is included in Appendix A.

Table 2-1.

Table 2-1. Research Objectives for Market Actor Interviews

Objective	Discussion items	Market Actor(s) Interviews					
		BPA staff	EER	Utility representative	PECI	Trade Allies	End-user (owner or manager)
Review and Refine Effectiveness Criteria	Do goals in reauthorization of ESG differ substantially from original authorization and implementation? Are there additional criteria to consider?	XX	XX	XX	XX		
Compare Administrative Processes	Identify and document administrative processes. Compare BPA administrative processes with PECI-ESG programs outside of BPA territory. Review administrative actions by market actors and solicit ideas to improve efficiency and communication.	XX	XX	XX	XX		
Compare Marketing and Outreach Efforts	Identify and document efforts. Compare BPA ESG efforts with PECI-ESG efforts in other utility territories. Compare market uptake in utility territories and compare with goals and BPA program requirements.	XX	XX	XX	X	XX	X
Program delivery experience	Describe the ESG program from the end-user perspective. Note any program delivery issues.		X	X	X	XX	XX
External/Internal Market Variations	Discuss external market drivers: electricity rates, market demographics, and the economy. How do external variations affect program uptake, if at all?			X	X	XX	XX

2.1.3 Benchmark Program and Best Practices

The Summit Blue team conducted research to review industry standards in utility-based commercial refrigeration programs both in the Pacific Northwest and around the country. The team reviewed iterations of the EnergySmart Grocer program administered by PECI in other utility territories by reviewing the EnergySmart Grocer websites and through a literature review. The team also reviewed impact and process evaluations from EnergySmart Grocer programs in Pacific Gas & Electric (California) territory and investigated other commercial refrigeration energy efficiency programs around the country, using the Database of State Incentives for Renewables & Efficiency (DSIRE) website.[8] Table 2-2 identifies the programs reviewed.

Based on this research, the Summit Blue team compared and contrasted program operations, administrative procedures and incentives between BPA's EnergySmart Grocer program and the EnergySmart Grocer programs delivered by PECI in Avista and Puget Sound Energy utility territory. The Summit Blue team also compared commercial refrigeration initiatives from the Energy Trust of Oregon and information from the Northwest Energy Efficiency Alliance's BetterBricks program.

Table 2-2. Commercial Refrigeration Programs Reviewed for Benchmarking

Utility	Program	Program Implementer
Avista	EnergySmart Grocer	PECI
Energy Trust of Oregon	Commercial Refrigeration	Energy Trust
NEEA	BetterBricks	n/a (research only)
Pacific Gas & Electric	EnergySmart Grocer	PECI
Puget Sound Energy	EnergySmart Grocer	PECI

2.1.4 Early Findings Reports

The team compiled early findings reports based on the outcome of the research findings and discussions with program stakeholders. These early findings reports were formatted as Discussion Guides to facilitate the exchange of information and ideas in a summary format prior to this final evaluation report. The Discussion Guides provided an outline to discuss preliminary findings and recommendations from the EnergySmart Grocer process evaluation and identified issues that may require additional research or development. The team also sought to assure that multiple viewpoints expressed by interviewees were properly vetted for inclusion in the final evaluation report.

Summit Blue reviewed the first Discussion Guide with BPA staff on April 6, 2009. The Discussion Guide was updated and expanded to address issues presented during the first discussion. Summit Blue and BPA staff reviewed the second Discussion Guide on April 22, 2009. This final evaluation report includes feedback from both conversations.

[8] www.dsireusa.org (viewed May 15, 2009)

2.1.5 Assessing Barriers and Opportunities for Effective Third-Party Program Implementation

One of the purposes of the Summit Blue evaluation is to identify programmatic or organizational barriers and opportunities for potential future third-party program implementation. Barriers and opportunities in large organizations such as the Bonneville Power Administration, as well as its network of member utilities, often revolve around organizational structure and communication channels. As a result, as the Summit Blue team identified organizational and communication issues during research and stakeholder interviews, the issues were compiled into a separate section of the evaluation report for reference if and when other third-party programs are contemplated. In so doing, it is the intention to create a "lessons learned" document that will add to the organization's institutional knowledge and continue its energy efficiency programs on a path of continuous improvement.

2.2 Program Materials Review

2.2.1 Current Materials

The EnergySmart Grocer program has created program marketing materials to support the *Inform to Invest* model for customer outreach. Inform to Invest is a strategy that positions the Field Energy Analyst as an expert in their field available to the end-use customer. The FEA provides technical and financial information to the end-use customer over the course of several onsite visits. If and when the end-use customer is ready to make an investment in energy efficiency measures, the Field Energy Analyst has already established a trusted working relationship with the end-use customer to help them complete the work. The program has created a website (www.energysmartonline.org), promotional materials, incentive and application forms, case studies and the necessary program reporting mechanisms to meet the requirements of the EnergySmart Grocer's work plan. This section includes a review of stakeholder comments about EnergySmart Grocer program materials.

- Promotional materials, such as program brochures, website and "branding materials" were generally well-received by program stakeholders. Stakeholders report that the materials are professional-looking, represent the program well and provide the end-use customer with something tangible to take away from their initial recruitment or audit.

- Despite positive reviews, few stakeholders, including end-use customers, described getting valuable information from the promotional materials. However, most stakeholders report only "briefly glancing" through the materials upon receipt. ***End-use customers report the most valuable document they receive is the Energy Savings Report.*** The Energy Savings Report (ESR) includes site-specific energy analysis for end-use customer, including preliminary recommendations to perform energy efficiency upgrades at the facility

- End-use customers most often identified ***the Field Energy Analyst and Utility Representative as the most trusted source of their program information***. Top reasons cited by end-use customers include: existing relationship with the utility and/or utility representative; technical knowledge of the FEA and/or utility representative and belief that participating in the program would result in an acceptable return on investment based on information provided by the initial audit and information contained in the Energy Savings Report.

Table 2-3 summarizes a selection of the EnergySmart Grocer program's materials, including the reaction and utilization from stakeholders. Reaction is intended to mean the first impression of the materials on the

stakeholder. Utilization is intended to mean whether the stakeholder gets valuable information from the material to help inform the stakeholder's decision making.

Table 2-3. EnergySmart Grocer Program Materials Overview and Stakeholder Reaction/Utilization

Program material	Stakeholder reaction	Stakeholder utilization
Marketing brochure(s)	Favorable	Not used
Energy Savings Report	Favorable	Referenced & Highly used
Website	Favorable	Not used much
In-person, one on one outreach efforts	Very favorable	Highly used
Letters from BPA member utility representatives	Mixed	Used by some stakeholders
Phone calls from BPA member utility representatives	Very favorable	Used
Phone calls from FEA	Very favorable	Used
Branding during initial customer audit	Mixed	Stakeholders confused by various program represented, lack of member utility presence in some cases

2.2.2 Program Material R

ecommendations

The Summit Blue team makes the following recommendations for the EnergySmart Grocer program's marketing materials. The recommendations are summarized in Table 2-4 with narrative discussion following.

Table 2-4. Recommendations for the EnergySmart Grocer program's promotional materials

Recommendation	Description	Responsible Party
Website, printed materials	Minimize investments in any upgrades or new promotional printed materials	PECI
Customer Case Studies	Expand customer case studies to reach distinct target markets, feature prominently on website, meetings with customers	PECI

Recommendation: Minimize Investment in Website, Developing New Marketing Materials

External program stakeholders (e.g., trade allies and end-use customers) found the EnergySmart Grocer program materials to be professional and informative. However, few stakeholders reported actually using these materials to help them make decisions about whether or not to invest in energy efficiency measures recommended by the EnergySmart Grocer program. Instead, stakeholders report the primary source of information for their decision-making was the Field Energy Analyst and the utility representative when the representative was involved with one or more customer visits. As a result of these findings, the Summit Blue team recommends minimizing the financial investment in developing additional printed marketing materials or enhancements to the program website except for customer case studies. The case studies should be simple and relatively low-cost, not as expensive to produce or print as a professional marketing piece. The case studies should be featured on the website but also distributed to customers.

Recommendation: Expand Customer Case-studies for Key Target Markets

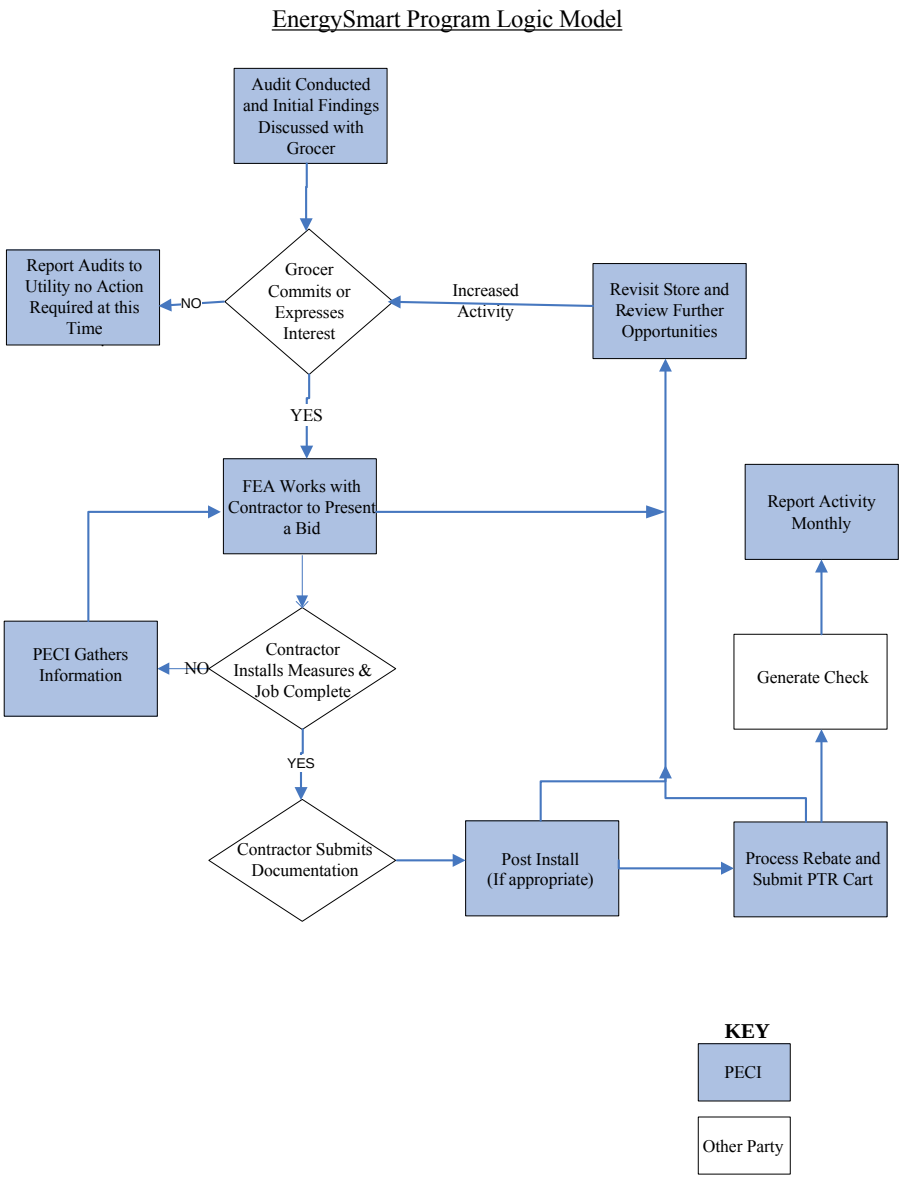
Customer case studies should be more prominently featured in the program's materials and website. The third-party implementer is currently developing a case study featuring a large regional grocer. The Summit Blue team recommends developing additional case studies for the most commonly found eligible facilities (e.g., convenience stores or small grocers, restaurants and commercial kitchen facilities).

2.3 Program Logic Model

A program logic model provides a picture of how a program is intended to work. It identifies the theory and assumptions underlying the program and links outcomes (both short- and long-term) with program activities and processes. The logic model is an important tool for energy efficiency programs as it can help program stakeholders to identify key program activities, outputs from the activities, short term outcomes, long-term outcomes and goals for the program. The Summit Blue team requested an EnergySmart Grocer program logic model in January 2009. Shortly thereafter, PECI staff supplied the following diagram in response to the Summit Blue team's request for information.

Figure 2-1 illustrates the current program logic model as provided by PECI.

Figure 2-1. EnergySmart Grocer Program Logic Model Supplied by PECI in January 2009



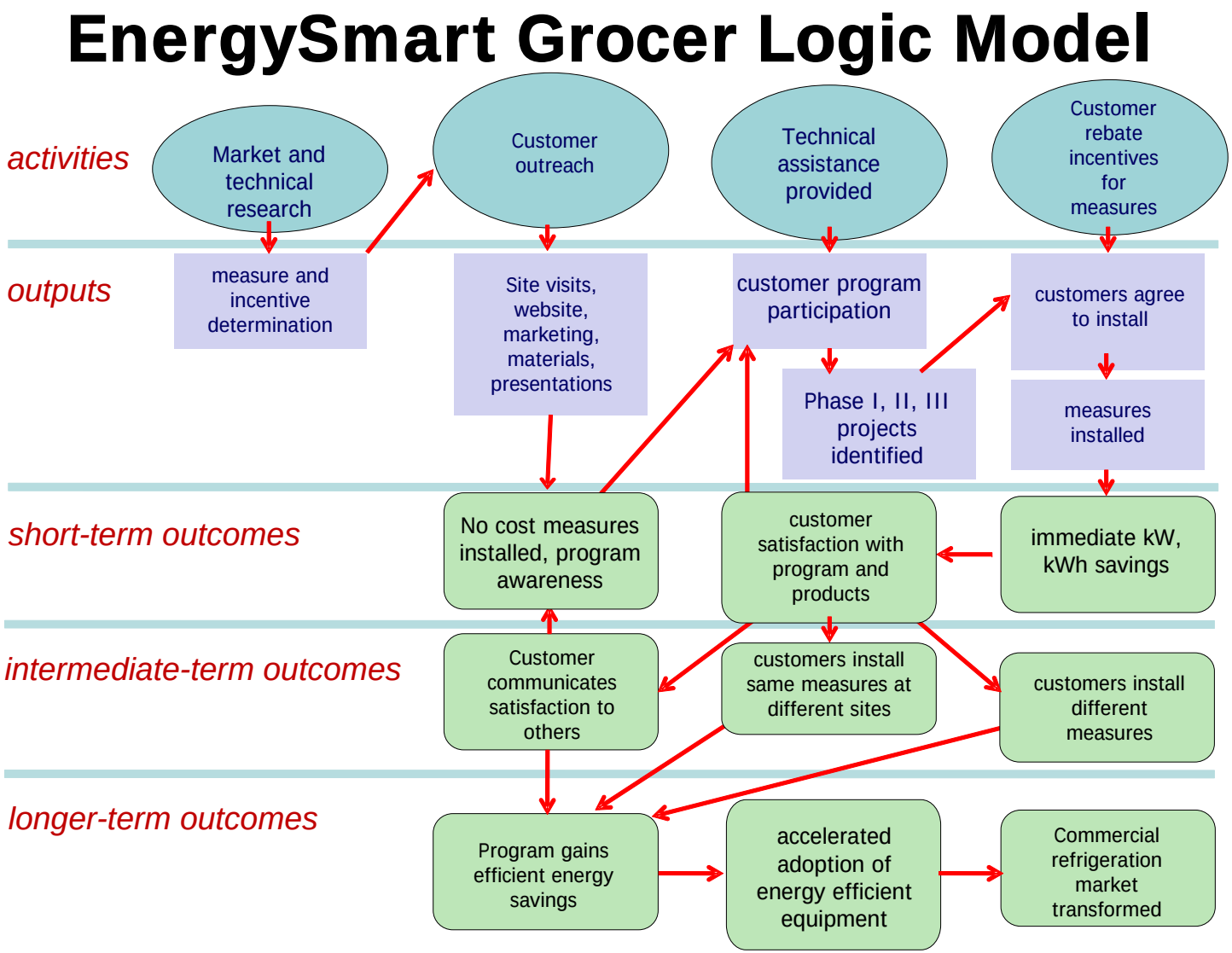
The PECI diagram is presented as a flow-chart of program activities. It adequately tracks how an EnergySmart Grocer project might get from initial recruitment to incentive check but does not identify the long term outcomes of the program or define key roles and responsibilities of the program market actors, other than those for PECI staff.

2.3.1 Recommended Logic Model Revisions

The logic model diagram supplied to Summit Blue by PECI provides a flow-chart of the program's customer activity rather than a comprehensive logic model. Summit Blue, through the results of its stakeholder interviews, expanded the logic model to identify key action items, short-term activities, long-term outcomes and goals for the program.

Based on these interview results, the team modified the structure of the logic model (Figure 2-2) to more clearly show some of the links between activities, outputs, short-term outcomes, intermediate-term outcomes and long-term outcomes for the EnergySmart Grocer program.

Figure 2-2. Proposed EnergySmart Grocer Logic Model



2.3.2 Roles & Responsibilities

The lack of defined roles and responsibilities is exhibited in both program implementation and administration. For example, utility representatives responded with vastly different interpretations of their roles in helping to implement the EnergySmart Grocer program; some representatives paid personal visits to their customers to inform them of the program and encourage them to participate, while other utility representatives only provided a list of potential customers for their utility territory. PECI offered the utility a menu of options for utility roles and responsibilities concerning initial customer contact in their service agreement, the role was selected by the utility and then the agreement was signed. Variability in the program implementation was a stated goal of the program; however, the differences in utility participation greatly affect the overall program effectiveness and consistency.

The ESG Service Agreement outlines specific roles and responsibilities from PECI and the BPA member utility.[9] However, many stakeholders interviewed expressed concerns about clearly understanding their role in the program. As a result, *Summit Blue recommends that utility representatives review their Service Agreement as a reminder of the general responsibilities held by respective actors.* Although the Service Agreements provide a good amount of detail in delivering the EnergySmart Grocer program, there may be a need to review its contents and perform a brief "check-in" amongst actors in a given utility territory. The purpose of the "check-in" would be: 1) To review the content of the Service Agreement, 2) To compare program action "on the ground" with those outlined in the Service Agreement, and 3) To identify any areas where program actors need further information on how to perform their roles in the program. This "check-in," if necessary, will likely vary by utility. Summit Blue has included the "general listing of services" from the Service Agreement below.

A general listing of PECI services include:

- Scheduling audits
- Conducting audits
- Installing measures such as compact fluorescent lamps and cooler misers during site visits where appropriate
- Managing and enrolling contractors into program
- Technical design reviews
- Rebate processing
- Determining installed measure savings
- Generating and submitting Carts via PTR system, including adjustments as needed
- Keeping utilities abreast of program activity
- Monitoring Reimbursement Expenditures (with Utility) for budgeting purposes

A general listing of Utility responsibilities include:

- Complete and submit EnergySmart participation letter
- Choose funding mechanism
- Select type of "eligible facilities"
- Select customer contact methodology

[9] PECI ESG Service Agreement.9.19.07 with DA changes.doc (word document)

Summit Blue recommends that BPA and PECI meet to discuss this DRAFT model and roles definition, gain confidence in its depiction of program linkages and distribute the logic model to member utility representatives during regularly scheduled correspondence. Energy Efficiency Representatives (EERs) should follow up with their participating member utilities to explain the logic model and help the utility representatives understand how their efforts fit into the big picture and vice-versa. BPA and PECI staff could also create a "webinar" presentation that clearly explains stakeholder roles and program linkages as depicted through the program logic model. This "webinar" could then be archived on the BPA website as a training and information resource for stakeholders.

2.4 Benchmarking & Best Practices Comparison

The objective of the benchmarking and best practices section of the process evaluation is to provide a view of the EnergySmart Grocer program relative to its peers in the Pacific Northwest and to commercial refrigeration programs in general. This section provides a benchmark for the EnergySmart Grocer program by providing a high level comparison the EnergySmart Grocer program with other programs administered by the third-party administrator, PECI and with other commercial refrigeration programs. Table 2-5 provides this high level comparison of program features. The recommendations section includes a summary of improvements that designed to continually improve program delivery.

Table 2-5. Comparison Benchmark of Major EnergySmart Grocer Program Features

Program Feature	Benchmark	Comment
Number of participating utilities; customization	Extremely high	Approximately 75 participating utilities
Administrative requirements	High	Per program design, the first years of a program an Inform to Invest strategy require substantial administrative investments
Energy Savings Measures Offered	Typical	Similar measures as other programs
Marketing/Outreach strategy	High	Per program design, the first years of a program with a "high touch strategy" require substantial marketing and outreach investments for field visits, audits, in-person visits
Energy Savings Measures installed (%)	High	The percentage of locations that have installed at least no-cost measures is 61%, which is higher than some other programs

The team reviewed EnergySmart Grocer programs in California, Puget Sound Energy and Avista territories.[10] This benchmark shows that the EnergySmart Grocer program is within a similar trajectory as other EnergySmart Grocer programs, given the unique characteristics of BPA's service territory, mix of stakeholders and sheer number of member utilities participating. While costs of energy savings measures and cost-effectiveness are discussed in more detail within the impact evaluation portion of this report, the process evaluation indicates that many of the program's administrative burdens are due primarily to the issues cited above, along with communications issues discussed elsewhere in this report.

2.5 Market Actor Interviews

The evaluation team conducted 36 interviews with program stakeholders during the months of February and March 2009. In addition, the team requested internal working documents from BPA and PECI in order to help elucidate actions taken in the past. Findings from Market Actor Interviews are organized according to the five research objectives articulated in the Integrated Impact and Process Evaluation Work plan. The research objectives and discussion items are summarized above, along with an indication of the primary sources of information regarding each objective.

2.5.1 Review and Refine Effectiveness Criteria

The EnergySmart Grocer program is the first large-scale energy efficiency program for BPA to deliver by a third-party program implementer. As a result, this process evaluation of the program provides an opportunity for BPA to review its actions, assess strengths and weaknesses of those actions, and identify opportunities for continuous improvement in the program's design and delivery. Although some adverse impacts to the program's implementation could not be foreseen (e.g., economic downturn), other challenges resulted from common organizational challenges within large organizations.

Basis of Program Design

The current EnergySmart Grocer program evolved from an ongoing program design discussion within BPA as early as 2005. After extensive research of commercial refrigeration programs throughout North America, BPA program staff negotiated a contract with PECI to transfer its EnergySmart Grocer program from Puget Sound Energy territory and Pacific Gas & Electric territory to offer it to BPA member utilities. The EnergySmart Grocer program implemented in BPA territory has substantially similar operations and goals as earlier iterations of the program implemented in other territories, such as Puget Sound or California utilities. However, many key program stakeholders report that the ESG program is not "transferrable" from other utility territories to BPA territory due to a variety of reasons, several of which are outlined below. These findings indicate that, although the ESG program has a solid basis in program design and a strong implementation team, the energy savings opportunities may be more difficult to achieve in the Pacific Northwest than in California.

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[10] Portland Energy Conservation, Inc.

http://www.peci.org/ComRetail/Grocery_Programs/overview.html (website viewed May 22, 2009)

EnergySmart Programs

http://www.energysmartonline.org/ (website viewed May 22, 2009)

Some of the key issues surrounding transferability of the program by knowledgeable program stakeholders are:

1. The number of entities involved with program implementation (e.g., 75 BPA member utilities, various staff departments within BPA, third-party program implementer, etc.) creates communication and coordination challenges not faced by the program's implementation in other territories (e.g., Puget Sound, California).

2. BPA member utilities were given the option to "customize"" the ESG program's implementation in their utility territory. Although this flexibility has been well-received by many utility representatives, it has also created significant additional administrative burden on program managers and staff from BPA and PECI. As procedures for customizing the program are fine-tuned, this approach can serve as a good model for other third-party programs.

3. Lower costs of electricity in BPA member utility territories than in California make the "payback" or "return on investment" longer or less favorable to end-use customers in BPA member utility territories than in California. Lower costs of electricity affect all end-use customers' decision-making, but especially those national grocery stores that have operations in areas with high electricity costs.

4. Contractual negotiations between BPA and the third-party implementer were predicated on data about qualifying facilities within BPA member utilities that was not necessarily intended to serve the specific purpose of pinpointing the actual number of stores, types of stores and/or locations of specific stores. This data contributed to BPA overestimating the number of qualifying facilities and kWh goals. The qualifying facility data supplied to program managers was based primarily on research from census data, Bureau of Labor Statistics North American Industry Classification System (NAICS) and GIS mapping.

EnergySmart Performance Work Plan Program Deliverables

The EnergySmart Performance Work Plan[11] provided by BPA to the third-party program implementer outlines fourteen tasks for the EnergySmart Grocer program's implementation. The third-party implementer has complied with the main deliverables for these tasks. The Summit Blue team's recommendations for potentially refining these tasks are included in the Recommendations, Section 2.5.2. Table 2-6 summarizes Summit Blue's findings regarding the performance on these deliverables.

[11] Updated PECI Performance WorkPlan.v8.doc (effective March 1, 2008) (The energy savings goal of 37M first-year kWh savings was reduced from an original goal of 52.6 M first-year kWh savings).

Table 2-6. EnergySmart Grocer Performance Work Plan Implementation Tasks and Deliverables

Implementation Tasks	Deliverable	Timeline	Delivered by Third-party Implementer
Recruit, hire and train staff	List of staff hired, training and utility assignments	Q2, 2007 and ongoing	Yes
Recruit and manage contractors	List of all recruited, trained and available contractors and their regional assignments. Manage contractors.	Ongoing starting Q2, 2007	Yes
Develop Marketing Materials	Final materials in hardcopy and electronic versions to BPA and stakeholders. Distribution list.	Q3, 2007	Yes
Target and Enroll Customers	Utility customers identified. Audits scheduled and recorded in PTR system.	Ongoing from Q2, 2007	Yes
Perform Site Audits	Site-specific audits completed. Reports generated, tracked in monthly reports.	Ongoing from Q2, 2007	Yes
Provide Results and Recommendations	Energy Savings Reports delivered to customers and utilities, retained by PECI for reference	Ongoing from Q2, 2007	Yes
Facilitate Phased Retrofits	Deliver 37M first-year kWh savings to participating utilities over the course of 30 months, April 2007 to September 2009.	Ongoing from Q2, 2007	TBD
Design Review	Design Review Approval Notification	Ongoing from Q2, 2007	Yes
Post-Installation Inspections	On-site inspections conducted within one month of request	Ongoing from Q2, 2007	Yes
Rebate Processing	Rebates received, processed, accepted and uploaded to PTR system.	Ongoing from Q2, 2007	Yes
Generate Energy Savings and Technical Requirements	Energy savings produced and ad hoc tasks, RTF and BPA processes implemented	Ongoing from Q2, 2007	Yes
Address Customer Service Issues	Establish a toll-free number for customer service. Log communication and outcomes.	Ongoing from start of program	Yes
Monthly Reporting	Monthly invoices, backup documentation, monthly progress report	Ongoing from start of program	Yes
Utility Recruitment and Assistance	Recruit utilities, answer questions, receive commitment. Provide program assistance.	Ongoing from start of program	Yes

Program Implementation Strategy to Date

The EnergySmart Grocer program contract directs BPA to compensate the third-party implementer a fixed monthly fee for administrative costs associated with the implementation and "ramp up" of the program. The contract calls for the same monthly fee for administrative costs whether the third-party program implementer delivers the energy savings goals (in first-year installed kWh) or not. There is a bonus available to the third-party implementer if the program exceeds the energy savings goals outlined in the work plan.

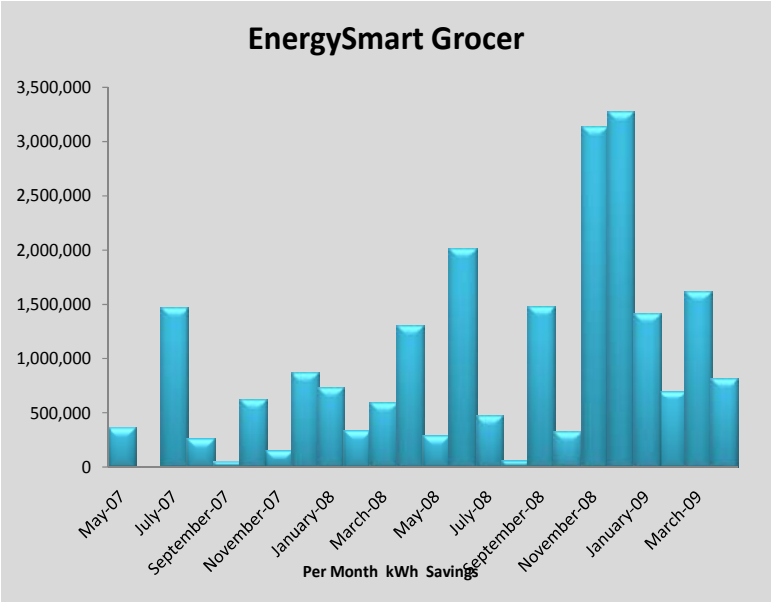
This contract was predicated upon the mutual understanding by the parties that the program requires a multi-year investment in order to obtain substantial energy savings goals. The early strategy of the program requires a substantial investment of time and resources to initiate the *Inform to Invest* model of reaching out to end-use customers and establishing relationships with them. After an initial period of relationship building with relatively low energy savings and high administrative costs while implementing no-cost measures during walk-through audits, the program theory predicts that administrative costs will stay the same or decrease and energy savings will increase as customers decide to implement Phase I or Phase II measures. This was expected due to repeat visits by FEAs to build relationships with the program's target end-use customers. Table 2-7 summarizes the program phases and the attributes of each phase. Figure 2-3 presents a graphic demonstrating this effect, as provided in PECI reporting to BPA.

Table 2-7. EnergySmart Grocer Program Phases, Attributes, and Approximate Timeline

ESG Program Phase	Attributes	Approx Timing
Start-up	Defining implementation, communication to stakeholders, ramping up internal resources, little or no energy savings, substantial administrative costs	October 2006—April 2007
Phase I program roll out	30 utilities recruited; relationship building with end-use customers; initial audits; energy savings from no-cost audit measures; high administrative costs	October 2006—April 2007
Phase II roll out	Additional utilities recruited; expanded program implementation; initial audits in new utility territories; revisits in Phase I program territories; increased energy savings from Phase I program utilities; administrative costs/kWh start to decrease	April 2007—January 2008
Full-capacity program implementation	Average monthly energy savings numbers increase; cost per kWh decreases; FEAs conduct re-visits with customers to implement Phase I, Phase II measures throughout utility territories; three large utilities (and additional utilities) enroll	January 2008—present

The EnergySmart Grocer program's monthly reports provide a snapshot of monthly program energy savings (first-year kWh). The program's monthly energy savings indicate a significant upward trend. The first-year kWh energy savings reported by PECI (1,000,000 kWh in FY 2008--11,000,000 kWh in FY09 to date) show a trend toward increased energy savings as the program gains traction in BPA member territories and end-use customers implement Phase I and Phase II measures.

Figure 2-3. April 2009 PECI Report: EnergySmart Grocer program energy savings by month[12]



The first-year kWh energy savings reported by the program to date demonstrate that the EnergySmart Grocer program is meeting the intended program implementation theory. However, key stakeholders had differing expectations regarding the timing associated with these energy savings.

As planned in the initial program ramp-up, PECI started to recruit utilities immediately. Although it was valuable to "hit the ground running" by engaging utilities early, there was no time allocated for BPA program staff and PECI to fully develop the operational guidelines for the EnergySmart Grocer program. As a result, some stakeholders were not fully informed about the program implementation strategy and the scope and timeframes associated with the program's ramp up, utility recruitment schedules and eventual first-year kWh savings. The lack of communication about the program's expected implementation left some stakeholders concerned about when the program would accomplish its energy savings goals even though the kWh delivery schedule was included in the Phase II delivery contract and

[12] 512_0409_PECI April Report.doc (delivered May 15, 2009)

the program's performance has tracked the anticipated delivery schedule. This confusion was generated primarily as a result of under-defined communication channels internal to BPA and between BPA and PECI.

Due to the short time frame between the Phase I utility recruitment and the Phase II utility recruitment, program managers and staff did not take sufficient time to review the Phase I utility recruitment, assess the barriers and opportunities presented in Phase I utility recruitment process, or adjust the program's design and implementation for Phase II utility recruitment accordingly. *Neither the contract nor the work plan states a specific requirement to conduct an interim review and assessment between Phase I and Phase II utility recruitment*. As a result, a systematic review and assessment between Phase I and Phase II was not completed and the program missed an opportunity to apply lessons learned from working with a small group of utilities to its wider program rollout in Phase II.

Specifically, the contract and work plan for the EnergySmart Grocer failed to specify the scope, timing and key deliverables of the program's early activities. The contract between PECI and BPA was completed in October 2006 and BPA member utilities were recruited that same month. However, in October 2006, the EnergySmart program was lacking definitions for many key elements, such as qualifying facilities, eligible measures, customer outreach protocol, and optimal interaction between FEAs and utility representatives. As a result, although the program "hit the ground running" and successfully recruited BPA member utilities and began to conduct initial audits at end-use customer locations, the program ended up making missteps and leaving some stakeholders disappointed.

Three examples illustrate the challenges faced by the EnergySmart Grocer program by "hitting the ground running" with under- or un-defined program elements.

Utilities Enrollment Priorities Not Defined

The open enrollment and region-wide recruitment for the EnergySmart Grocer program resulted in several utilities with relatively small and rural territories (with fewer or harder to reach qualifying facilities) joining the program first. Open enrollment resulted in uncertainty among program managers regarding the enrollment of large member utilities with many qualifying facilities. As a result, the ESG program allocated unforeseen additional resources to areas "east of the Cascades" that did not yield the necessary energy savings for the program to be perceived as successful by some stakeholders. Although this accomplished the goal of providing member utilities with flexibility to implement the ESG program, it also resulted in program roll-out, hiccups, leading to underperforming energy savings results and high cost per kWh for achieved energy savings.

Program Measures Not Defined

The EnergySmart Grocer program originally proposed auto-closers and door gaskets as direct install measures and considered whether strip curtains should be included. These measures were approved for the EnergySmart Grocer program implemented in Pacific Gas & Electric territory in California. However, the Regional Technical Forum (RTF) initially rejected these measures for the EnergySmart Grocer program implementation in BPA member utility territories because the RTF did not accept the energy savings assumptions based on the ASHRAE formula. This decision significantly affected the program's estimated savings and cost per kWh assumptions. Eventually, BPA conducted testing of these measures and approved a deemed savings for auto-closers and door gaskets. This process took approximately 18 months and estimated $ 100,000 in costs paid by BPA.

Qualifying Facilities Not Defined

In the last example, the ESG program installed commercial lighting retrofits at a series of schools in Idaho and a correctional facility, also in Idaho. Some program stakeholders expressed concerns about whether the ESG program should claim these savings or whether these savings should be attributed to the previously existing BPA commercial lighting program. Eventually, BPA and PECI agreed that the ESG program could target lighting within areas that house commercial refrigeration (e.g., lighting upgrades within a school's kitchen or cafeteria building but not at the rest of the school). Although the misunderstanding was satisfactorily resolved, it required time and resources to address the issue regarding where credit would be attributed for lighting measures. In addition, as a result of an expanded scope of qualifying facilities, the program decided to change its name from EnergySmart Grocer program to EnergySmart. This name change was announced in the program implementer's May 2007 report.

2.5.2 Recommendations to Refine Effectiveness Criteria

Recommendation: Revisions to EnergySmart Performance Work Plan

The Summit Blue team recommends the inclusion of "continuous improvement" provisions in a new iteration of the program's workplan. Although the EnergySmart Performance Work Plan adequately outlines key tasks for the third-party program implementer, the Work Plan omits the need for periodic review and evaluation of the program. In addition, most of the tasks are given a very broad timeline (e.g., ongoing from Q2 2007 or ongoing from start of program). Therefore, the Summit Blue team recommends:

- BPA revise the EnergySmart Performance Work Plan to include periodic program reviews/webinars with key program stakeholders as part of a continuous improvement goal for the program. The purpose of these "continuous improvement" reviews would be to solicit constructive criticism from program stakeholders and share information to address any program obstacles in a proactive manner. Participants could include utility representatives, program staff, trade allies and other stakeholders. These program reviews would differ from the current program reports to stakeholders because they would be more interactive with an opportunity to address concerns ahead of time through sharing information. Periodic program reviews may also reduce the number of ad hoc reviews, thereby increasing program efficiency.
- The substance of the program reviews be developed by BPA with input from PECI and BPA member utilities to get a 360-degree view of perspectives and needs for the program reviews.
- Although the ESG program has achieved many of its implementation goals, the program would benefit from improved operational planning and communication of the operations plan to member utilities and stakeholders.

A key revision should also include expectations surrounding the standardization of customer visits from Field Energy Analysts. Although a FEA should be given latitude to address customer segments based on their own professional judgment, BPA should request that the third-party implementer produce a "script" or talking points for FEAs with certain standard disclosure requirements at site visits. These standard disclosures should include information about the local participating utility and other agreed upon messages.

Communication Channels and BPA Information Archives

Using the proposed logic model as a starting point for discussion, the Summit Blue team recommends that BPA provide a forum to better define and streamline communication channels between BPA staff, PECI,

BPA member utilities and other contractors such as Synergy Consulting, Inc. (the PTR contractor). Regular conference calls with key stakeholders may be required until communication channels are understood and accepted by all parties.

The evaluation team recommends designing an electronic information exchange or data storage feature for important information and communications regarding the EnergySmart Grocer program. This information feature may already exist within a current BPA database or website, or could be implemented through a shared drive. The rationale for a formal information archive stems from the need for easily identifiable and accessible information for program operations and periodic review. For example, several key staff from BPA and PECI either retired, changed firms or changed positions during the EnergySmart Grocer program's development and implementation. Additionally, the Summit Blue team recommends that meeting minutes be taken at all management meetings or meetings where important decisions will be made, if not done so already. Creating an information archive with important decisions, rationales and reviews will help ensure that previous knowledge and work is not lost when a person leaves their post or information is requested from a meeting held too long ago for people to accurately remember what was decided. In addition, the location of the information archive should be easily accessible to those with access.

Engage BPA Member Utilities in a Voluntary Advisory Group

Many utility representatives interviewed stated that they would be willing to provide feedback to the program implementers regarding the program's performance in their utility territory. The Summit Blue team recommends convening an EnergySmart Grocer utility advisory group to provide a forum by which member utility representatives join a conference call on what is working well and what could be improved. One method that can work well is to provide a short email to utility reps (or website 'button') asking if they have specific issues and would be willing to share them. Follow-up calls from BPA program staff could garner the feedback these individuals have to offer, without the need to convene a meeting, while still providing an informal forum for individuals to share concerns and ideas for improvement. The goal would be to provide a member utility roundtable on a regular basis to share stories from the field and discuss best practices for effective implementation. Additional members of this call could include the EERs, FEAs and other BPA and PECI staff.

2.5.3 Improve Administrative Processes

The second objective of stakeholder interviews was to compare administrative processes between the EnergySmart Grocer program and other programs in which the particular stakeholder may participate. The purpose of this objective is to review whether the EnergySmart Grocer's administrative processes are perceived as appropriate by stakeholders relative to the amount of energy savings that the program is delivering or other goals of the stakeholder. The primary stakeholders involved in these interviews were BPA staff, PECI staff, and utility representatives. Trade allies and end-use customers were also interviewed. This section includes findings about stakeholders' perceptions of the EnergySmart Grocer program's administrative processes.

Several stakeholders interviewed reported that the administrative burden involved with administering the EnergySmart Grocer program is high, including PECI, the BPA Program Manager, the BPA PTR manager, and the PTR sub-contractor. The team outlines the reporting requirements of PECI in Table 2-8. The administrative burdens associated with the BPA program manager, the BPA PTR manager and the PTR subcontractor appear to be a function of a lack of defined roles and responsibilities and a lack of scheduled review for the EnergySmart Grocer program's operations and implementation. There are different viewpoints about the relative administrative burden for the program. For example, the BPA program staff would like it noted that the administrative burden to them seems appropriate on such a large

contract ($315,000 contract/month). On the other hand, the PECI staff reports that the administrative burden is higher for this program than it is for EnergySmart Grocer programs in other utility territories. In addition, the administrative burden is high on BPA program staff, including the program manager, PTR manager and PTR subcontractor. Due to the large number of persons interviewed who raised this topic, the Summit Blue team would recommend discussing the topic of administrative burden at an appropriate time.

Table 2-8. Select EnergySmart Grocer Program Reporting Requirements

Reporting Requirement	Frequency	Size or Amount	Responsible Party
Program Report	Monthly	13-14 pages with 6 attached spreadsheets	PECI
ESG Program Manager meeting	Monthly	Varies	PECI/ESG program manager
EER meeting	Monthly	Varies	PECI/EERs
Ad Hoc Information Requests	Often	Varies	PECI/ESG program manager
Utility communications	Often	Varies	PECI/utility representatives

PECI Reports a High Administrative Burden

Compared to its administration of the EnergySmart Grocer (or comparable commercial refrigeration programs) in other utility service territories, PECI reports that the administrative burden associated with the EnergySmart Grocer program in BPA member utility territories is quite high. In an effort to address this issue, PECI has recently implemented an online customer relationship management reporting tool called *Sprocket* that the third-party implementer will use to provide real-time reporting to member utilities and BPA. PECI anticipates that the implementation of the "*Sprocket*" customer relationship management tool will reduce the amount of staff time required to compile monthly reports or respond to information requests.

Member Utility Representatives Report No Significant Burden

Representatives of BPA member utilities generally do not report a significant administrative burden relative to implementation of the program. In some cases, the BPA member utility representatives report a need to engage in training regarding accepting carts in the PTR system. Most BPA member utility representatives report that, once they are sufficiently trained in accepting carts in the PTR system, the administrative burden associated with the EnergySmart Grocer program is relatively low.

End-Use Customers and Trade Allies Report No Significant Burden

End-use customers and trade allies did not report significant concerns regarding the administrative processes associate with the EnergySmart Grocer program.

2.5.4 Recommendations for Improving Administrative Processes

Streamline Reporting Requirements

The EnergySmart Grocer program may be able to leverage *Sprocket's* real-time data tracking and management software to reduce the amount of time and resources required to compile monthly reports for the program. As program stakeholders are trained to use Sprocket and become comfortable with the program's outputs, consider opportunities to streamline or condense reporting requirements from PECI. One possibility would be more robust written quarterly reports and less formal monthly reports.

Although PECI feels that the reporting requirements for the program are high compared to other programs, the BPA project team feels that the reporting requirements are appropriate for the program. The parties should discuss how to effectively use the Sprocket data tracking and management software, along with current reporting formats, to best meet the BPA project team's reporting needs while minimizing the time requirements of ESG program staff. The improved reporting system will also save time for BPA staff and should be viewed as a "win-win" situation.

Leverage PECI's Administrative Resources

The Summit Blue team interviewed staff from PECI and learned that staff that administer the EnergySmart Grocer program for BPA, Puget Sound Energy and Avista all work within the same office and have frequent contact to share information. The Summit Blue team would *recommend establishing regular lines of communication between the implementing utilities (e.g., BPA, Puget Sound Energy and Avista) and their respective administrative teams at PECI to periodically meet and discuss best practices and opportunities.* These ESG "roundtable" discussions could be held periodically and include a range of topics based on the interest of the parties ranging from best practices in program implementation to comparing market penetration and other trends within the different programs.

2.5.5 Marketing and Outreach

The purpose of this research objective was to determine how effective the current EnergySmart Grocer marketing and outreach strategies are for recruiting end-use customers and trade allies. The primary stakeholders interviewed included BPA staff, PECI staff, utility representatives and end-use customers. This section includes findings about the EnergySmart Grocer program's marketing and outreach efforts.

Inform to Invest (I2I) Strategy

The EnergySmart Grocer program utilizes a marketing and outreach strategy referred to as Inform to Invest (I2I). Inform to Invest is commonly referred to as a "high touch strategy." The goal of the I2I strategy is to create a professional relationship with the end-use owner or manager in order to establish the Field Energy Analyst (FEA) as a trusted source of technical and financial information regarding opportunities to implement energy efficiency measures at the end-use customer's location(s).

Implementation of the I2I strategy varies greatly according to the needs of the end-use customer, the involvement of the BPA member utility representative in the appropriate utility territory and the characteristics of the Field Energy Analyst. In some utility territories, a representative from the local utility facilitates customer meetings for an FEA by sending out letters introducing the ESG program to their customers and/or potentially joining the FEA at one or more meetings with an end-use customer(s).

These utility territories are often smaller and/or more rural utilities with a relatively few eligible end-use customers.

In other utility territories, a local utility provides a list of eligible customers to the program implementer and requests that the program implementer conduct the customer outreach. In some cases, larger utilities with many potential eligible end-use customers are utilities that are likely going to ask the program implementer to reach out to eligible end-use customers in their service territory.

Program stakeholders report being very satisfied with the I2I strategy of the Energy Smart Grocer program. According to multiple stakeholders interviewed during the process evaluation, the program's one-on-one and in-person visits associated with the I2I strategy are critical to gaining the trust and confidence of decision-makers in the commercial refrigeration target markets.

Table 2-9 illustrates the EnergySmart Grocer program's I2I Strategy in separate customer contacts.

Table 2-9. Key Components of the EnergySmart Grocer's Inform to Invest Strategy

Customer Contact	Action	ESG Party Responsible
First contact	Introductory letter from ESG or BPA member utility sent to end-use customer	FEA or BPA member utility representative
Second contact	Phone call to schedule in-person visit	FEA (BPA member utility representatives have done this in some cases)
Third contact	Initial audit at customer location, install no-cost measures, produce Energy Savings Report	FEA (utility representatives accompany FEA in some cases)
Fourth contact	Follow up visit or phone call with end-use customer regarding interest in installing measures[13]	FEA (utility representatives accompany FEA in some cases)
Fifth contact	Customer agrees to install measures, signs paperwork	FEA
Sixth contact	Phase I or Phase II measures installed[14]	Contractor
Seventh contact	Measure installs verified	FEA (utility representatives accompany FEA in some cases)
Eighth contact	Customer receives incentive check	PECI staff/Utility representative

[13] Fourth Contact note: This customer follow up conversation often lasts several months and includes several follow up phone calls or in-person visits by the FEA in order to convince the customer to go forward with installing program measures.

[14] Sixth—Eighth Contact note: these "customer contacts" may be repeated several times if end-use customer installs additional measures.

Utility Representatives' Observations about Marketing and Outreach Efforts

Utility representatives reported general satisfaction with the EnergySmart Grocer program's marketing and outreach efforts. Concerns that were expressed during interviews with utility representatives are outlined in three primary topics below.

Under-reporting of BPA Member Utility Name and/or Logo During Customer Visits

Despite being perceived as generally very successful, utility representatives report wide discrepancies among Field Energy Analysts' use of a local BPA member utility name, logo and/or other references when conducting outreach to end-use customers. For example, some customers report that Field Energy Analysts make very little or no mention of their local utility, while other customers report that the Field Energy Analyst made a site visit together with a representative of their local utility.

Initial Program Roll-out and Communication with Utility Customers

Utility representatives reported most often that the source of disappointment with initial program roll-out was when utility would notify its customers that the ESG program was "available" and the program implementer was unable to follow-up with utility customers within the timeframe expected by the utility representatives. Parties report a combination of factors leading to this disappointment, including:

- lack of communication regarding the expected timeframe for initial customer outreach upon successful utility recruitment;
- larger number of utilities signing up "east of the Cascades," resulting in under-staffing in these utility territories and the lack of a defined "utility recruitment and customer roll-out procedure" that resulted in different utilities communicating with their customers regarding the ESG program in different ways; and
- lack of uniform program roll-out within member utilities made it more difficult and expensive for FEAs to meet utility representative's expectations in some cases.

Energy Savings Reports

Some program stakeholders have expressed concerns about the accuracy of the Energy Savings Report (the initial estimate of potential energy savings that an end-use customer receives after their initial facility audit) delivered by Field Energy Analysts to potential end-use customers.

Another stakeholder confirmed that the Energy Savings Reports do not take into account site specific information and are not designed to provide "reliable" energy savings estimates, but instead to provide more of a "marketing tool" for FEAs to encourage end-user customers to implement energy efficiency measures. The reports are designed to provide in a simplified manner realistic energy saving estimates. One of the purposes of the impact evaluation is to see how close those estimates are.

2.5.6 Recommendations for Marketing and Outreach Strategy

The Summit Blue team's research indicates that end-use customers find that Field Energy Analysts are one of the most trusted sources of information about technical and financial information regarding energy efficiency measures. The Summit Blue team recommends the following program investments to attempt to maximize the investments in the Field Energy Analyst outreach effort:

- Invest in FEA training to make their presentations more consistent—create a script, talking points or best practices for FEAs and consider implementing regular "practice sessions" between FEAs where FEAs can critique each others' presentations and share information and best practices.

- When conducting customer outreach, FEAs should attempt to leverage the local utility relationship with their customers through: greater recognition of local utility logos, more frequent mention of utility names during outreach presentations, and inviting utility representatives to join a site visit when possible. It is extremely important that FEAs include local utilities' names and contact information on every customer visit.

- Utilities representatives report that, generally, utilities could do a better job of pointing out local "success stories" for local customers. These success stories don't necessarily need to be in the form of a formal case study, but can be more anecdotal. In order to be successful, the subject should be relatively local, willing to be contacted by other potential customers (and to give their contact information to potential customers), and have installed measures long enough ago in order to have some utility records that indicate energy savings at the subject location.

2.5.7 Program Delivery Experience

The purpose of this research objective is to obtain first-hand feedback about the technical and financial effectiveness of the program and the level of customer service provided to program end-use customers. The primary stakeholders interviewed for these topics included trade allies, end-use customers, as well as BPA staff and PECI staff.

Member Utilities Report Favorable Interactions with Third-Party Provider

- Utility representatives, generally, find working with PECI administrative staff to be favorable.
- Utility representatives, generally, report working with current FEAs, to be favorable.
- Several member utilities report a need for "technical expertise" in their territories and would like to see FEAs be able to provide "complete one-stop audit" for their customers.

End-use Customer and Trade Allies Report Favorable Interactions with Third-Party Provider

End-Use customer experiences, with some minor program administrative/implementation mistakes, have been largely positive. End-use customers that did encounter program errors report satisfaction with the resolution of those program errors. Trade allies additionally report favorable experiences working with the EnergySmart Grocer program.

2.5.8 External/Internal Market Variations

The purpose of this set of questions was to determine whether the economic downturn, electricity rates or other important external or internal market variations were having a significant impact upon the EnergySmart Grocer program's performance. All categories of stakeholders were asked about these topics, including BPA staff, PECI staff, utility representatives, trade allies and end-use customers.

Stakeholders report that the current economic downturn has significantly affected end-use customers' willingness to invest in energy efficiency measures and has affected all stakeholders in various ways. For

example, some end-use customers (e.g., store owners or managers) report a hesitancy to invest in energy efficiency measures at this time in an effort to conserve cash in order to mitigate market risk. Additionally, some trade allies report a focus on "core business strategy" and a general unwillingness to allocate resources to investigate new markets or services, such as the ESG program. Despite generally adverse effects of the economic downturn, some utility representatives reported an interest in "serving our customers, especially under-served or hard-to-reach market segments, especially in these difficult economic times."

2.5.9 Recommendations for External/Internal Market Variations

Summit Blue recommends that BPA continue to investigate the commercial refrigeration market space to gauge the impacts of the economic downturn on end-use customer willingness to invest in energy efficiency measures. This investigation may include market assessment reports or less formal feedback from FEAs or utility representatives. BPA should continue to investigate additional energy savings measures and incentive schedules for current energy savings measures. This will help insure that the program is up to date with industry best practices and is adapting its energy savings opportunities and incentives measures to the market.

2.6 Barriers & Opportunities for Effective Third-Party Program Implementation

The Evaluation plan calls for the Summit Blue team to extrapolate findings from the EnergySmart Grocer program to the implementation of effective third-party programs, in general. Overall, the EnergySmart Grocer Program provides strong evidence in support of BPA considering other third-party program implementation opportunities. This section includes findings and recommendations for effective third-party program implementation.

2.6.1 Organizational Opportunities for Effective Third-Party Program Implementation

BPA has many organizational assets that create a favorable environment for implementing effective program delivery via third-party implementers. Table 2-10 identifies the organizational opportunities within BPA for effective third-party program implementation with narrative discussion about each finding following the table.

Table 2-10. Organizational Opportunities for Effective Third-Party Program Implementation

Organizational Opportunity	Finding
BPA's Vision & History of Innovation	BPA's vision and successful history of innovation create a favorable framework for providing a structure to launch new third-party programs
Structure of BPA	The organizational structure of BPA, including BPA member utilities covering a wide range of geographic, population, and socio-economic characteristics. The large number of utilities presents diverse needs and opportunities to serve those needs in creative ways, potentially using third-party program administrators.
Third-party program implementer expertise	BPA develops a third-party selection criteria list and may consider requesting information from market providers
Access to Research & Resources	BPA's internal expertise and research, along with close collaborations with other research organizations in the Pacific Northwest, create a valuable network of information and resources.
Human Resources	The people within BPA, the BPA member utilities and the third-party program implementer are ultimately what make their organizations successful.

BPA's Vision & History of Innovation

BPAs Energy Efficiency group has a long history of collaboration with regional stakeholders to provide energy efficiency programs and services. This history provides opportunities to effectively screen, pilot, and deliver third-party DSM programs in the region.

Structure of BPA

The structure of BPA enables the organization to involve its member utilities in a variety of energy efficiency discussions and program designs. In the stakeholder interviews, BPA member utilities report being "most open" to third-party implementation when a program is developed that fills a gap in the utilities' internal capabilities or provides services to the EE market most effectively addressed in a regional manner.

Third-party Program Implementer Expertise

The third-party program implementer for the EnergySmart Grocer program, PECI, provides a wealth of experience and knowledge regarding their particular program. As BPA continues to develop additional programs for third-party implementation, BPA staff may want to consider developing performance

criteria for selecting a third-party program implementer to collaborate with BPA and its member utilities and customers. In addition, BPA could periodically request third-party information or qualifications to keep appraised of latest developments within the private market. The goal for creating performance criteria or requesting information would be to help ensure that third-party program implementers have the requisite technical and financial expertise to make contributions to their respective programs.

Access to Research and Resources

BPA is a major funder and contributor the Northwest Energy Efficiency Alliance and its sector initiatives, Northwest ENERGY STAR (residential), BetterBricks (commercial), Industrial Efficiency Alliance (industrial). Research and reports prepared by the Northwest Energy Efficiency Alliance, as well as those prepared by other regional stakeholders such as the New Buildings Institute and the Cascadia Chapter of the U.S. Green Building Council, provide BPA with several sources of innovative ideas and research with which to develop new initiatives. The Summit Blue team recommends continuing to engage with these resources to keep appraised of industry initiatives and market sector action. Program development initiatives should leverage this research whenever possible.

Human Resources

The ultimate success of BPA's energy efficiency organization is due to the people that currently comprise the staff of the organization and their predecessors as well as the staff of BPA member utilities. The Summit Blue team was fortunate to have the opportunity to interview 40 stakeholders in conjunction with developing this process evaluation. Having had this opportunity, the Summit Blue team is aware of the talent and dedication of these individuals and their colleagues in the region. As a result, one of the main objectives of the team's recommendations is to enhance the opportunities for individuals from around the region to make suggestions and contributions to the success of BPA energy efficiency programs. For example, most utility representatives that were interviewed report a willingness to serve on a focus group for new initiatives in some capacity. The Summit Blue team recommends providing a forum for comments on new initiatives, including soliciting and discussing ideas for new market sectors to be served or ideas on how to more effectively implement programs in current market sectors.

2.6.2 Recommendations for Effective Third-Party Program Implementation

This section outlines the evaluation team's recommendations to implement effective third-party program implementation. Our recommendations are included in the table and then followed by brief narrative. Table 2-11 lists Summit Blue's recommendations for effective third-party program implementation.

Table 2-11. Effective Third-Party Program Implementation Recommendations

Recommendation	Description	Responsible Party
Involve utilities early, often	Create open forum or expand existing forums for input	BPA
Develop and implement the New Initiatives Checklist	The New Initiatives Checklist document should be expanded upon and updated	BPA
Pilot programs	Programs should be rolled out in pilot phase and reviewed before being considered for "open enrollment"	BPA
Utilizing third-party implementer expertise	Incorporate workplan development period into contractual requirements	BPA

Involve Utilities Early, Often

BPA member utilities report being "most open" to third-party implementation when a program is developed that fills a gap in the utilities' internal capabilities or is most effectively addressed as a region. The structure of the BPA enables the organization to involve its member utilities in a variety of energy efficiency discussions and programs. If there is not a forum that appropriately considers the feedback of BPA member utilities on program design, performance and review, then the BPA should consider putting a forum in place. BPA member utilities could self-identify with any number of energy efficiency topics for BPA forums to contribute ideas and potentially lay the groundwork for future program ideas.

Develop and Implement New Initiative Checklist

The BPA Energy Efficiency organization provided the Summit Blue team with a Working Draft version of a New Initiative Checklist, dated February 5, 2007.[15] The goal of the New Initiative Checklist is to create a "set of guidelines for consideration when developing a new program, project or initiative." This checklist is the start of a very helpful planning document for future new initiatives within BPA's energy efficiency group. It will help ensure that programs are designed and reviewed in a fashion that considers a number of critical components before the program is "rolled-out". This process of design considerations and final program review includes making adjustments as needed to the program design based on the final review. The document states that the BPA energy efficiency organization will "continue to refine this list as we gain more experience with developing new (energy efficiency) initiatives." The Summit Blue team recommends that BPA fully develop and implement the New Initiative Checklist document (working draft revised 2/5/07).

[15] The New Initiatives Checklist (Working Draft 2/5/07) is included in Appendix D.

Implement Pilot Programs and Review on a Regular Basis

The Summit Blue team recommends including a proposed program timeline in the new initiatives checklist that would include a template for a pilot program along with a review and evaluation of the pilot program prior to full-scale launch.

Utilize Third-Party Expertise: Workplan Development Phase

The Summit Blue team recommends including a workplan development period into its contractual mechanism where a third-party program implementer would respond to proposed BPA workplans and negotiate with BPA on key program deliverables and workplans. The final accepted workplan would be the product of BPA and the third-party implementer's negotiations.

3 BILLING ANALYSIS

This chapter presents the approach used in the billing data analysis to estimate realization rates for the Energy Smart Grocers program. It describes the data that were collected, steps taken to prepare the data, and the analytical methods that were used to perform the billing analysis. Section 3.2 presents the results of this analysis.

3.1 Methodology

3.1.1 Program Tracking Data

Program tracking data were used to identify program participants who installed measures through the Energy Smart Grocers program. Table 3-1 shows that information was received on 466 customer sites that participated in the program from May 2007 through September 2008. A total of 1,296 different measures were installed for this group of customers, and they came from sixty-six different utilities.

These tracking data provided site-specific information on the quantity of units installed for each measure, such as number of motors or linear feet of gaskets. Total first-year kWh savings for these measures were also provided and were based on the number of installed units and the deemed savings per unit. Savings were reported at the busbar level, which was equal to site savings times a factor of 1.07625.

Some measures (gaskets and autoclosers) were distributed as free measures through the program. Other measures received a rebate. Out of the 466 stores that participated in the program, 320 received rebates and 146 received only the free measures. There were no first-year kWh savings claimed for the free measures in the original database.[16]

Table 3-1. Summary of Participating Stores and Billing Data Sample

	Stores	Measures	First-Year kWh Savings at Busbar	Utilities
All Participating Stores	466	1,296	11,048,855	66
Participating Stores that Received Rebates	320	926	11,048,855	60
Billing Data Sample of Participating Stores that Received Rebates	142	479	8,874,442	15

Collecting billing data for a billing analysis was more difficult for this program than for most since the participating customers came from so many different utilities. Data requests needed to be sent to each utility to collect the billing data that was required for the analysis. In order to limit the number of data

[16] Later in the study, estimated savings for the free measures were provided so realization rates could be calculated in the billing analysis.

requests to a manageable amount, participation was analyzed by utility. It was found that a small number of utilities covered most of the savings achieved by the program. Only fifteen utilities needed to provide billing data to cover 80% of the total program savings.

The program tracking data that were used in the billing data analysis included the following:

- Unique Account ID;
- Customer name and town;
- Description of measures installed;
- KWh savings from installed measures; and
- Installation date of measures.

A review of the measure data showed that most customers installed measures that helped them save energy on refrigeration, and some installed measures for more efficient lighting. There were no instances of savings from installation of energy efficiency measures related to HVAC.

In constructing the participation variables used in the billing analysis, a zero was used for all months prior to the installation date of each measure. After that date, the participation variable was set to the supplied estimate of kWh savings adjusted to match the number of days in the associated billing period. Some participants installed multiple measures that each had different installation dates.

3.1.2 Merging Program Tracking and Billing Data

The next step in this process was to merge the program tracking data with the billing information received for participants from the fifteen utilities that responded to the data request. BPA combined the data from the fifteen utilities into a single standardized dataset for analysis. This was very helpful since the data had been supplied in fifteen different formats.

After the tracking and billing data was merged, an initial screening was done on the savings ratio. The *savings ratio is the first year savings estimate from the tracking system as a fraction of the total kWh use from the billing records for that customer location.*

Table 3-2 presents the summary of the savings ratios calculated for each customer location. Roughly half of the customer locations show savings ratios of 2% or less while the other half show savings that spread from 3% to 30%. A sizable share, 20%, show savings in the 5% to 9% range and another 15% of locations show savings of 10% or more.

Table 3-2. Summary of Savings Ratios

Savings Ratio	Locations	Percent
1% or less	41	29%
2%	27	19%
3%	16	11%
4%	9	6%
5% to 9%	26	20%
10% to 19%	16	11%
20% to 30%	5	4%

The savings ratio distribution for this study is much more reasonable than what is typically found in larger studies.[17] This indicates that the program tracking data and billing data are clean and well-matched. This can probably be attributed to the fact that the billing data was collected from relatively small utilities that had to give personal attention to the selection of the correct accounts for the customers in their data request.

Only two customers needed to be dropped from this analysis because their savings were as great or greater than their bill. This is an indication that there was a mismatch between the program tracking data and the billing data. This kind of mismatch is typical in billing analysis, particularly for commercial customers where there are problems with multiple meters at single locations and customer churn. Finding only two cases with a mismatch is not a matter of concern.

After combining the tracking and billing data, it was found that 50% of the sites had at least one full year of billing data available for the post-installation period and most of those had considerably more than twelve months. Of the sites that did not have a full year of post-installation data, only 18% had less than six months. This is a very healthy set of post-installation billing data. The lack of a full year of data for every customer should not affect the reliability of the estimate of realization rates given that the model is a monthly savings model, not an annual savings model.

It would have been interesting to compare the average size of participants in the sample vs. the population to assess if there was any significant bias towards large stores given the way that the sample was selected. Unfortunately, the data was not available to make this assessment. Size of the stores in annual kWh consumption is not known for the population. It is only known for the customers in the sample. Some categorical information for the population was available that identified Store Type. Store Type provided some basic square footage categories that indicated size, but this information was missing for many of the customers so it was not possible to do a meaningful comparison of the sample to the population. However, the sample did include all of the smaller stores that were in the larger utilities that supplied billing data. If significant differences truly exist in savings realization rates for stores in smaller utilities, this difference would only be affecting about 20% of the overall program savings.

[17] Multiple Small Business Services Programs Impact Evaluation 2007 FINAL REPORT - UPDATE, prepared by Summit Blue Consulting and submitted to Cape Light Compact, National Grid, NSTAR, Unitil and Western Massachusetts Electric Company, September 2008.

3.1.3 Weather Data

The final step in the data collection was to bring in weather data for weather normalization of energy use. Daily weather data was collected from the National Oceanographic and Atmospheric Administration (NOAA) for each of the official weather stations in the areas where the participating customers were from. Both heating degree days and cooling degree days were calculated for each billing period for each customer using the weather station closest to the customer location.

A "degree day" is a unit of measure for recording how hot or how cold it has been over a 24-hour period. The number of degree days applied to any particular day of the week is determined by calculating the mean temperature for the day and then comparing the mean temperature to a base value of 65 degrees F. (The "mean" temperature is calculated by adding together the high for the day and the low for the day, and then dividing the result by two.) If the mean temperature for the day is, for example, five degrees higher than 65, then there have been five cooling degree days. On the other hand, if the weather has been cool, and the mean temperature is, for example, 55 degrees, then there have been 10 heating degree days (65 minus 55 equals 10).[18]

3.1.4 Billing Analysis

The statistical model that was developed to estimate the savings from the Energy Smart Grocer program was framed within the Statistically Adjusted Engineering (SAE) approach. Under this approach, the program tracking system's estimate of savings is included as an explanatory variable in a regression equation with the billed electricity consumption as the dependent variable. The estimated coefficient on the estimate of savings is interpreted as the realization rate. That is, the coefficient indicates the percentage of the estimate of energy savings that is realized on average according to the analysis of billing records.

For this analysis, data are available both across customers (i.e., cross-sectional) and over time (i.e., time-series). With this type of data, known as "panel" data, it becomes possible to control at once for differences across facilities as well as differences across periods in time through the use of a "fixed-effects" panel model. The fixed-effect refers to the assumption that differences across customers can be explained in large part by customer-specific intercept terms, as discussed below.

Because the consumption data in the panel model includes months before and after the installation of measures through the program, the period of program participation (or the participation window) may be defined specifically for each customer. This feature of the panel model allows for the pre-installation months of consumption to act as controls for post-participation months. In addition, this model, unlike annual pre/post-participation models such as annual change models, does not require a full year of post-participation data.

The fixed effects model can be viewed as a type of differencing model in which all characteristics of the customer, which (1) are independent of time and (2) determine the level of energy consumption, are captured within the customer-specific constant terms. In other words, differences in customer characteristics that cause variation in the level of energy consumption, such as building size and structure, are captured by constant terms representing each unique customer facility.

[18] http://www.srh.noaa.gov/ffc/html/degdays.shtml

Algebraically, the fixed-effect panel data model is described as:

$$y_{it} = \alpha_i + \beta x_{it} + RR \cdot E_{it} + \varepsilon_{it}$$

Where:

y_{it}	=	Energy consumption for site *i* during month *t*
α_i	=	Constant term for site *i*
β	=	Vector of coefficients
x	=	Vector of variables that represent factors causing changes in monthly consumption (i.e., the time-effects variables such as weather)
RR	=	The estimated coefficient that represents the realization rate
E_{it}	=	The tracking system estimate of savings for site *i* during month *t*
ε	=	Error term

It is possible to apply the fixed effects model to estimate a realization rate for the total savings from the program or to estimate realization rates for different categories of measures. This study focused on estimating realization rates for categories of measures since that provided more useful information.

At first glance it may seem that bill changes from small impact measures may get swallowed up and attributed to larger measures in the billing analysis, especially if both measures are installed concurrently. This would only happen if the small impact measure and the large impact measure are installed at exactly the same time. This is not a common occurrence in this dataset. And even when this does happen, the Statistically Adjusted Engineering model protects against this by feeding in expected savings for each measure. For example, if the expected savings for a small measure is 50 kWh per month and the expected savings for a large measure is 2,000 kWh per month, the model would look for 2,050 kWh of savings in the monthly bills. If it found that the bills only dropped by 1,750 kWh instead of 2,050, it would assign a realization rate of 85% (1,750/2,050) to both the small measure and the large measure because it can't distinguish a difference between the two in that particular case. However, this is where the power of the fixed effects model comes in. Realization rates seen for those same measures in other customers who did install them at different times would be used to estimate the average realization rates for each measure over the whole sample.

Another challenge with billing analysis models occurs when there are significant changes in use for particular customers, such as a store addition. This increased use in the total bill without any assignable cause in the model can hide the savings that occur underneath it. The protection against this occurrence is a large sample size. If the sample size is large enough, it is likely that the number of customers that increase use will be matched by a similar number of customers that decrease use, or at least the percentage of customers with significant changes in use will be small, and the average response to the installation of measures will be only minimally biased overall. Since the sample sizes in this study are relatively small, care should be taken to interpret the results as indicators of likely realization rates rather than precise estimates of them.

Although energy use can go up during the holiday season, a seasonal correction factor for Thanksgiving and Christmas was not included in the model because it was not expected that it would make a significant

difference on the estimation of the realization rate. The increase in use during these holiday periods is relatively modest for a grocery store, and it only represents a small share of the total number of months over the year. Also, it would be difficult to create an accurate seasonal correction factor given that the consumption data was supplied for billing months rather than calendar months. The variation in billing month start and end dates across all customers would not be easy to match to a consistent impact from the relatively short stretch of the holiday period which would slide across billing months in varying degrees for each customer. Given the combined low expected value and low reliability, a seasonal correction factor was not used.

Developing Realization Rates

The methodology of this study was designed to develop realization rates for gross energy savings. The gross energy savings reported in the tracking system is compared to billing usage to estimate the extent to which the predicted level of gross energy savings actually occurred. The customer's electric bill will reflect the reduction in energy usage that occurred, but it does not provide any insight into the level of free-ridership associated with that reduction in energy use and cannot reflect what the customer would have done in the absence of the program. The realization rate only reflects what actually happened and can be measured.

The realization rates from this study should be applied to gross energy savings estimates from engineering calculations or deemed savings to create evaluated gross energy savings estimates. Additional estimates of free-ridership and/or spillover effects would need to come from other studies and be applied to the evaluated gross energy savings to estimate net energy savings. The development of net energy savings estimates is beyond the scope of this study.

One unique aspect of this study is that the reported savings in the tracking system are at the busbar level, that is, losses have been added to energy reductions at the customer site to reflect total energy reductions on the system. Since bills only reflect the energy reductions at the customer site, the realization rates from the billing analysis would be at 93%, not 100%, when evaluated savings match what is recorded in the tracking system. For this reason, the modeled realization rates are adjusted by the losses factor to reflect the true realization rate. For example, if the initial results of the billing analysis showed a 93% realization rate, it is reported as 100% in this report for proper application to the reported program tracking savings.

3.2 Billing Analysis Results

This section of the report presents the results from the billing analysis.

The final model was able to provide meaningful and statistically significant realization rates for three measure types, which were well represented in the data and had significant energy savings per customer. Table 3-3 shows that a realization rate of 0.77 was found for energy efficient lighting measures, 1.27 for energy efficient cases, and 1.07 for floating head pressure controls.[19]

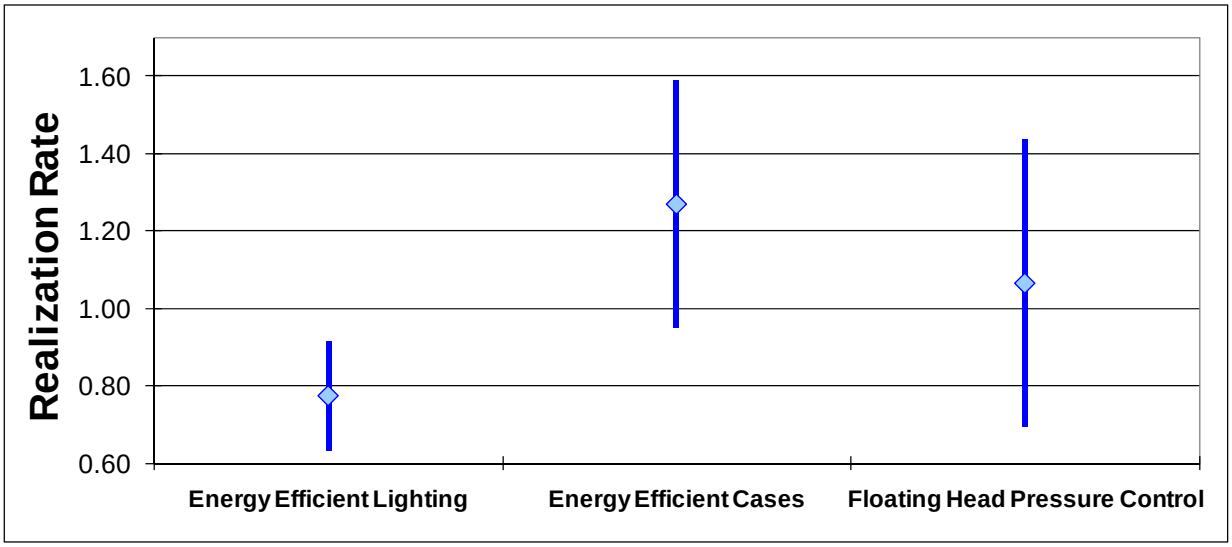
Figure 3-1 illustrates the range of the estimated realization rates at the 90% confidence level. It shows a smaller range around the estimated realization rate for energy efficient lighting, and a wider range for the estimated realization rates for energy efficient cases and floating head pressure control

Table 3-3. Realization Rates for Measure Types

Measure	Realization Rate	T-value	Statistically Significant at the 90% Confidence Level?	Precision at the 90% Confidence Level	Lower Bound of Realization Rate at 90% Confidence Level	Upper Bound of Realization Rate at 90% Confidence Level
Energy Efficient Lighting	0.77	9.17	Yes	± 18%	0.63	0.92
Energy Efficient Cases	1.27	6.41	Yes	± 25%	0.95	1.59
Floating Head Pressure Control	1.07	4.69	Yes	± 35%	0.69	1.44

[19] These are the true realization rates for the program and reflect adjustments made to the initial model results. The realization rates which come directly out of the regression model equal the (Observed Savings at the Customer Site) /(Deemed Savings at the Customer Site * Losses Factor). To accurately reflect the realization rate for savings achieved through the program, the ratio of (Observed Savings at the Customer Site * Losses Factor)/(Deemed Savings at the Customer Site * Losses Factor) must be calculated. Realization rates directly from the model are multiplied by the Losses Factor to create the true realization rates for the measures. The true realization rates are reported here and can be applied to either deemed savings at the customer site level or to the deemed savings at the busbar level.

Figure 3-1. Realization Rates for Measure Types



The wide margin of error around these realization rates indicates that the billing analysis results are not precise enough to be used to fine-tune energy savings estimates for individual program measures. However, the billing analysis results are valuable in their verification that savings near the estimated values for some of the largest energy saving measures could actually be seen in the bills across the available sample of customers.

The exact specification and results of the final fixed effects model can be found in Appendix D.

An outlier study was performed as part of the model development and four customers were removed from the sample because they created extreme instability in the realization rates.

Table 3-5 at the end of this section shows how individual measures were grouped into categories for analysis. The goal was to combine measures that were likely to have had savings estimated in a similar manner. These groupings would be most likely to identify consistent realization rates.

The model was run on all of the measure categories. However, many of the resulting realization rates for individual measure categories were either not statistically significant or they were outside of reasonable expected values. Additional work was done to evaluate which of the measure categories were based on a sufficient number of customers and a large enough energy savings per customer to be expected to provide reasonable realization rates that could be applied to the general population. Energy efficient lights, energy efficient cases and floating head pressure controls were the only measure categories that met these criteria. They represent the categories where the expected savings was greater than 4% of the total bill and there were more than eight customers with savings in that category.

Some initial work was also done to assess the realization rate for total savings. This was found to be an unreliable estimate because there were some participants where overall use increased over the time period of interest. To the model, this appeared to be a correlation to the occurrence of some measures but is more likely to have actually been an expansion in store size or operating hours. At a total sample size of 142 cases that had sufficient pre- and post- billing data for analysis, there simply were not enough cases to overcome all of the variability in the bills to report a reliable overall realization rate.

3.2.1 Assessment of the Lighting Realization Rate

Savings due to lighting retrofits are typically well-documented and consequently are deemed measures under the ESG program. PECI uses a standard spreadsheet to calculate lighting savings. This combines user-entered hours of operation with standard wattages for fixtures to estimate savings from a retrofit.

Despite the generally well established lighting wattages, the billing analysis estimated the lighting realization rate as only 77.5% ±14.1% for a 90% confidence interval, giving a maximum realization rate of 92%. For a 95% confidence interval, the uncertainty increases to 16.9%, giving a maximum realization rate of 94%.

Summit Blue examined the inputs to the lighting calculations and determined the following:

- Wattages used for fixtures are within a few watts of those typically used and do not vary consistently either high or low. Therefore, these inputs are not likely to have any detrimental effects on the realization rate.

- Hours of operation for sales areas were generally close to those stated by the grocery stores themselves. If anything, slightly longer hours might be the case due to stocking times.

- Only one site, which made up less than 1% of lighting savings, showed significantly (34%) overstated hours. This may be due to a change in operation times or hours used for stocking, but since the site is a very small portion of program savings any discrepancies here are not likely to affect the overall realization rate.

- Slightly less than 99% of lighting retrofit savings are from a single retail chain.

The pre-retrofit hours for stock rooms and storage areas are listed as 8,760, even though the retail areas are listed as operational hours. It is not possible to verify if this was the case prior to the retrofit. Occupancy sensors listed as part of these retrofits were seen to be operating at the sites that were included in the engineering sample. However even if the pre-installation hours are overstated or the occupancy sensors are not achieving the full savings expected, non-retail areas account for slightly less than 7% of lighting savings and any overstatement of pre-retrofit hours or occupancy sensor use here is unlikely to cause more than a few percent decrease in realization rate.

Overall there did not appear to be any significant issues with the calculation methodology or assumptions used by PECI to estimate lighting retrofit savings. There are a few possible reasons for the relatively low realization rate determined by the billing analysis:

- The billing analysis is providing a low value due to effects of other measures.

- The 90% confidence interval indicates that the actual realization rate could be as high as 92%, rather than the estimated 77%.

- Stores did not actually install the lamp and ballast combinations listed for the retrofit. This could be verified by examining invoices, which Summit Blue did not have for this review, or by opening fixtures to verify the ballasts and lamps in use.

- Hours have been extended since the lighting retrofit. This does not appear to be the case for operational hours, but stocking hours could have been changed.

- Emergency lights could be in use and operating 8,760 hours per year. Since Summit Blue was not at any of the sites after hours it is difficult to say if this is the case. However, it is similarly not possible to determine if any 24 hour lighting was in use before the retrofit.

- Additional lights have been added since the retrofit. This would not actually affect the realization rate for the retrofit itself, but could affect the billing analysis adversely.

Some may feel that the low realization rate found in the billing analysis for the lighting measures warrants a review of the lighting calculator, or additional analysis on interactive effects with lighting. While this type of additional analysis may offer some insight, it is the team's recommendation that this level of endeavor is not warranted at this time. The team does not believe that the lighting calculator or the interactive effects need to be re-examined based on the results of a 77% realization rate from the billing analysis, given the small sample size of only eleven cases that this is based on. The single best thing that could be done to improve the lighting realization rate estimate is to increase the sample size for a new billing analysis. Adding another year of data will help quite a bit, particularly since the participation in this program has been growing since the time period that was used for this analysis. Summit Blue recommends reconsidering these options if the realization rate continues to be low after more cases of lighting efficiency are added to a billing analysis.

3.3 Sample Characteristics

Table 3-4 shows that there were three measures with savings that were large enough per customer to be identifiable, and each of these three had a healthy number of cases. Interestingly, the estimated realization rates for these three groups were all reasonable and statistically significant. Based on this analysis, only *model results for Energy Efficient Cases, Energy Efficient Lighting, and Floating Head Pressure Controls were reported as reliable results from the billing analysis.* This confirms that these measures had significant enough savings to impact billing data for the sites.

Table 3-4. Relative Sample Size and Savings per Customer for Measures

Measure Category	Number of Customers with this Measure in the Sample	First-year MWH Savings per Customer
Energy Efficient Cases	6	166.3
Energy Efficient Lighting	11	127.4
Floating Head	15	94.9
Multiplex Controls	16	30.0
Compressor	1	25.0
Evaporative Motors	25	19.7
Anti Sweat Controls	6	11.8
Energy Efficient Lighting for Cases	4	10.8
Night Covers	15	10.2
VFD-Motors	1	9.0

Measure Category	Number of Customers with this Measure in the Sample	First-year MWH Savings per Customer
Electronically Commutated Motor	1	6.0
Gaskets	70	2.9
CFL for Freezers	96	2.5
CFL	2	2.5
Doors	2	2.5
Auto-Closers	12	1.2
Vending Machines	36	1.1

Table 3-5. Measure Categories for Billing Analysis

Category	Measure
Auto-Closers	Auto-Closers for Glass Reach-in Doors -- Cooler
	Auto-Closers for Glass Reach-in Doors -- Freezers
	Auto-Closers for Walk-in Coolers
	Auto-Closers for Walk-in Freezers
Gaskets	Gaskets for Reach-in Glass Doors, Low Temp
	Gaskets for Reach-in Glass Doors, Medium Temp
	Gaskets for Walk-in Cooler Main Door
	Gaskets for Walk-in Freezer Main Door
CFL	CFLs non refrigerated spaces
Energy Efficient Lighting	General Lighting Retrofit
	Lamp & Ballast Retrofit
	FM_140 400 Watt HID fixtures to 5 T8 fixtures with sensors
	Lighting - Controls - 100 to 200 Watts controlled
	Overhead Lighting Adjustment - see November report for details
Energy Efficient Lighting for Cases	Case Lighting - Low Temp - T12 to LED
	Case Lighting - Low Temp - T8 to LED
	Case lighting T-10/12 to T8, 4 ft
	Case lighting T-10/12 to T8, 5 ft
CFL for Freezers	CFL for walk-in cooler/freezer

Category	Measure
Anti Sweat Controls	Controls - Anti-Sweat Heat - Energy Management System - Low Temp
	Controls - Anti Sweat Heat - Dedicated ASHC Device - Low Temp
	Controls - Anti Sweat heat - Dedicated ASHC Device - Low Temp
	Controls - Anti Sweat Heat - Dedicated ASHC Device - Med Temp
	Controls - Anti Sweat heat - Dedicated ASHC Device - Med Temp
Energy Efficient Cases	Cases - Low Temp Reach-in to High Efficiency Reach-in
	Cases - Low Temp Open to Reach-in
	Cases - Low Temp Coffin to High Efficiency Reach-in
	Cases - Medium Temp Open Case to New High Efficiency Open Case
	Cases - Medium Temp Open Case to New Reach In
Electronically Commutated Motor	Electronically Commutated Motors for Compressor Head Fans
Evaporative Motors	Evap motors: shaded pole to Electronically Commutated Motor in display cases
	Evap motors: shaded pole to Electronically Commutated Motor in Walk-in
Floating Head Pressure Controls	Floating Head Pressure Control w/ VFD- Air Cooled
	Floating Head Pressure Control - Air Cooled
Doors	Special Doors with Low/No ASH for Low Temperature Reach-in
	CEE Tier II Solid Door Freezer - 30.1 cu ft - 60 cu ft
	CEE Tier II Solid or Glass Door Refrigerator - 30.1 cu ft - 60 cu ft
Night Covers	Night covers - vertical display case
	Night covers - horizontal display case
Multiplex Controls	Multiplex - Controls - Floating Head Pressure
	Multiplex - Controls - Floating Head Suction Pressure
	Multiplex - Controls - Floating suction pressure - Air-Cooled
Compressor	Multiplex - Compressors - Air-cooled Condenser
	Multiplex - Efficient/oversized Condenser - Air Cooled
	Efficient compressor - Low temp
VFD-Motors	Refrigeration - VFD - Motors
Vending Machines	Vending Machine Controller-Small Machine or Machine without Illuminated Front
	Vending Machine Controller-Large Machine w/Illuminated Front
	Vending Machine Controller-Glass Front Beverage Merchandiser

4 ENGINEERING EVALUATION

4.1 Evaluation Issues and Objectives

The chapter presents the results of identifying engineering based savings estimates for measures installed in the program. The primary objectives of this part of the analysis were to:

1. Conduct a brief review of the Grocer Smart software to assess the current savings methodology of the program.

2. Provide engineering estimates of savings and realization rates for GrocerSmart software deemed calculated and provisionally deemed measures.

3. Verify the continued operation of deemed savings measures at sites.

4.2 GrocerSmart Software

As part of this evaluation, BPA asked Summit Blue to review the GrocerSmart software used by PECI for the Energy Smart Grocer Program. PECI was reluctant to share their proprietary tool with Summit Blue for un-restricted review; however, PECI hosted a presentation of the software for the Summit Blue team to learn about the capabilities and inputs for the estimation engine. PECI discussed the structure of the software, and derivation of inputs such as full load hours, degradation factors, and system efficiency.

The major benefits of the tool are:

- Ease of use with audit results in a couple hours;

- Estimation of energy savings and payback at the measure level;

- Customization to the audited site; therefore, more accurate than deemed savings;

- Cheaper to deploy than hourly simulation tools such as DOE-2, while still based on the DOE-2 developed DEER 2005 prototype store; and

- Ability to incorporate deemed and calculated savings into a single analysis.

GrocerSmart pulls together all inputs required for measure analysis. Results from hundreds of DOE2 simulations of a prototype store with different permutations of equipment and controls are imbedded in the database that supports the software. These are combined with weather data, case data and simple audit data from the store to produce site-specific savings for recommended measures. In general, the method appears to give reasonable savings results for the measures demonstrated during the presentation and most measures analyzed for this study.

In summary, the Summit Blue team was impressed by the tool in terms of its capabilities and utility. PECI was able to demonstrate sample savings estimates for select measures as part of the brief presentation by stepping through data input windows with Summit Blue.

The logic behind the estimation software is solid. The overarching issue, however, is that *the GrocerSmart software is a black-box model*, and PECI's tight control over demonstrating the detail of the code still leaves some uncertainty regarding how estimates are derived. However, the thoughtfulness of the interface, the thoroughness of the data collection, and the apparent reasonableness of the results indicates the model is a quality analysis tool. Given that the California DEER database has been updated since the development of the DEER 2005 prototype store, it should be anticipated that PECI will examine the most recent DEER prototypes for any improvements in how they define their engineering model prototype grocery store.

4.3 Methodology Overview

The primary goal of the engineering evaluation of the EnergySmart Grocer program was to develop engineering-based savings estimates for measures installed by the program. The EnergySmart Grocer program divided efficiency measures into three categories:

- Deemed savings
- GrocerSmart software deemed calculated savings
- Provisionally deemed savings

The *deemed* category of measures included:

- Auto-closers (deemed by the RTF 11/4/08);
- Gaskets (deemed by the RTF 11/4/08);
- Lighting (other than LED case lighting);
- Commercial refrigerator and freezer replacement; and
- PC Controls.

The *deemed calculated* (via GrocerSmart software) category of measures included:

- Multiplex compressors and controls;
- Floating head pressure controls;
- Condensers;
- Electronically Commutated Motors;
- High efficiency cases;
- Low ASHC doors;
- Suction line insulation;
- Motors; and
- VFDs.

The *provisionally deemed* category of measures were newer and had less well established savings. They included:

- Anti-sweat heat controls (ASHC);
- Evaporator motors in display cases and walk-ins;

- Evaporator fan controls;
- Night covers;
- LED case lighting; and
- Vending machine controls.

The Summit Blue team worked with PECI to obtain data on the installed and planned measures and the program participant sites. Contacts with utilities for the sites were made through BPA. Additional data was collected through site visits by SBC personnel. The program tracking system lists the types of measures installed and the savings estimated for each measure.

The evaluation priorities based on percentage of total program savings and number of installations were for the following measures, all of which were deemed calculated except for anti-sweat heater controls, which were provisionally deemed:

1. Floating head pressure controls
2. Floating suction pressure controls
3. Variable frequency drives on compressors
4. Variable frequency drives on condensers
5. Electronically commutated motors (ECMs)
6. Antisweat heater controls (ASHCs) and low ASHC doors

Measures that could not be evaluated due to lack of installations included the following, all of which were provisionally deemed:

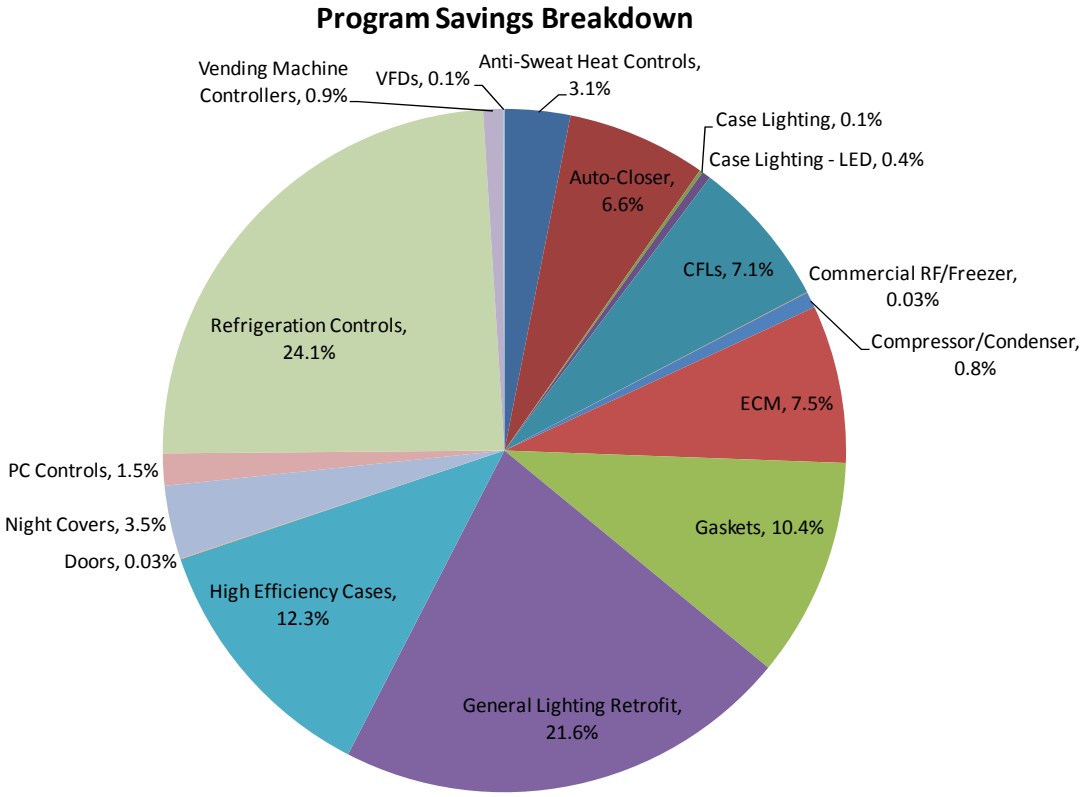
1. Night covers
2. Light Emitting Diode (LED) case lighting
3. Vending machine controls

The following subsections provide information on the methods used for site selection and analysis of key measure savings.

4.3.1 Site Selection

A priority of this engineering assessment was to help provide savings values for the *provisionally deemed* and GrocerSmart software *deemed calculated* measures, which had the most uncertainty in predicted (ex-ante) savings. However, it should be noted that provisionally deemed measures made up only 7.5% of total program savings at the time the PECI database was provided for this program review. Figure 4-1 provides an illustration of program savings by measure type for all sites in the population.

Figure 4-1. Program Savings by Measure Type



The installation of each measure had already been verified by PECI as a part of the ESG program; however, the accuracy of predicted savings were not evaluated at that time. In order to evaluate the accuracy of program savings estimates, this engineering evaluation sought to evaluate a representative sample of program measures' evaluated energy savings.

Summit Blue worked with PECI to obtain data on the installed and planned measures and the program participant sites. Contacts with utilities for the sites were made through BPA. Additional data was collected through site visits by SBC personnel. The program tracking system listed the types of measures installed and the savings estimated for each measure.

As shown in Table 4-1, deemed measures make up almost half of program savings. Deemed calculated measures (excluding lighting) make up most of the remaining savings, with provisionally deemed measures comprising slightly less than eight percent of the total.

Table 4-1. Program Savings by Measure Category

Category	kWh	% of savings
Deemed Savings	6,311,431	47.8%
Provisionally Deemed	993,324	7.5%
Deemed Calculated	5,912,300	44.7%
Total	13,217,055	100.0%

Sites with the GrocerSmart software deemed calculated category measures were ranked by total amount of savings per measure, and the ten largest sites by savings were targeted for on-site inspections. All of the applications were reviewed to verify the accuracy of the initial savings calculations.

The predicted savings from the ten largest sites, by GrocerSmart software deemed calculated savings totals, were compared to the program as a whole to determine their level of representation for overall program savings. Since the savings from deemed measures are well established by the RTF and the Summit Blue team did not provide any new estimates on these types of measures, they were not included in the engineering sample ranking. These top ten sites comprised 41% of program savings as of September 2008, when this engineering review began. It should be noted that when the evaluation of this program began, savings from gaskets and auto-closers were not yet included the program. The retroactive addition of the newly deemed savings for these measures reduces the sample to 35% of overall program savings. Figure 4-2 illustrates the sample portion of the program savings including the shares of savings by measure type.

Figure 4-2. Engineering Sample Portion of the Program Savings

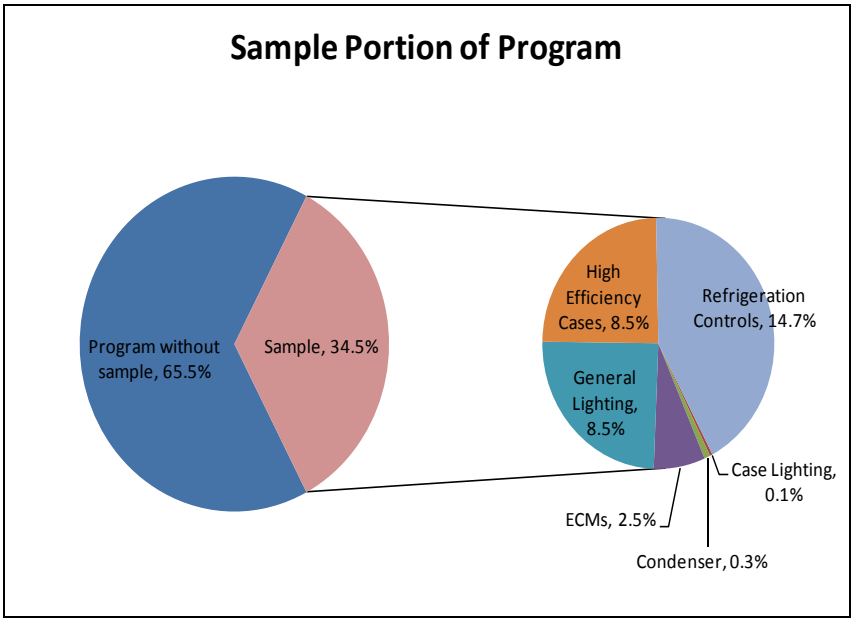


Figure 4-3 provides an illustration of the savings by measure type for the sample of the ten largest sites as selected by GrocerSmart software deemed calculated savings. Because of the small number of provisionally deemed installations, the sample did not contain any of these measures. A significant effort was made to locate upcoming installations of these measures, and an evaluation is currently underway for one location installing LED lighting and ASHCs on low temperature reach in cases. It should be noted that BPA has already commissioned and received one report of savings from an ASHC installation. [20] However, this was for medium temperature reach in cases in contrast to the low temperature units, which made up the majority of program savings for ASHCs.

[20] *Customer X M&V Findings, Anti-sweat Heaters and ECM Motors*, EMP2, Inc. January 2009.

Figure 4-3. Sample Savings by Measure Type

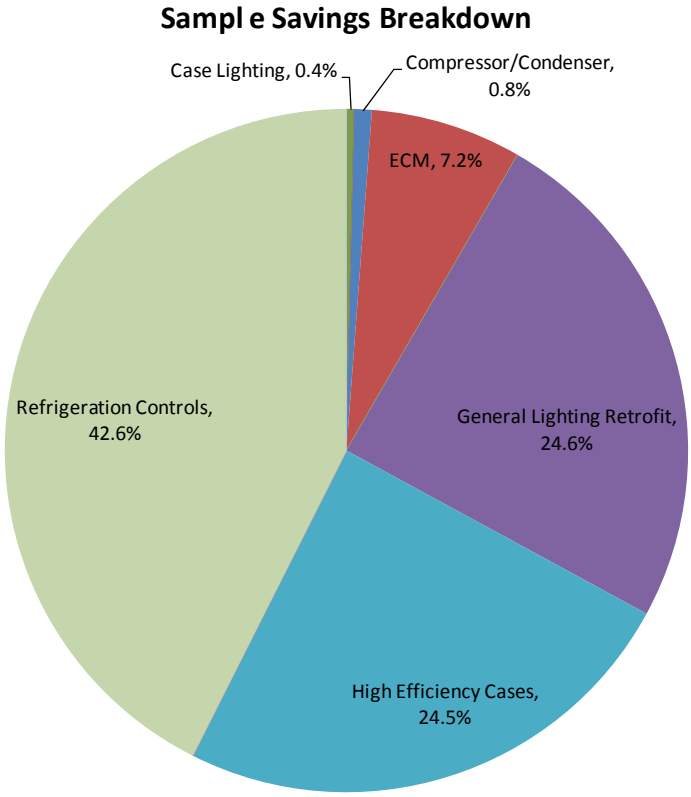


Table 4-2 provides a detailed listing from the top ten sites of the implemented GrocerSmart software deemed calculated and provisionally deemed refrigeration savings. .

Table 4-2. Measures Implemented by Engineering Assessment Sample Site

Site #	Measure	Quantity	Claimed Savings (kWh at Busbar)
1	Floating head pressure controls	190 HP	78,426
	Floating suction controls	190 HP	48,714
	Shaded pole motors to Electronically Commutated Motors	125 motors	42,125
	Cases-low temp open to reach-in	24 ft	45,432
	Cases-low reach-in to high efficiency	146 ft	157,334
	Cases-med temp open to high efficiency open	200 ft	50,708
	Cases-med temp open to reach-in	16 ft	8,117
	Case lighting T10/12 to T8	66 lamps	16,962
	General lighting retrofits and adjustments	4 projects	582,706
2	Floating head pressure controls with VFD	255 HP	225,165
	Floating suction controls	255 HP	56,610

Site #	Measure	Quantity	Claimed Savings (kWh at Busbar)
3	Shaded pole motors to Electronically Commutated Motors	177 motors	59,649
	Floating suction controls	215 HP	38,526
	Floating head pressure controls with VFD	215 HP	239,745
	General lighting retrofit	2 projects	115,926
4	Shaded pole motors to Electronically Commutated Motors	189 motors	63,693
	General lighting retrofit	1 project	72,868
	Floating suction controls	245 HP	44,962
	Floating head pressure controls with VFD	245 HP	228,775.92
5	Shaded pole motors to Electronically Commutated Motors	191 motors	64,367
	Floating suction controls	255 HP	46,748
	Floating head pressure controls with VFD	255 HP	236,169
	General lighting retrofits	2 projects	330,987
6	Cases-low reach-in to high efficiency	237 ft	258,567
	Cases-med temp open to high efficiency open	374 ft	63,020
	Shaded pole motors to Electronically Commutated Motors	169 motors	56,953
7	Cases-low reach-in to high efficiency	65 ft	94,120
	Cases-med temp open to high efficiency open	104 ft	28,184
	Floating head pressure controls	70 HP	35,490
	Floating suction controls	70 HP	17,850
	Shaded pole motors to Electronically Commutated Motors	1 motor	337
	Air-cooled condenser	15.5 tons	37,433
8	Floating head pressure controls	265 HP	162,710
	Floating suction controls	252 HP	63,000
9	Floating head pressure controls	275 HP	157,850
	Floating suction controls	275 HP	64,625
10	General lighting retrofit	1 project	19,883
	Cases-low temp open to reach-in	24 ft	96,360
	Cases-low temp reach-in to high efficiency	192.5 ft	204,478
	Cases-med temp open to high efficiency open	434 ft	108,500
	Shaded pole motors to Electronically Commutated Motors	118 motors	39,766
	Floating head pressure controls with VFD	161.5 HP	161,177
	Floating suction controls	161.5 HP	37,306

The ten sites listed above are reasonably representative of overall program savings as shown in Table 4-3. However, a few measures were either over- or under-represented and may warrant future studies. Specifically, anti-sweat heater controls, night covers, and CFLs and represent between three and nine percent of program savings each, but were not included in the top ten sites at all. Of these, CFLs were a

deemed measure for which neither additional savings calculations nor site visits are unlikely to provide any additional data. However, anti-sweat heater controls and night covers were both provisionally deemed measures that were explored more fully through targeted site visits. Contrastingly, refrigeration controls (primarily floating head pressure controls) and high efficiency cases were substantially overrepresented in the sample. However, as these are difficult measures to assess, this overrepresentation assisted in the analysis by providing additional data for analysis.

One additional site visit was also arranged. At this site both ASHCs and LED lighting were planned for existing freezer cases. Attempts were made to locate site for night covers as well; however, this was not possible.

The largest single category of program savings are from the deemed measure of general lighting retrofits at 18.4%. However the combination of floating suction pressure, at 11.8%, and floating head pressure controls with VFDs, at 11.4%, exceeds the lighting total. An additional 1% of program savings came from similar controls without VFDs or air cooling. Consequently, multiplex controls make up the largest share of non-deemed program savings by a substantial amount. Low temperature reach in retrofits are the next largest savings category at 8% of the total. A complete list of program measures is shown in Table 4-3, along with the total savings for each measure in the sample and program as a whole. The largest single category of program savings are from the deemed measure of general lighting retrofits at 18.4%. However the combination of floating suction pressure, at 11.8%, and floating head pressure controls with VFDs, at 11.4%, exceeds the lighting total. An additional 1% of program savings came from similar controls without VFDs or air cooling. Consequently, multiplex controls make up the largest share of non-deemed program savings by a substantial amount. Low temperature reach in retrofits are the next largest savings category at 8% of the total. A complete list of program measures is shown in Table 4-3, along with the total savings for each measure in the sample and program as a whole. It can be seen that the sample reflects largest savings categories well.

Table 4-3. Program Savings by Measure

measure	total	sample total	overall savings %
Auto-Closers for Glass Reach-in Doors -- Cooler	327,420	0	2.5%
Auto-Closers for Glass Reach-in Doors -- Freezers	542,493	0	4.1%
Auto-Closers for Walk-in Coolers	1,841	0	0.0%
Case Lighting - Low Temp - T12 to LED	35,923	0	0.3%
Case Lighting - Low Temp - T8 to LED	19,159	0	0.1%
Case lighting T-10/12 to T8, 4 ft	16,962	16,962	0.1%
Case lighting T-10/12 to T8, 5 ft	2,776	0	0.0%
Cases - Low Temp Coffin to High Efficiency Reach-in	80,559	0	0.6%
Cases - Low Temp Open to Reach-in	141,792	141,792	1.1%
Cases - Low Temp Reach-in to High Efficiency Reach-in	1,059,557	718,499	8.0%
Cases - Medium Temp Open Case to New High Efficiency Open Case	332,523	250,412	2.5%
Cases - Medium Temp Open Case to New Reach In	8,117	8,117	0.1%
CEE Tier II Solid Door Freezer - 30.1 cu ft - 60 cu ft	2,863	0	0.0%
CEE Tier II Solid or Glass Door Refrigerator - 30.1 cu ft - 60 cu ft	1,236	0	0.0%
CFL for walk-in cooler/freezer	914,570	0	6.9%
CFLs non refrigerated spaces	17,541	0	0.1%
Controls - Anti Sweat heat - Dedicated ASHC Device - Low Temp	199,176	0	1.5%
Controls - Anti Sweat heat - Dedicated ASHC Device - Med Temp	81,492	0	0.6%
Controls - Anti-Sweat Heat - Energy Management System - Low Temp	129,826	0	1.0%
ECMs for Compressor Head Fans	5,846	0	0.0%
Efficient compressor - Low temp	1,506	0	0.0%
Evap motors: shaded pole to ECM in display cases	656,813	326,890	5.0%
Evap motors: shaded pole to ECM in Walk-in	325,000	0	2.5%
FM_140 400 Watt HID fixtures to 5 T8 fixtures with sensors	37,786	37,786	0.3%
Gaskets for Reach-in Glass Doors, Low Temp	560,699	0	4.2%
Gaskets for Reach-in Glass Doors, Medium Temp	585,861	0	4.4%
Gaskets for Walk-in Cooler Main Door	142,740	0	1.1%
Gaskets for Walk-in Freezer Main Door	82,356	0	0.6%
General Lighting Retrofit	2,428,026	827,061	18.4%
Lamp & Ballast Retrofit	370,964	248,413	2.8%
Lighting - Controls - 100 to 200 Watts controlled	10,321	0	0.1%
Multiplex - Compressors - Air-cooled Condenser	96,239	37,433	0.7%
Multiplex - Controls - Floating Head Pressure	78,426	78,426	0.6%
Multiplex - Controls - Floating Head Suction Pressure	48,714	48,714	0.4%
Multiplex - Controls - Floating suction pressure - Air-Cooled	1,560,450	725,677	11.8%
Multiplex - Efficient/oversized Condenser - Air Cooled	2,046	0	0.0%
Multiplex - Floating Head Pressure Control w/ VFD- Air Cooled	1,502,279	1,091,031	11.4%
Night covers - horizontal display case	40,716	0	0.3%
Night covers - vertical display case	418,766	0	3.2%
Overhead Lighting Adjustment - see November report for details	9,110	9,110	0.1%
PC Controls	200,783	0	1.5%
Refrigeration - VFD - Motors	8,680	0	0.1%
Special Doors with Low/No ASH for Low Temperature Reach-in	3,754	0	0.0%
Vending Machine Controller-Glass Front Beverage Merchandiser	115,169	0	0.9%
Vending Machine Controller-Large Machine w/Illuminated Front	3,875	0	0.0%
Vending Machine Controller-Small Machine or Machine without Illuminated Front	4,305	0	0.0%
total	**13,217,055**	**4,566,322**	**100.0%**

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Initially it was planned to evaluate both GrocerSmart software re deemed calculated and provisionally deemed savings at some sites; however, none of the ten largest deemed savings sites had any provisionally deemed measures installed. During site visits, verification of installation of deemed measures was preformed, but no new savings estimates will be performed on the deemed category of measures. All of the facility lighting listed for the sites was found to be present and operating as expected during site visits.

4.3.2 Evaluation Engineering Methods and Process

Ideally engineering fieldwork for measurement and verification (M&V) of energy savings includes full documentation of affected systems pre- and post- measure installation. Actual power measurement of key equipment both before and after installation greatly enhances the accuracy and confidence of final savings estimates.

Early in this evaluation, BPA staff indicated that typically there had been difficulties arranging pre- and post-measurements at sites where GrocerSmart software deemed calculated and provisionally deemed measures were being installed. The Summit Blue team experience echoes that of BPA for this project. Many locations that initially indicated interest in measure installation later cancelled or delayed projects, thus inhibiting scheduling of pre-measurement activities. At sites where installations occurred, most program participants installed multiple measures simultaneously. Sometimes an installation amounted to a single case operated along with other cases on a multiplex compressor rack. These factors made isolating measure impact difficult and added complexity to determination of interactive effects.

Despite these uncertainties Summit Blue was able to, through engineering assessment, determine savings associated with measures comprising 50% of non-deemed savings. Where possible the methods included pre-installation measurement of systems.

For the installed GrocerSmart software deemed calculated category of measures, post installation metering was employed at 10 sites where it was expected to provide useful data with the results used in engineering algorithms to estimate the energy savings. The ten on-site inspections included installation verification along with measurement and monitoring the targeted equipment. Once metering and verification had been performed at individual sites, the evaluation results were used to verify the estimated savings generated by the GrocerSmart software. In some cases, stores had built in monitoring equipment that was used in conjunction with metering. For the provisionally deemed category of measures, both pre- and post-installation measurements of three sites were performed with the resulting data used to estimate energy savings.

Table 4-4. Engineering Site Visit Information

Type of Engineering	Number	Measure Verification
Total Site Visits	10	
Floating Head Pressure	9	7 sites assessed
Electronically Commutated Motors	7	5 sites assessed
High Efficiency Cases	4	2 sites assessed

Post installation metering was performed with Onset HOBO current loggers. Current transformer sizes ranged from 20 amps to 600 amps full range and were selected depending upon the maximum current of the installation being monitored. In order to determine power factor a Fluke 43B and an Amprobe ACD-31P were used for spot measurements. Both of these units provide power factor information and are true RMS meters. The Fluke 43B also provides a plot of waveforms and harmonic distortion. Measurements from the two meters were compared to each other for several of the measurements with high harmonic distortion, to verify the accuracy of the Amprobe in these situations, and with low current values, since both meters had full range currents of around 600 amps compared to some measurements below ten amps. The two meters were found to give measurements within a few percent of each other in all cases. In addition, since the HOBO current loggers are not true RMS meters, their measurements were compared to the spot measurements to verify that their readings were not adversely affected by harmonic distortion. No significant affects were found. Additionally, for one of the VFD installations, the HOBO current logging was supplemented by three phase, true-RMS power logging with a Dent Instruments Elite Pro. At sites where built in monitoring of temperature was not available for floating head pressure and floating suction controls, Pace Scientific temperature loggers were used to determine the refrigerant line temperature and Onset temperature loggers were used to log ambient temperature conditions. The majority of logging was performed at three or five minute intervals over a period of three weeks, although in a few cases a shorter logging interval was used because of rapidly varying conditions. Appendix E provides a detailed list of equipment used during this evaluation.

Logging intervals were selected based upon the variation rate of power observed during spot measurements. With the exception of a few ASHC installations, variation rates were found to be slow and logging intervals of several minutes were employed in order to permit three full weeks of logging to help with weather effects. The ASHC installation with extremely rapid variation intervals were logged at a much faster speed and compared to a longer term, slower logger to adjust for both measurement limitations and the need for longer term data.

BPA and EMP2 had previously performed pre-installation metering on an electronically commutated motor (ECM) and anti-sweat heater control installation. The data from the EMP2 report was compared with metering activity performed by the Summit Blue team to provide a more accurate picture from multiple installations. Vending machine controls were directly installed by PECI during site visits. *CoolerMisers* were attached to refrigerated vending machines to shut off the system using a motion sensor. A plug load logger has been installed in the only location where an active unit was found where the LED lighting installation is expected, but it has not yet been retrieved.

Gross Energy and Demand Impacts

The engineering analysis normalized to adjusted evaluated kWh and kW savings[21] was used to estimate the impact from each installation. Measurements were also normalized to full weeks to account for the difference in use between weekend and weekdays at stores.

[21] The adjusted actual kWh and kW savings are based on local normalized weather.

4.4 Measure Evaluation

4.4.1 Floating Head / Suction Pressure Controls and VFD Modulating Compressors and Condensers

These measures alone or in combination permit refrigeration compressors to operate more efficiently by reducing the pressure difference across the compressor. In the case of floating pressure controls, this is accomplished primarily by controlling the condenser fans to cool the compressed refrigerant below the factory-set standard operating pressure. Operation at lower head pressures is possible when outdoor conditions were cool enough to enable the condenser fans to provide the additional temperature and pressure reduction.

VFD modulation of compressors and condenser fans permits the refrigeration system to more precisely track the optimal load curve rather than switching on and off equipment in discrete steps. In the EnergySmart Grocer Program, these measures were mostly installed in combination and they all affect the power consumption of the refrigeration system. As such, the Summit Blue team was not able to disaggregate the savings of each individual measure when installed in combination, and savings and realization rates for these measures are presented in aggregate. In some locations, only the floating pressure controls were installed. For these sites, Summit Blue report realization rates for the floating pressure alone.

These measures together claimed savings of 3,190,000 kWh in the incentive applications, which is 29% of the total claimed savings for the program. The measures were installed at 20 sites. Summit Blue performed measurement and verification (M&V) at nine sites, which represent 61% of the measure in the program applications. The predicted savings were based on the auditor's inputs to the GrocerSmart software for the individual sites.

Methodology

Pre-installation data were not available for these sites. Summit Blue collected nameplate information at each M&V site, took spot measurements of temperatures and power and installed dataloggers or acquired trend log data from the automation and control system for points required for the analysis. The analysis is limited by the amount and type of data it is feasible to capture from the operating equipment. The analysis method is based on compressor performance with fixed pressure setpoints versus performance with floating pressure controls. In the absence of fixed setpoint (pre-installation) operation, Summit Blue used operating data at the highest monitored ambient temperatures as an estimate of fixed setpoint performance. This assumption approximates fixed pressure control because the pressures cannot float when ambient temperatures are high.

Refrigeration system power varies according to the load placed on the system and the number of compressors that must stage on to meet the load. Typically higher system loads occur when the stores were open and customers were opening refrigeration cases, etc. Staging data from the automation systems were used to apportion staging conditions at each outdoor air temperature condition. Analysis of system performance was executed for each combination of compressor staging and daytime vs. night-time operation.

Data collection and analysis covered a minimum 16 days at each site.

Without exception, suction and discharge pressures and temperatures show good correlation with outdoor air temperature indicating the floating pressure controls are working. At higher outdoor temperatures, the system pressures and temperatures become more constant and are more independent of outdoor temperature thus indicating predicted performance when floating pressure controls are not effective. Concurrent electric current data logged with dataloggers on the systems also show similar correlation with outdoor temperature at lower temperatures and less correlation at higher temperature.

Summit Blue used these correlations (linear or quadratic at lower temperatures and near constant at higher temperatures) as the models to estimate system kW for each outdoor air temperature, stage and nighttime/daytime permutation. Using Typical Meteorological Year data for appropriate weather stations Summit Blue estimated the number of operating hours at each staging level for daytime and nighttime operation at each temperature.

$$kWh = \Sigma_{occupied\ hours}\ kW(temp, stage) + \Sigma_{un\text{-}ccupied\ hours}\ kW(temp, stage)$$

Pre-installation kWh was calculated using the system power at high outdoor temperatures analogous to fixed pressure control operation) at each staging level with the same apportionment of staging and occupancy as the post-installation model. The difference between the modeled pre-installation consumption and the post-installation consumption is the Summit Blue team's estimate of savings.

Results

The results of the analysis of Floating Pressure Controls and VFD plus Floating Pressures from these measures show 119% and 84% realization rates, respectively, when compared to savings estimates in the applications based on the GrocerSmart software. The results at individual sites range from 48% to 202% of predicted savings. The results by site are provided in Table 4-5 and Table 4-6.

Table 4-5. Floating Head/Suction Pressure Controls

Site Number	Install HP *predicted*	Savings kWh *predicted*	Savings kWh *evaluated*	Realization Rate
Site #8	265	225,710	297,987	132%
Site #7	70	53,340	88,031	165%
Site #1	190	127,140	257,234	202%
Site #9	275	222,475	107,047	48%
Total	**800**	**628,665**	**750,299**	**119%**

Table 4-6. Floating Head/Suction Pressure Controls PLUS VFDs

Site Number	Install HP *predicted*	Savings kWh *predicted*	Savings kWh *evaluated*	Realization Rate
Site #10	162	198,483	178,729	90%
Site #5	255	282,917	248,817	88%
Site #2	255	281,775	194,658	69%
Site #3	215	278,271	166,445	60%
Site #4	245	273,737	425,131	155%
Total	**1,132**	**1,315,183**	**1,106,734**	**84%**

Substantially lower-than-predicted savings for floating pressure controls (with and without VFDs) are a result of lower than expected system loading. In several cases, the final compressor stage(s) never started during the monitoring period. It is possible that higher loads are encountered during other times of the year, or it is possible that the installed equipment is significantly over-sized. Absent evidence of higher loading, our evaluation estimates are based on observed and monitored actual operations. In cases with higher than predicted savings, it appears that the estimated installed horsepower was lower than the nameplate data recorded on site during the evaluation.

The lower realization rates for applications with floating pressure controls and VFDs could again be a result of lower than anticipated refrigeration loads or it might be the result of interactive effects among the measures. Additionally, reduced VFD savings may be because many of the non-VFD compressor racks and condensers nevertheless employ staged operation rather than simply operating full time or some VFD savings is attributed to complementary measures such as optimizing pressure controls. Since the overall savings is not far from the predicted savings, Summit Blue recommends no changes to the program, but future evaluation work might target the interactive effects.

A 2006 review of the EnergySmart Grocer program in California[22] estimated 646 kWh/HP savings for floating head and suction pressure controls combined. This was significantly lower than the previously deemed value of 1,094 kWh/HP used in California. Summit Blue's analysis is based more on metered usage and less on modeling than the California study, and the savings found for the BPA program is between the California deemed and reported values. Additionally, the cooler climate in BPA's territory relative to California would be expected to produce higher savings for these controls, so Summit Blue does not find that the results of the California study affect the findings of this current analysis.

[22] "Final Evaluation, Monitoring, and Verification (EM&V) Report for the EnergySmart Grocer Program 2004-2005", Study ID PEC0002.01, PWP, Inc., June 8, 2006

4.4.2 Electronically Commutated Motors

Electronically Commutated Motors (ECMs) are small DC motors that drive evaporator fans in walk-in and display refrigerators and freezers. They replace shaded pole AC motors of the same size on a one-for-one basis. Fractional-horsepower shaded pole motors frequently have efficiency less than 50% in these applications. ECMs typically exceed 80% efficiency.

The ECM measures claimed savings of 982,000 kWh, which is about 9% of the total claimed saved in the program. The measures were installed at 35 sites. Summit Blue performed M&V at five sites for reach-in display cases, which represent 27% of the ECM measure savings.

Methodology

Pre-installation data were not available for these sites; Summit Blue analyzed data presented in a case study report prepared by EMP2, Inc. for Bonneville Power[23] to estimate pre-installation power on a per-fan basis. While on-site, Summit Blue measured post-installation true power on circuits dedicated to evaporator fans. These measurements produce a snapshot of motor performance. Summit Blue also installed data loggers on the same circuits to see if fan power varied over time. Summit Blue's expectation was that the evaporator fans are continuous devices.

Data loggers were left for a minimum of 16 days at each site. Actual performance matched Summit Blue's continuous operation expectations except for a few fans that were turned off for approximately ½ hour nightly. Spot measurements and hours of operation combine in Summit Blue's primary energy savings estimates.

Furthermore, these motors and fans were located inside the refrigerated space in display cases and walk-in coolers. In this configuration, Summit Blue assumes that all waste heat from the motors enters the refrigerated system as an additional sensible cooling load. This agrees with the ASHRAE Handbook's estimate commercial refrigeration system performance for retail food store equipment.[24]

Results

The M&V results for ECMs show an overall 139 % realization rate when compared to savings estimates from the incentive application, with an average savings of 469 kWh per motor. This is significantly less than the savings for ECMs on walk-in units of 1,193 kWh per motor, but still a substantial increase over the deemed reach-in value of 337 kWh per motor. Table 4-7 provides this overall ECM realization rate as well as rates by site number.

[23] *Marcus Food M&V Findings, Anti-sweat Heaters and ECM Motors*, EMP2, Inc. January 2009.

[24] "Retail Food Store Refrigeration and Equipment", *ASHRAE Refrigeration Handbook*, 2002

Table 4-7. Electronically Commutated Motors on Reach-in Cases Realization Rates

Site Number	Application - *predicted*		Per Motor - *evaluated*			Site kWh Savings	Realization Rate
	Install Count	kWh Savings	Primary W Savings	Total W Savings	kWh Savings		
Site #10	118	39,766	53.0	76.0	646	76,276	192%
Site #1	125	42,125	22.3	32.1	272	34,057	81%
Site #5	191	64,367	48.4	69.5	590	112,778	175%
Site #3	177	59,649	43.1	61.8	525	92,963	156%
Site #4	189	63,693	25.7	36.9	313	59,217	93%
Total	**800**	**269,600**	38.5	55.2	469	375,291	139%

The high realization rate might be attributed to several factors.

1. Baseline assumptions in the GrocerSmart software:

    a. It is not clear whether the incentive application estimates include interactive effects with the refrigeration equipment. In general, these interactive effects could account for all of the difference between the predicted and estimated evaluated savings.

    b. PECI reports that the baseline motor power used in the model are derived from secondary sources rather than from verified measurement. These secondary sources provide good initial assumptions that can be improved with measured values.

2. Baseline motor power used for the evaluation. Since pre-installation measurements were not available, Summit Blue based the pre-installation Watts on the EMP2 report cited earlier and engineering estimates for shaded pole motors. It is possible these data are not representative. Summit Blue recommends development of better estimates for pre-installation power:

    a. Require pre-installation measurement of motor circuits in the application, when possible.

    b. Derive a new standard baseline for shaded pole motor power with a sufficiently large sample of field data. Some refrigeration system installations have evaporator motors on a separate circuit, where it is possible to get a clean (no other loads) pre-installation measurement. A sufficiently large sample of shaded pole motor measurements could be used to develop valid baselines when good pre-measurement is not possible. The sample might be stratified based on case type and/or walk-in refrigerator evaporator motors.

The EMP2 report at one site raises concerns about power factor for some ECMs. Their measurements found and average power factor of 0.45 or ECMs versus 0.63 for shaded pole motors. All of Summit Blue's hand measurements of true power show power factors greater than 0.55 with an average of 0.66. Given the greatly reduced amp draw of the ECM equipment, the Summit Blue team concludes that power factor issues with ECMs are no worse than the baseline technology.

4.4.3 High Efficiency Cases

High efficiency cases consist of several separate measures:

- ECMs;
- Anti-sweat heater controls (ASHCs) ; and
- Low ASHC doors, including T8 lighting.

Although LED lighting is available with these cases, it was not installed in any of the cases inspected.

All of the efficient cases included in the sample were manufactured by Hussmann.

Anti-Sweat Heater Controls and Low ASHC Doors

Anti-sweat heaters are installed in the doors of reach-in cases in order to prevent condensation from coating the door and obscuring the customers' view of products. Standard anti-sweat heaters run continuously, regardless of the actual presence of condensation. Anti-sweat heater controls employ moisture sensors in the case doors to determine when to turn heaters on and off, reducing overall power use. Low ASHC doors are specifically designed to reduce the amount of time during which the heaters need to be used.

It was only possible to monitor ASHCs at two sites, although eight individual case circuits were monitored at these locations. At both of these locations spot measurements were used to verify which breakers operated anti-sweat heaters, the supply voltage, and the rate of switching of these units. Since the heaters had a unity power factor and no harmonic distortion, current logging was deemed to be sufficient to determine power consumption. All of these heaters were installed on 120 volt circuits. In some cases the switching rate of the heaters was very high and both high speed (5-second interval) several day logging and slower speed (5-minute interval), multi-week logging were employed together to determine the percent of time the heaters were operating.

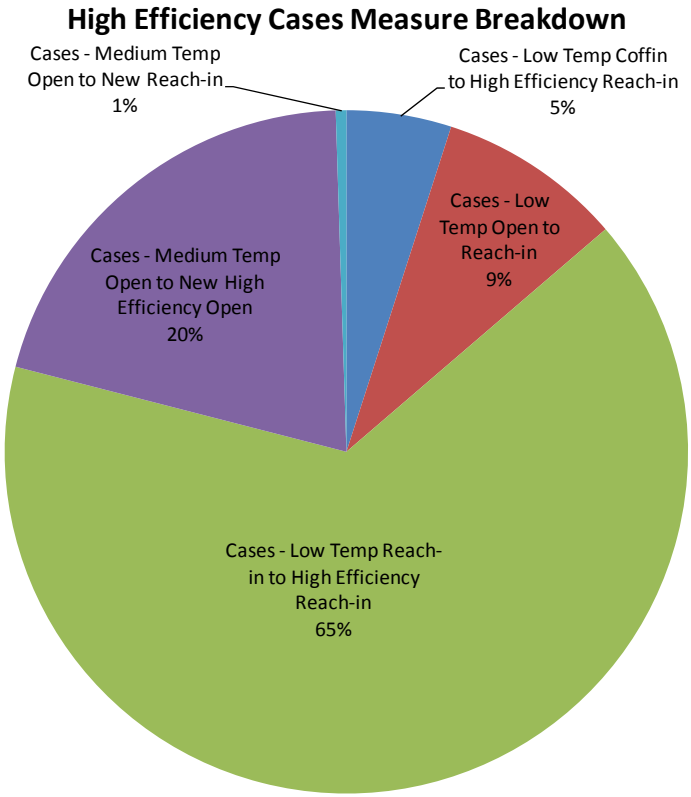
Since there were no installations of solely ASHCs included in the sample, they are treated here together with low ASHC doors. When the low ASHC doors were installed, not only were heater controls included, but the doors were only found in 16 feet medium temperature reach-in cases. This meant that the number of heater controls were reduced as was the wattage of the controls.

To further compound the monitoring problem, these anti-sweat heaters could not be monitored independently so they have not been included in this analysis. Since medium temperature reach-in units constitute only a very small portion of total case savings, as shown in Figure 4-4, this is not surprising. However, BPA previously performed a study that included pre- and post- installation measurements of ASHCs on medium temperature reach-in units and this data can be used for comparison purposes.

Interactive heating effects were treated as though all of the excess heat entered the case. This was based on looking at the heating effects under different conditions. Excess heat from the ECMs and anti-sweat

heaters was assumed to remain in the case as they are cooler than the surrounding space. A COP of 1.3 for freezer cases and 2.4 for medium temperature cases was used to calculate the excess heating load due to this for interactive effects.

Figure 4-4. High Efficiency Case Program Savings



Although poor labeling of breakers in many locations caused some uncertainty in the exact length of cases being monitored, the measured power for anti-sweat heaters was found to be in the range between 87 and 192 watts per case door. Considering the breakers often include multiple cases which are not necessarily of the same type, this is consistent with the Hussmann specifications, which are shown in Table 4-8.

Table 4-8. Anti-sweat Heater Power

Case and Door Type	Anti-sweat Heater Power per Case Door
Low temperature case with standard doors	227 watts[25]
Low temperature case with Innovator doors	139 watts[26]
Low temperature case with Innovator II doors	53.5 watts[27]
Medium temperature case with standard doors	78 watts[28]
Medium temperature case with Innovator doors	53.5 watts[29]

Since, as was previously mentioned, all of the high efficiency cases included in the sample were manufactured by Hussmann, and heater power is straightforward to measure, their values were used to develop base ASHC savings. Based on on-site measurements, it appears that the majority of the low-temperature reach-in cases use Innovator rather than Innovator II doors. Additionally, this is the more conservative estimate and will be used here in the absence of details to the contrary.

Logging ASHC use at two locations resulted in a range of use time from 55% on to only 36% activity over a period of three weeks. Use was heavier on weekends and during other busy hours, as would be expected. A weighted average by store resulted in average ASHC turn on 53% of the time. This corresponds to the savings for only the addition of controls, without the addition of efficient doors. Table 4-9 shows the results from circuits monitored for ASHC verification. Table 4-10 shows the realization rate breakdown for high efficiency cases.

[25] Hussmann RL with Anthony Doors Data Sheet Set p. 4

[26] Hussmann RL with Innovator Doors Technical Data Sheet p. 4

[27] Hussmann RL with Innovator II Doors Technical Data Sheet p. 4

[28] Hussmann RM with Anthony Doors Data Sheet Set p. 4

[29] Hussmann RM with Innovator Doors Technical Data Sheet p. 4

Table 4-9. ASHC Savings

Location	% Time Off	Total Circuit Wattage	# Freezer Doors[30]	Average Watts/Door
Site 1, Circuit 1	52	441	14	148
Site 1, Circuit 2	64	1,638		
Site 1, Circuit 3	48	1,632	31	87
Site 1, Circuit 4	44	1,066		
Site 1, Circuit 5	49	1,370	16	192
Site 1, Circuit 6	47	1,701		
Site 10, Circuit 1	46	457	16	72
Site 10, Circuit 2	45	699		
Total	**48**[31]	**9,004**	**77**	**107**

Table 4-10. Low Temperature Reach-in High Efficiency Cases

Site Number	kWh/foot Savings *predicted*	ECM kWh/foot Savings *evaluated*	ASHC and doors kWh/foot Savings *evaluated*	kWh/foot Savings *evaluated*	Realization Rate
Site #1	1,078	136	1,325	1,461	136%
Site #10	1,083	323	1,262	1,585	146%
All Sites[32]	**1,127**	**235**	**1,293**	**1,528**	**136%**

The addition of both anti-sweat heater controls and low ASHC doors on low temperature reach-in cases resulted in 1,283 kWh/linear ft of evaluated savings. The evaluated ECM savings of 469 kWh/motor from Section 4.4.2, at one motor per two linear foot of casing, provides 235 kWh/linear foot of savings including interactive effects. Adding this to the ASHC savings gives 1,528 kWh/linear foot savings on low temperature reach-in retrofits, as detailed in Table 4-9. The GrocerSmart program treats this as a calculated measure, which averages 1,127 kWh/linear foot over the existing installations. This results in a

[30] Number of doors are according to labels on breaker panels and equipment schedules.

[31] Weighted average

[32] Total includes all program high efficiency cases calculated from overall ECM savings rate for four sites and ASHC savings for two sites so the total is not the average of the two sites for which high efficiency cases were fully evaluated.

realization rate of 136% for low temperature reach-in retrofits, which account for 65% of high efficiency case retrofit savings.

Table 4-11. Annual Energy Savings for High Efficiency Low Temp Reach In Cases

Component	Per Door kWh Savings at Busbar	Per Foot kWh Savings at Busbar	kWh/foot Savings with Interactive Effects
ASHCs	1,032	516	913
Case Doors	462	231	409
Electronically Commutated Motors	266	133	235
Total	1,760	880	1,528

4.5 Engineering Analysis Results

Despite limitations and uncertainties stemming from sparse pre-installation data, the engineering analysis for this impact evaluation was able to substantiate savings for measures that comprise 50% of non-deemed savings attributed to the program. The results of the engineering analysis point toward good realization rates for most measures. In most cases, the GrocerSmart software is producing savings estimates that are good and conservative for planning and approving projects for inclusion in the program.

With engineering methods Summit Blue determined that a majority of measures and projects evaluated exceeded the estimates currently used by the program, from floating head pressure and floating suction controls, ASHCs, and ECMs. Very few measures showed less savings in the evaluation, VFD measures for the refrigeration equipment being the prime example. All but ECM measures had realization rates less than 20% different from savings predicted with the GrocerSmart software.

- In general the GrocerSmart software does an adequate job of predicting savings at the measure level. Some minor changes might be necessary for ECM savings estimates and improved knowledge about actual refrigeration loads could be used to reduce application specific savings overestimates.

- Future acquisition of good pre-installation operating data is key for minimizing uncertainty around savings estimates for key measures such as floating pressure controls, VFDs on refrigeration equipment, ECMs and high-efficiency cases

- With the exception of VFDs (84% realization rate), the GrocerSmart software calculated measure savings tend to be slightly conservative, with ECMs showing the largest difference between predicted and evaluated savings (139% realization rate).

- There was a wide variation in savings realization among sites. This is not surprising as different ambient temperatures, store occupancy, and controls schemes can easily affect savings.

Recommendations for future Energy Smart Grocer work evaluations:

- Summit Blue recommends that GrocerSmart audits collect data on maximum loading and adjust analysis inputs to derive more accurate savings estimates. This step will greatly improve estimated savings from floating pressure control installations by minimizing over-sizing biases.

- Uncertainty in savings estimates for ECM in cases s stems from sparse information for an accurate baseline. Summit Blue recommends deriving a new standard baseline for shaded pole motor power with a sufficiently large sample of field data. Some refrigeration system installations have evaporator motors on a separate circuit, where it is possible to get a clean (no other loads) pre-installation measurement. A sufficiently large sample of shaded pole motor measurements could be used to develop valid baselines when good pre-measurement is not possible. The sample might be stratified based on case type and/or walk-in refrigerator evaporator motors.

- Evaluation of the effectiveness of *VendingMiser* controls is inconclusive because controllers located in several of the larger savings sites had been disconnected. According to corporate personnel, these were older units and because the motion sensor was mounted remotely from the vending machine, the units tended to be disconnected when the vending machine was moved. Future work looking at the *VendingMiser* and its persistence are needed to derived deemed savings for this measure.

- As with many impact evaluations, the accuracy of the analysis is dependent upon not only the current system configuration but also upon the pre-installation operation of the system. Uncertainties associated with the baseline could be reduced if pre-installation monitoring, or at least spot measurements of equipment power consumption, were included as part of the GrocerSmart program. This may not prove to be practical, as metering power requires several weeks and it is often difficult to determine which sites will actually move forward with equipment installation. Spot measurements of power on compressor racks, fan motors, anti-sweat heaters, and condensers are not time consuming and would be useful in savings analysis; however, many field personnel are not qualified to work on live electrical equipment, and it may not prove practical to perform these measurements at all sites.

5 INTEGRATED IMPACT EVALUATION

This chapter integrates the results from the two different impact evaluation results and estimates measure realization rates based on this integration.

The billing analysis collected data from a sample of 142 stores. These stores represented about 30% of all the participating stores, but more importantly, the sample represented 80% of the claimed first-year kWh savings for the program.

The billing analysis statistical model that was developed to estimate the savings from the Energy Smart Grocer program was framed within a Statistically Adjusted Engineering (SAE) approach, as defined in Section 3. There were 17 measure categories included in the billing analysis. These categories are referenced in Table 5-1.

The strength of the billing analysis approach is that actual energy use data at each participating store is being used to estimate the energy impacts. Energy use data across customers and over time is utilized along with a vector of variables that represent factors causing changes in energy consumption. These variables include the installation of various measures, as well as weather based data. Energy consumption data and explanatory variables for months both before and after installation of measures are included. The pre-installation months of consumption act as controls for the post installation months.

A limitation of the billing analysis technique is that the impacts from each of the included measures needs to be large in relation to the overall bill in order provide statistically valid results. The billing analysis performed on this sample of data provided statistically valid results for only three of the measure categories. Results from both the billing and engineering analyses are provided in Table 5-1. The engineering approach for the energy impact analysis relied on site visits to both verify measure installation and functionality, as well as to collect equipment data and perform short term metering on the specific installed measures. The goal was to provide engineering estimates of savings and realization rates for the GrocerSmart software deemed calculated and the provisionally deemed measures.

Ten sites with the top savings were selected to be included in the engineering analysis approach. Section 4.3 identifies the process used to select the sites and the measures evaluated.

Table 5-1. Measure Realization Results

Measure Category	Billing Analysis Realization Rate	Engineering Analysis Realization Rate	Recommended Realization Rate
Energy Efficient Cases	1.27	1.36 (low temp only)	1.27
ECMs in cases	N/A	1.39	1.39
Lighting	0.77	N/A	0.77
Floating Head Controls - w/o VFDs	1.07	1.19	1.19
Floating Head Controls - w/ VFDs		0.84	0.84

5.1 Integration of Results

As shown in Table 5-1, the billing analysis provided statistically valid results for three groups of measures. The engineering analysis also provided results for three groups of measures, but the measure groups only partially overlap. The final recommended realization rates are a nearly equally shared mix of billing and engineering analyses.

The evaluation for lighting installations was only conducted using the billing analysis approach. Through the billing analysis, the realization rate for this category of measures was estimated to be 0.77. Of all the measure categories, lighting was the only one with a realization rate less than 1.0. No engineering or on-site inspection of lighting measures was included for this study; however, SBC staff did review the inputs into the lighting calculations to see if hours of operation or lamp wattage values could explain the low realization rate. This review concluded that the inputs into lighting calculations were reasonably sound and could not explain the low realization rate. Possible reasons were provided in section 3.2.1, but identifying the reason cannot be achieved without additional extensive research.

For the floating head controls set of measures, the billing analysis grouped all of the measures into one while the engineering analysis was able to differentiate between floating head controls both with and without variable speed drives.

The billing analysis based realization rate for the combined group was estimated to be 1.07. The engineering analysis was able to separately meter the floating head controls with VFDs and the controls without VFDs. The resulting realization rates were 1.19 for the controls without VFDs and 0.84 for the controls with VFDs. Combining the controls with VFDs and the controls without VFDs gave an engineering based realization rate of 0.96. This is lower, but relatively close to the 1.07 found in the billing analysis and well within the realization rate bounds at the 90% confidence level. From the engineering analysis, the inclusion of VFDs with floating head controls reduced measure realization significantly. The engineering analysis found that at those sites with low measure realization rates, there was lower system loading than was predicted by the model. In several cases, the final compressor stage(s) never started during the engineering study monitoring period.

Both the billing analysis and the engineering analysis included a large share within their respective samples of the total savings claimed from the floating head pressure controls category of measures. The analysis was performed for similar measures within the category and the overall category results were also close between the two methods. The directly comparable engineering estimate for measure realization was slightly lower than the billing analysis measure realization estimate, but well within the bounds of statistical confidence of the billing analysis result. The fact that the engineering analysis was able to develop realization rates separately for the installations having VFDs is an important consideration. The Summit Blue team recommends utilizing the two engineering based estimates of measure realization for this measure category.

The billing analysis for Electronically Commutated Motors (ECMs) could not develop a statistically valid measure realization rate However, the engineering analysis was able to develop measure realization rates for those in reach in cases. In the engineering analysis, the overall measure realization rate is estimated to be a high 1.39. Five different sites were included in the engineering assessment. In all five cases, the site specific measure realization ranged from 0.93 to 1.92.

It is the Summit Blue assessment that the existing motors are running at higher loads than anticipated by the GrocerSmart model, and the ECM motors therefore have greater impact than predicted by the model. In addition, the Summit Blue results are comparable to what BPA found in a separate independent impact

assessment of ECMs cited earlier in Section 4.4.2. Considering the consistency of large realization rates among all the sites, Summit Blue concludes that the 1.39 realization rate is reasonable.

The billing analysis for energy efficient cases provided a statistically valid measure realization rate of 1.27. The engineering analysis provided a measure realization rate of 1.36, but only for low temperature reach-in cases.

The billing analysis included both low temperature and medium temperature cases and is not directly comparable to the engineering analysis. The engineering analysis focused on low temperature reach-in cases with the added complications that the engineering analysis could not isolate the low temperature reach-in case from the anti-sweat heater controls or from the ECM that were also installed at the sampled site.

At the sites where ECMs could be isolated, the measure realization rate is a high 1.39. By having ECM impacts included with the low temperature reach-in case impacts and the anti-sweat heater control impacts, Summit Blue believes it is reasonable to infer that the higher 1.36 realization rate found in the engineering analysis is higher than the 1.27 billing analysis based measure realization rate because of the high realization rates coming from ECMs. Based on this assessment, Summit Blue recommends that the billing analysis realization rate of 1.27 be applied to all energy efficient cases. It is Summit Blue's conclusion that the engineering analysis, with its inclusion of ECMs, supports this value.

5.2 The Program Level Realization Rate

As outlined in the previous section, both the billing analysis and the engineering analysis provide reasonable estimates of measure realization rates for certain categories of measures. The billing analysis is limited to only those measures that provide savings large enough to be discernable within the overall electricity use of the site. The engineering analysis is limited by the difficulty to isolate individual measures where related measures have also been installed. However, by employing both of these approaches, a set of reasonable measure realization rates were developed for a subset of measures.

Using both the billing analysis and the engineering analysis techniques within an evaluation appears to be an effective approach. The limitations of the billing analysis technique, particularly of measuring small load impacts, is not a major issue with the engineering analysis approach. However, the difficulty of isolating loads can in some cases be overcome with the billing analysis approach. Further, while billing analysis cannot be effectively utilized for many measures, it is a lower cost evaluation alternative for those measures that can be effectively assessed with the technique. The recommended measure category realization rates are a mixture of billing and engineering analysis based values. These values are illustrated in Figure 5-1.

Figure 5-1. Measure Category Realization Rates

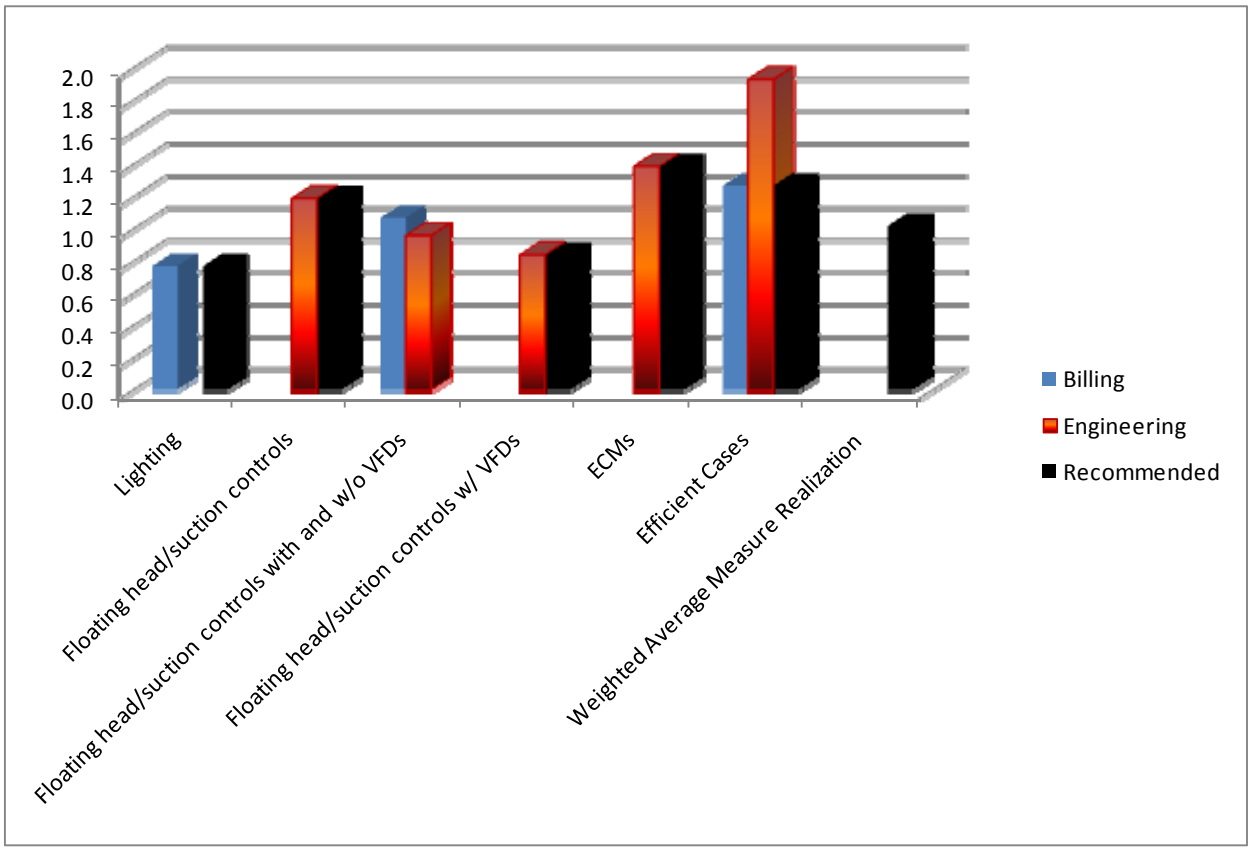


Table 5-2 lists the measures and claimed savings for the program as reported at the time of sample selection in late 2008. To develop a program level realization rate, the measure realization rates listed above were applied to the specific measure categories in the table. Measure realization rates were applied to about 30% of the individual measure categories, but these measures represent about 70% of the claimed savings.

Measures that did not have realization rates did not have their claimed savings adjusted. The measures with realization rates did have their claimed savings adjusted. This sum was divided by the original claimed sum to give *a program level realization rate of 1.02*. Although some of the specific measure categories had low and high realization rates, overall the program is performing near its predicted rate.

Table 5-2. Measure Category and Program Level Realization Rates

Measure Category	Total Claimed Savings (kWh)	Claimed Savings as Percent of Total Claimed Savings	Measure Realization Rate	Adjusted Savings (kWh)	Adjusted Savings as Percent of Total Adjusted Savings
Auto-Closures	871,754	6.6%	na	871,754	5.7%
Case Lighting	74,820	0.6%	na	74,820	0.5%
Energy Efficient Cases	1,622,547	12.3%	1.27	2,060,635	13.6%
Doors	4,099	0.0%	na	4,099	0.0%
CFLs	932,111	7.1%	na	932,111	6.1%
Anti Sweat Controls	410,493	3.1%	na	410,493	2.7%
Efficient compressor - Low temp	1,506	0.0%	na	1,506	0.0%
ECM in Cases	987,659	7.5%	1.39	1,372,846	9.0%
Lighting	2,856,207	21.6%	0.77	2,199,280	14.5%
Gaskets	1,371,657	10.4%	na	1,371,657	9.0%
Air Cooled Condenser	98,285	0.7%	na	98,285	0.6%
Floating Head Controls - w/o VFDs	1,687,590	12.8%	1.19	2,008,233	13.2%
Floating Head Controls - w/ VFDs	1,502,279	11.4%	0.84	1,261,914	8.3%
Night Covers	459,482	3.5%	na	459,482	3.0%
PC Controls	200,783	1.5%	na	200,783	1.3%
Refrigeration - VFD - Motors	8,680	0.1%	na	8,680	0.1%
Doors for Low-Temp Reach-in	3,754	0.0%	na	3,754	0.0%
Vending Machine Controls	123,348	0.9%	na	123,348	0.8%
	13,217,055		**1.02**	13,463,679	

5.3 Cost Effectiveness

Cost effectiveness for the EnergySmart Grocer Program was measured using a number of different benefit cost tests. These cost-effectiveness tests include the:

- Total Resource Cost (TRC): The TRC includes all quantifiable costs and benefits regardless of who accrues them. The present value of avoided costs (the benefits) is divided by the technology cost and the program administrative costs. A TRC value of greater than 1.0 indicates that the resource is cost effective.

- Utility Cost (UTC): The UTC measures the net costs based on the costs incurred by the program administrator (including incentive costs) and excluding any net costs incurred by the participant. The benefits are similar to the TRC benefits. However, the costs are defined more narrowly. In the TRC, the full incremental measure cost is included, along with program administrative costs. In the UTC, the program administrative costs are included but only the incentive paid by the utility is included as the measure cost.

- Participant Cost (PCT): The Participants Test is the measure of the quantifiable benefits and costs to the customer due to participation in a program. The present value of the utility bill reduction over the life of the DSM measure plus the value of the incentive received is divided by the incremental cost of the DSM measure.

- Ratepayer Impact Measure (RIM): The RIM measures what happens to customer bills or rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates or bills will go up if revenues collected after program implementation is less than the total costs incurred by the utility in implementing the program. This test indicates the direction and magnitude of the expected change in customer bills or rate levels. It is calculated by taking the present value of avoided costs (the benefits) and dividing by the sum of the present value of lost revenues plus the incentive cost plus the program administrative cost.

Each of these tests provide assessment of cost effectiveness from different stakeholder perspectives. A value greater than 1.0 in any of these tests indicates higher benefits relative to costs for that specific perspective. The most common cost effectiveness assessment tool is the TRC test. It is a valuable cost effectiveness measure because it accounts for all benefits and all costs, regardless of the source of the cost.

Table 5-3 and Table 5-4 provide the program/measure specific data needed for the cost effectiveness tests. Combining the estimates of installed savings across the three program years finds lighting with the most installed energy savings, followed by the combined floating head controls, energy efficient cases, and ECMs. Per BPA staff request, the program-level savings were not adjusted for the 1.02 realization rate.

Table 5-3. EnergySmart Grocer Program Savings Data by Measure Category for FY2007

	Program-to-date	Year-to-date (Fiscal)	Month (March 2009)
Energy Savings	21,532,350	10,478,611	1,612,198
Invoiced	$5,753,593	$1,868,610	$311,435
Incentive $	$1,570,888	$749,441	$151,069
Utility Admin Cost $	$314,178	$149,888	$30,214
Incentive $/kWh	$0.07	$0.07	$0.09
Non-Incentive $/kWh	$0.27	$0.18	$0.19

The financial/utility assumptions included in the financial tests are provided in Table 5-5.

Table 5-5. EnergySmart Grocer Program Utility Inputs

Variable	BPA Inputs
Discount Rate	5.00%
Environmental Adder	10.00%
Participant Costs	45% of Incentive
Line Losses	7.63%

Based on the inputs provided in Tables 5-2 through 5-5, B/C cost effectiveness ratios were calculated. Table 5-6 provides a summary of the results for each of the B/C ratios. Only the RIM test has a B/C ratio of less than 1.0 with a value of 0.5. Each of the other tests have B/C ratios greater than 1.0 with the PCT having the largest ratio with a value 0f 20.18. The most commonly used cost effectiveness test, the TRC, has a B/C ratio of 1.42. The relative positions of each of these tests is appropriate. The RIM test reflects the costs of the incentives and the lost revenues. The PCT test reflects the incentives received and the savings accruing from their energy bill.

Table 5-6. EnergySmart Grocer Program Cost Effectiveness Summary

Cost Effectiveness Test	Total Claimed Savings (kWh)	Measure Realization Rate	Adjusted Savings (kWh)	Total Claimed Savings (kWh)	Adjusted Savings (kWh)
Utility (UTC	$10,373,401	$7,358,602	$3,014,799	1.41	$0.036
Participant (PCT)	$13,413,849	$664,697	$12,749,152	20.18	$0.003
Ratepayer Impact (RIM)	$10,373,401	$20,772,451	-$10,399,050	0.50	$0.101
Total Resource (TRC)	$11,410,741	$8,023,299	$3,387,442	1.42	$0.039

APPENDIX A: STAKEHOLDER INTERVIEW GUIDES & LIST OF PERSONS INTERVIEWED

Introduction

This EnergySmart interview document includes separate guides for the following program stakeholders:

- BPA Staff (also includes EnergySmart Office—Design (ESD) questions)
- BPA Energy Efficiency Representatives (EER) (also includes ESD questions)
- Utility Representatives (also includes ESD questions)
- PECI Staff
- Trade Allies
- End-Use Owner/Manager

Interview Objectives

(From final work plan Jan 9, 2009)

Objective	Discussion items	Market Actor(s) Interviews					
		BPA staff	EER	Utility representative	PECI	Trade Allies	End-user (owner or manager)
Review and Refine Effectiveness Criteria	Do goals in contract of ESG differ substantially from other ESG contracts and implementation in other utility territories?	XX	XX	XX	XX		
Compare Administrative Processes	Identify and document administrative processes. Compare BPA administrative processes with PECI-ESG programs outside of BPA territory. Review administrative actions by market actors and solicit ideas to improve efficiency and communication.	XX	XX	XX	XX		
Compare Marketing and Outreach Efforts	Identify and document efforts. Compare BPA ESG efforts with PECI-ESG efforts in other utility territories. Compare market uptake in utility territories and compare with goals and BPA program requirements.	XX	XX	XX	X	XX	X
Program delivery experience	Describe the ESG program from the end-user perspective. Note any program delivery issues.		X	X	X	XX	XX
External/Internal Market Variations	Discuss external market drivers: electricity rates, market demographics, and the economy. How do external variations affect program uptake, if at all?			X	X	XX	XX

EnergySmart Interview Guide

Bonneville Power Administration Staff

Introduction

Hello, my name is Josh Arnold with Summit Blue Consulting. I am calling on behalf of Lauren Gage and the Energy Smart Program. I am interviewing people who work the Energy Smart Program to get their comments about their experiences and observations in working with the program. I would like to ask you some prepared questions about your experience with the Energy Smart program. I expect our conversation to last between 30 min to 60 min. Your responses in this interview will remain confidential. We will be using your comments, as well as those of other interviewees to help inform our report, but we will not attribute your comments directly to you unless we confirm with you at a later date that it is OK to do so. Your name will be listed as an interviewee in an appendix to the report that we will submit to the Bonneville Power Administration. Is this acceptable to you?

Confirm contact information

Date: _____ Interviewer: _____

BPA Staff:

Address:

Phone:

Email:

Effectiveness Criteria

1. How effective was the BPA contract at enabling the third-party contractor to work with customer utilities?

2. Are you satisfied with the way that the contractual terms have outlined the performance objectives of the EnergySmart program? What is working well? What could be improved?

3. How well is the BPA contract providing BPA participating utilities with flexibility to adopt and implement the program in their utility territories v. creating additional administrative burdens for the BPA or PECI program managers?

4. In your opinion, do all of the stakeholders have a clear understanding of their roles and responsibilities, including communication and reporting, under the current contract? Please describe.

5. Is there a feedback mechanism for program stakeholders (e.g. end-use customers, trade allies and/or utility representatives) to provide comments about the EnergySmart program directly to BPA? Is this feedback opportunity sufficient? How could communication channels be improved?

6. (**For Engineers only**). Have you conducted field inspections for the EnergySmart program? What percent of your time is devoted to scheduling and conducting inspections? How have these field inspections provided additional insight and value to the program? Do you think that the number/percent of sites receiving field inspections be increased or decreased? (Probe based on responses).

7. Do you have any other comments on your experience with the EnergySmart program?

Administrative Process

8. Please comment on the effectiveness of the following EnergySmart program administrative processes:

In your view, how well does BPA, including staff and EERs, do the following? Which activities does BPA perform best?

- Recruit utilities?
- Include program energy efficiency measures?
- Assign incentive levels for program energy efficiency measures (e.g. $.07/kWh, etc.)?
- Provide for customer tracking through the Project Tracking Registry (PTR) system?
- Provide reporting on program goals and achievements to stakeholders, such as the Regional Technical Forum or NWPPCC?
- Work with participating utilities to provide flexibility while minimizing the administrative burden to BPA or PECI?
- Provide for dispute resolution among program stakeholders (e.g. between PECI and trade allies, etc.)?

How well does PECI do the following? Which activities does PECI perform best?

Recruit and train internal EnergySmart program office staff?

- Recruit and train internal EnergySmart Field Energy Analysts (FEAs)?
- Develop and adhere to the EnergySmart program's Utility Service Schedule?
- Recruit utilities to participate in the EnergySmart program?
- Recruit, train and manager contractors for the EnergySmart program (also known as 'trade allies')?
- Report potential problems or relevant issues to BPA in a timely fashion?

How well do utility representatives do the following? Which activities do utility representatives perform best? :

- Promote the EnergySmart program?
- Work with BPA to inform their stakeholders about the EnergySmart programs?
- Work with PECI to inform their stakeholders about the EnergySmart program?
- Communicate with BPA or PECI about the potential to recruit customers or trade allies within their service territory?
- Communicate any questions or concerns about the EnergySmart program on the part of participating utilities or their customers?

9. Do you see any specific opportunities to streamline any of the administrative processes discussed previously?

10. Do you have any other comments on the program's administrative processes?

Marketing & Outreach Efforts

11. Please comment on the effectiveness of the following EnergySmart program marketing and outreach efforts to recruit utility participation. What marketing and outreach piece is most effective?

- Website
- Promotional printed materials, such as program brochure
- Customer applications and other printed forms
- In-person presentations, such as trade shows or events
- One-on-one phone calls or office visits

12. How well does PECI develop, improve and update marketing and identity materials for the EnergySmart program?

13. Please comment on how well the EnergySmart program has recruited, trained and managed contractors or trade allies? What are the specific challenges to recruiting trade allies? How well has PECI responded to those challenges?

14. Do you have any ideas on ways that PECI could increase contractor participation? Do you have any other comments on the program's contractor participation?

Program Delivery Experience

15. Does the EnergySmart program provide an appropriate incentive level to motivate the target markets in question? For example, do you think that the program would be able to leverage its funding more fully by increasing (or decreasing) its incentive levels?

16. Should the incentives for all of the measures be consistent or should some measures receive higher (or lower) incentive levels? What about "bonus" incentives for multiple measures (e.g. receive an additional $X amount if you install two or more measures at the same time.)

17. Is the EnergySmart program responsive to its utility customers? Have you heard about any utility representatives not being satisfied with any of the following:

- Initial recruitment and program introduction to utility representative
- Integration of utility into EnergySmart program
- Response times with answers to questions
- End-use customer satisfaction, including rebate processing
- End-use trade allies satisfaction
- Any others not mentioned previously
- Providing the utility with monthly reports or other ad hoc reporting (Lauren 1-30)

External/Internal Market Variations

18. Have any utility representatives or other program stakeholders expressed concerns about the success of the EnergySmart program due to the current economic environment? If so, please describe:

19. Are the EnergySmart target customers (e.g. grocery stores and other locations with refrigeration equipment) reluctant to invest right now in any upgrades?

20. What other factors outside of the EnergySmart program may be driving interest in participation?

Wrap Up (only ask if topics haven't been explored already)

21. Overall, how satisfied are you with the EnergySmart program?

22. Do you have any other recommendations to improve the EnergySmart program?

23. Do you have anything else that you would like to share about the EnergySmart program?

EnergySmart Design—Office Program Questions (ONLY MIRA VOWLES)

Next, I'd like to shift our discussion to the EnergySmart Design—Office program and ask you a few questions about your experience with this program.

24. How familiar are you with the EnergySmart Design—Office program?

25. Do you think the ESD-Office program has appropriate incentive levels for its target markets?

26. Do you think the ESD-Office program is appropriately structured as a prescriptive rebate program to address its target markets?

27. In your opinion, do you think that the EERs and utility representatives have a clear understanding of the EnergySmart Design—Office program?

28. Have you received any market response, including project leads, from new construction design professionals or associated organizations? If so, please describe.

29. Do you have any recommendations for opportunities to potentially increase marketing and outreach for the ESD—Office program?

30. What else besides additional marketing and outreach might help the ESD-Office program get some traction in today's tight construction market?

31. Any other comments about the ESD—Office program?

Thank you for participating and helping us make the EnergySmart and EnergySmart Office—Design program as effective as possible.

EnergySmart Interview Guide

BPA Energy Efficiency Representatives

Introduction

Hello, my name is Josh Arnold with Summit Blue Consulting. I am calling on behalf of Lauren Gage and the EnergySmart Program. I am interviewing people who work the EnergySmart Program to get their comments about their experiences and observations in working with the program. I would like to ask you some prepared questions about your experience with the EnergySmart program. I expect our conversation to last between 45 min to 60 min. Your responses in this interview will remain confidential. We will be using your comments, as well as those of other interviewees to help inform our report, but we will not attribute your comments directly to you unless we confirm with you at a later date that it is OK to do so. Your name will be listed as an interviewee in an appendix to the report that we will submit to the Bonneville Power Administration. Is this acceptable to you?

Confirm contact information

Date: _____ Interviewer: _____

BPA Staff:

Address:

Phone:

Email:

Effectiveness Criteria

1. How do you see your role in the EnergySmart program? [Confirm list of BPA utilities serviced and utility representatives here.]

2. When did PECI recruit your utilities for the EnergySmart program? Was the recruitment process effective in your opinion?

3. Overall, how satisfied are "your" utility representatives with the EnergySmart program?

Is the EnergySmart program achieving the expectations of your utility representatives in their territories?

4. Has the contract with PECI provided your utilities with enough flexibility to be able to implement the program as they wish while minimizing the administrative burden on you and your utility representatives?

5. Does PECI have a clear understanding of their roles and responsibilities, including communication and reporting, with you and your utility representatives? Are there areas or topics of communication that could be improved upon? Please describe.

6. Is there a feedback mechanism for program stakeholders (e.g. end-use customers, trade allies and/or utility representatives) to provide comments about the EnergySmart program directly to BPA? Is this feedback opportunity sufficient? How could communication channels be improved?

7. Are there metrics or items that you or your utility representatives would like to see tracked, but are not currently being tracked by PECI?

8. Other comments on BPA's EnergySmart program goals?

Administrative Process

9. Please comment on the effectiveness of the following EnergySmart program administrative processes:

How well does BPA: Which activities does BPA perform best?

- Recruit utilities?
- Provide for customer tracking through the Project Tracking Registry (PTR) system?
- Work with participating utilities to provide flexibility while minimizing the administrative burden to BPA or PECI?

How well does PECI: Which activities does PECI perform best?

- Recruit and train internal EnergySmart Field Energy Analysts (FEAs)?
- Develop and adhere to the EnergySmart program's Utility Service Schedule?
- Recruit utilities to participate in the EnergySmart program?
- Recruit, train and manager contractors for the EnergySmart program (also known as 'trade allies')?
- Report potential problems or relevant issues to BPA in a timely fashion?
- Provide stakeholders with program reporting?

How well do utility representatives: Which activities do utility representatives perform best?

- Promote the EnergySmart program?
- Work with BPA to inform their stakeholders about the EnergySmart programs?
- Work with PECI to inform their stakeholders about the EnergySmart program?
- Communicate with BPA or PECI about the potential to recruit customers or trade allies within their service territory?
- Communicate any questions or concerns about the EnergySmart program on the part of participating utilities or their customers?

10. Do you see any specific opportunities to streamline any of the administrative processes discussed previously?

11. Do you have any other comments on the program's administrative processes?

Marketing & Outreach Efforts

12. Please comment on the effectiveness of the following EnergySmart program marketing and outreach efforts to utilities: What effort is most effective?

- Website
- Promotional printed materials, such as program brochure
- Customer applications and other printed forms
- In-person presentations, such as trade shows or events
- One-on-one phone calls or office visits

13. How well does PECI develop, improve and update marketing and identity materials for the EnergySmart program? Do you have any specific end-use customer feedback about the marketing and identity materials?

14. Please comment on how well the EnergySmart program has recruited, trained and managed contractors or trade allies in your utilities' territories. What are the specific challenges to recruiting trade allies? How well has PECI responded to those challenges? Do you have any specific examples from your utility representatives about contractor participation?

15. Do you have any ideas on ways that PECI could increase contractor participation? Do you have any other comments on the program's contractor participation?

16. How does PECI's marketing and outreach tactics compare to other BPA energy efficiency programs?

Program Delivery Experience

17. How satisfied are your utility representatives with the EnergySmart program's market penetration in their territory? Are the utility representatives happy with the EnergySmart program's Utility Service Schedule (the document that outlines the geographic and market segment distribution goals for the EnergySmart program)?

18. Do your utility representatives share end-use customer or contractor feedback about the EnergySmart program with you? Have you heard any comments about utility customers, end-use customers or trade allies being unhappy about the amount of time between any of the following:

- FEA first contact and scheduling of audit
- Audit and report
- Report and facilitating measures
- Design Review
- Post-installation inspection
- Rebate processing
- Generating Energy Savings and Technical Information through PTR system
- Dispute Resolution
- Monthly reporting
- Any others not mentioned previously

19. Are you missing any EnergySmart program information or tools that would help you share timely information with your utility representatives or respond to their questions more effectively?

20. During this conversation [or in a subsequent conversation], I'd like to follow up with you on the implementation of the EnergySmart program by discussing specific jobs in various utility territories. We've selected some projects in your utility territories based on the EnergySmart program reporting. Do you have any end-customers in your utility territories that you think would be able to provide us with additional insight into the effectiveness of the EnergySmart program? Please explain why.

List PROPOSED projects and issues here:

Example

BPA utility ABC Market Question about interaction between utility rep, PECI and trade ally.

List any additional RECOMMENDED projects and issues here:

External/Internal Market Variations

21. Have any specific end-users, trade allies, utility representatives or other program stakeholders expressed concerns about the success of the EnergySmart program due to the current economic environment? (For example, was there a major employer in any of your utility territories that recently closed, etc.)

22. Are utility representatives reporting that grocery stores or other program target markets are reluctant to invest right now in any upgrades?

23. Are you aware of any other specific factors outside of this program in your utility territories that may be driving interest in participation?

If so, please describe:

Wrap Up (only ask if topics haven't been explored already)

24. Do you have any recommendations to improve the EnergySmart program?

25. Do you have anything else that you would like to share about the EnergySmart program?

EnergySmart Design—Office Program Questions

Next, I'd like to shift our discussion to the EnergySmart Design—Office program and ask you a few questions about your experience with this program.

26. How familiar are you with the EnergySmart Design—Office program?

27. Do you think that your utility representatives have a clear understanding of the EnergySmart Design—Office program?

28. Are you aware of any specific projects or new construction design firms in your utility territories that have expressed interest in enrolling in the EnergySmart Design—Office program? If so, please describe with specifics:

29. Have you or your utility representatives received any market response, including project leads, about the EnergySmart Design—Office program from new construction design professionals or associated organizations? If so, please describe.

30. Do you have any recommendations for opportunities to potentially increase marketing and outreach for the ESD—Office program?

31. What else besides additional marketing and outreach might help the ESD-Office program get some traction in today's tight construction market?

32. Any other comments about the ESD—Office program?

Thank you for participating and helping us make the EnergySmart and EnergySmart Office--Design program as effective as possible.

EnergySmart Interview Guide

Utility Representative

Introduction

Hello, my name is Josh Arnold with Summit Blue Consulting. I am calling on behalf of the Bonneville Power Administration. I am interviewing people who work with the EnergySmart Program to get their comments about their experiences and observations about working with the program. I would like to ask you some prepared questions about your experience with the EnergySmart program. I expect our conversation to last between 45 min to 60 min. Your responses in this interview will remain confidential. We will be using your comments, as well as those of other interviewees to help inform our report, but we will not attribute your comments directly to you unless we confirm with you at a later date that it is OK to do so. Your name will be listed as an interviewee in an appendix to the report that we will submit to the Bonneville Power Administration. Is this acceptable to you?

Confirm contact information

Date: _____ Interviewer: _____

Utility:

Representative Name:

Address:

Phone:

Email:

Effectiveness Criteria

1. How do you see your role in the EnergySmart program?

2. When did PECI recruit your utility for the EnergySmart program? Was the recruitment process effective in your opinion? How valuable was the initial assessment of interest by PECI?

3. Overall, how satisfied are you with the EnergySmart program? Is the EnergySmart program achieving your expectations:

- Program comprehensiveness
- End-use customer outreach (including geographic and market diversity)
- Contractor outreach and training
- Energy savings
- Communications and reporting
- Servicing your utility territory through the Utility Service Schedule
- Rebate processing

4. Has the contract with PECI provided you with enough flexibility to be able to implement the program as you wish while minimizing the administrative burden on you?

5. Does PECI have a clear understanding of their roles and responsibilities, including communication and reporting, with you? Are there areas or topics of communication that could be improved upon? Please describe.

6. Is there a feedback mechanism for you or your customers to provide comments about the EnergySmart program directly to BPA? Is this feedback opportunity sufficient? How could communication channels be improved?

7. Are there metrics or items that you would like to see tracked, but are not currently being tracked by PECI?

7.5. Are you getting the support you need from BPA? PECI?

8. Other comments on BPA's EnergySmart program goals?

Administrative Process

9. Please comment on the effectiveness of the following EnergySmart program administrative processes:

How well does BPA: Which activities does BPA perform best?

- Recruit utilities for the EnergySmart program?
- Provide for customer tracking through the Project Tracking Registry (PTR) system?
- Respond to your program leads in your territory?
- Respond to your questions or concerns regarding the EnergySmart program?

How well does PECI: Which activities does PECI perform best?

- Recruit and train internal EnergySmart Field Energy Analysts (FEAs)?
- Develop and adhere to the EnergySmart program's Utility Service Schedule?
- Recruit, train and manage contractors (also known as 'trade allies') for the EnergySmart program?
- Report potential problems or relevant issues to you in a timely fashion?
- Work with you to inform you about updates to the EnergySmart program?
- Respond to your questions or concerns or those of your customers?
- Respond to program leads that you may provide to them?
- Provide you with materials or other support to help promote the EnergySmart program to your customers?
- Provide you with regular and/or ad hoc program reporting?

How well do utility representatives: Which activities do utility representatives perform best?

- Promote the EnergySmart program?
- Work with BPA to inform their stakeholders about the EnergySmart programs?
- Work with PECI to inform their stakeholders about the EnergySmart program?
- Communicate with BPA or PECI about the potential to recruit customers or trade allies within their service territory?
- Communicate any questions or concerns about the EnergySmart program on the part of participating utilities or their customers?

10. Do you see any specific opportunities to streamline any of the administrative processes discussed previously?

11. Do you have any other comments on the program's administrative processes?

Marketing & Outreach Efforts

12. How long did it take after your utility agreed to implement the EnergySmart program for PECI to start contacting customers in your territory?

13. How well does PECI develop, improve and update marketing and identity materials for the EnergySmart program? Do you have any specific end-use customer feedback about the marketing and identity materials? What materials are most effective?

- Website
- Promotional printed materials, such as program brochure
- Customer applications and other printed forms
- In-person presentations, such as trade shows or events
- One-on-one phone calls or office visits

14. Please comment on how well the EnergySmart program has recruited, trained and managed contractors or trade allies in your service territory. What are the specific challenges to recruiting trade allies in your territory? How well has PECI responded to those challenges? Do you have any specific examples about contractor participation?

15. Do you have any ideas on ways that PECI could increase contractor participation in your territory? Do you have any other comments on the program's contractor participation?

Program Delivery Experience

16. How satisfied are you with the EnergySmart program's market penetration in your territory?

17. Are you satisfied with the EnergySmart program's Utility Service Schedule (the document that outlines the geographic and market segment distribution goals for the EnergySmart program)?

18. In your opinion, does the "high-touch" strategy of the program provide customers with a greater motivation to participate in the program? (explain as necessary) Does the audit and 'no-cost' measure approach provide an appropriate incentive for the customer to participate in the program? Do you have any ideas about other ways to provide incentives for end-use customers to participate in the EnergySmart program?

19. Do your end-use customers or contractors share feedback about the EnergySmart program with you? Have you heard any comments from end-use customers or trade allies about being unhappy about the amount of time between any of the following:

- FEA first contact and scheduling of audit
- Audit and report
- Report and facilitating measures
- Design Review
- Post-installation inspection
- Rebate processing
- Generating Energy Savings and Technical Information through PTR system
- Dispute Resolution
- Monthly reporting
- Any others not mentioned previously

19. Have you conducted field inspections for the EnergySmart program? Are you aware of any end-use customers in your territory that have received field inspections? If so, have these field inspections provided additional insight or value to the program? Do you think that BPA should continue to inspect field installations? Should field inspections be increased or decreased? (Probe based on responses).

20. Are you missing any EnergySmart program information or tools that would help you share timely information with your customers or contractors to respond to their questions more effectively?

21. During this conversation [or in a subsequent conversation], I'd like to follow up with you on the implementation of the EnergySmart program by discussing specific jobs in your territory.

We've selected some projects in your territory based on the EnergySmart program reporting. Do you have any customers in your territory that you think would be able to provide us with additional insight into the effectiveness of the EnergySmart program? Please explain why.

List PROPOSED projects and issues here:

Example

BPA utility ABC Market Question about interaction between utility rep, PECI and trade ally.

List any additional RECOMMENDED projects and issues here:

External/Internal Market Variations

21. Have any specific end-user customers, trade allies or other program stakeholders expressed concerns about the success of the EnergySmart program due to the current economic environment? (For example, was there a major employer in your utility territory that recently closed, etc.)

22. Are your customers or contractors reporting that grocery stores or other program target markets are reluctant to invest right now in any upgrades?

23. Are you aware of any other specific factors outside of this program in your utility territory that may be driving interest in participation?

If so, please describe:

Views about Turnkey Third-Party Program Implementation

As you may be aware, the EnergySmart program is delivered through a third-party provider who provides turnkey services to BPA and its member utilities.

24. How does your experience with the EnergySmart Program affect how you might receive additional commercial or residential programs from BPA that are delivered through 3rd party providers?

25. If interested in future BPA turnkey programs, would you be interested in participating in program design focus groups or other forums?

26. Do you typically design your DSM programs in-house, or do you solicit 3rd party providers to deliver programs through a bid process? Or by picking vendors that approach you with an offering? (example: lighting efficiency program)

27. Would you prefer to implement future programs with your utility staff, through 3rd party providers, or through BPA?

Wrap Up (only ask if topics haven't been explored already)

28. What other things could BPA do to stimulate energy efficiency markets in the refrigeration sector within its service territory?

29. What type of program or infrastructure support would you like to see BPA play in the future, given its regional footprint and historic role in efficiency in the region?

30. Do you have any recommendations to improve the EnergySmart program?

31. Do you have anything else that you would like to share about the EnergySmart program?

EnergySmart Design—Office Program Questions

Next, I'd like to shift our discussion to the EnergySmart Design—Office program and ask you a few questions about your experience with this program.

26. How familiar are you with the EnergySmart Design—Office program?

27. Do you think that new construction professionals in your territory have a clear understanding of the EnergySmart Design—Office program?

28. Are you aware of any specific projects or new construction design firms in your territory that have expressed interest in enrolling in the EnergySmart Design—Office program? If so, please describe with specifics:

If none, is there any office construction activity in your service territory? Given the current financial recession, when do you expect to see office construction in your territory?

29. Have you received any market response, including project leads, about the EnergySmart Design—Office program from new construction design professionals or associated organizations? If so, please describe.

30. Do you have any recommendations for opportunities to potentially increase marketing and outreach for the ESD—Office program?

31. What else besides additional marketing and outreach might help the ESD-Office program get some traction in today's tight construction market?

32. Any other comments about the ESD—Office program?

Thank you for participating and helping us make the EnergySmart and EnergySmart Office--Design program as effective as possible.

EnergySmart Interview Guide

PECI Staff

(Note: We conducted in-depth interviews with PECI staff in September 2008. This interview will be follow up to the interviews of other stakeholders.)

Introduction

Hello, my name is Josh Arnold with Summit Blue Consulting. I am calling on behalf of the Bonneville Power Administration to follow up from our discussions in September 2008. As you recall, I am leading the process evaluation of the EnergySmart program for BPA. I am interviewing people who work the EnergySmart Program to get their comments about their experiences and observations in working with the program. I expect our conversation to last between 60-90 min. Your responses in this interview will remain confidential. We will be using your comments, as well as those of other interviewees to help inform our report, but we will not attribute your comments directly to you unless we confirm with you at a later date that it is OK to do so. Your name will be listed as an interviewee in an appendix to the report that we will submit to the Bonneville Power Administration. Is this acceptable to you?

Confirm contact information

Date: _____ Interviewer: _____

PECI Staff:

Address:

Phone:

Email:

Effectiveness Criteria

1. Are you getting the organizational and managerial support that you need from BPA to effectively implement the EnergySmart program and achieve your program's goals? What areas are working well, what could be improved?

2. Are you satisfied with the way that the contractual terms have outlined the performance objectives of the EnergySmart Grocer program through the PECI Performance Workplan?

3. Do you think the program design and/or planning process resulted in appropriate program goals for energy savings, utility participation and servicing and contractor recruitment? Are there other program goals that you would like to comment on?

4. Are there certain performance objectives or responsibilities that are positively or negatively affecting implementation? Is the performance bonus a motivating factor affecting implementation?

5. How well is the BPA contract providing the participating utilities with flexibility to adopt and implement the program in their utility territories v. creating additional administrative burdens for your program managers or those at the utilities or BPA?

6. In your opinion, do all of the stakeholders have a clear understanding of their roles and responsibilities, including communication and reporting, under the current contract? Could communication channels be improved? Please describe.

7. Do you have any other comments on the EnergySmart program's workplan, contract or processes associated with producing the workplan or contract?

Administrative Process

8. Is the Project Tracking Registry (PTR) system enabling you to track customer data in an efficient, transparent and useful manner?

9. Are there aspects of the current program, including the program's design and contracting process, that create administrative burdens for PECI? Administrative efficiencies?

10. Would you recommend any alternative program structures that could lead to administrative efficiencies?

11. Please comment on the effectiveness of the following EnergySmart program administrative processes:

How well does BPA, including staff and EERs: What activities does BPA do best?

- Recruit utilities?
- Include program energy efficiency measures?
- Assign incentive levels for program energy efficiency measures (e.g. $.07/kWh, etc.)?
- Provide for customer tracking through the Project Tracking Registry (PTR) system?
- Provide reporting on program goals and achievements to stakeholders, such as the Regional Technical Forum or NWPPC?
- Work with participating utilities to provide flexibility while minimizing the administrative burden to BPA or PECI?
- Provide for dispute resolution among program stakeholders (e.g. between PECI and trade allies, etc.)?

In your view, how well does your own firm PECI: What does your firm do best?

- Recruit and train internal EnergySmart program office staff?
- Recruit and train internal EnergySmart Field Energy Analysts (FEAs)?

- Develop and adhere to the EnergySmart program's Utility Service Schedule?
- Recruit utilities to participate in the EnergySmart program?
- Recruit, train and manager contractors for the EnergySmart program (also known as 'trade allies')?
- Report potential problems or relevant issues to BPA in a timely fashion?

How well do utility representatives: What do utility representatives do best?

- Promote the EnergySmart program?
- Work with BPA to inform their stakeholders about the EnergySmart programs?
- Work with PECI to inform their stakeholders about the EnergySmart program?
- Communicate with BPA or PECI about the potential to recruit customers or trade allies within their service territory?
- Communicate any questions or concerns about the EnergySmart program on the part of participating utilities or their customers?

12. Do you see any specific opportunities to streamline any of the administrative processes discussed previously?

13. Do you have any other comments on the program's administrative processes?

Marketing & Outreach Efforts

14. Please comment on the effectiveness of the EnergySmart program marketing and outreach efforts to recruit utility participation. What went well? What didn't go as expected? What is your perception of utility satisfaction?

15. Please comment on how well the EnergySmart program has recruited, trained and managed contractors or trade allies? What are the specific challenges to recruiting trade allies? How well has PECI responded to those challenges?

16. How are you addressing the contractor participation rate? What specific strategies have you implemented? What do you have planned for the rest of the year?

17. Please comment on the effectiveness of the EnergySmart program marketing and outreach efforts to reach end-use customers under the Utility Service Schedule. Does the Utility Service Schedule provide a reasonable framework to provide program managers with direction or is it too prescriptive? Do you have any recommendations to improve the Utility Service Schedule?

18. Please comment on the effectiveness of the EnergySmart program marketing and outreach efforts to recruit end-use customers. What market segments are most responsive to the program? What market segments are not as responsive?

19. How well do you think your marketing and identity materials are working to enroll commercial end-use customers in the program? What materials are most effective?

- Website
- Promotional printed materials, such as program brochure
- Customer applications and other printed forms
- In-person presentations, such as trade shows or events
- One-on-one phone calls or office visits

20. Please comment on the process to develop, improve and update marketing and identity materials for the EnergySmart program. What has gone well? What could be improved?

Program Delivery Experience

21. Overall, how is the program tracking vis a vis its performance goals? What are your strategies to address program performance?

22. Does the EnergySmart program provide an appropriate incentive level to motivate the target markets in question? For example, do you think that the program would be able to leverage its funding more fully by increasing (or decreasing) its incentive levels?

23. Should the incentives for all of the measures be consistent or should some measures receive higher (or lower) incentive levels? What about "bonus" incentives for multiple measures (e.g. receive an additional $X amount if you install 2 or more measures at the same time.)

24. Please describe the program logic model or flow chart for an end-use customer. (Request copy of logic model if not yet obtained.)

25. Please comment on the EnergySmart program's customer responsiveness. Have you been informed about any utility representatives not being satisfied with any of the following and if so, what actions have you taken to address their concerns:

- Initial recruitment and program introduction to utility representative
- Integration of utility into EnergySmart program
- Response times with answers to questions
- End-use customer satisfaction, including rebate processing
- End-use trade allies satisfaction
- Any others not mentioned previously

External/Internal Market Variations

26. Have any utility representatives or other program stakeholders expressed concerns about the success of the EnergySmart program due to the current economic environment? If so, please describe:

27. Are the EnergySmart target customers (e.g. grocery stores and other locations with refrigeration equipment) reluctant to invest right now in any upgrades?

28. What other factors outside of the EnergySmart program may be driving interest in participation?

Wrap Up (only ask if topics haven't been explored already)

29. Overall, how satisfied are you with the EnergySmart program's implementation and success in BPA territory?

30. Do you have any recommendations to improve the EnergySmart program's implementation in BPA territory? Specifically, are there successful initiatives occurring

in EnergySmart implementation in other utility territories (such as California) that could be transferred to BPA territory?

31. Are there additional 3rd party turnkey programs that you think BPA should consider implementing (either PECI's or others)?

32. What other things could BPA do to stimulate energy efficiency markets in the NW? What type of program or infrastructure support would you like to see BPA play in the future, given its regional footprint and historic role in efficiency in the region?

33. Do you have anything else that you would like to share about the EnergySmart program?

EnergySmart Interview Guide

Trade Allies

Introduction

Hello, my name is Josh Arnold with Summit Blue Consulting. I am calling on behalf of the Bonneville Power Administration and your local utility provider [insert name of utility provider here]. I am interviewing people who work with the EnergySmart Program to get their comments about their experiences and observations in working with the program. I would like to ask you some prepared questions about your experience with the EnergySmart program. I expect our conversation to last between 15 and 30 min. Your responses in this interview will remain confidential. We will be using your comments, as well as those of other interviewees to help inform our report, but we will not attribute your comments directly to you unless we confirm with you at a later date that it is OK to do so. Your name will be listed as an interviewee in an appendix to the report that we will submit to the Bonneville Power Administration. Is this acceptable to you?

Confirm contact information

Date: _____ Interviewer: _____

Trade Allies Name:

Address:

Home office Utility Territory:

Respondent name, title: _____

Respondent phone: _____

I am calling on behalf of the Bonneville Power Administration and [insert local utility here] regarding the EnergySmart program. Our program records indicate that your firm was the Trade Ally of record at [insert store location here] with the EnergySmart program.

List measures here, if available:

Are you familiar with this job and your firm's participation in this program?

Background Questions

1. How would you describe your firm?

1. Mechanical Contractor
2. HVAC-R Contractor
3. Energy Services Firm
4. Plumbing Contractor
5. Manufacturer's Representative
6. Other (please specify_____)

2. What types of energy related services or equipment does your firm provide? (Please describe in detail).

3. What is your job title? What are your daily responsibilities? How long have you worked at your firm?

4. Approximately how many full-time employees work at your firm?

5. Does your firm have a corporate objective or business strategy that focuses on energy efficiency?

1. Yes
2. No
3. Don't know

Marketing and Outreach Efforts

6. How did your firm learn about the EnergySmart Program? (Probe for details of process)

1. Presentation by PECI (1)
2. PECI account representative contacted me (2) (follow up question: by phone before or after presentation?)
3. Utility account representative contacted me (3)
4. Utility or BPA website (4)
5. PECI website (5)
6. Other (Specify:_____)

7. Do you have any recommendations about trade associations or other organizations that would be good recruitment sources for the EnergySmart program?

8. Please describe your experience with enrolling as a contractor or Trade Ally in the EnergySmart program. Was the paperwork burden acceptable? Were the enrollment requirements acceptable? Do you have any recommendations about how to improve the enrollment process?

Program Delivery Experience

9. About how many projects with the EnergySmart program has your firm completed?

10. Please describe your firm's experience with the audit, ordering and installation process at [insert store location here] with the EnergySmart program.

11. From your perspective, were there any problems with the audit, ordering or installation process at [insert store location here]? (Probe: audit, ordering, installation) If so, how were these problems resolved?

12. How satisfied was your customer (e.g. end-use owner or manager) with the EnergySmart job that you performed? Do you ask your customers to complete a customer satisfaction survey? If so, would you be willing to share that with us?

13. Have you installed other energy saving equipment at [insert store location here] in addition to the energy efficiency measures proposed through the EnergySmart program? What equipment did you install? Are you considering installing any other energy saving equipment at [insert store location here]?

14. Have you participated in any other energy efficiency programs offered by your utility or BPA? Which ones?

15. Are you receiving EnergySmart program materials and/or administrative support? Are these resources sufficient to help you complete EnergySmart jobs? How could the program materials be improved? How could the administrative support be improved? What program materials are most effective for you?

16. Overall, how satisfied are you with the EnergySmart program?

17. Do you think the "high touch" approach (explain if necessary) is motivating your customers to install additional energy efficiency measures than they would otherwise?

18. Do you think the final inspection process is sufficient to verify that the work has been completed? Was the final inspection a burden to your customer?

19. Have any of your jobs been verified in the field by a representative from BPA or PECI? If so, was the verification sufficient to show that the work has been completed? Was the verification a burden to your customer?

20. Did you have any specific issues in regard to your interactions with BPA or PECI that were left unresolved?

21. Have any of your customers received rebates from the EnergySmart program? If so, have any of your customers been unhappy about the amount of time between the installation of the

energy efficiency measures and the final inspection? What about the time to receive their rebate check?

22. Do you have any other comments or recommendations that you would like to share about the EnergySmart program?

External/Internal Market Variations Conditions

22.. How would you describe the current market demand for energy efficiency measures such as lighting or refrigeration technology upgrades in your area?

23. Has the current economic downturn affected your customers' willingness to install energy efficiency measures at their stores? If so, in what ways?

24. Do you have any recommendations on how to increase customer participation in the EnergySmart program? Are the incentives sufficient? Is the paperwork or administrative process sufficient? Is the timeline between the initial audit and the completion of the job reasonable?

Wrap Up (only ask if topics haven't been explored already)

25. How does your experience with the Energy Smart Grocer Program affect how you might participate in additional programs from BPA that are delivered in conjunction with 3rd party providers?

26. (If interested in future BPA turnkey programs), would you be interested in participating in program design focus groups or other forum?

27. What other things could BPA do to stimulate energy efficiency markets in the refrigeration sector within your service area?

28. What type of program or infrastructure support would you like to see BPA play in the future, given its regional footprint and historic role in efficiency in the region?

29. How might the EnergySmart program work better for your business?

30. Do you have anything else that you would like to share about your experience with the EnergySmart program?

Thank you for participating and helping us make the EnergySmart program as effective as possible.

EnergySmart Interview Guide

End-Use Owner or Manager

Introduction

Hello, my name is Josh Arnold with Summit Blue Consulting. I am calling on behalf of the Bonneville Power Administration and your local utility provider [insert name of utility provider here]. I am interviewing people who have participated in the EnergySmart Program to get their comments about their experiences and observations. I would like to ask you some prepared questions about your experience with the EnergySmart program. I expect our conversation to last between 15 min to 30 min. Your responses in this interview will remain confidential. We will be using your comments, as well as those of other interviewees to help inform our report, but we will not attribute your comments directly to you unless we confirm with you at a later date that it is OK to do so. Your name will be listed as an interviewee in an appendix to the report that we will submit to the Bonneville Power Administration. Is this acceptable to you?

Confirm contact information

Date: _____ Interviewer: _____

Store Name:

Utility Territory:

SBC Store ID (from Billing Analysis Matrix_v2.xls document):_____

Store Type:

Respondent name, title: _____

Respondent phone: _____

Background Questions for Decision Maker

As you may recall, the EnergySmart program provides free energy efficiency measures such as door gaskets for your cooler cases, compact fluorescent lighting while providing you with an audit about how to save money and energy at your store. Our program records show that your [type of store] recently participated in the EnergySmart program and received the following measures:

List measures here, if available:

Are you knowledgeable about your [type of store]'s participation in the program?

I would first like to ask you some questions about your role at your [type of store].

1. How would you describe your [type of store]?

    1. Convenience Store
    2. Small market or grocery store
    3. Large grocery store
    4. "Superstore"
    5. Restaurant
    6. Other (please specify_____)

2. What is your job title and daily responsibilities?

3. How long have you worked at [type of store].

4. What percentage of your time is required to address HVAC-R equipment or energy-related issues?

5. Approximately how many full-time employees work at this location?

6. What are the approximate hours of operation at your location?

7. What is the approximate square footage of your [type of store]?

8. Does your [type of store or company] have a corporate objective or policy that focuses on energy efficiency?

    1. Yes
    2. No

3. Don't know

Marketing and Outreach Efforts

9. How did you learn about the EnergySmart Program? (Probe for details of process)

Presentation by PECI (1)
PECI account representative contacted me (2) (follow up question: by phone before or after presentation?)
Utility account representative contacted me (3)
Utility or BPA website (4)
PECI website (5)

Trade Ally or contractor

Other (Specify:_____)

10. What motivated you to give permission for the EnergySmart program to perform an audit at your location?

Free measures
Free audit
Energy savings
Money savings
Marketing or promotional
Other

11. How effective was the EnergySmart marketing and outreach materials in helping you to make a decision about enrolling in the program? What materials are most effective?

Printed promotional materials
Customer application
Other printed forms
Website
Field Energy Analyst (FEA) attire
Energy Audit report

12. How effective was the Energy Audit in providing you with useful information in a timely fashion?

Content of the report
Technical information about equipment
Potential cost savings
Look and format of the report
Delivery of the report

13. How soon after the audit did the FEA present the report to you? Did the FEA talk through the report with you? Was the FEA able to answer all of your questions about the audit report? Did you have any questions about the report or program that the FEA was not able to answer?

Program Delivery Experience

14. Did the audit and free energy measures (such as door gaskets and CFLs) convince you to install additional energy savings measures at your location? Why or why not? Are there other incentives that you would like to see associated with the audit that would convince you to install additional energy savings at your location? If so, what? Was the audit process overly burdensome to you? Was it thorough enough?

15. Does the EnergySmart program offer your location an appropriate incentive level to motivate you to install energy savings measures? Why or why not? (Run down list of measures here).

16. Were you satisfied with your experience in working with the EnergySmart program through the following:

- FEA first contact and scheduling of audit
- Audit and report
- Report and facilitating measures
- Design Review
- Post-installation inspection
- Rebate processing
- Generating Energy Savings and Technical Information through PTR system
- Dispute Resolution
- Monthly reporting
- Any others not mentioned previously

17. Has your location received a final or post-installation inspection?

18. Has your location been verified by a BPA or utility representative?

19. Have you experienced any problems with the equipment installed at your location at any time during the installation or subsequently. (Probe: during the audit, ordering, installation, operations) Were the problems resolved to your satisfaction?

20. Were there any problems with the installation contractors at any time during the, ordering, installation or subsequently?? (Probe: audit, ordering, installation, operations) Were the problems resolved to your satisfaction?

21. Have you noticed if your electric bill has decreased since you have installed the energy efficiency measures at your location? How much? Did you attribute the decrease to the program?

22. Have you installed other energy saving equipment in your store in addition to the energy efficiency measures proposed by EnergySmart program? What equipment did you install? Are you considering installing any other energy saving equipment in your store(s)?

23. Have you participated in any other energy efficiency programs offered by your utility or BPA? Which ones?

24. How does your experience with the Energy Smart Grocer Program affect how you might participate in additional programs from BPA that are delivered in conjunction with 3rd party providers?

25. (If interested in future BPA turnkey programs), would you be interested in participating in program design focus groups or other forum?

26. What other things could BPA do to stimulate energy efficiency markets within the refrigeration sector in your local area?

27. What type of program or infrastructure support would you like to see BPA play in the future, given its regional footprint and historic role in efficiency in the region?

28. Overall, how satisfied are you with the EnergySmart program?

External/Internal Market Variations Conditions

29. Has the current economic downturn affected your decision making regarding energy usage and/or the EnergySmart program? In what ways?

Wrap Up (only ask if topics haven't been explored already)

30. Do you have any additional recommendations about how to improve the EnergySmart program?

31. Do you have anything else that you would like to share about your experience with the EnergySmart program?

Thank you for participating and helping us make the EnergySmart program as effective as possible.

The Summit Blue team thanks the following people for their time and insight:

BPA staff interviewed (not in any order)

- Karen Meadows, Planning (at kick-off meeting only)
- Lauren Gage, Evaluation
- Gary Smith, EnergySmart Grocer program manager
- Mira Vowles, EnergySmart Design Office program manager
- Rebecca Clark, EER
- Melissa Podeszwa, EER
- Mark Ralston, EER
- Lloyd Meyer, EER
- Frank Brown, EER
- Tom Hannon, EER
- Margaret Lewis, EER
- Boyd Wilson, EER
- Ryan Fedie, Engineering Manager
- Dick Stroh, Commercial Engineer
- Rosalie Nourse, EER
- Tim Scanlan, Commercial Sectors Lead
- Tim Steele, Commercial Engineer
- Grant Vincent, PTR Manager

Utility Representatives Interviewed (not in any order)

- Chris Aiken, Energy Services Coordinator, Kootenai Electric Cooperative
- Peter Meyer, Assistant Energy Services Manager, Tacoma Power
- Steve Brown, Energy Services Coordinator, Okanogan County PUD No. 1
- Debbie Peters, Okanogan County PUD No. 1
- Edward Monson, Energy Advisor, Benton Public Utility District
- Greg Whiting, Seattle City Light
- Jill Steiner, Patrice Lundquist & Tom Hovde, Snohomish PUD
- Travis Reeder, Energy Management Specialist, Eugene Water and Electric Board
- Larry Blaufus, Senior Manager, Energy Services & Technology, Clark PUD
- Martha Warachowski, Orcas Power & Light Cooperative
- Tim Lammers, Commercial Service Advisor, Columbia River Public Utility District
- Don Newton, Energy Services Coordinator, Flathead Electric Cooperative
- Virginia Harman, Manager of Communications, Glacier Electric Cooperative, Inc.
- Jim Wellcome, Conservation Manager, Cowlitz County, Public Utility District No. 1
- Larry Giardina, Conservation Analyst, City of Ashland

PECI staff interviewed (concurrently):

- Jessica Kramer, Stephen Achilles, Duane Whitehurst, Alan Grobe
- Steven Cofer, The Cadmus Group (formerly program manager with PECI)

APPENDIX B: DOCUMENTS REVIEWED

Program Materials

BPA_Incentive_Application_Sept_08.pdf

BPA_Incentive_Worksheet_Sept_08.pdf

BPA_Terms_and_Conditions_Sept_08.pdf

BPA_Access_Agreement_Sept_08.pdf

Revised information from April 2009

Marketing

TradeAlly_Lighting_CutSheet_Feb08.Final.pdf

512.brochure.Final.pdf

Map_PNW_8.5x11_04.08.pdf

Reports

All EnergySmart program reports from 2007, 2008 & 2009
EnergySmart program logic model
EnergySmart Performance Workplan v8
Utility participation letter
PECI ESG Service Agreement
EnergySmart Service Agreement with BPA approved Amendment
Incentive Worksheet
Revised Participation Letter November 2008
Utility contact list
Contractor contact list
Quantum Evaluation from 2004
PWP, Inc. 2004-5 EM&V Report

EnergySmart Grocer Program

New Incentive Checklist Working Draft 2/5/07

Grocery Store Initiative staff document (11/30/06)

Sprocket powerpoint presentation

APPENDIX C: NEW INITIATIVE CHECKLIST

Energy Efficiency

Bonneville Power Administration

New Initiative Checklist

This checklist should be used when developing a new program/project/initiative (P/P/I). A more detailed set of questions related to each area of consideration is provided on the following pages.

This checklist should be viewed as a set of guidelines for consideration and that not all questions will apply to every situation. Also, please remember that this checklist is not all inclusive. There may well be issues not on this list that have to be addressed. We will continue to refine this list as we gain more experience with developing new EE initiatives.

P/P/I Name: _____

	Area of Consideration	**Comments**
_____	1. CRC/CAA Implementation Manual	_____
_____	2. ECM Technical Specifications	_____
_____	3. BPA's Willingness-to-Pay Determination	_____
_____	4. M&V Requirements	_____
_____	5. Evaluation Plan	_____
_____	6. Tracking/Reporting Requirements/PTR System	_____

_____ 7. Contractual Mechanism To Be Used _____

_____ 8. Remedies and Corrective Actions _____

_____ 9. Implementation Roles and Responsibilities _____

_____ 10. Modification Process _____

_____ 11. RTF Review/Recommendation _____

_____ 12. External Coordination/Utility Notification _____

_____ 13. Marketing _____

_____ 14. Budget Authorization _____

The following is a list of questions that should be answered as you develop a new program/project/initiative (P/P/I). They are listed in roughly the proper sequence, although each situation is different and may require deviation from the order these categories are listed. The main point is to make sure you consider these questions as part of the development process for new EE P/P/Is. The Programs Manager (Steve Fucile) and Sector Leads are on point to make sure these questions get answered for any new EE P/P/I that in commissioned under their respective Sector Strategies.

1. **Implementation Manual:** Make sure you consult the CRC/CAA Implementation Manual (i.e., Salmon Book) to be sure your P/P/I is consistent with the applicable requirements. If your P/P/I is not covered by the current IM, what changes will be necessary in future editions of the Manual to accommodate your new P/P/I? What are the notification requirements regarding your changes? Coordinate any necessary changes with the appropriate sector lead and K. Keating.

2. **ECM Technical Specifications:** Which ECMs are involved in this initiative? What are the associated technical specifications? Is a calculator required? Are the savings deemed? What are the kWh savings, measure life, installations costs, etc.? Who is responsible for pulling this information together and getting them approved (i.e., sector engineer, K. Keating)?

3. **BPA's Willingness-to-Pay Determination:** What is the WTP level and who needs to be involved in approving the recommended reimbursement approach (at a minimum, coordination with Ken Keating is required; Ken will decide if an issue needs to be brought before the EEMT-2) ? What is the payment structure? Will it work for the end users, the customers and BPA?

4. **M&V Requirements:** For ECMs, what are the M&V, inspection, documentation and oversight requirements? How much of an administrative burden will these requirements be for the utility? For BPA? What impact will these costs have on the ECM's cost effectiveness? Coordinate with the appropriate sector engineer and K. Keating.

5. **Evaluation Plan:** What is the evaluation plan? What information are you going to need in order to determine whether or not the P/P/I achieved the desired objectives/results? What data/information will be needed to evaluate the new P/P/I?

6. **Tracking and Reporting Requirements and PTR System Programming:** What are the tracking and reporting requirements for this initiative? Will the PTR system need to be modified to accommodate this initiative? What will it cost to program the changes and have you factored in the time to achieve these changes and notified the right people (i.e., G. Vincent, P. Tawney)? What about the EE database considerations (i.e., G. Vincent, R. Maddox, K. O'Sullivan)?

7. **Contractual Mechanism To Be Used:** What contractual mechanism will be used for this initiative (e.g., CAA exhibit, procurement, etc.)? Who needs to be involved in preparing and approving the necessary documents? Make sure you have a complete program description before preparing a contract or PTR/COTR modifications.

8. **Remedies and Corrective Actions:** What are the remedial actions that will be taken if things don't go right (e.g., ECMs not installed, etc.)? Who is "on the hook" if such a situation comes about? Do we have the right contractual language to protect BPA?

9. **Implementation Roles and Responsibilities:** Are the implementation roles and responsibilities (i.e., marketing, negotiating, installing, inspections, etc.) of the various players clearly spelled out (BPA staff, customers, vendors, etc.)? Are the timeframes/milestones realistic and agreed to by the assigned parties?

10. **Modification Process:** What are the parameters surrounding changes/modifications once the initiative is launched? How much flexibility does the COTR/field engineer have regarding the installed ECMs, etc.?

11. **RTF Review/Recommendation:** Does the RTF need to review any aspect of this initiative (e.g., cost effectiveness, savings level, protocols, etc.)? If so, have you allowed sufficient time for that to happen and notified the right people? Coordinate through Bruce Cody, EE's rep on the RTF, and the appropriate sector engineer. *Remember, the RTF recommends and BPA approves any ECMs that will receive a reimbursement of BPA funds.*

12. **External Coordination and Utility Notification:** Have you coordinated with the appropriate External parties (e.g., ETO, NEEA, states, etc.) to make sure we are not duplicating or confusing our new P/P/I with something they are doing? What advance notice is required by utilities? Have you checked with the EERs/USB regarding what information utilities will need to inform their decision to participate or not? We need to consider the utilities' planning and budget processes in our efforts.

13. **Marketing:** Who is the "target" audience for this new P/P/I? Do you have a well thought out marketing plan with clear assignments about who is going to do what? Coordination with the EERs/AEs is critical.

14. **Budget Authorization:** What is the budget necessary to design and implement the new P/P/I and who has to approve it (i.e., Sector Lead, EEIM, EEVP, COO)? Make sure to follow the EE budget delegation procedures.

APPENDIX D: DETAILED MODEL RESULTS

This appendix shows the detailed results of the billing analysis model as run in the Statistical Analysis System (SAS) software. The results reflect the model specification in the following manner:

$y_{it} = \alpha_i + \beta x_{it} + RR \cdot E_{it} + \varepsilon_{it}$

Where:

y_{it} = Energy consumption for site *i* during month *t*

= *Average Daily kWh for site i during month t (aveDailykWh)*

α_i = Constant term for site *i*

= *(These are not reported since they are voluminous and not the results of interest.)*

β = Vector of coefficients

= *(These are the values in the 'Estimate' column for CDDbyday and HDDbyday.)*

x = Vector of variables that represent factors causing changes in monthly consumption (i.e., the time-effects variables such as weather)

= *Average Daily Cooling Degree Days for site i during month t (CDDbyday)*

Average Daily Heating Degree Days for site i during month t (HDDbyday)

RR = The estimated coefficient that represents the realization rate

(These are the values in the 'Estimate' column for the MEASURESavingsbyDay variables.)

E_{it} = The tracking system estimate of savings for site *i* during month *t*

= *All of the MEASURESavingsbyDay variables (these are the average daily kWh savings for site i in month t for the MEASURE listed)*

ε = Error term *(unknown)*

The SAS System

The TSCSREG Procedure

Fixed One Way Estimates

Dependent Variable: aveDailykWh

Model Description	
Model Statement Label	MODEL8
Estimation Method	FixOne
Number of Cross Sections	136
Time Series Length	96

Fit Statistics			
SSE	561993797.9	DFE	3244
MSE	173240.9981	Root MSE	416.2223
R-Square	0.9881		

F Test for No Fixed Effects and No Intercept			
Num DF	Den DF	F Value	Pr > F
136	3244	1571.35	<.0001

Parameter Estimates					
Variable	DF	Estimate	Standard Error	t Value	Pr > |t|
REFR_CNTRLsavingsbyDay	1	2.73882	0.62	4.42	<.0001
CASES_EEsavingsbyDay	1	-1.17801	0.1838	-6.41	<.0001
EVAP_MOTORsavingsbyDay	1	1.086412	0.5908	1.84	0.066
LIGHT_EEsavingsbyDay	1	-0.72185	0.0787	-9.17	<.0001
CASELITEsavingsbyDay	1	-8.04015	2.2125	-3.63	0.0003
FLOATHEADsavingsbyDay	1	-0.98502	0.21	-4.69	<.0001
CFL_FRZsavingsbyDay	1	-0.09354	2.0233	-0.05	0.9631
GASKETSsavingsbyDay	1	-2.91546	2.0885	-1.4	0.1628
VENDINGsavingsbyDay	1	-7.41134	6.6214	-1.12	0.2631
ANTISWEATsavingsbyDay	1	0.012653	1.2576	0.01	0.992
NIGHTCOVERsavingsbyDay	1	3.964053	1.2435	3.19	0.0014
CFLsavingsbyDay	1	-0.12105	22.2741	-0.01	0.9957
AUTOCLOSERsavingsbyDay	1	-1.22957	7.7096	-0.16	0.8733
FRZDOORsavingsbyDay	1	4.803705	14.3647	0.33	0.7381
ECMsavingsbyDay	1	3.256338	10.5099	0.31	0.7567
REFR_COMPsavingsbyDay	1	5.921361	1.8615	3.18	0.0015
REFR_VFDsavingsbyDay	1	-8.75339	7.8027	-1.12	0.262
CDDbyday	1	37.93996	4.8223	7.87	<.0001
HDDbyday	1	-4.16382	0.9709	-4.29	<.0001

APPENDIX E: IMPACT EVALUATION FIELD EQUIPMENT DETAILS

Equipment used for measurements in the engineering analysis consisted of:

Current logging:

1. Onset Computer Corporation HOBO U12-006 four channel loggers
2. Onset Computer Corporation HOBO U12-013 two external channel plus temperature and relative humidity loggers (only external channels used for current measurements)
3. Onset Computer Corporation HOBO U12-012 one external channel plus temperature, relative humidity, and lighting loggers (only external channel used for current measurements)
4. Onset Computer Corporation CTV-A 20 amp current transformers
5. Onset Computer Corporation CTV-B 50 amp current transformers
6. Onset Computer Corporation CTV-C 100 amp current transformers
7. Onset Computer Corporation CTV-D 200 amp current transformers
8. Onset Computer Corporation CTV-E 600 amp current transformers

Pipe temperature logging:

1. Pace Scientific XR440 Pocket Data Loggers
2. Pace Scientific PT510 RTD Temperature Sensors
3. Pace Scientific PT520 RTD Temperature Sensors

Ambient temperature logging:

1. Onset Computer Corporation HOBO U12-013 two external channel plus temperature and relative humidity loggers
2. Onset Computer Corporation HOBO U23-001 outdoor temperature and relative humidity loggers

Power logging:

Dent Instruments ELITEpro energy logger

Power spot measurements:

1. Fluke 43B Power Quality Analyzer
2. Amprobe ACD-31P clamp on power meter