New Hampshire CORE Residential ENERGY STAR® Lighting Program

Impact and Process Final Evaluation Report

Prepared for
New Hampshire Utilities

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Table of Contents

List of Figures

List of Tables

List of Appendices

1. Executive Summary

The New Hampshire Electric Utilities[1] commissioned a study to evaluate the CORE New Hampshire Residential ENERGY STAR® Lighting Program (NH RESL) including both the program impacts (2009-2010 Program Years) and processes. This program was last evaluated in 2003. The main objectives of the impact evaluation included a) determining the gross energy savings due to NH RESL and determining updates for the engineering estimates used to track and calculate savings including installation rates, hours of use, coincidence factors and reduced wattage, and b) estimating the market saturation of efficient lighting by measuring counts of household sockets and lighting inventory. The objectives of the process evaluation included determining how effectively the program promoted energy-efficient lighting products using instant coupons and mail-in rebates and identifying opportunities for improvements to program operations.

1.1 2009-2010 Program Activity Summary

Table 1 presents a summary of the gross annual savings for NH RESL program years 2009 and 2010 by residential lighting product category and by delivery channel based upon the site-level measurement and verification (M&V) performed in this evaluation. CFLs accounted for nearly 96 percent of the program savings across both years, with multi-packs making up almost 75 percent of the program savings and single CFLs accounting for almost 21 percent. Also, just over 96 percent of the savings generated by the program in 2009 and 2010 came from in-store rebates. The program savings shown in Table 1 reflect the results of the on-site visits in that the following parameters have been revised as appropriate for each lighting product category: the quantities of program products sold, the in-service rates, the annual hours of use, and the reduction in lamp wattage.

[1] National Grid, New Hampshire Electric Cooperative (NHEC), Public Service of New Hampshire (PSNH) and Unitil.

Table 1: Evaluated 2009-2010 Program Year Annual Electric Savings

Adjusted Annual Savings, MWh	CFLs	CFL Multi-Packs*	Interior Fixtures	Exterior Fixtures	Torch-ieres	LEDs	Total Savings
Retail Savings	3,486,472	15,386,912	481,880	143,716	1,022	0	19,500,002
Catalog Savings	408,359	0	117,069	35,223	6,390	66,560	633,601
Total Program Savings	3,894,831	15,386,912	598,949	178,939	7,412	66,560	20,133,603

1.2 Key Study Methods

There were five primary activities undertaken as part of this study. The bullets below provide a brief description of each.

- On-site assessments at the homes of 75 program participants, including the installation of 306 lighting loggers, to inform the impact portion of the study.
- On-site assessments at the homes of 21 non-participating customers for use in estimating CFL saturation.
- Tracking database review to assess the reliability and accuracy for program reporting purposes.
- Surveys of 350 participants and 350 non-participants to inform study objectives such as estimating market saturation, program satisfaction and awareness, drivers and barriers and remaining opportunities.
- In-depth interviews with program staff, retailers and contractors to identify program aspects that run smoothly and effectively and any issues that need to be addressed, including program administration, the fulfillment process, program marketing, including the statewide catalog.

1.3 Results

The next two sections present the overall results of the impact and process evaluation followed by a summary of recommendations. The results and recommendations rest upon the findings of this study and KEMA's vast experience performing these types of surveys, interviews of stakeholders, on-site visits and lighting logger studies, and working with tracking databases during impact and process evaluations.

Impact Results

Subsequent to conducting 75 on-site visits to NH RESL participant homes, KEMA determined that several of the assumed values used to estimate annual electric energy and demand savings for the program are due to be updated. As shown in Table 2 and Table 3, these include the following updates:

- 18 percent decrease to the in-service rate of residential CFLs (driven in part by the increased number of multi-packs purchased that may increase quantities stored by participants),
- 15 percent increase to the wattage differential between the program CFLs and those bulbs replaced by program CFLs,
- 42 percent reduction to the average daily hours of use (often the result of saturating high use sockets) when compared to the 2009-2010 program assumptions, and
- 34 percent increase to the quantity of CFLs sold through the program (resulting from a comparison of the quantities reported in the 2009-2010 tracking databases and those recorded during on-sites), and
- A six percent decrease to the winter on-peak coincidence factor (no change to the summer on-peak coincidence factor).

The above changes led to an overall 2009-2010 NH RESL program savings of 20,133,603 MWh that, when compared to the planned savings of 29,540,717 MWh, yields an overall realization rate of 68.2 percent as shown in Table 1. In addition, 2012 Program Year inputs have been included in Table 3. Among other things, this table shows the sponsors' assumption that delta watts will decrease in response to the Energy Independence and Security Act (EISA) of 2007, which mandates the removal of incandescent bulbs within certain lumen ranges from retailer shelves beginning January 1, 2012.

Table 2: Evaluated 2009-2010 Program Year Inputs & Annual Electric Savings

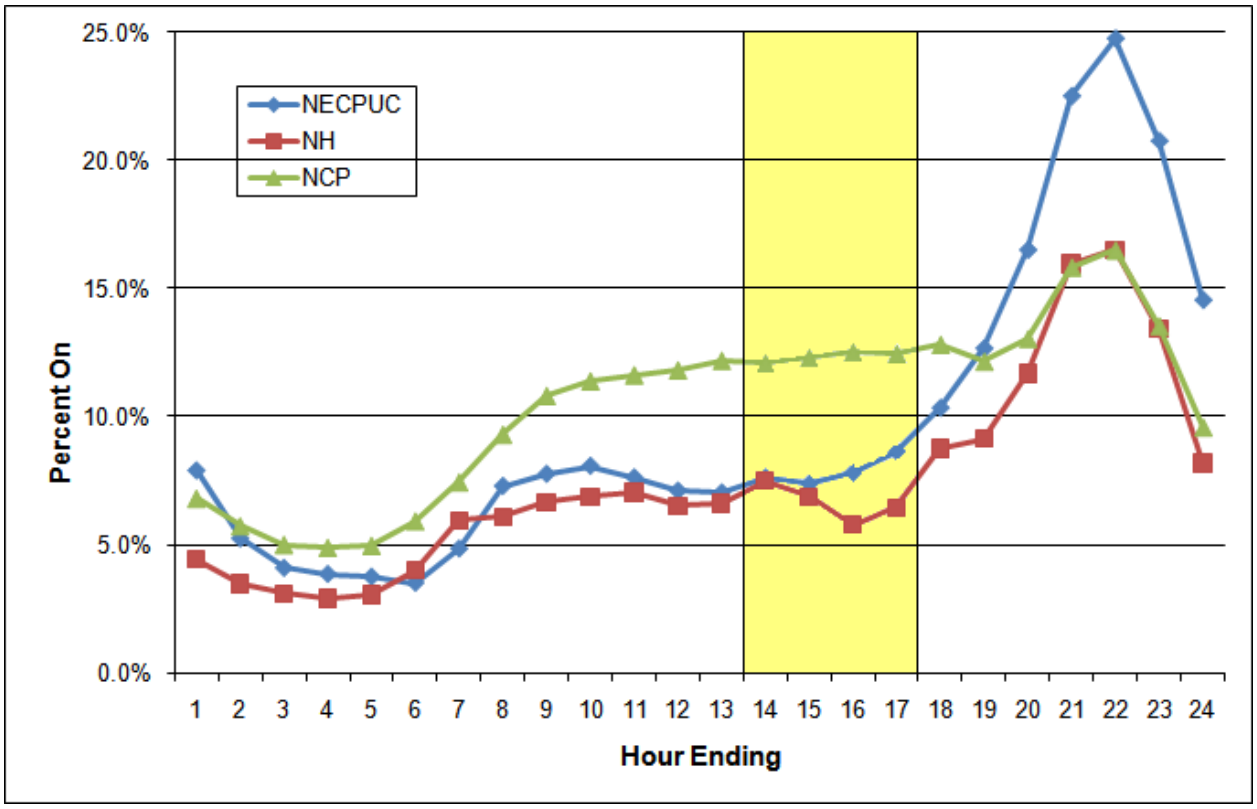
Adjusted Annual Savings Inputs	CFLs	CFL Multi-Packs*	Interior Fixtures	Exterior Fixtures	Torch-ieres	LEDs	Total Savings
Retail							
In-Service Rate	62.3%	62.3%	96.4%	100.0%	93.5%		
Annual Hours	719.4	719.4	719.4	719.4	719.4		
Delta Watts	46.1	184.5	85.3	85.3	95		
Savings Per Unit (kWh)	20.7	82.7	59.2	61.4	63.9		
Adjusted Units	168,567	185,985	8,146	2,342	16	0	
Retail Savings Subtotal (MWh)	**3,486,472**	**15,386,912**	**481,880**	**143,716**	**1,022**	**0**	**19,500,002**
Catalog							
In-Service Rate	62.3%		96.4%	100.0%	93.5%	95.0%	
Annual Hours	719.4		719.4	719.4	719.4	1241.0	
Delta Watts	46.1		85.3	85.3	95	38.0	
Savings Per Unit (kWh)	20.7		59.2	61.4	63.9	44.8	
Adjusted Units	19,744	0	1,979	574	100	1,486	
Catalog Savings Subtotal (MWh)	**408,359**	**0**	**117,069**	**35,223**	**6,390**	**66,560**	**633,601**
Combined							
Total Program Savings (MWh)	**3,894,831**	**15,386,912**	**598,949**	**178,939**	**7,412**	**66,560**	**20,133,603**

Upon reconciling the on-site observations with the tracking database to determine the quantity of program products sold, it was determined that CFLs accounted for nearly 96 percent of the NH RESL savings across 2009-2010, with multi-packs making up almost 75 percent and single CFLs for nearly 21 percent. Furthermore, just over 96 percent of the 2009-2010 NH RESL savings resulted from the in-store rebate coupons.

KEMA conducted a lighting logger study at participant homes to inform an update to the winter and summer on-peak coincidence factors for NH residential lighting. A total of 306 loggers were installed in this effort. Figure 1 presents a comparison of the average summer lighting profile

from this study to the profiles from the recent NCP Markdown[2] and NECPUC Coincidence Factor[3] studies. The shaded area represents the summer on-peak hours used in this study (1 PM to 5 PM, non-holiday weekdays from June to August) which are consistent with those set forth by ISO-NE. While the percent "on" varies for all three studies, the shape of the NECPUC study profile is very similar to that determined in the course of this study. Table 3 shows the resulting updates to the winter and summer on-peak coincidence factors.

Figure 1: Average Summer Lighting Profile Comparison



[2] http://www.env.state.ma.us/dpu/docs/electric/09-64/12409nstrd2ae.pdf

[3] http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/National%20Grid/116_RLW_CF%20Res%20C&I%20ltg.pdf.

Table 3: Annual Savings Input Results

Annual Savings Inputs	Retail				Catalog			
	Program Assumptions		Recommended Evaluation Results		Program Assumptions		Recommended Evaluation Results	
	2009-2010	2012	Result	Precision	2009-2010	2012	Result	Precision
CFLs								
In-Service Rate	80.3%		62.3%	±4.4%	80.3%		62.3%	±4.4%
Annual Hours	1,241.0		719.4	±15.5%	1,255.6		719.4	±15.5%
Delta Watts	40.8	31.5	46.1	±3.6%	41.1	31.5	46.1	±3.6%
CFL Multi-Packs								
In-Service Rate	80.3%		62.3%	±4.4%	N/A			
Annual Hours	1,241.0		719.4	±15.5%				
Delta Watts	163.2	126.0	184.5	±3.6%				
Interior Fixtures								
In-Service Rate	96.4%		No Change		96.4%		No Change	
Annual Hours	1,241.0		719.4	±15.5%	1,255.6		719.4	±15.5%
Delta Watts	85.3		No Change		85.3		No Change	
Exterior Fixtures								
In-Service Rate	100.0%		No Change		100.0%		No Change	
Annual Hours	1,241.0		719.4	±15.5%	1,255.6		719.4	±15.5%
Delta Watts	85.3		No Change		85.3		No Change	
Torchieres								
In-Service Rate	93.5%		No Change		93.5%		No Change	
Annual Hours	1,098.7		719.4	±15.5%	1,262.9		719.4	±15.5%
Delta Watts	95.0		No Change		95.0		No Change	
LEDs								
In-Service Rate	N/A				95.0%		No Change	
Annual Hours					1,241.0			
Delta Watts					38.0			
On-Peak Coincidence Factors								
Summer	7.6%		7.6%	±15.6%	7.6%		7.6%	±15.6%
Winter	28.6%		22.7%	±13.6%	28.6%		22.7%	±13.6%

For program planning and evaluation purposes, updates to in-service rates and delta watts values are considered for each lighting category as new information becomes available. Based on the findings of this study, in-service rates and delta watts values for CFLs are recommended for update as shown in Table 1 and Table 3. The corresponding values associated with program interior fixtures and LEDs are not recommended for updating, however, due to the small sample sizes in this study (11 interior fixtures in three homes and 8 LEDs in three homes). Values for hours-of-use, on the other hand, tend to be more transferrable across residential lighting measure types since they depend more on room type and hours of daylight and less on measure type. Hence, the hours-of-use value determined from the data collected during this study is applied to all lighting measures except LEDs. For LEDs, we still find the hours-of-use value currently in use to be valid because nearly one-third of the LEDs sold through the program in 2009-2010 were nightlights--products that typically are in use for more hours than most residential lighting products.

In addition to updating some of the parameters described above, the on-site visits to 75 participant and 21 non-participant homes showed that an average of 28.1 percent of the lighting sockets in New Hampshire residences contain CFLs. This is in keeping with the national upward trend of CFL usage in recent years largely driven by some very effective incentive programs including NH RESL, national market growth and, to an undetermined extent, the imminent phasing-in of EISA.

Process Results

The evaluation team examined the following components of the NH RESL Program: design; outreach; operations including data management; outcomes; and current and future barriers and opportunities. This evaluation is based on in-depth interviews with three utility program managers, two implementation contractors, five each of participating and non-participating retailers, CATI surveys with 350 participant customers and 350 non-participant customers, and on-site surveys with 75 participating and 21 non-participating customers. The rich data set this research developed was analyzed, cross-referenced, and synthesized to produce the results summarized below.

Design

The NH RESL Program design is based on point-of-purchase rebates and lighting catalog outreach and sales. This design provides a high degree of accountability and adaptability by collecting customer and product data on unit rebated. It does incur the costs of field staff,

constrains the number of outlets for measures, and may create an administrative burden for customers and retailers. The research found that the program is meeting its goals, is aligned with the interests and objectives of the stakeholders, and is generally well regarded by all involved.

Outreach

Customer outreach efforts include point-of-purchase materials, bill inserts, a paper catalog, and a web-presence for information and ordering. APT, the implementation contractor, provides ongoing outreach and support to retailers. All of the outreach efforts were positively recalled by their respective targets.

While overall non-participant awareness of the program has dropped to 26% from the 40% found by the 2003 evaluation effort, other indicators of outreach success have substantially improved in the intervening years, e.g. non-participant awareness of store displays jumping from 2% in 2003 to 25% in 2011. It is our conclusion that, in light of the high saturation of CFLs in all customer segment homes and the degree to which all customers report purchasing this product, this general lack of awareness is more an artifact of familiarity than an indicator of program under-achievement.

Operations

Program operations are well defined and efficiently implemented. Those involved with program delivery, utility staff, implementation staff, and participating retailers, have developed mature and effective relationships. The program is able to adapt promptly, as evidenced by a change in the fixture offering in response to a discovered program shortcoming in point of purchase processes. Program sponsors, implementing contractors, and retailers reported that the relationship with the program offers substantial benefits and expressed respect for the other entities involved. From the customer perspective, program operations are easy to comprehend and not unduly burdensome. They express a high degree of satisfaction with all delivery mechanisms including the in-store coupon, the catalog, the web site, and the mail order process.

At the sponsors' direction, the evaluation team reviewed the tracking data for its ability to support measurement and verification. We found that all fields were at least 97% complete, nearly all fields were 100% complete, and the system captured sufficient data for program

operations but offers the opportunity for improvement with regard to evaluation needs as addressed in the recommendations below.

Outcomes

The program scored high on the key indices of measure awareness, measure availability in the market place, measure adoption at end-use, and retailer and customer satisfaction. Awareness of standard CFLs was high, at 98% for participants and 79% for non-participants, albeit lower for specialty CFLs. The on-site survey found CFLs in all but one non-participant home even though more had stated they had none in the preliminary telephone survey, demonstrating that, even if unaware, non-participants likely possess CFLs. Customer satisfaction with the program overall was high, with 75% of instant rebate customers and 78% of mail order customers rating the program at 8 or better on a scale of 1 to 10, where 1 means "not at all satisfied" and 10 means "very satisfied." On the same scale, 71% of participants and 52% or non-participants, who purchased the bulbs without program support, reported satisfaction with CFL performance at eight or better. The on-site survey found CFLs in an average 42% of available sockets in participant homes and 29% in non-participant homes. In terms of the remaining sockets, 56% of participants and 31% of non-participants reported they would definitely replace an incandescent with a CFL in the future.

Barriers and Opportunities

The phase-in of EISA offers both a challenge and an opportunity. The challenge lies in the lowered end-use baseline energy use, which results in lower, or marginal, savings from CFLs, the mainstay of lighting programs for the last decade. The opportunity it offers is related to new and exciting technologies, e.g. LED, and new opportunities for outreach, e.g. providing market information, that can help build the Program's relationship with customers. The NH RESL has the infrastructure in place, and has built mutually beneficial relationships over time, that will enable it to successfully meet the sponsors' objectives of saving energy and building awareness in this time of change.

1.4 Key Recommendations

Impact Recommendations

We recommend that the sponsors consider updating the parameters and assumptions used to estimate lighting savings. Specifically, we recommend that the assumed in-service rate of CFLs, hours of use and the winter on-peak coincidence factor calculated from this study be considered for use in tracking lighting energy and peak demand savings. We also recommend that the sponsors increase the delta watts per CFL to those observed in this study for at least one more year (2012) until the effects of EISA are better known. These suggested changes are summarized in the table below.

Annual Savings Inputs	Retail		Catalog	
	Result	Precision	Result	Precision
CFLs				
In-Service Rate	62.3%	±4.4%	62.3%	±4.4%
Annual Hours	719.4	±15.5%	719.4	±15.5%
Delta Watts	46.1	±3.6%	46.1	±3.6%
CFL Multi-Packs				
In-Service Rate	62.3%	±4.4%	N/A	
Annual Hours	719.4	±15.5%	N/A	
Delta Watts	184.5	±3.6%	N/A	
Interior Fixtures				
Annual Hours	719.4	±15.5%	719.4	±15.5%
Exterior Fixtures				
Annual Hours	719.4	±15.5%	719.4	±15.5%
Torchieres				
Annual Hours	719.4	±15.5%	719.4	±15.5%
On-Peak Coincidence Factors				
Winter	22.7%	±13.6%	22.7%	±13.6%

We also recommend that the sponsors put a renewed focus on the participating retailer training program and ensure that each program-representative visit to the retailers provides repeated and additional training regarding the proper use of the coupons and their importance to the program process. We also recommend that the sponsors continue to use the recently updated coupons that provide a clearer explanation of the pack size associated with each coupon--this is expected to improve the tracking of program purchases.

Process Recommendations

We present a summary of our recommendations for sponsor consideration below.

a. Recommendation: In light of the high levels of stakeholder and customer satisfaction expressed, the existing platform of program operations appears sufficiently designed to meet the changing requirements of the market. Overall, we find that the Residential Energy Star Lighting program is producing significant energy savings and suggest only incremental improvements that we believe will help it continue to evolve in effectiveness and performance.

b. Recommendation: Absent a change in the regulatory regime or sponsor drivers, we do not recommend shifting to an upstream program. As one contractor noted, ""If they're meeting their goals cost effectively then changing their approach may not have any particular value."

c. Recommendation: In light of the expressed concerns regarding performance characteristic of specific products, we recommend that the sponsors consider developing a means for gathering and disseminating available feedback on specific lighting products from customers.

d. Recommendation: The gap between customer awareness of the program and customer adoption of the measures leads to the recommendation that the sponsors continue efforts to educate consumers regarding energy–efficient lighting options, including instruction on using lumens and color profiles to select appropriate lighting products rather than watts in the near term.

e. Recommendation: In light of market awareness, pricing, and EISA requirements, the program should consider ramping up its LED offerings as quickly as is prudent. We anticipate that existing program mechanisms can readily accommodate this effort.

f. Recommendation: In the interim, building specialty CFL awareness would greatly assist in continuing the saturation of CFLs into homes. Specific approaches for increasing awareness might include in-store displays and web-based videos on nhsaves.com showing the performance of for candelabra, dimmable, and three-way CFL bulbs.

g. Recommendation: The effort to increase program awareness, specifically through bill inserts and point of purchase displays, should be maintained. These efforts may be complemented by direct mailings to targeted areas (e.g. low-density retailer enrollment) or populations (e.g. home heating assistance eligible customers) to reach underserved markets.

h. Recommendation: The lag between product distribution and Energy Star certification suggests that sponsors might explore the ability of the implementation contractor to obtain information about new products slated to be introduced in retail stores.

i. Recommendation: To further increase efficiency of an already efficient program, the sponsors might establish guidelines for threshold dollar-amount invoices from the rebate/coupon processor and product fulfillment vendor.

j. Recommendation: Two out of five non-participating retailers were not aware of the program. Furthermore, two out of the three non-participant retailers who were aware of the program reported that they had not been contacted to participate.

k. The low level of program awareness among non-participating retailers leads us to recommend that the sponsors:

   - Establish a schedule of revisits for all non-participating retailers, and, with the exception of chain stores where corporate decisions may be the barrier, consider adding an enrollment incentive to the retailer offering;
   - Build and maintain list of decision maker contacts at each retail location, and approach them for both program implementation issues and evaluation information; and,
   - Develop a marketing package to non-participant retailers that includes retailer case studies, these evaluation findings, information on likely market shifts from EISA impacts.

l. The New Hampshire Residential Energy Star® Lighting database appears to be relatively well populated in the fields that are useful or necessary for evaluation purposes. We suggest the following mechanisms for improvement:

   - The number of lamps per data entry record in some cases is not clear. We recommend that a field be added to the dataset explicitly stating the number of bulbs per record;
   - Program sponsors may consider complementing the program with a scalable retailer incentive mechanism based data completeness and accuracy.

m. While the market has been substantially transformed over time, there is still a measurable difference between participant and non-participant measure adoption. We recommend continuation of program efforts to provide a seamless transition for emerging technologies, preserve the relationship and infrastructure investments made over many years, and to allow for continuous improvement within program management and administration.

2. Program Overview

Four New Hampshire electric utilities (NH Utilities) have collaborated to operate the New Hampshire Residential ENERGY STAR® Lighting Program (NH RESL) since 2002: National Grid, New Hampshire Electric Cooperative (NHEC), Public Service Company of New Hampshire (PSNH) and Unitil. The overall goal of NH RESL has been to raise the visibility of and increase the use and availability of energy efficient lighting products in order to build customers' demand for the products to the point that the market will become self-sustaining. The program is open to residential customers in New Hampshire and offers rebates for qualifying interior and exterior ENERGY STAR® bulbs and fixtures through both the NHSaves hard copy and web-based catalog (at a reduced cost) and through participating retailers (in the form of instant coupons and mail-in rebates).

Applied Proactive Technologies (APT) has been providing retailer recruitment and training, point of purchase and marketing materials and services to ensure the availability and visibility of ENERGY STAR® lighting products. Also, Energy Federation Inc. (EFI) has been providing catalog product fulfillment. The catalog was designed to raise customers' awareness of and demand for energy efficient lighting products and to highlight new lighting technologies. In addition, the program sets out to promote the energy efficiency and environmental benefits of the latest lighting technologies and leverage the ENERGY STAR® branding from the companion programs also offered in New Hampshire including ENERGY STAR® Homes, ENERGY STAR® Appliances, and Home Performance with ENERGY STAR®.

EFI also handles retail rebate processing and takes many steps to ensure that the sponsors' rebate amounts correspond to the products purchased and that the sponsors receive the most complete, high quality data from the rebate coupons as possible. EFI also records two different bulb counts, one being "Customer Reported" and the other being "EFI Estimated". The electric utilities have been consistently reporting program savings based on "Customer Reported". They realize this may be more conservative than the "EFI Estimated" count, but they are assuming that the customer has the most accurate information at the time they are filling out the rebate coupon. As part of this evaluation, KEMA reviewed the process and observed the following:

- If a customer leaves the "bulbs" field blank, EFI typically fills in the lowest quantity of bulbs associated with the completed rebate coupon. For instance, if a customer fills out a $3.00 rebate coupon (which is for 4-packs and 5-packs) and leaves the "bulbs" field blank, EFI will fill in the blank with "4-pack."

- If the customer provides a recognizable model number, EFI typically records the pack-size of this product based on the model number. This is recorded as the "theoretical count" value and is present in the database along with the customer-reported "bulbs" field.
- Although each rebate form clearly states the types of products for which it is intended, it is ultimately up to cashiers to decide whether to accept the rebate form for the products being purchased. There have been reported instances of a cashier providing a rebate of a higher value than the pack size purchased. For instance, a cashier might provide a $3.00 rebate (which is for 4-packs and 5-packs) when the customer provided a model number that is associated with a single bulb. When these instances occur, EFI only reimburses the store for the value of the coupon that should have been used--$1.00 in this case.

Table 4 presents the program savings assumptions and total program savings by measure type and program track (retail vs. catalog). Nearly 97% of 2009-2010 program savings resulted from products purchased using the in-store rebates offered at participating lighting retailers. More than 95% of the total savings were due to CFL purchases.

Table 4: 2009-2010 Program Tracking Savings and Assumptions

Annual Savings Inputs	CFLs	CFL Multi-Packs*	Interior Fixtures	Exterior Fixtures	Torch-ieres	LEDs	Total Savings
Retail							
In-Service Rate	80.3%	80.3%	96.4%	100.0%	93.5%		
Annual Hours	1241.0	1241.0	1241.0	1241.0	1098.7		
Delta Watts	40.8	163.2	85.3	85.3	95.0		
Savings Per Unit (kWh)	40.7	162.6	102.0	105.9	97.6		
Units	125,027	137,946	8,146	2,342	16	0	
Retail Savings Subtotal (MWh)	**5,083,365**	**22,434,510**	**831,270**	**247,918**	**1,561**	**0**	**28,598,625**
Catalog							
In-Service Rate	80.3%		96.4%	100.0%	93.5%	95.0%	
Annual Hours	1255.6		1255.6	1255.6	1262.9	1241.0	
Delta Watts	41.1		85.3	85.3	95.0	38.0	
Savings Per Unit (kWh)	41.4		103.2	107.1	112.2	44.8	
Units	14,644	0	1,979	574	100	1,300	
Catalog Savings Subtotal (MWh)	**606,832**	**0**	**204,326**	**61,477**	**11,218**	**58,240**	**942,092**
Combined							
Total Program Savings (MWh)	**5,690,197**	**22,434,510**	**1,035,596**	**309,395**	**12,779**	**58,240**	**29,540,717**

* CFL multi-packs were assumed to be packs of four in the tracking system and units represents the number of packs.

3. Evaluation Methodology

3.1 Impact Evaluation

3.1.1 Impact Evaluation Sample Design

The sample was designed so that, using data gathered during customer on-site surveys, we would be able to report statewide program savings with a precision equal to or better than +/- 10% at the 90% confidence interval for the overall results. While the surveys were designed to yield results allowing for any level of disaggregation represented in the sample, such as technology and utility, KEMA did not have pre-determined confidence interval targets therein.

Using data provided by NH Utilities, Table 5 illustrates the distribution of lighting measures purchased by program participation channel. Participation in the NH RESL program is dominated by households (92%) purchasing CFLs only, and the remaining households (8%) purchasing fixtures, torchieres, LEDs or a combination of measures. Ninety-five percent of the participants used retail coupons and the other 5% used catalog, mail or combinations of participation channels.

Table 5: Participant Proportions by Measures and Channels

Measure(s) Purchased	Catalogne or Mail & Multiple Channels	In Store, only	Grand Total	Proportion
CFL(s) only	1,473	77,059	78,532	92%
Fixtures, Torchieres, LEDs or Multiple Measures	2,751	4,361	7,112	8%
Grand Total	4,224	81,420	85,644	100%
Proportion	5%	95%	100%	-

Drawing from the proportions shown in Table 6, the allocation of 350 sample points were preliminarily selected and stratified by a) the categories of measures purchased and b) the participation channels.

Table 6: Proportional Allocation of CATI Sample for Participants

Measure(s) Purchased	Catalog or Mail & Multiple Channels	In Store, only	Grand Total	Proportion
CFL(s) only	6	315	321	92%
Fixtures, Torchieres, LEDs or Multiple Measures	11	18	29	8%
Grand Total	17	333	350	100%
Proportion	5%	95%	100%	-

A modified proportional sample design approach for RESL participants was then developed as shown in Table 7 whereby the proportion of participants by type of measures purchased were maintained but the number of participants using alternate program delivery channels was increased from 17 to 50. The modest oversample of 33 participants who participated in the program through catalog orders, mail-in rebate redemptions or by a combination of methods allowed for gathering information necessary for the process evaluation regarding the less-utilized channels. The oversample of 33 participants were allocated proportionately across type of measures purchased, i.e. 30 (92%) were from the CFLs-only category and three (8%) from the category of measures other than only CFLs. The oversampling plan, therefore, increased the proportion from 5% to 14% for households participating in the program through channels other than or in combination with using an in-store coupon.

Table 7: Final CATI Sample for RESL Participants

Measure(s) Purchased	Catalog or Mail & Multiple Channels	In Store, only	Grand Total	Proportion
CFL(s) only	36	285	321	92%
Fixtures, Torchieres, LEDs or Multiple Measures	14	15	29	8%
Grand Total	50	300	350	100%
Proportion	14%	86%	100%	-

It was expected that the goal for the 350 completed participant CATI surveys would yield a sufficient number of participants also willing to allow KEMA to conduct an on-site visit that

included lighting hours-of-use metering. The target was to complete a total of 75 on-site visits that would provide residential lighting metering data during summer hours.

3.1.2 On-site Data Collection

KEMA visited 75 participant homes to validate CFL installation, penetration and saturation rates and to learn current installation rates, hours of use, coincidence factors and changes in wattages. This information was to be captured to inform updates to the engineering estimates used to calculate program savings. While the study set out to conduct on-site visits at homes of 75 participants and 75 non-participants, another component involved installing lighting loggers in participant homes in order to capture hours of use information for all installed program products.

Potential recruits were identified through the Process Evaluation Participant and Non-participant Computer-Aided Telephone Interviews (CATI) discussed in Sections 3.2.3.4 and 3.2.3.5. At the conclusion of each successful phone survey, customers were asked whether they would be interested in participating in the on-site visit portion of the study. Those that expressed interest were contacted by a KEMA recruiter and an on-site visit was scheduled on a day and time convenient for the customer.

Table 8 shows the recruitment dispositions for the participant and non-participant calls. Only 83 of the 350 participants who completed a phone survey expressed interest in an on-site visit. Of these, only 43 customers scheduled a visit. To reach our goal of 75 participant on-site visits, the sponsors agreed to offer participating customers who refused a site visit (either during the phone survey or during the on-site recruiting effort) an incentive to change their minds. The remaining 32 participant on-site visits were made up of customers who allowed a visit after being offered an incentive.

Table 8 also shows that only 51 of the 350 non-participants who completed a phone survey expressed interest in a site visit. When KEMA attempted to contact those 51 non-participants, 20 of them either declined an on-site or could not be reached despite ten call attempts. Twenty-one of these homes were visited to gather socket count data to inform the statewide CFL saturation results.

Table 8: On-site Recruitment Dispositions

Sample Group	Quantity	Scheduled (with incentives)	Refused	Unable to Reach
Interested Participants	83	47 (4)	16	19
Disinterested Participants	267	28 (28)	122	117
Interested Non-participants	51	21	16	14

Information collected during on-site visits included: fixture type (wall, ceiling, desk lamp), bulb type (CFL, incandescent, halogen), bulb shape (spiral, A-bulb, flood), socket type (screw, pin, candelabra), wattage, and specialty characteristics (dimmable, 3-way) for all installed lighting products by room type. Similar information was also gathered for all CFLs that were kept in storage. Whenever possible, KEMA recorded the manufacturer, model number, year of purchase, and store of purchase for all installed and stored CFLs. For all installed non-CFL products, KEMA asked customers about the likelihood of installing CFLs in their residence upon burnout.

Each on-site customer was also asked a series of questions subsequent to the socket count data collection such as the age of the home, the likelihood of purchasing CFLs for immediate use vs. stockpiling and storing for use at a later time, the frequency with which they replace CFL fixtures (interior and exterior), and the extent to which the program has influenced the purchase of non-rebated CFL products. The on-site survey instrument is provided as an Appendix to this report.

3.1.3 Impact Evaluation Program Lighting Metering

The information gathered through this task facilitated an update to the input parameters used to track and calculate program savings; including installation rates, hours of use, summer and winter coincidence factors, and wattage reductions.

A key step in updating these estimates involved selecting an appropriate sample size necessary to achieve the ±10% relative precision at the 90% confidence interval, as stated in the RFP. However, ISO-NE FCM compliance only requires ±10% relative precision at the 80% confidence interval for summer and winter coincidence factors. We used the appropriate confidence interval for each parameter to estimate the required sample size using the following equation:

$$n_0 = \left(\frac{z \times cv}{P} \right)^2$$

where,

n_0 = the required sample size before adjusting for the size of the population,
z = a constant based on the desired level of confidence, e.g., 1.645 for the 90% confidence level and 1.282 for the 80% confidence level,
cv = the anticipated coefficient of variation,
P = the desired precision

The coefficient of variation (cv), or error ratio, is of central importance to this sample design. A cv of 0.5 is used for similar or homogeneous measures with very little or no differences. A cv of 1.0, on the other hand, is used for measures that are very different or heterogeneous.

Based on historical data from residential lighting program evaluation work that KEMA has performed in the northeast United States, the appropriate error ratios and sample sizes for each parameter are shown in Table 9. The sampling unit (n_0) represents the number of unique lighting schedules since the coincidence factors and hours of use depend upon schedule rather than the number of products or homes. Therefore, if two program products were installed on the same switch, only one logger will be installed to gather hours of operation for those two products. We predicted that program products would be installed on an average of four unique schedules per home.

Table 9: Error Ratios and Sample Sizes

Parameter	z	cv	P	Error Ratio, n_0	Adjusted Sample Size
Summer CF	1.282	2.15	10%	760	190
Winter CF	1.282	1.17	10%	225	56
Hours of Use	1.645	1.04	10%	293	73
In-Service Rate	1.645	0.95	10%	244	61
Delta Watts	1.645	0.56	10%	85	21

Lighting loggers were installed on all program products installed at a sample of 75 homes to achieve the desired precision for the winter coincidence factor, hours of use, installation rate, and delta watts. This target was based on the assumption that an average of four loggers per

site would need to be installed to capture unique schedules in each of the 75 homes to yield a total of 300 schedules. Lighting loggers were only installed on products that could be logged safely and reasonably and included three primary lighting types: CFLs, energy efficient fixtures, and torchieres. After a minimum of 2 weeks of metering, the loggers were removed for data retrieval and analysis. Due to the timing of the study, the lighting loggers could not be installed during winter peak hours; they were installed during summer peak hours, as per the ISO-NE FCM peak hours defined below:

Summer Peak- 1-5 PM, non-holiday weekdays in June, July, and August;

Winter Peak- 5-7 PM, non-holiday weekdays in December and January

It has been our experience that lighting use is driven primarily by daylight hours. In addition to the variability of daylight hours over the course of a year, there are other seasonal factors that also affect summer lighting usage such as vacations and warmer weather resulting in people being outdoors more often in the summer than during other seasons. Both of these factors may cause hours of lighting use to decrease during the summer. To capture these effects, KEMA recommended logging in the summer. Assuming an average of four unique schedules could be captured at each home, a sample of 75 would achieve ±16.0% relative precision at the 80% confidence interval. Three unique schedules would achieve ±18.4% relative precision.

During the winter peak months of December and January, it is dark 100% of the time from 5-7pm. During both April and June, the sun will not set until after 7pm in New Hampshire. The methodology used to calculate a winter coincidence factor using summer data is described in detail in the 'Summer and Winter On-Peak Coincidence Factors' section below.

3.1.4 Impact Evaluation Savings Calculation Methods

This section presents the methodology used to calculate program savings and summer and winter peak coincidence factors. The core activity used to inform these savings estimates involved data collection during on-site visits. The analysis was performed in a spreadsheet based upon all of the on-site information gathered for each program lighting product purchased in the participant homes that were visited.

In-Service Rate

The in-service rate was calculated by dividing the number of products that were still installed at the time of each on-site visit by the number of products that all of the participants in the on-site sample received through the program. Products that were not installed at the time of the visit and whose disposition could not be recalled by the customer were considered to be "not installed."

Delta Watts

Delta watts values, or wattage differentials, were calculated by subtracting the wattage of each program product by the wattage of the product that it replaced, as reported by the customer. While customers were generally able to provide pre-program wattages for most program products, there were some instances in which program products were installed in new applications or the customer was unable to recall what the program product had replaced. In such instances, the average replaced wattage reported by those customers who had been able to provide a response was used as the pre-program wattage for those unable to answer, as shown in Table 10[4] below. For example, if a 14-watt CFL was installed in a new lamp and the wattage of the removed bulb could not be provided, it was assumed to have replaced a 58.4-watt bulb.

[4] Based on the ENERGY STAR® lighting assumption that a CFL replaces an incandescent bulb that is four times its wattage, as found at: http://www.energystar.gov/ia/products/lighting/cfls/downloads/CalculatorCFLs.xls.

Table 10: Customer-Reported CFL Replacement Wattages

CFL Wattage	n	Average Replaced Wattage	Incandescent Equivalent Wattage[5]
9	30	56.0	40
13	61	55.7	60
14	233	58.4	60
15	28	63.9	60
19	9	66.1	75
20	9	59.1	75
23	37	57.1	75
26	16	69.1	100
30	3	100.0	150
32+	4	150.0	150

For comparison, the table also shows, in the right-most column, the incandescent equivalent wattages corresponding to those for each replaced by a CFL, as published by ENERGY STAR®. It is interesting to note that the sample average replacement wattages were found to be:

- much higher than the ENERGY STAR® assumption for low wattage CFLs (9 watts),
- about the same for medium wattage CFLs (13-15 watts), and
- somewhat lower for high wattage CFLs (19+ watts), in general.

[5] http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/LightingCalculator.xlsx.

Hours of Use

To calculate annual hours of use, we applied two independent analytical approaches to the time-of-use data. In the first approach, we expanded the logger data to represent an entire year using the percentages in Table 11 from the extended metering study performed by RLW Analytics (now part of KEMA) in 2004-2005[6]. For instance, if a particular logger was installed from August 1 through August 31, the logger hours of operation would be divided by 7.37% to annualize the logger hours.

Note that all of the loggers were installed for at least two weeks in August 2011 and many were installed for the whole month. To annualize the data when loggers are installed for only part of a month, we assign daily percentages to the logger data for each day a logger was installed by dividing the percentage from the table below by the number of days in that particular month. For example, if a logger was installed in July, the hours from this logger would be divided by 0.22452% (6.96% divided by 31 days) for each day the logger was installed in July. If this same logger was removed in September, the logger hours would be divided by 0.23774% (7.37% divided by 31) for each day in August and by 0.267% (8.01% divided by 30) for each day in September.

Table 11: Proportion of Lighting Hours of Use by Month

Month	Total Hours	% of Total Annual Hours	Month	Total Hours	% of Total Annual Hours
January	97.3	9.76%	July	69.3	6.96%
February	79.9	8.01%	August	73.5	7.37%
March	87.0	8.73%	September	79.8	8.01%
April	76.7	7.69%	October	92.4	9.27%
May	74.7	7.49%	November	96.8	9.71%
June	71.5	7.18%	December	97.9	9.82%

As previously indicated, we also employed a second method for annualizing lighting logger hours and estimating winter peak coincidence factors from summer data and vice versa. In this

[6] http://publicservice.vermont.gov/energy/ee_files/efficiency/eval/marivtfinalresultsmemodelivered.pdf, Page 5.

second approach, we estimated lighting profiles using the same methodology that KEMA developed for the 2006-2008 CPUC evaluation[7]. Though more details can be found in the preceding references, we provide a brief overview of the second analysis approach below.

In short, the first analysis method used assumed that the hours of darkness were evenly distributed across a given calendar month of the year. If, instead, we represent the hours of darkness over the course of a year using a sinusoidal function, we can reconstruct an annualized series of greater resolution by using the data from lighting loggers that were only in place during a fraction of the year. To better represent the annual seasonality, the sine wave is at its peak at the winter solstice (December 21) and at its trough at the summer solstice (June 21), as shown in Figure 2.

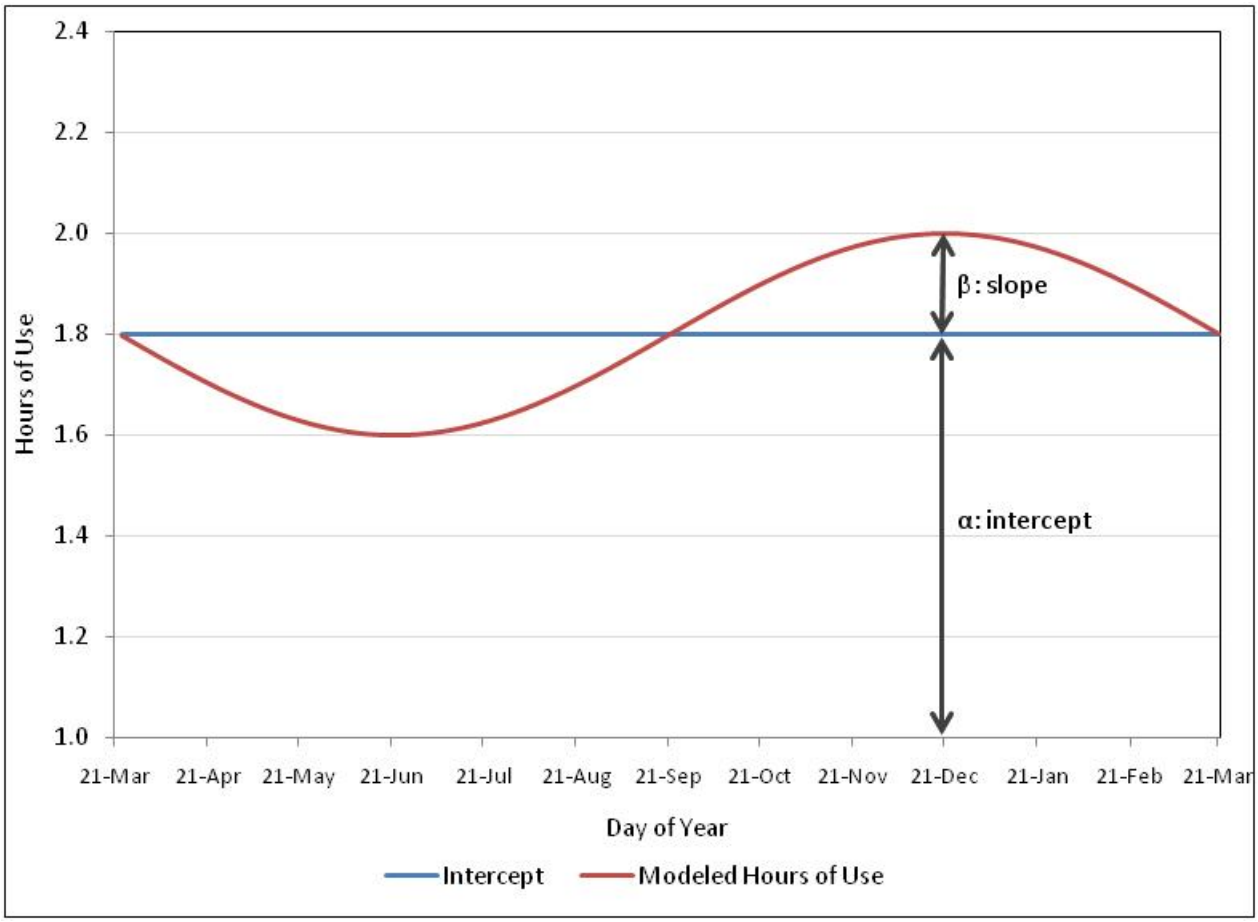
The x-axis shows the day of the year, and the y-axis presents projected daily hours of use. The sinusoid shape is a close approximation to hours of darkness along the year. In addition, it exhibits a number of convenient features:

- The intercept of the weekday (weekend) model is the average weekday (weekend) use over the year;
- The slope of the sinusoid model is the difference between use on the solstices (the days of minimum and maximum daylight) and the average use.

The sinusoidal model was used to produce an estimate of the daily hours of use for each logger and for each day type.

[7] *Final Evaluation Report: Upstream Lighting Program, Vol 1, CALMAC CPU0015.01.* http://www.calmac.org/publications/FinalUpstreamLightingEvaluationReport_Vol1_CALMAC_3.pdf

Figure 2: Illustration of Sinusoidal Model



To simplify the following discussion, however, we will omit the choice of day type from the equations. The equation for estimating the daily hours of use for each logger is as follows:

$$H_{id} = \alpha_i + \beta_i \sin(\theta_d) + \varepsilon_{id}$$

where

H_{id}	=	Hours of use for logger *i*, on day of the year *d*
α_i	=	Intercept coefficient for logger *i*
β_i	=	Sinusoid coefficient for logger *i*
θ_d	=	Angle for day of the year *d*, with $\theta_d = 0$ at spring and fall equinox, $\theta_d = \pi/2$ on December 21, and $\theta_d = -\pi/2$ on June 21
ε_{id}	=	Residual error.

By using the above model and factoring in the day types (e.g., weekdays and weekends/holidays), the average annual daily hours of use are calculated by taking a weighted average of all of the reconstructed annualized series.

Summer and Winter On-Peak Coincidence Factors

This section discusses the methodology used to determine the seasonal adjustment necessary to calculate a winter coincidence factor using summer data. First, to calculate the average summer seasonal peak coincidence factor for each logger, we first calculated the coincidence factors for the non-holiday, weekday hours for the hours of interest (hour ending 14 through 17) during which lighting loggers were in place in July and August. Although the summer peak begins in June, the timing of this study prevented any loggers from capturing June data.

Since loggers in this study gathered data during the summer, only, it was necessary to estimate a winter seasonal adjustment factor to apply to the summer logger data. To determine the average winter seasonal peak coincidence factor for each logger dataset, we began by identifying the unweighted ISO-NE On Peak coincidence factors for the winter hours of interest (hour ending 18 and 19) during the ISO-NE winter seasonal peak months (December and January) and the summer seasonal peak months (June, July, and August), using the findings of a Coincidence Factor Study performed by RLW Analytics in 2007[8].

As shown in Table 12, a simple average of the December and January averages yields a winter seasonal average of 28.7 percent while the simple average of the July and August averages yields a summer seasonal average of 11.8 percent. The ratio of winter and summer seasonal averages, or 2.431, was multiplied by the summer coincidence factors to estimate the winter coincidence factors for each logger.

[8] Coincidence Factor Study Residential and Commercial Industrial Lighting Measures, RLW Analytics Inc., Spring 2007, pp. 10-11. http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/National%20Grid/116_RLW_CF%20Res%20C&I%20ltg.pdf.

Table 12: Winter and Summer On-Peak Adjustment Factors

Hour Ending	NECPUC December	NECPUC January	NECPUC July	NECPUC August
18	27.0%	28.2%	10.6%	11.0%
19	27.6%	32.0%	13.1%	12.6%
Average of Hours	27.3%	30.1%	11.8%	11.8%
Seasonal Average	**Winter**		**Summer**	
On-Peak Adjustment Factor	28.7%		11.8%	
Ratio of Winter to Summer On-Peak Adjustment Factors	2.431			

Using the second analysis method described in the Hours of Use section, we have taken the sinusoidal model one step further to provide hourly resolution and, thereby, estimate peak coincidence factors. More specifically, we estimate the percent of time on in each hour of the day as a function of a sinusoidal wave. Thus, the percent on for each logger, for each day of year, and for each hour of day is estimated by:

$$pct_{idh} = \alpha_{ih} + \beta_{ih}\sin(\theta_d) + \varepsilon_{idh}$$

where

pct_{idh} = Percent on for logger *i*, on day of the year *d*, at hour *h*

α_{ih} = Intercept coefficient for logger *i*, hour *h*

β_{ih} = Sinusoid coefficient for logger *i,* hour *h*

θ_d = Angle for day of the year *d*, with $\theta_d = 0$ at spring and fall equinox, $\theta_d = \pi/2$ on December 21, and $\theta_d = -\pi/2$ on June 21

ε_{idh} = Residual error.

The above method enables us to produce lighting profiles for each hour of the year and, then, estimate peak coincidence factors by projecting use during the peak periods for summer and winter. Taken another step further, this method provided adjusted confidence intervals for the estimated hours of use and peak coincidence factors. Since multiple loggers were installed in the same home, they cannot be treated as completely independent from one another. We account for this fact when calculating confidence intervals around the estimates as follows: To address the clustering effect, we use a procedure to produce corrected standard errors that are estimated using a Taylor series. With these corrections, we are able to generate 90%

confidence intervals for the estimates of annual hours of use and 80% confidence intervals around the summer and winter peak coincidence factors.

Annual Savings (kWh) and Realization Rate

Using many of the parameters described above, annual kWh savings are calculated for each installed program product using the following formula:

$$AnnualkWh = \left(\frac{\text{Delta W} \times HOU \times 365}{1000} \right)$$

where

$Annual\ kWh$	=	Annual kWh Savings
$Delta\ W$	=	Differential wattage between the program product and the replaced product
HOU	=	Annual hours of use as calculated from the logger data
365	=	Days per year (to annualize the calculation)
$1{,}000$	=	Watts per kilowatt (to convert to kWh)

To calculate savings at the program level, the resulting annual kWh savings, above, is multiplied by the quantity of products sold through the program and the in-service rate calculated from the on-site visits. Finally, the realization rate can be determined simply by dividing the calculated annual savings by the tracking savings for all of the sampled sites.

3.2 Process Evaluation Methodology

3.2.1 2009 Tracking Data Review

KEMA reviewed the program tracking system database maintained by Energy Federation Inc. (EFI), who provided the database on behalf of the sponsors. The database review was intended to answer on the following questions:

- Do the databases contain all necessary fields for program tracking, evaluation and energy savings calculations?
- Are the data complete such that the necessary fields have been populated?

- What is the quality of the data? Are the data in a consistent format that allows for analysis and reporting (e.g., units identified and consistent, mutually exclusive categories)?

3.2.2 Process Evaluation Sample Design

3.2.2.1 Participant Sample Design

For the purposes of this evaluation, program participants were defined as customers in the program-tracking database that had utilized an instant discount or submitted a mail-in rebate. The instant discount was available when customers purchased qualified lighting products by placing an order through the catalog or website, or by using a coupon at a retailer. The mail-in rebate was available to customers that purchased qualified lighting fixtures at a retailer. As previously discussed in 3.1.1, the final design for the sample frame of participants was as shown in Table 7.

3.2.2.2 Non-participant Sample Design

A program non-participant was defined as a customer that had not participated in the NH Residential ENERGY STAR® Lighting Program in the past five years. To the extent possible, KEMA also excluded those customers that occupy ENERGY STAR® new homes. The KEMA team used the residential customer datasets obtained from each utility to develop the sample frame of non-participants. Table 13 illustrates the sample design for the CATI survey of non-participants that KEMA developed using data provided by the utilities. KEMA used a stratified random sample design, using electric utility and county as stratification variables. The sample was allocated across utilities proportional to the budget split for the evaluation. Counties were used as a stratification variable to ensure geographic distribution of the sample across the state. The goal for the CATI for non-participants was 350 completed surveys--it was thought that this number would be sufficient to yield enough willing to participate in an on-site to reach a total of 75 completed on-site visits.

Table 13: Sample Design for Non-participants

County	Census Population	% Pop	Electric Utility				Grand Total	% Sample
			National Grid	NHEC	PSNH	Unitil		
Belknap	61,102	4.6%		5	14		19	5.4%
Carroll	47,591	3.6%		8	9		17	4.9%
Cheshire	77,174	5.9%	2		18		20	5.7%
Coos	32,217	2.5%			9		9	2.6%
Grafton	85,626	6.5%	8	7	7		22	6.3%
Hillsborough	402,576	30.6%	3		102		105	30.0%
Merrimack	148,156	11.3%		1	20	16	37	10.6%
Rockingham	296,680	22.6%	7	3	44	25	79	22.6%
Strafford	121,656	9.3%			31		31	8.9%
Sullivan	42,641	3.2%	1	1	9		11	3.1%
Grand Total	1,315,419	100%	21	25	263	41	350	100.0%
Proportion from Sponsor			6.0%	7.1%	75.1%	11.7%	100.0%	-

3.2.2.3 Retailer Sample Design

The sample frame for participating retailers was developed from the program-tracking database. Retailers were aggregated into tiers based on their volume of in-store coupons processed in 2009. The tiers varied in store composition, as expected, with the lower-volume tiers including many hardware or supply stores, and the higher-volume tiers including fewer, but larger, home improvement stores. The top tier of 10% of retailers accounted for 46% of the in-store coupons processed, as shown in Table 14. One retailer from each tier was randomly selected to be interviewed, with an effort of diversifying geographically. All retailers selected as participating retailers were currently participating in the program.

Table 14: Sample Design for Participating Retailers

Tier	Typical Store Type	Retailers n=109	Program Participation per Tier n=105, 848
1	Hardware/Supply	30%	1%
2	Hardware/Supply	25%	3%
3	Hardware/Supply	20%	16%
4	Home Improvement	15%	35%
5	Home Improvement	10%	46%
All	Combined	100%	100%

The sample frame for non-participating retailers was based on the database obtained from Applied Proactive Technologies (APT). Non-participating retailers to be interviewed were selected to represent the same types of stores as in the participating retailer sample and to be geographically dispersed.

3.2.3 Process Evaluation Data Collection

The evaluation team conducted several activities to gather information to estimate market saturation, awareness, drivers and barriers, satisfaction and remaining opportunities. A major source of information for the process information was gathered using Computer Aided Telephone Interview (CATI) surveys with some additional in-depth interviews as follows:

- In-depth interviews of four NH Utilities implementation staff members, 1 each;
- In-depth interviews of the two hired implementation contractor staff members, 1 each;
- Phone interviews of retailer representatives, 5 participating and 5 non-participating;
- CATI surveys of program participants, 350 NH Utilities customers; and
- CATI surveys of non-participants, 350 NH Utilities customers.

Survey instruments were developed to include, as appropriate, questions phrased similarly to those questions used in the 2003 Evaluation of the New Hampshire Residential Lighting Program[9] and the Technical Potential Study[10] to facilitate comparisons between studies.

[9] http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/PSNH/NH%20Lighting%20Process%20and%20Impact%202003%20Final%20Report%20EXEC%20SUMMARY.pdf

[10] http://www.puc.nh.gov/Electric/GDS%20Report/GDS%20Final%20Report.htm

Additional survey questions were added to gain an understanding of perceptions regarding the Energy Independence and Security Act (EISA); these were phrased similarly to the questions used in the 2009-2010 Residential Lighting Market Research Study[11] for the Northwest Energy Efficiency Alliance.

3.2.3.1 Implementation Staff Interviews

The objectives of this task were to assess, from the program managers' perspectives, how well the program has been operating, to identify the aspects that ran smoothly and effectively and any issues that need to be addressed. The interview guide is provided in Appendix A. Interview results were combined with other findings to inform the evaluation and describe the program's operations and issues. The interviews of the program managers were also used to inform and augment the participant and non-participant survey effort by providing additional detail regarding New Hampshire's lighting market as well as program operations and communications.

KEMA interviewers conducted three interviews with NH utility program implementation staff to obtain information on program history, objectives, logic, communications, and operations. We also reviewed program-marketing materials. The interviews addressed utility staff perspectives on program strengths, perceived weaknesses (from all perspectives), and what issues they hoped the process evaluation would address. Program staff are often well aware of any issues associated with their programs and can be insightful regarding specific solutions (and barriers to implementing these solutions). If these staff had specific needs, wants or concerns pertaining to the evaluation goals, KEMA considered these objectives in addition to others identified by the NH utilities. We completed staff interviews via telephone to best utilize project resources.

3.2.3.2 Hired Contractors Interviews

KEMA conducted two in-depth interviews with representatives of the program's hired implementation contractors (APT and EFI). These interviews focused on program objectives, communications, and operations as well as their perceptions of the program's strengths and weaknesses. These interviews are important for both the process and impact evaluation, as representatives of these organizations may be closer to the lighting products discounted by the program as well as to the conditions in participating retail stores; their perspectives are thus

[11] http://neea.org/research/reports/10-216_Lighting.pdf

essential to a thorough evaluation. The interview guides for the implementation contractors APT and EFI are provided in Appendices B and C, respectively.

The interview with the retail implementation contractor included the following:

- Overall retailer response to the program
- Retailer recruitment and experiences
- Management of qualified products
- ENERGY STAR® brand
- Program benefits for retailers
- Program reporting system
- Suggestions for program improvement

The interview with the catalog fulfillment contractor included the following:

- Order fulfillment processes
- Coupon and rebate processing
- ENERGY STAR® brand
- Quality assurance procedures
- Program reporting system
- Suggestions for streamlining or otherwise improving processes

3.2.3.3 Retailer Representatives Interviews

KEMA conducted ten phone interviews with representatives of retailers that sell lighting products; five with participating retailers and five with non-participating retailers. The retailers were asked to comment on their satisfaction with NH RESL and provide their perspectives on the effects of CFL promotions on sales, availability, diversity, price, quality, and consumer acceptance of CFLs, with a particular focus on the program's CFL promotions. They were also asked for their opinions on remaining CFL market barriers and potential effects of the 2007 EISA energy bill. The interview guides for the participating and non-participating retailer representatives are provided in Appendices D and E, respectively.

3.2.3.4 Participant CATI Surveys

The KEMA team conducted 350 CATI surveys with program participants to verify measure installation and evaluate program delivery effectiveness, market conditions, program impacts, and demographic characteristics. It was assumed that every five completed calls would result in one recruited home for the on-site and metering components of the study. In addition to this recruitment function, the surveys were also intended to focus on obtaining detailed information to help the NH utilities understand the typical profiles of participating and non-participating customers. The participant interviews were designed to cover the following issues:

- Verification of information contained in the program tracking database:
  - Type and quantity of program measure(s) purchased
  - Address where program measure(s) were installed
- Program awareness and satisfaction:
  - Program CFL(s) and fixture(s) installed
  - Program marketing (POP materials, catalog, etc)
  - Program processes, paperwork, interactions with program staff, if applicable
  - The program as a whole
- Non-Program purchases
  - Estimated number of CFLs and CFL fixtures in the household
  - Satisfaction with CFLs and CFL fixtures
  - Likelihood of purchasing more CFLs and CFL fixtures
- Awareness and interest in new lighting products such as LEDs
- Awareness and understanding of Energy Independence and Security Act (EISA)
- Demographics and household characteristics
- Recruiting for on-site visits and metering

The CATI survey instrument for NH RESL program participants is provided in Appendix F**.**

3.2.3.5 Non-participant CATI Surveys

The KEMA team also conducted 350 surveys with program non-participants to assess awareness of lighting measures and to recruit 75 households for the on-site visits of the impact evaluation.

The non-participant interviews were designed to cover the following issues:

- Confirmation of not having participated in program in past 5 years
- Awareness of CFLs and CFL fixtures
- Program awareness (i.e. marketing materials, NH Saves catalog, etc)
- Reasons for not participating if aware
- Past and present use/purchase of CFL bulbs and fixtures
  - Estimated number of CFLs and CFL fixtures in the household
  - Satisfaction with CFLs and CFL fixtures
  - Likelihood of purchasing more CFLs and CFL fixtures
- Awareness and interest in new lighting products such as LEDs
- Awareness and understanding of Energy Independence and Security Act (EISA)
- Demographics and household characteristics
- Recruiting for on-site visits

The CATI survey instrument for non- participant customers of NH Utilities is provided in Appendix G.

4. Evaluation Results

4.1 Impact Evaluation and CFL Saturation Results

This section describes the impact evaluation and CFL saturation results, as informed by on-site visits to a total of 96 homes in New Hampshire. The on-site survey instrument used for this study is provided in Appendix H.

4.1.1 Impact Evaluation Results

The impact evaluation results are informed by the data gathered at the homes of 75 participants. A total of 901 program products were received by these participants for an average of 12.0 products per sample point. This is higher than the 10.2 products per participant found in the program population and is due to the fact that customers who purchased higher numbers of program products were targeted during the on-site recruitment phase so that 300 or more loggers could be installed in the 75 homes while staying within the evaluation budget.

Thirty-eight of the products captured by the sample were removed from the analysis due to customer reports that they "could" be installed in other locations in New Hampshire inaccessible to our auditors. Two of these products were given away, while the other 36 were received by three customers who own/maintain apartment buildings and said that the program products "could" be in tenant spaces. Due to the fact that the installation of these products could not be observed, they were removed from the analysis altogether.

To account for the oversampling of participants that purchased large quantities of products, the results were weighted by splitting the participant population into two groups; large quantity purchasers and small quantity purchasers. To determine the cut-off point between those groups, the total number of products purchased (705,912) was divided in half (352,956). The quantity of purchases made by each customer were then tallied and sorted in ascending order and their sum product was used to determine the quantity of purchases at which this cut-point was reached.

This cut-point was found to be approximately 12 products. Therefore, customers with fewer than 12 purchases were considered "small purchasers" and customers with 12 or more

purchases were considered “large purchasers.” Using this cut-point, the results are weighted using the weights provided in Table 15 below.

The measure weights provided below are used to calculate results that are typically not dependent on measure type. Inputs such as hours of use and summer and winter coincidence factors are dependent on room location and hours of daylight. Inputs such as in-service rate and delta watts, however, can greatly depend on measure type. Due to the fact that the sample (and population) is heavily dominated by CFLs, a participant CFL weight was calculated to determine CFL annual savings inputs. Using the same method described above for all measures, the CFL-only cut-point was also determined to be approximately 12 products.

Table 15: Participant Weights

Participant Group	Sample	Population	Sample Weights
All Measures			
Large Purchasers	17	14,563	856.6
Small Purchasers	58	71,081	1,225.5
CFLs Only*			
Large Purchasers	24	14,216	584.2
Small Purchasers	49	71,428	1,466.1
* Two customers in the sample did not purchase any CFLs through the program.			

Quantity Adjustment

We based this impact study upon an EFI database of lighting activity. However, the database did not contain a definitive product quantity field. As discussed in the “New Hampshire ENERGY STAR® Residential Lighting Program Tracking Data Review” Memo (Appendix I of this document), there are two fields in the in-store rebate dataset which contribute to the quantity of products purchased; ‘Bulbs’ and ‘Product Pack Size’. While the ‘Product Pack Size’ field is rather self-explanatory, the ‘Bulbs’ field was not well defined and could be interpreted either as the total number of bulbs purchased or as the total number of packages purchased.

If the first interpretation had prevailed, then the numbers in this field would have been divisible by the ‘Product Pack Size’ field. In many cases, however, this was not true. For instance, there are numerous cases where the ‘Product Pack Size’ field indicates that a six-pack of CFLs was

purchased. For many of these instances, the 'Bulbs' field indicates that six or twelve bulbs were purchased; implying that one or two packages were purchased. However, in some cases the 'Bulbs' field indicates that fewer than six bulbs were purchased, while in others it reports that seven or ten bulbs were purchased.

If the second interpretation had prevailed, where the 'Bulbs' field was used to represent the total number of packages purchased, then the product of this field and the 'Product Pack Size' field would have equaled the total number of bulbs purchased. Again, in many cases, this was not true, either. Making this assumption would have lead to nearly 450 cases where 324 products were purchased in one visit and nearly 5,000 cases where 144 products were purchased in one visit; this outcome was deemed highly unlikely.

Although the sponsors reported that the 'bulbs' field is to be used to determine the product quantities when applying program savings, applying this assumption uniformly would have allowed for the possibility of underestimating program savings. In order to avoid missing program savings, we instructed field staff to inquire with each customer about the minimum and maximum of program products based on the pack size. For instance, if the 'bulbs' field for a particular purchase contained a "4" and the 'product pack size' field contained a "4", the auditor was instructed to inquire whether four, eight, twelve, or sixteen products had been purchased and verified quantities were adjusted as follows:

- If one to four were reported to have been purchased by the customer and were found in the home, then only four were included in the analysis.
- If five to eight products were reported by the customer and found in the home, then eight products were included in the analysis.
- If nine to twelve products were reported by the customer and found in the home, then twelve products were included in the analysis.
- If 13 to 16 products were reported by the customer and found in the home, then 16 products were included in the analysis.

Knowing that the 'bulbs' field was crucial to the sponsors' calculated program savings, it became necessary to adjust this quantity based on what was found by the auditors and reported by customers in the field. These adjustments were calculated as shown in Table 16 below

whereby the actual number of lighting purchased through the program was found to be more than a third greater than the number suggested by the tracking data alone.

Table 16: Sample Tracking Quantity Compared to On-site Quantity by Measure

Measure Type	Tracking System Quantity	On-site Quantity	Quantity Adjustment
CFLs	626	844	134.8%
Interior Fixtures	11	11	100.0%
LEDs	7	8	114.3%
Total	644	863	134.0%

Some possible reasons why customer-reported bulb quantities might be lower than the quantities actually purchased are provided below:

- **Customers may be entering the number of packages purchased instead of the number of bulbs.** A customer may purchase THREE four-packs and only fill out ONE rebate form and write in the number '3' as the quantity purchased, when they actually purchased 12 products.

- **Customers could be using one rebate form for multiple pack purchases.** For instance, a customer may use ONE $3.00 rebate form for the purchase of THREE 4-packs and write '4' in the bulbs field when they actually purchased 12 products.

- **Customers may leave the "bulbs" field blank on the rebate form.** When this occurs, EFI typically assumes the lowest quantity of bulbs associated with the completed rebate coupon. For instance, if a customer fills out a $3.00 rebate coupon intended for 4-packs and 5-packs, but leaves the "bulbs" field blank, it is assumed that a 4-pack was purchased.

- **Customer may use a single-pack rebate form when purchasing more than one product.** This may happen because the store has run out of the appropriate forms, has moved the products to a different location in the store without also moving the forms, or because the customer did not read or understand the different forms and simply used the wrong one. If a customer were to do this and leave the "bulbs" field blank, EFI would default to one product when the customer may have actually purchased 10 or 12 products.

Since the quantity discrepancies were discovered by KEMA for the 2009-2010 programs, the NH Utilities have recently taken the following steps to alleviate some of discrepancies:

- The sponsors have created training sessions for participating retailer staff regarding the proper use of the rebate forms to reduce the incidence of rebate form/product purchase mismatches.

- The sponsors redesigned the rebate coupons to include more recognizable color patterns and text in hopes of improving the rate of customers selecting the correct rebate forms for their purchases. The new coupons include an easily recognizable "starburst" that explains what pack sizes each rebate form can be used for, as shown in Figure 3.

Figure 3: 2012 Program Instant Rebate Coupon

In-Service Rate

The in-service statuses of the 863 products received by the sample used for the impact analysis are provided in Table 17 below. Nearly 27% of the products purchased by the sample were not found installed and the customers could not recall what may have happened to them or whether they were purchased at all. Nearly 13% were found in storage and one CFL was reported to have burned out in March of 2011. The CFL in-service rate of 62.3% and overall in-service rate of 61.7% have been weighted using the weights provided in Table 15.

While these results are generally lower than the current program assumptions of 80.3% for CFLs, 96.4% for interior fixtures, and 95.0% for LEDs, the sample sizes are very small for both interior fixtures and LEDs. For this reason, we recommend retaining the current in-service rate assumptions for these products.

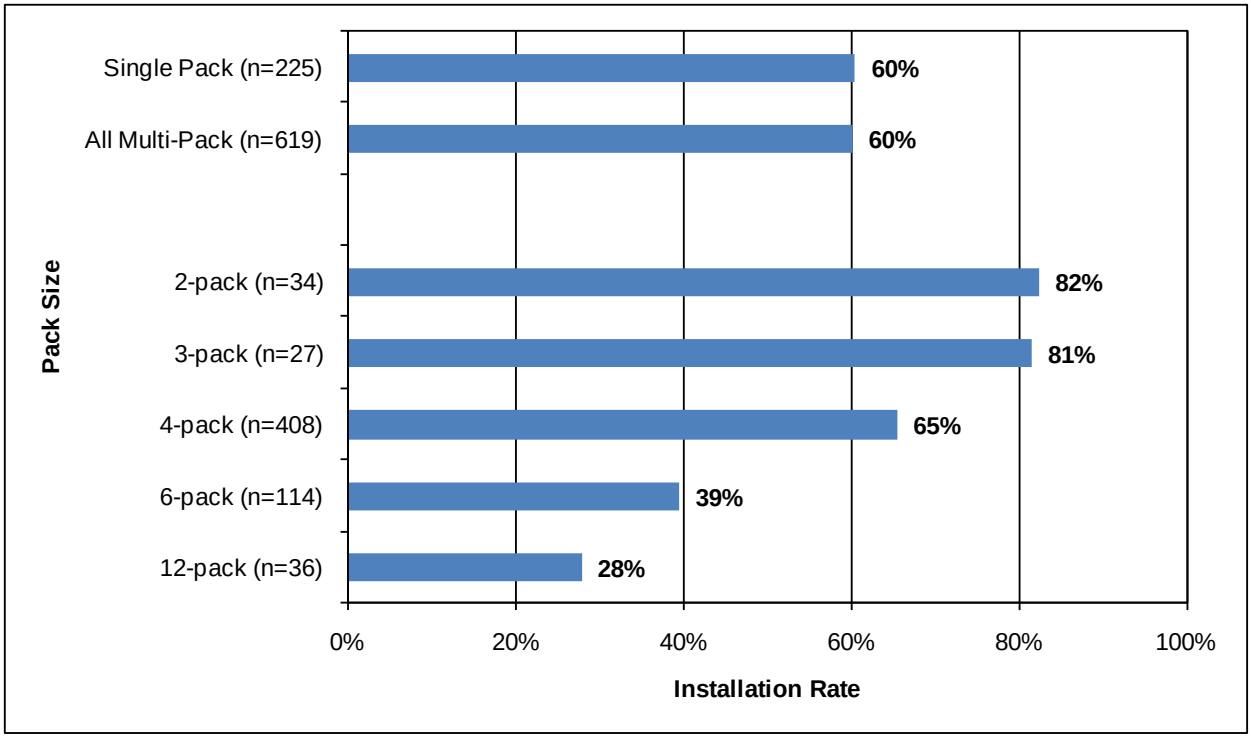
Table 17: In-Service Rate Results

Product Status	CFLs (n=844)	Interior Fixtures (n=11)	LEDs (n=8)	All (n=863)
Installed	62.3%*	90.9%	50.0%	**61.7%***
Relative Precision (±10% at 90%CI)	±4.4%	±27.3%	±58.0%	**±4.5%**
Why Not Installed?				
Not Found/Customer Did Not Know	26.7%	9.1%	50.0%	26.7%
In Storage	13.0%	0.0%	0.0%	12.7%
Burned Out	0.1%	0.0%	0.0%	0.1%

* These results are weighted as described above; the simple average for CFLs is 60.2% and the overall simple average is 60.5%.

Figure 4 shows the installation rate of program CFLs according to the number of CFLs sold per package. In general, CFLs from smaller packs have a higher installation rate than those from larger packs--except for single pack CFLs which had an installation rate of 60 percent. Overall, single packs and multi-packs had identical installation rates.

Figure 4: Installation Rates by CFL Package Size



Without conducting a survey at the point of purchase, we cannot be sure what motivated participants to purchase the six and twelve multi-packs when fewer than half were found to be installed.

Delta Watts

Table 18 presents the on-site observed inputs for wattage displaced by the installed program products. The weighted average differential wattage for CFLs is 46.1 watts with ±3.6% precision at the 90% confidence interval. Across all program products, the weighted average delta watts is 45.8 watts with a precision of ±3.6% at the 90% confidence interval. The delta watts results for CFLs compare favorably against the 2009-2010 program assumption of 41.1 watts and even more favorably against the 2012 program assumption of 31.5 watts.

It is important to note that due to the small sample sizes for interior fixtures and LEDs, we recommend retaining the current delta watts assumptions for these measures.

Table 18: Delta Watts Results

Product Status	CFLs (n=508)	Interior Fixtures (n=10)	LEDs (n=4)	All (n=522)
Delta Watts	46.1*	67.4	2.8[12]	**45.9***
Relative Precision (±10% at 90%CI)	±3.6%	±23.8%	±35.8%	**±3.6%**
* These results are weighted as described above; the simple average for CFLs is 45.0 and the overall simple average is 45.1.				

Hours of Use

Time-of-use lighting loggers were installed to capture 306 unique lighting schedules encompassing 465 program products for an average of 37.9 days. The annual and daily hours of use results gathered from these loggers are shown in Table 19. Using the typical analysis method, program products were found to be in use for approximately 719 hours annually (or 2.0 hours per day) with a precision of ±15.5% at the 90% confidence interval. Using the sinusoidal method described earlier resulted in an average of 1.8 hours per day with a precision of ±24.5% at the 90% confidence interval. This is a significant finding since both estimates are much lower than the current program assumptions of 3.4 hours per day.

Table 19: Hours of Use Results

Product Status	CFLs (n=458)	Interior Fixtures (n=7)	All (n=465)
Annual Hours of Use	695.4	816.9	**719.4***
Daily Hours of Use	1.9	2.2	**2.0***
Relative Precision (±10% at 90%CI)	±16.3%	±72.9%	**±15.5%**
* This result is weighted as described above; the simple annual average is 698.2 hours or 1.9 daily.			

Table 20 provides the hours of use results by room type. Sixty percent of the logged products were installed in bedrooms, kitchens, bathrooms, and living rooms, and were on for an average

[12] All LEDs in the sample were night lights.

of 1.5 hours per day. The daily hours of use by room type ranged from 0.4 for attics to 5.1 for dining rooms.

Table 20: Hours of Use by Room Type

Room	Program Products Logged	Annual Hours	Daily Hours
Bedroom	79	241.4	0.7
Kitchen	76	874.0	2.4
Bathroom	69	279.8	0.8
Living Room	55	870.2	2.4
Hallway	35	400.2	1.1
Basement	32	756.5	2.1
Dining Room	31	1,864.5	5.1
Office	26	338.6	0.9
Exterior	19	1,778.4	4.9
Family Room	16	448.6	1.2
Closet	10	362.3	1.0
Garage	9	817.9	2.2
Laundry Room	5	936.8	2.6
Attic	3	153.8	0.4
Weighted Average	**465**	**719.4**	**2.0**

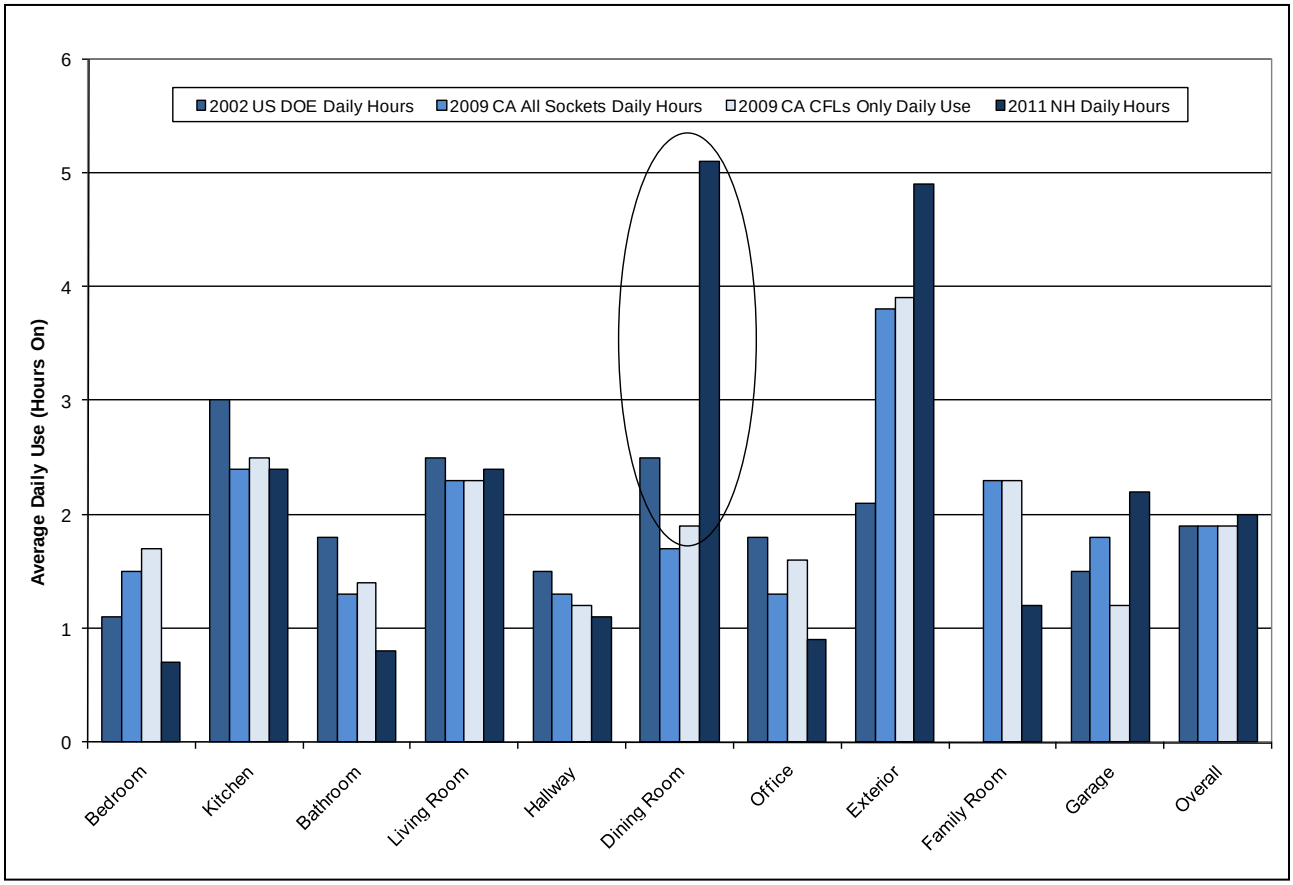
Figure 5 compares the daily hours of use results presented above to those from a 2002 DOE report[13] and the 2009 CPUC lighting evaluation[14]. As the figure shows, the results from this study line up well with those from these other two sources with the exception of those in the dining room, which are circled.

The high hours of use in the dining room from this study is due primarily to one customer who used their dining room lights for almost 12 hours per day. When this customer was removed from the analysis, the average daily hours of use in the dining room shifts to 2.5 hours per day.

[13] http://www.energystar.gov/ia/products/downloads/CFL_Market_Profile.pdf

[14] http://www.energydataweb.com/cpucFiles/18/FinalUpstreamLightingEvaluationReport_2.pdf

Figure 5: Daily Hours of Use by Room Type Compared to Other Studies



Summer and Winter On-Peak Coincidence Factors

Table 21 presents the resulting summer and winter ISO-NE on-peak coincidence factors. The weighted overall summer on-peak coincidence factor was calculated to be 7.6% with a precision of ±15.6% at the 80% confidence interval.

The weighted average "percent on" from 5pm-7pm on non-holiday weekdays in July and August from the logger data was 9.32%. Using the adjustment factor (243.1%) discussed in Section 3.1.4, the winter on-peak coincidence factor is estimated to be 22.7% (or 2.431*0.0932) with a precision of ±13.6% at the 80% confidence interval. The sinusoidal modeling method provided similar results for the summer on-peak coincidence factor (7.8% ±24.2% at the 80% confidence interval) but very different results for the winter on-peak coincidence factor (12.1% ±17.0% at

the 80% confidence interval). For winter peak, we recommend using the 22.7% value from the first analysis method since the adjustment factor used for its calculation was based on measured data primarily collected in the northeast United States.

Table 21: Summer and Winter On-Peak Coincidence Factor Results

Product Status	CFLs (n=458)	Interior Fixtures (n=7)	All (n=465)
Summer On-Peak Coincidence Factor	7.2%	8.1%	**7.6%***
Summer Relative Precision (±10% at 80%CI)	±16.7%	±95.9%	±15.6%
Winter On-Peak Hours During Summer Months Coincidence Factor	8.9%	12.6%	9.3%*
Adjusted Winter On-Peak Coincidence Factor[15]	21.7%	30.5%	**22.7%**
Winter Relative Precision (±10% at 80%CI)	±14.4%	±66.8%	±13.6%

* These results are weighted as described above; the simple average for summer is 7.2% and the simple average for adjusted winter is 21.8%.

Annual Savings (kWh) and Realization Rate

Using the savings inputs calculated on-site and presented above, Table 22 presents a 2009-2010 Program Year annual savings of 20,134 MWh. Compared to the tracking savings presented in Table 4, the program realization rate was found to be 68.2%.

As mentioned earlier, in-service rates and delta watts vary for measure types so only those calculated for CFLs are used in the table below. The sample sizes for interior fixtures (11 products in three homes) and LEDs (8 products in three homes) were deemed too small to consider updating the in-service rate and delta watts inputs for these measures.

Hours of use tends to be more transferrable across residential lighting measure types since they depend less on measure type and more on room type and hours of daylight. Hence, the hours of use calculated from the data collected on site can applied to all measures except for LEDs in the table below. The current hours of use assumption for LEDs is considered reasonable because nearly one-third of the LEDs sold through the program in 2009-2010 were nightlights;

[15] To calculate this result, the winter on-peak hours during summer month's coincidence factor were multiplied by 243.1% as discussed in Section 3.1.4.

these products typically have more hours of use than most residential lighting products.

Table 22: 2009-2010 Program Year Annual Savings

Adjusted Annual Savings Inputs	CFLs	CFL Multi-Packs*	Interior Fixtures	Exterior Fixtures	Torch-ieres	LEDs	Total Savings
Retail							
In-Service Rate	62.3%	62.3%	96.4%	100.0%	93.5%		
Annual Hours	719.4	719.4	719.4	719.4	719.4		
Delta Watts	46.1	184.5	85.3	85.3	95		
Savings Per Unit (kWh)	20.7	82.7	59.2	61.4	63.9		
Adjusted Units	168,567	185,985	8,146	2,342	16	0	
Retail Savings Subtotal (MWh)	**3,486,472**	**15,386,912**	**481,880**	**143,716**	**1,022**	**0**	**19,500,002**
Catalog							
In-Service Rate	62.3%		96.4%	100.0%	93.5%	95.0%	
Annual Hours	719.4		719.4	719.4	719.4	1241.0	
Delta Watts	46.1		85.3	85.3	95	38.0	
Savings Per Unit (kWh)	20.7		59.2	61.4	63.9	44.8	
Adjusted Units	19,744	0	1,979	574	100	1,486	
Catalog Savings Subtotal (MWh)	**408,359**	**0**	**117,069**	**35,223**	**6,390**	**66,560**	**633,601**
Combined							
Total Program Savings (MWh)	**3,894,831**	**15,386,912**	**598,949**	**178,939**	**7,412**	**66,560**	**20,133,603**

For another way of viewing the results, Table 23 presents annual kWh savings by room type. Exterior lighting savings are much higher than those in other spaces due to both high delta watts and high hours of use. On the other hand, delta watts were found to be fairly consistent across interior room types and, hence, annual energy savings are primarily driven by hours of use in interior spaces.

Table 23: Annual Savings by Room Type

Room Type	Average Delta Watts of Program CFL Installations	Hours on Per Day	Annual Energy Savings (kWh)
Exterior	70.5	4.9	126.2
Dining Room	40.6	5.1	75.6
Laundry Room	47.4	2.6	44.9
Living Room	47.0	2.4	41.2
Kitchen	44.8	2.4	39.2
Garage	46.2	2.2	37.1
Basement	45.7	2.1	35.1
Family Room	47.9	1.2	21.0
Hallways	44.4	1.1	17.8
Closet	44.0	1.0	16.1
Office	39.4	0.9	12.9
Bathrooms	39.7	0.8	11.6
Bedrooms	44.9	0.7	11.5
Attic	38.8	0.5	7.1
Simple Average	45.0	1.9	31.2

4.1.2 2009-2010 Results Compared to 2012 Planning Assumptions

The NH Utilities' plans for the 2012 NH RESL Program were due before 2009-2010 evaluation results were available. Recognizing the need for the sponsors to use the results of this evaluation for planning purposes, Table 24 presents annual energy savings for the products purchased during the 2009-2010 Program Years using the 2012 Program Year planning assumptions. These assumptions are nearly identical to those used in 2009-2010 with the exception of the delta watts assumptions for CFLs. The assumed 2012 planning delta watts were reduced from 40.8 watts for retail CFLs and 41.1 watts for catalog CFLs to 31.5 watts for all CFLs (highlighted below).

Since CFLs accounted for 97% of all lighting products sold through the program in 2009-2010, a comparison of the on-site savings from Table 22 to the 2012 planning savings in Table 24 results in a realization rate that is nearly 20% higher (87.1%) than reported using the 2009-2010 assumptions.

Table 24: Annual Savings for 2009-2010 Products Using 2012 Delta Watts

2009-2010 Annual Savings Inputs	CFLs	CFL Multi-Packs*	Interior Fixtures	Exterior Fixtures	Torch-ieres	LEDs	Total Savings
Retail							
In-Service Rate	80.3%	80.3%	96.4%	100.0%	93.5%		
Annual Hours	1241.0	1241.0	1241.0	1241.0	1098.7		
2012 Delta Watts	31.5	126	85.3	85.3	95.0		
Savings Per Unit (kWh)	31.4	125.6	102.0	105.9	97.6		
Units	125,027	137,946	8,146	2,342	16	0	
Retail Savings Subtotal (MWh)	**3,924,657**	**17,320,762**	**831,270**	**247,918**	**1,561**	**0**	**22,326,168**
Catalog							
In-Service Rate	80.3%		96.4%	100.0%	93.5%	95.0%	
Annual Hours	1255.6		1255.6	1255.6	1262.9	1241.0	
2012 Delta Watts	31.5		85.3	85.3	95.0	38.0	
Savings Per Unit (kWh)	31.8		103.2	107.1	112.2	44.8	
Units	14,644	0	1,979	574	100	1,300	
Catalog Savings Subtotal (MWh)	**465,090**	**0**	**204,326**	**61,477**	**11,218**	**58,240**	**800,351**
Combined							
Total Program Savings (MWh)	**4,389,747**	**17,320,762**	**1,035,596**	**309,395**	**12,779**	**58,240**	**23,126,519**

4.1.3 CFL Saturation Results

This section summarizes the results of the 75 participant and 21 non-participant socket counts performed in support of this study. Since the sample does not equally represent the population in New Hampshire, the results are weighted using the weights presented in Table 25.

Table 25: CFL Saturation Sample Weights

Sample Group	Sample	Population	Sample Weights
Participants	75	85,644	1,142
Non-participants	21	1,230,826	58,611
Total	96	1,316,470[16]	-

In the 96 homes visited from the sample, a total of 5,801 sockets were counted for a simple average of approximately 60.4 sockets per home. As Figure 6 shows, more than half (57.0%) of the sockets in New Hampshire are occupied by incandescent bulbs, while 28.1% are filled with CFLs. (This compares favorably to Massachusetts, which recently reported a CFL saturation rate of 26% as shown in Table 28). Of the remaining 15% of sockets, 7.8% contain fluorescent bulbs, 6.9% contain halogen bulbs, and 0.3% contain LEDs.

Figure 6: Weighted Statewide CFL Saturation Results

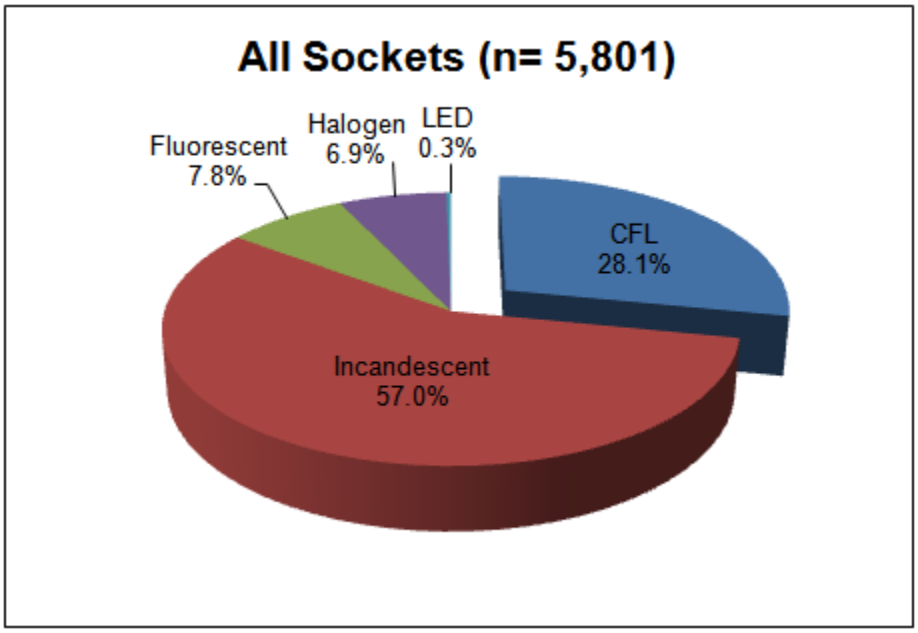


Table 26 presents the weighted average number of bulbs by room and bulb type. The average home visited in New Hampshire was found to have 60.4 bulbs; 55.1 on the interior and 5.3 on

[16] http://quickfacts.census.gov/qfd/states/33000.html.

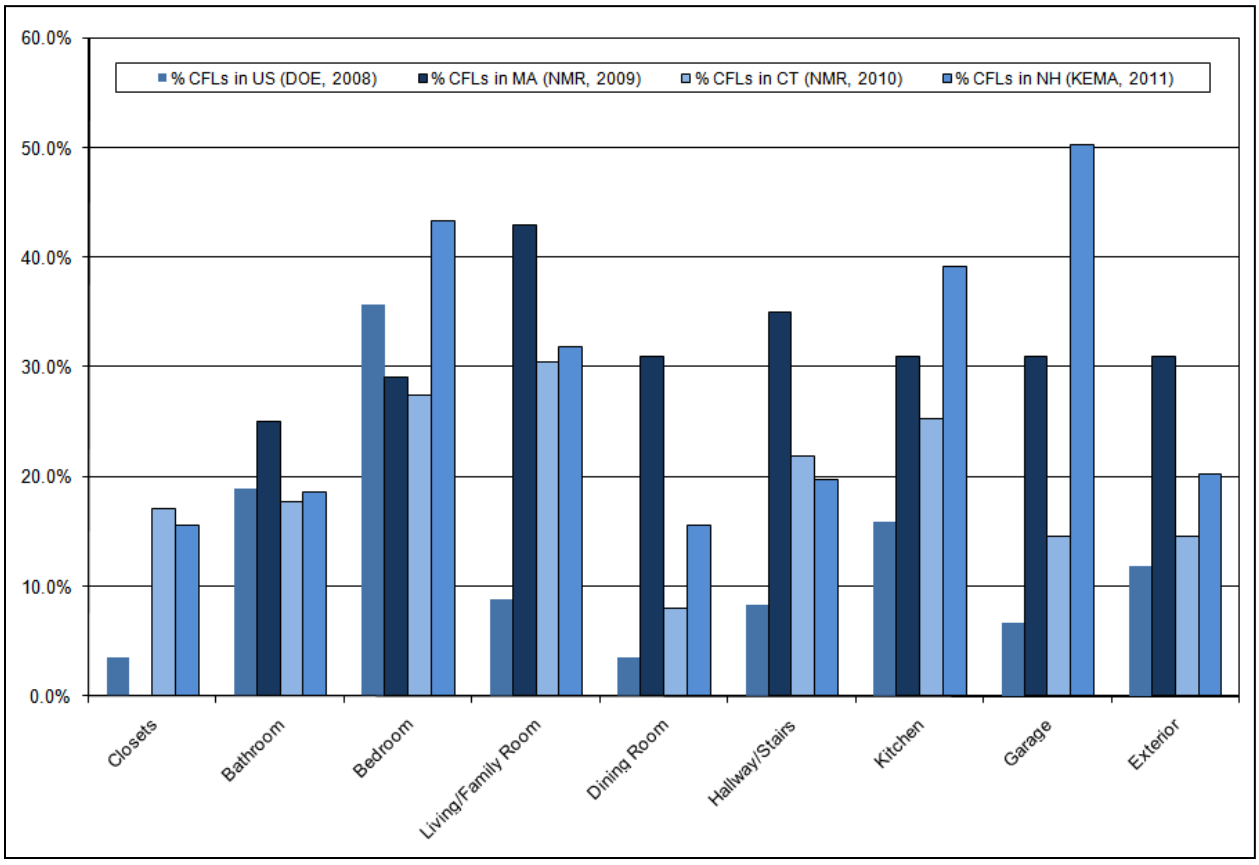
the exterior. By room type, living/family rooms had the most sockets with an average of 10.3; followed by bathrooms, kitchens, and bedrooms, which averaged 8.7, 8.2, and 6.6, respectively. By bulb type, the average home in New Hampshire has 29.8 incandescent bulbs, 14.7 CFLs, 4.1 fluorescents, 3.6 halogens, and 0.1 LEDs. Furthermore, according to this study, the population in New Hampshire also has an average of 2.4 CFLs in storage.

Table 26: Weighted Average Number of Sockets per Home by Room and Bulb Type

Location/Type	Mean	% CFL
	52.4	28.1%
By Area		
Interior	47.7	28.9%
Exterior	4.7	20.2%
By Room		
Living/Family Room	10.3	31.8%
Bathrooms	8.7	18.6%
Kitchen	8.2	39.2%
Bedrooms	6.6	43.3%
Hallway/Stairs/Foyer	3.7	19.7%
Basements	3.4	19.7%
Dining Room	2.5	15.5%
Garage	1.4	50.3%
Laundry Room	1.1	5.4%
Closets	1.0	15.5%
Office	0.7	9.2%
Attic	0.02	28.0%
By Bulb Type		
Incandescent	29.8	
CFLs	14.7	
Fluorescent	4.1	
Halogen	3.6	
LEDs	0.1	

Figure 7 compares these room level CFL saturation results to those estimated by the DOE in 2008[17] and to those from saturation studies in Connecticut, Massachusetts, Rhode Island and Vermont in 2009[18] and in Connecticut in 2010[19].

Figure 7: CFL Saturation by Room Compared to Other Studies



For every non-CFL found installed in the sampled homes, the customer was asked to estimate the likelihood that it would be replaced by a CFL on a 5-point scale from “very likely” to “very unlikely”. Table 27 shows the simple results among participants and non-participants and then the averages that were weighted to represent the population using the weights provided in Table 25. These weighted averages show that nearly 69.1% of incandescent bulbs, 33.5% of fluorescent bulbs, and 46.1% of halogen bulbs were reported as “likely” or “very likely” to be

[17] http://www.energystar.gov/ia/products/downloads/CFL_Market_Profile.pdf
[18] http://www.env.state.ma.us/dpu/docs/electric/09-64/12409nstrd2ae.pdf
[19] http://www.ctsavesenergy.org/files/CT%20Lighting%20Report%203-2-2010.doc

replaced by CFLs. More than half of the installed fluorescent (57.4%) and halogen (53.4%) bulbs and all of the LEDs were reported as "unlikely" or "very unlikely" to be replaced by a CFL.

Table 27: Likelihood of Replacement with a CFL

Response	Bulb Type			
	Incandescent	Fluorescent	Halogen	LEDs
Participants (n=75)				
Very Likely	8.8%	1.7%	2.0%	0.0%
Likely	47.3%	4.3%	15.7%	0.0%
Neither	4.1%	2.6%	7.0%	0.0%
Unlikely	29.6%	64.6%	58.9%	0.0%
Very Unlikely	10.1%	26.8%	16.3%	100.0%
Non-Participants (n=21)				
Very Likely	14.1%	7.4%	4.1%	0.0%
Likely	55.8%	29.6%	44.6%	0.0%
Neither	15.3%	9.9%	0.0%	0.0%
Unlikely	14.8%	53.1%	51.4%	33.3%
Very Unlikely	0.0%	0.0%	0.0%	66.7%
Weighted Total (n=96)				
Very Likely	13.8%	6.8%	3.9%	0.0%
Likely	55.3%	26.7%	42.2%	0.0%
Neither	14.6%	9.1%	0.6%	0.0%
Unlikely	15.7%	54.4%	52.0%	30.2%
Very Unlikely	0.6%	3.0%	1.4%	69.8%

4.1.4 Comparison of Evaluation Inputs to Those from Other Studies

Table 28 compares the input parameter and CFL saturation results from this study to those from other residential lighting evaluations conducted within the last five years. We provide the state/sponsor, year of study, and results for each study.

While the in-service rate found during the current evaluation is lower when compared to that of other recent studies, the delta watts, daily hours of use, and summer and winter coincidence factor results from this study generally fall in the middle when compared to these other studies.

The daily hours of use results have been trending downwards in recent years. Early hours of use studies of CFLs had hour of operation estimates of 2.8 to 3.2 hours per day. The more recent studies performed in California and the Northwest in the last two years, are much lower and suggest daily operation of 1.8 to 1.9 hours. The measured result for the current NH study (2.0 hours per day) is in line with the results from these other studies, which were between 1.2 and 3.2 hours/day.

The CFL saturation results have had an upward trend in recent years and the results from this study have continued that trend with a CFL saturation rate of 28.1%. Such trending is expected to continue as CFLs gain more traction in the market place. This trend will likely gather momentum over the next several years as EISA takes effect.

Table 28: Comparison of Evaluation Inputs to Those from Other Studies

Year	Source	In-Service Rate (Page #)	Delta Watts (Page #)	Daily Hours of Use (Page #)	Coincidence Factor		CFL Saturation (Page #)
					Summer (Page #)	Winter (Page #)	
2011	**Current Evaluation**	**62.3%**	**46.1**	**2.0**	**7.6%**	**22.7%**	**28.1%**
-	2009-10 NH Tracking	80.6%	41.9	3.4	-	-	-
-	2012 NH Planning	80.6%	32.6	3.4	-	-	-
2011	MA Annual Lighting Report[20]	-	-	-	-	-	26.0% (43)
2010	NEEA Energy Analysis Study[21]	-	-	1.2 (2-11)	-	-	-
2010	CPUC Upstream Lighting[22]	71.0% (42)	44.5 (42)	1.8 (42)	6.4% (42)	-	-
2010	CT CFL Market Study[23]	-	-	-	-	-	23.0% (29)
2009	CT, MA, RI, & VT NCP Markdown[24]	76.6% (59)	45.7 (60)	2.8 (60)	10.8% (60)	22.0% (60)	-
2008	WI CFL Delta Watts Study[25]	-	53.3 (3)	-	-	-	-
2008	MA Lighting Program MPER[26]	-	-	-	-	-	21.4% (41)
2007	WI CFL Installation Rate Study[27]	81.0% (1-2)	-	-	-	-	-
2007	ME Lighting Process & Impact[28]	66.0% (102)	45.3 (103)	3.2 (103)	-	33.6% (104)	-
2007	NECPUC Coincidence Factor[29]	-	-	-	8.2% (11)	29.8% (12)	-

[20] http://www.ma-eeac.org/docs/2011%20EM&V%20Studies/MA%20Res%20Lighting%202010%20Eval%20Overall%20Rpt%20Vol%201.pdf

[21] http://neea.org/research/reports/10-217_Final.pdf

[22] http://www.energydataweb.com/cpucFiles/18/FinalUpstreamLightingEvaluationReport_2.pdf

[23] http://www.ctsavesenergy.org/files/CT%20Lighting%20Report%203-2-2010.doc

[24] http://www.env.state.ma.us/dpu/docs/electric/09-64/12409nstrd2ae.pdf

[25] http://www.focusonenergy.com/files/document_management_system/evaluation/cfldeltawattsanalysis_report.pdf

[26] http://www.cee1.org/eval/db_pdf/1246.pdf

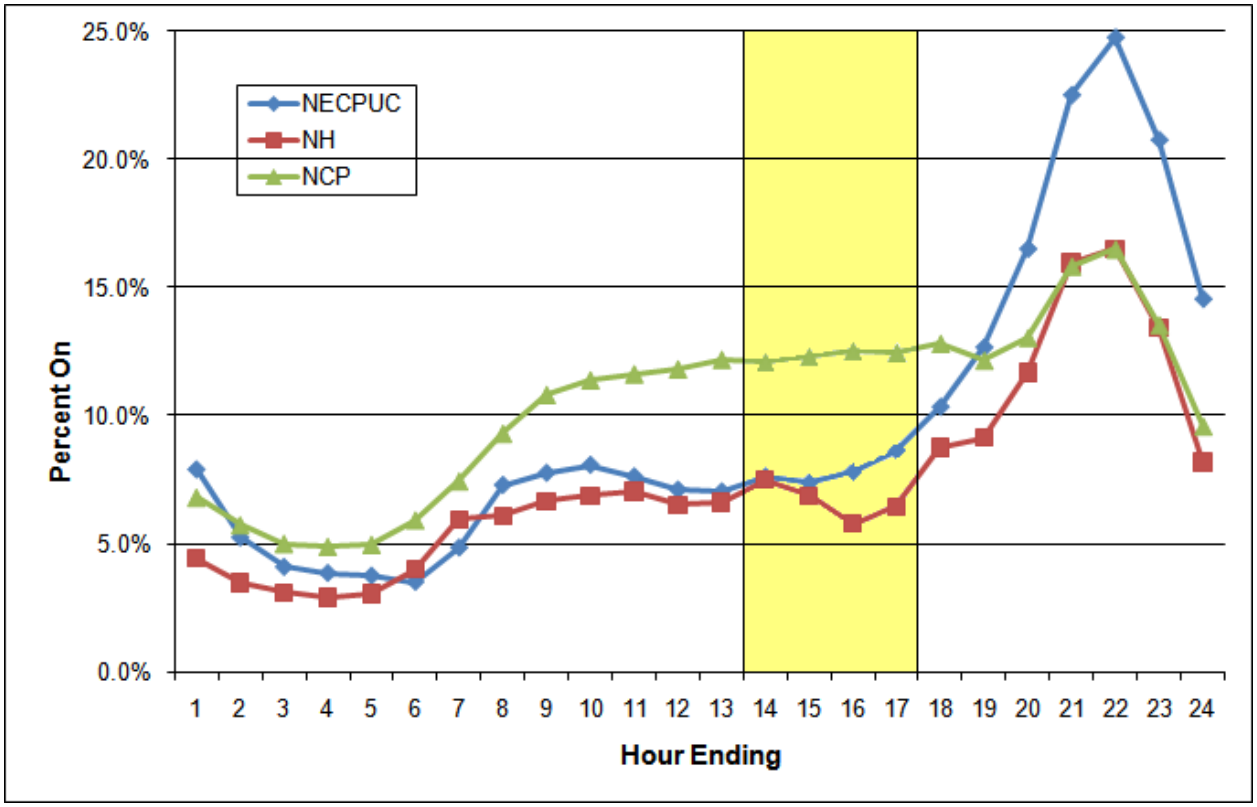
[27] http://www.focusonenergy.com/files/document_management_system/evaluation/cflinstallationrates_study.pdf

[28] http://www.cee1.org/eval/db_pdf/564.pdf

[29] http://www.puc.nh.gov/Electric/Monitoring%20and%20Evaluation%20Reports/National%20Grid/116_RLW_CF%20Res%20C&I%20ltg.pdf

Figure 8 presents a comparison of the average summer lighting profile from this study as compared to the profiles from the NCP Markdown and NECPUC Coincidence Factor studies referenced above. The shaded area represents the summer on-peak hours used in this study (1pm-5pm, non-holiday weekdays from June-August), which are consistent with those set forth by ISO-NE. While the percent "on" varies for all three studies, the shape of the NECPUC study profile is very similar to that of this study. This suggests that using the relationship between the summer and winter coincidence factors from the NECPUC study to estimate the winter coincidence factor in this study should provide a reliable estimate.

Figure 8: Average Summer Lighting Profile Comparison



4.1.5 Customer On-site Survey Results

This section contains the weighted results of the brief survey that concluded each participant and non-participant site visit. Using the weights provided in Table 25, Table 29 shows that

nearly 60% of the homes in New Hampshire were more than 20 years old at the time of the on-site visits. The weighted average age of all homes in New Hampshire is 36.2 years.

Table 29: Age of Homes Visited

Home Age Range	Weighted %
0-5 years	9.0%
6-10 years	5.0%
11-15 years	13.8%
16-20 years	13.7%
21-35 years	20.0%
36-50 years	10.1%
>50 years	28.4%
Average Age	*36.2*

During the on-site visits, occupants were asked to estimate the proportion of purchased CFLs that they installed immediately versus those stored for use at a later time. A weighted average of 82.7% of CFLs purchased by the on-site sample was reported to have been installed immediately; the remaining 17.3% were reported to have been stored. These self-reported estimates were supported by the on-site assessment: 82.5% of the products located on-site had been installed and 17.5% were found in storage.

Table 30 presents the responses of the on-site sample when asked about CFL fixture replacements in their homes. Approximately two percent of the population was found to have an interior CFL fixture and fewer than 0.2% reported needing to replace it. When replacements were necessary, these were reported to have occurred an average of 3.5 years after they were installed. Those that had not yet needed replacement averaged 3.3 years of operation. Approximately five percent of the population has had an exterior CFL fixture for an average of 4.0 years without ever needing to replace it.

Table 30: Interior and Exterior CFL Fixture Replacements

	CFL Fixture Type	
	Interior	Exterior
% with CFL Fixture	1.9%	4.7%
% replaced	0.2%	0.0%
Avg. Age Replaced	3.5 years	
Avg. Age without Replacement	3.3 years	4.0 years

Participants only were asked to estimate how many non-rebated CFLs they purchased since receiving the utility-sponsored CFL rebates in 2009-2010. Table 31 shows that nearly half of the sample reported making no non-rebated CFL purchases since participating in the program. The average number of non-rebated CFL purchases made since program participation was 6.6 across all participants.

Table 31: Customer-Reported CFL Purchases since NH RESL Participation

# of spillover CFLs	% of Sample (n=75)
None	46.7%
1-5	14.7%
6-10	17.3%
11-15	8.0%
16-20	5.3%
20+	8.0%
Average	*6.6*

4.1.6 Study Error Ratios for Future Use

As stated in Section 3.1.3 above, the coefficient of variation (or error ratio) is of central importance to any sample design. In Table 32, we provide the error ratios for this study. These error ratios can be used to estimate the necessary sample sizes of future studies of residential lighting programs.

Table 32: Error Ratios from Current Study

Input Parameter	Error Ratio
In-Service Rate	0.79
Delta Watts	0.51
Hours of Use	1.70
Summer CF	2.24
Winter CF	1.92

4.2 Process Evaluation Results

4.2.1 Program Design

Utility program managers report that program goals are clearly defined in terms of budgets, energy saved, and participation targets. The goals are set through an iterative process that takes into consideration past program performance, current market factors, and program features such as rebate levels, targeted measures or markets, and anticipated savings by measure. At the individual level, the program managers reported that they viewed their primary goal as educating customers regarding ENERGY STAR® lighting.

Adaptability and accountability were key drivers in program design according to the information provided by program managers and implementation contractors. Adaptability is necessary to meet the sponsors' interesting in assuring that sufficient funds are available through the year to meet all eligible rebate requests. This amount is fixed during the year before the program year and does not change unless additional funds become available, for example, payments from the Regional Greenhouse Gas Initiative (RGGI) were used to supplement budgets during the study period. If program funds were fully subscribed prior to the end of the program year, the program might need to be suspended, which would not only frustrate some customers in the short-term but also might have deleterious long-term program-wide impacts, reducing the customer confidence both in utility program and the value of energy efficiency.

Accountability is achieved through a structured control system based on rebate forms and regular reporting from the implementation contractors, APT and EFI. Quality control measures are in place to verify purchase price, confirm product and customer eligibility, and to assure that to the extent possible each program dollar can be tracked. As EFI explained, rules are in place

as per the NH Utilities that prevent EFI from reimbursing retailers for misused coupons. Examples of misuses that cannot be reimbursed include submissions of blank or illegible coupons or from customers residing outside of New Hampshire.

The convergence of adaptability and accountability was seen in one reported instance. Quality control measures alerted NH Utilities to a processing loophole at one specific retail outlet that permitted abuse. On an in-store visit to a home improvement store, APT staff observed two customers purchasing twelve fixtures and receiving $10 instant rebates for these and subsequently returning them for a refund at full price, a deception these individuals had apparently practiced in other locations. The NH Utilities quickly changed the program offering for lighting fixtures from an instant coupon to a mail-in rebate to prevent fraudulent activity such as this. The mail-in rebate form, created by NH Utilities and distributed by APT, must be accompanied by a receipt, an original UPC code, and the customer's electric account number.

The NH Utilities program might be categorized as grass roots design, in that the incentives and primary marketing are targeted towards end-use customers. Program managers reported that they were extremely happy with this design and that the planning and management structures were able to produce the most effective and efficient program possible in line with the program goals and budgets. They value the design features that enables them monitor the program through the year and promptly revise offerings to respond to the dynamic residential lighting market. The implementation contractors, experts in the field with broad-based experience, reported that the NH Utilities supported an appropriate mix of lighting products. Both contractor representatives offered positive comments regarding the program design, one offering that "it is one of the more fluid programs that we operate, it is a model for what we consider a successful program" and the other noting that at customer/consumer level this program was "very understanding."

The APT representative, the contractor with primary responsibility for recruiting retail outlets, noted that the NH Utilities' requirement for specific customer participation data precludes the implementation option of wholesale markdowns on qualifying products, know as an "upstream" program design. Upstream program designs promote ENERGY STAR® qualified lighting products in the form of discounts that greatly reduce the cost of energy-efficient lighting products. They typically use a wholesale buy-down mechanism but can also use retailer-direct midstream incentives where beneficial. This representative acknowledged that if an upstream markdown program design were to be implemented within the relatively small current budget, the program would likely have to be closed early due to lack of funds.

Participating retailers reported general satisfaction with the NH RESL program and acknowledged benefits from participation .e.g. “We sell more of the multi-packs because people want to use the coupons”. With regard to current program design features, they offered comments in two general areas, noting the administrative burden of rebate coupon processing and the limits placed on eligible products. Neither the participating nor non-participating retailers interviewed offered suggestions for an alternative program design, rather suggesting increased rebates or expanded product range.

As part of the customer CATI survey, respondents were asked to provide some basic demographic information, including building type, ownership status, household income, and level of educational achievement. The participant population, when compared to the non-participant population, is more likely to live in a single-family home (83% to 71%) that they own (93% to 79%), and have higher income and educational achievement. Table 33 through **Table** 36 below summarize the demographic findings. We include comparable statistics, to the extent possible, from the U.S. Census Bureau’s 2010 American Community Survey as reference point for the demographs of the entire population.

Table 33: Residential Building Types Surveyed

Residential Building Type	Participant n=350	Non-participant n=350	ACS 2010
Single family detached home	83%	71%	63.3%
Townhouse, duplex, or row home	7%	5%	6.1%
An apartment or condo with 3-4 units	3%	7%	5.8%
An apartment or condo with 5 or more units	3%	9%	13.4%
Mobile home	2%	4%	6.0%
Other	1%	1%	na
Don't know	0%	1%	Na
Refused	1%	3%	Na

Table 34: Home Ownership of Those Surveyed

Own Residence	Participant n=350	Non-participant n=350	ACS 2010
Yes	93%	79%	71.7%
No	6%	19%	28.3%
Refused	1%	3%	na

Table 35: Household Income Ranges of Those Surveyed

Household Income Range	Participant n=350	Non-participant n=350
LESS THAN $50K	15%	23%
Less than $9,999 ($5K)	1%	3%
$10,000 to $29,999 ($20K)	6%	10%
$30,000 to $49,999 ($40K)	8%	10%
$50K AND LESS THAN $110K	34%	29%
$50,000 to $69,999 ($60K)	15%	10%
$70,000 to $89,999 ($80K)	8%	10%
$90,000 to $109,999 ($100K)	10%	9%
$110K AND MORE	18%	14%
$110,000 to $149,999 ($130K)	11%	14%
$150,000 to $199,999 ($175K)	4%	4%
$200,000 or more ($300K)	2%	3%
Refused	34%	34%

Table 36: Highest Level of Education of Those Surveyed

Highest Level of Education Completed	Participant n=350	Non-participant n=350	ACS 2010
Not a high school graduate	1%	4%	8.6%
High school graduate or GED (high school equivalency)	14%	13%	29.8%
Some college, trade, or vocational school	20%	25%	18.9%
College graduate	34%	29%	30.4%*
Postgraduate degree	26%	22%	12.4%
Refused	5%	7%	NA

* - ACS combines "some college" and "associates" degree. The NH Survey treated attainment of associate and bachelors as "College Graduate," so we combined ACS's total in this figure.

These findings are consistent with findings from other jurisdictions within this market segment. There is a correlation between ownership, building type, and willingness to invest in energy efficiency. In the residential market, there have been successful program designs that reach the lower income strata. These are typically at least in part public purpose programs that tolerate lower benefit-cost ratios. This demographic information, rather than suggesting program design changes, confirms design expectations of the current program.

4.2.2 Outreach

Outreach is a critical component for program success. The goals of outreach are to generate awareness and instill as much interest in the program as possible. The NH RESL program targets two key audiences, retailers and end-use customers. This section presents our findings on the NH RESL programs efforts.

Retailer Outreach

The NH RESL program design requires retailer engagement, and the first step to engagement is awareness. APT is responsible for retailer recruitment. APT has an ongoing process for recruiting retailers, including site visits to new stores. The APT respondent reported that independent and smaller retailers are easier to recruit because they are less likely to require approval or coordination with a corporate office. If they are also residential customers of NH Utilities, retail storeowners and staff are exposed to the same marketing efforts as customers, which are substantial and thus well aware of the program. Participant retailers are clearly aware

of the program. Three out of five non-participant retailers were also aware of the program, although none of them could recall if they had been invited to participate in the program.

All of the retailers interviewed reported stocking compact fluorescent lamps. Table 37 below shows that participating and non-participating retailers sold Energy Star® CFLs in roughly the same proportion.

Table 37: ENERGY STAR® CFLs Sold as Reported by Retailers

CFLs with ENERGY STAR® Rating	Participating Retailers (n=5)	Non-Participating Retailers (n=4)
ENERGY STAR® CFLs	85%	88%
Non-ENERGY STAR® CFLs	15%	13%

Four out of five non-participant retailers rated the stocking Energy Star® products as greater than 3 a scale of 1 through 5 with 1 meaning "not at all important" and 5 meaning "extremely important." The three respondents who rated it the highest revealed that all CFLs stocked in their stores were Energy Star®-rated. These retailers also indicated that they would be interested in participating in this program in future years. Beyond awareness of the state-specific program, awareness of the national Energy Star ® lighting program, and stocking of Energy Star ®-rated lighting products, is in line with the NH Utilities' program objectives.

Customer Outreach

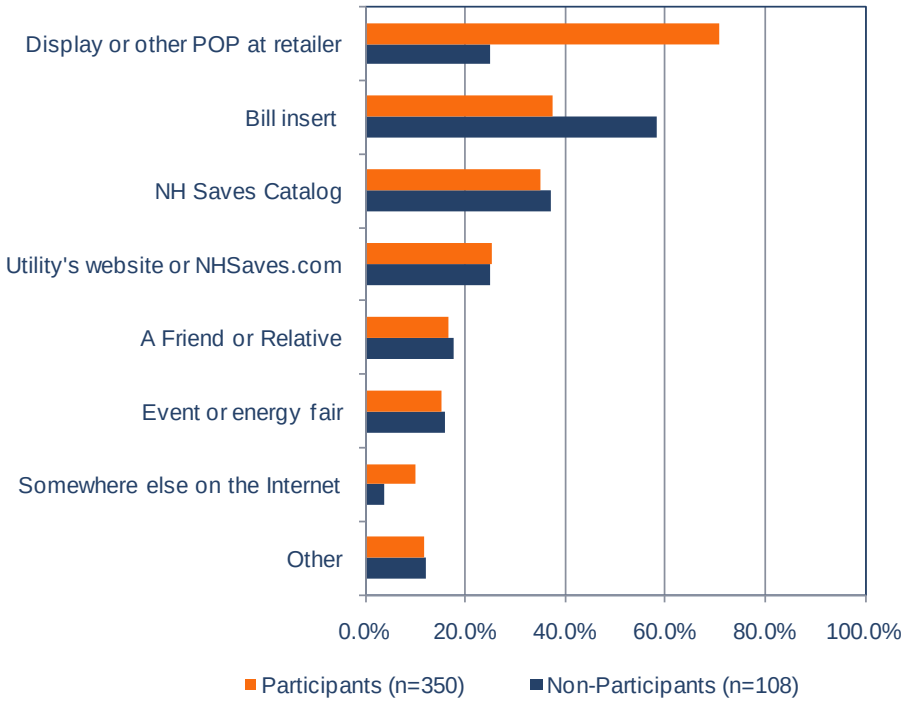
NH RESL participants have demonstrated Program awareness by virtue of their completion of an in-store or mail-in rebate form. Non-participant customers were asked whether they are aware of the NH RESL Program and, overall, 26 percent were. Awareness, however, varied by utility as shown in Table 38.

Table 38: Non-Participant Awareness of RESL by Utility

NH Utilities	n	Percent Aware
PSNH	263	29%
National Grid	21	29%
NH Electric Co-operative	25	24%
Unitil	41	7%
Overall	350	26%

Participants and non-participants familiar with the NH RESL Program were asked how they came to know of the program. Their responses are summarized in Figure 9. Among program participants, 71 percent identified retailer displays or other point-of-purchase information as a source of program awareness. Participants also frequently cited bill inserts, the NH Saves Catalog, or websites (utility and NHSaves.com) as sources of awareness. Among non-participants aware of the program, most (58 percent) cited bill inserts as a source of information, followed by the NH Saves Catalog. Only 25 percent of non-participants cited point-of-purchase information.

Figure 9: Means of Learning of NH RESL Program



The primary sources of program awareness as found in the current evaluation are comparable to the findings of the 2003 Process and Impact Evaluation of the NH RESL. Then and now, retailer displays were most frequently mentioned by participants and bill inserts most frequently mentioned by non-participants. There are some significant difference between the past and current findings worth noting:

- Non-participant mention of store displays increased dramatically from 2 percent in 2003 to 25 percent in 2011;
- Catalog recall has increased substantially among both participants and non-participants in 2011 (35% P, 37% NP, respectively) than in 2003 (19% P, 20% NP);
- Website use has increased from 3% for both customer groups in 2003 to roughly 25% in 2011; and,
- Acquaintance sources, e.g. friends or relatives, increased to just under 20% for each group in 2011, compared to 8% for each group in 2003.

Unfortunately, overall awareness of the NH RESL program among non-participants statewide has decreased from 40% in 2003 to 26% in 2011.

Catalog

Among participants that had not ordered from the catalog, 38% or 113 reported that they had seen the catalog. Of these 79% (89) reported that they had looked through it (see Table 39). Including the 50 participants who ordered through the catalog (and were therefore not asked these two questions), 47 percent of total participants saw the catalog and 40 percent took the time to look through it (85 percent of those who saw it).

Forty non-participants indicated that they became aware of the Program through the NH Saves Catalog. The remaining non-participants that expressed program awareness were asked if they recalled seeing the catalog, and 20 indicated that they had. These two groups together (non-participants who indicated through either question that they had seen the catalog) represent 56 percent of program-aware non-participants.

Table 39: Familiarity with Catalog If Aware of Program

Catalog Use	Participant[30] (n=300)		Non-participant (n=108)	
	Value	% Yes	Value	% Yes
Recall seeing catalog	113	38%	60	56%
Looked through catalog	89	79%	33	83%[31]

Participants and non-participants that had viewed the catalog were asked to rate the usefulness of several types of information it contains. Table 40 summarizes the responses among participants and non-participants.

[30] Excludes those who participated through the catalog.

[31] Unfortunately, a programming error precluded asking those who recalled seeing the catalog when prompted whether they remembered looking through it. However, of the 40 non-participants who mentioned the catalog as a way of becoming aware of the program, 83 percent of them recalled looking through the catalog.

Table 40: Catalog Information Rated for Usefulness

Catalog Features Rated as Useful or Very Useful	Participants n=139	Non-participants n=53
Descriptions of the lighting products in the catalog	71%	57%
Types of lighting products available to purchase in the catalog	68%	49%
Tips on how you can save more energy	59%	70%
Information about the various NH EE Programs	52%	34%
Information on how / where to use EE lighting products	48%	58%
Stories about how customers are using EE products	32%	25%

Participants rated information that assists in purchase decisions, product types and descriptions, highest while non-participants rated energy-saving tips highest. The catalog can be documented to help participants save energy. In light of the non-participant rating of the energy tips, it may also be helping non-participants.

Lastly, with regard to the catalog, at the conclusion of the non-participant survey, 64% of non-participants accepted an offer to have the catalog mailed to them, demonstrating its ongoing value as a marketing tool.

4.2.3 Program Operations

The full range of program operations was reviewed for this evaluation. Program operations were explored through three primary stakeholder categories; retailers, end-use customers, and those responsible for program delivery (utility staff and implementation contractors). The following sections are organized to address program operations as they are affecting these stakeholders.

Retailer Focus

The program activities focused on retailers are recruitment, training, support and stocking, and rebate processing. We present our findings for each of these in the following sections.

Recruitment

APT is responsible for retailer recruitment, which is a continual process as businesses open, change management and ownership, and close. APT staff visit new retail outlets with the

objective of enrolling them in the program. The APT representative offered the following comments regarding this process;

- Smaller, independently-owned retailers are typically easier to recruit because the decision-making authority is local;
- National chain outlet are likely to require approval from or with coordination with the corporate headquarters. Participation decisions can take significant time and administrative effort. Additionally, due to the organization-wide policies, RESL Program promotional materials may not be accepted.
- Once enrolled retailers rarely leave the program, typically happening only at store closure.
- The program design, which requires in-store processing, precludes enrollment of some outlets, e.g. the Market Basket chain. This organization focuses on markdowns and has not been willing to accommodate the NH RESL program requirements.

Training

APT trains retailer staff through largely informal presentations focused on the attributes of Energy Star®-qualified products and the benefits of selling and using them. They explain program processes and requirements, how it is funded, and the reason for its existence. They also provide education on the lighting provisions of the EISA law and introduce new products or unfamiliar technologies. Regarding this last element, they encourage retail staff to emphasize the expanding pool of options available for saving lighting energy rather than focusing on regulatory action.

One program challenge that APT cited was the impact of the high employee turnover rate in larger stores. Employee turnover results in the loss of the investment in training on program practices, requires training of new staff, and may, in the interim, lead to reduced sales of program-supported measures and reduced customer and retailer satisfaction resulting from errors in coupon processing.

Support and Stocking

APT makes frequent visits to participating stores to ensure that coupons and products are adequately stocked, appropriate signage is in place, the shelves neat, and staff appropriately

trained. Oftentimes, the retailers will accidentally move things around and products get scattered about without realizing the impacts to the customer presentation. In addition, coupons can run out during periods of high sales. Visits from APT representatives help keep shelf displays in order. APT often takes photographs of the location before and after their improvements to document their efforts. APT representatives also make sure that qualified products are appropriately labeled with Energy Star® stickers (or have been removed from those products that have been de-listed).

Program administrators periodically conduct store visits in conjunction with APT to ensure that program signage is in place and retailer' needs are met. At the time of the interviews, one of the utilities had new administrators on staff. As part of their training, they shadowed APT during several large store visits to better understand their processes. For stores visits conducted solely by APT, the utilities received summary updates. APT store visits are also intended to ensure that in-store coupons and other program materials are fully stocked.

Rebate Processing

EFI follows quality control procedures to maintain the highest possible quality of customer data for the NH Utilities and adhere to the NH Utilities program design requirements. Customers are required to complete a form providing their name and address at the retail checkout to earn the discount instantly. Retailers, in turn, submit batches of these coupons to EFI for processing and reimbursement. Within each batch, EFI expects retailers to organize and itemize the receipts, provide a total count of products sold, and the total reimbursement expected. EFI staff enters both the summarizing information as well as the coupon-specific information into a database.

Quality control measures are in place to verify Energy Star® model numbers and product eligibility, to confirm that the pricing requirements have been met, and to verify customer electric account information. EFI works to keep the percentage of unverifiable account numbers to less than 10%. Every two weeks, the database is "frozen" to mail out the reimbursement checks; in total, the turnaround time is 3-4 weeks. EFI reported that they do not generally encounter concerns from the retailers unless the amount of reimbursement is less than that expected. As EFI explained, rules are in place as per the NH Utilities that prevent EFI from reimbursing retailers for misused coupons. Examples of misuses that cannot be reimbursed include submissions of blank or illegible coupons or from customers residing in a state outside of New Hampshire. In such instances, EFI provides the retailer with a detailed account of the reasons

for the exclusions. If the retailer expresses displeasure, they are advised to contact APT for retraining.

In addition to verifying customer and product eligibility, EFI implements processes to assure that participation limits are enforced. Customers are only eligible to participate at defined levels in each program year. These limits were enforced by EFI. EFI cross-checked the customer name and town from the in-store coupons and account numbers from the mail-in rebate forms with the database of active accounts provided by the utilities. If, through this process, the customer's account number could be determined, it was added to the program-tracking database. If the customer's account number could not be determined, no further steps were taken to limit program products per customer so as not to drive up rebate processing costs. For large orders placed through the catalog, EFI would notify the utilities and seek permission to process. Sometimes the larger orders were for small new construction or remodeling which the utilities approved on a case-by-case basis. If there were a lot of instances of missing information from a certain store, EFI would alert the NH Utilities and APT, in turn, would contact the store. If a significant amount of information was missing from a large purchase, the store that processed the coupon risked not being reimbursed.

Customer Focus

Customers participate in the program through two mechanisms; in-store purchases and mail order. We present our findings for each of these in the following sections.

In-Store Purchase

The majority of participants (97 percent) who used an in-store coupon indicated that they obtained the retail coupon in the store where they made the purchase and indicated that it was easy to find in the store (98 percent). Ninety-five (95) percent of participants found the retail coupon easy to understand and fill out. Overall, the participants who used a retail coupon were quite satisfied with the instant rebate program for CFLs and multi-packs, with 75 percent of them giving a rating of 8, 9 or 10 on a 10-point scale where 10 represents "very satisfied."

The program provides multiple avenues of access to program information. A significant portion (60 out of 350 or 17%) of participants reported visiting the NH Saves or utility website to get information or download. Of these, 95% (53 respondents) reported that the website provided the information they needed.

Mail Order Purchase

The NH program provides customers with a variety of purchase mechanisms in addition to physical stores. Product can be purchased by placing orders over the telephone, via the website, or by mailing in an order form. Fifty of the participant sample (14%) had purchased their efficient light products by one of these methods. These participants were asked a series of questions about their experience.

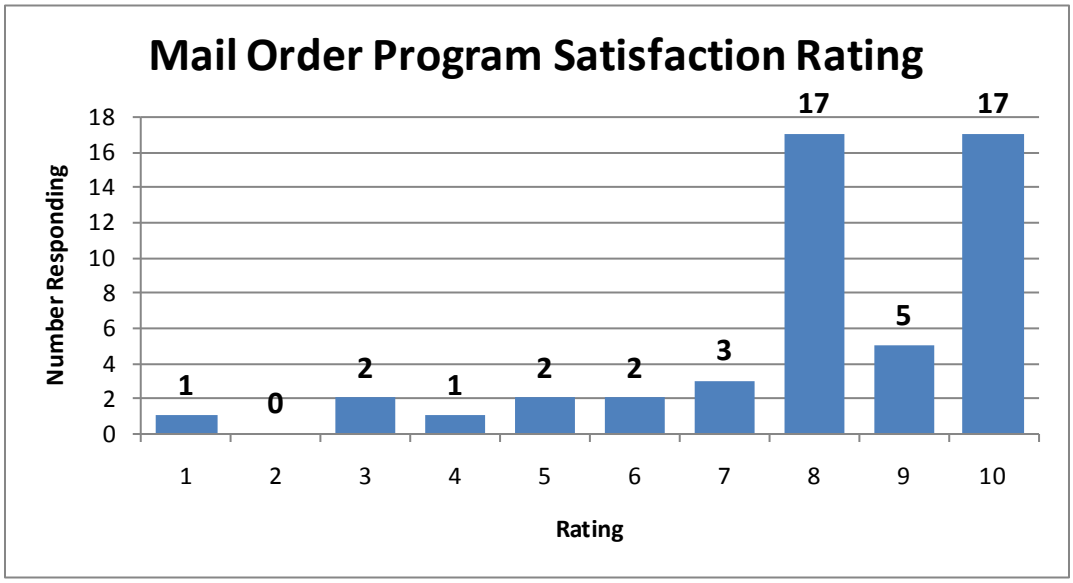
As shown in Table 41 below, although some of the individual sample sizes are low, taken as a whole customers found the process easy and the time frame for delivery reasonable.

Table 41: Summary of Non-Store Purchase Experience

Question	% Yes
Was it easy to find the lighting products in which you were interested in the catalog? (n=26)	92%
Was it easy to find the lighting products in which you were interested in on the website? (n=15)	87%
Was it easy to order the lighting products over the phone? (n=11)	82%
Was it easy to order the lighting products from the website? (n=15)	80%
Was the order form in the catalog easy to understand and fill out? (n=15)	100%
After the order was submitted, did the lighting products arrive in a reasonable amount of time? (n=50)	90%

Overall satisfaction with the mail order offerings is high, with 78% of participants rating the program at 8 or higher on a scale of 1 to 10 where 1 is not at all satisfied and 10 is very satisfied, as shown in Figure 10 below.

Figure 10: Satisfaction with Mail Order Offering



EFI did not report recurring complaints or negative feedback from customers related to program participation or performance, validating the findings from this sample population. The most frequent challenge encountered with customers is their inability to recall their electric utility account number, which is required for telephone purchases.

Utility Sponsor and Contractor Focus

The program is designed and overseen by a working group composed of representatives from the NH Utilities and the implementation contractors, APT and EFI. Utility staff reported high satisfaction with both APT and EFI with regard to program delivery. APT and EFI report good lines of communication with one another and with NH Utilities as well as high satisfaction with their working group. Positive attributes noted by respondents include:

- Quarterly working meeting are efficient and sufficient. The program runs so smoothly that there is infrequent need for additional meetings;

- APT and EFI have demonstrated willingness to make running adjustments to program delivery and design and to engage in special events and additional effort to enhance program delivery;
- Program tracking and reporting consistently meets the requirements of the NH Utilities;
- APT and EFI are both extremely accommodating to the NH Utilities needs. Examples of this include, but are not limited to:
    - EFI provides real time access to activity reports via the internet;
    - APT developing customer friendly marketing materials and a lighting demonstration platform (Light Bar) that are highly regarded by utility staff;
    - APT and EFI both provide real time reporting on exceptions or changes in the market to support adaptive program management;
    - APT and EFI work effectively together to ensure that coupons are processed smoothly and the retailers and utilities are happy;
- EFI offers an "excellent" product pricing structure;
- EFI effectively manages the challenging issues raised when retailer-submitted reimbursement requests must be denied due to program guidelines;
- APT was commended by utility staff for providing insight into the status and needs of the retail market and for providing a consistent program to retailers and customers that limits confusion;

All of the respondents involved with planning and implementation observed that it was remarkable that four different utilities with four different missions were able to collaborate so effectively to the same end. As one utility representative remarked, "We all behave as if we're like one, and it's such an accomplishment." An implementation contractor representative noted "it is a model for what we consider a successful program. There is nothing I would consider changing."

4.2.4 Review of 2009 Tracking Data

Program managers cited "evaluable program data" as a key management concern. To this end, we reviewed the tracking data provided by the program sponsors. Overall, we found that program systems are doing an excellent job of meeting this need. This section presents the results of our review.

NHSaves Catalog Data

The NHSaves catalog data were provided in three separate files. One file contained customer information (name, address, phone number, etc.). The second file contained detail on the products that were purchased (product description and quantity), while the third consisted of order tracking information (order date and utility name). All three files contained an 'account number' field that was used to combine the catalog data needed for this evaluation into one dataset.

Table 42 provides the field name, description, level of need to support an evaluation (independent of the other fields[32]), and percent complete for each of the catalog data fields that were deemed to be useful or necessary for evaluation purposes. All fields are at least 97% complete and nearly all of them are 100% complete.

[32] Although certain fields have been flagged as "necessary" to support an evaluation, some of these fields may only be "useful" when considering the other information that is present for a particular product. For instance, if the model number for a product is missing, the manufacturer name and wattage of that product would be sufficient to identify it in the field (along with customer verification).

Table 42: 2009-2010 NHSaves Catalog Data Field Completeness

Field Name	Field Description	Level of Evaluation Need	% Complete
SACCOU	Account Number	Necessary	100.0%
SFNAME	Customer First Name	Necessary	96.8%
SLNAME	Customer Last Name	Necessary	100.0%
SSADD	Customer Street Address	Necessary	100.0%
SSCITY	Customer Street City	Necessary	100.0%
SSTATE	Customer Street State	Necessary	100.0%
SSZI	Customer Street Zip	Useful	100.0%
SPHONE	Customer Phone	Necessary	99.4%
SMADD	Customer Mailing Address	Useful	100.0%
SMCIT	Customer Mailing City	Useful	100.0%
SMSTATE	Customer Mailing State	Useful	100.0%
SMZI	Customer Mailing Zip	Useful	100.0%
SDESC	Product Description	Necessary	100.0%
IQTY	Quantity of Product Purchased	Necessary	100.0%
DORDER	Date Ordered	Necessary	100.0%
Utility Name	Utility Name	Useful	100.0%

2010 Mail-In Rebate Fixture Data

The 2010 mail-in rebate fixture data were provided in two separate files. The first file contained customer information (name, address, phone number, etc.), while the second contained more detailed information such as store name and city and product description. Both files contained a 'rebate number' field which was used to combine the data needed for this evaluation into one dataset. The first file also contained an 'account number' field, allowing this data to be merged with the catalog data described above and, thus, making it easier to identify customers who may have participated through both channels.

Table 43 provides the percent complete for each of the data fields that were deemed useful to support an evaluation. As was the case with the catalog data, nearly all of these fields are 100% complete and all but one of the "necessary" fields are 99% or better. The customer phone number field is the lone field that is less than 99%, with a 77% completion rate. Although it would require more time, it is possible that phone numbers can be looked up based on the

availability of other customer information that is present in the tracking system, as nearly all of the records that are missing phone numbers have complete name and address information.

Table 43: 2010 Mail-In Rebate Fixture Data Field Completeness

Field Name	Field Description	Level of Evaluation Need	% Complete
Rebate#	Rebate Number	Necessary	100.0%
Last Name	Customer Last Name	Necessary	100.0%
First Name	Customer First Name	Necessary	99.1%
HStreet Name	Customer Street Address	Necessary	100.0%
Hcity	Customer Street City	Necessary	100.0%
HState	Customer Street State	Necessary	100.0%
HZipcode	Customer Street Zip	Useful	100.0%
HPhone	Customer Phone	Necessary	77.1%
Account#	Account Number	Necessary	100.0%
Utility	Utility Name	Useful	100.0%
Check Date	Check Date	Necessary	100.0%
Store Name	Store Name	Necessary	100.0%
Store Address	Store Address	Useful	90.9%
Store City	Store City	Necessary	100.0%
Store State	Store State	Useful	100.0%
Part#	Model Number	Useful	100.0%
Quantity	Quantity of Product Purchased	Necessary	100.0%
Description	Product Description	Necessary	100.0%
Manufacturer	Product Manufacturer	Useful	100.0%
Fixtype	Fixture Type	Necessary	100.0%

In-Store Coupon Data

The in-store coupon data used to support this evaluation were provided in two files: one with 2009 data and the other with 2010 data. For all data fields deemed useful or necessary to support an evaluation, Table 44 provides the proportion of each that contained adequate information. Two-thirds (14 out of 21) of these fields were 100% complete. Two others, 'Account Number' and 'Customer First Name', were more than 96% complete. Four of the remaining five fields were 82%-90% complete, while the 'Product Model Number' field was only 63% complete.

Although 37% of the products in this database were missing information in the 'Product Model Number' field, nearly half of those contained adequate information in the 'Product Manufacturer' *and* 'Product Wattage Range' fields to allow KEMA to deduce the product model number and raised the proportion of "identifiable" products to 80.3%.

Table 44: 2009-2010 In-Store Coupon Data Field Completeness

Field Name	Field Description	Level of Evaluation Need	% Complete
Rebate#	Rebate Number	Necessary	100.0%
Last Name	Customer Last Name	Necessary	100.0%
First Name	Customer First Name	Necessary	99.1%
HStreet Name	Customer Street Address	Necessary	100.0%
Hcity	Customer Street City	Necessary	100.0%
HState	Customer Street State	Necessary	100.0%
HZipcode	Customer Street Zip	Useful	100.0%
HPhone	Customer Phone	Necessary	77.1%
Account#	Account Number	Necessary	100.0%
Utility	Utility Name	Useful	100.0%
Check Date	Check Date	Necessary	100.0%
Store Name	Store Name	Necessary	100.0%
Store Address	Store Address	Useful	90.9%
Store City	Store City	Necessary	100.0%
Store State	Store State	Useful	100.0%
Part#	Model Number	Useful	100.0%
Quantity	Quantity of Product Purchased	Necessary	100.0%
Description	Product Description	Necessary	100.0%
Manufacturer	Product Manufacturer	Useful	100.0%
Fixtype	Fixture Type	Necessary	100.0%

4.2.5 Program Outcomes

Program sponsors have twin objectives, to acquire verifiable savings, addressed in the impact section of this evaluation, and to raise the visibility, availability, and customer acceptance of energy efficient lighting products in order to build demand to the point that the market is self-

sustaining. In this section, we address components of the latter, including perspectives on the Energy Star® brand, product stocking patterns, and customer satisfaction.

Product Awareness and Availability

Compact Fluorescent Lamps

Participants, having purchased CFLs through the program were uniformly aware of them. Non-participants were also aware of CFLs, 98% reporting awareness. Within the pool of 342 non-participants that were aware of CFLs, 79% reported having purchased at least one CFL sometime in the past and 73% percent purchased at least one CFL in the past two years.

Other Technologies

Awareness of specialty CFLs is low when compared to that for standard CFLs, reported at 55% for participants and 33% for non-participants. Respondents that indicated awareness were asked whether they were aware of specific types of specialty CFLs. Table 45 shows these results excluding products with less than 1% awareness in both populations.

Table 45: Awareness of Specialty CFL Types

Awareness of Specialty CFL Types	Participants n=194	Non-participants n=113
Overall	55%	33%
Shaped like regular incandescent bulbs	32%	43%
Globe / sphere / vanity	23%	12%
U-shaped / tube shaped	21%	12%
Reflector / flood / spotlight	16%	12%
Candelabra / flame shape (for chandelier)	11%	1%
Dimmable CFL	4%	2%
Plug-in base	2%	1%
3-way CFL	2%	1%

As part of the issues explored with participants and non-participants, we inquired about awareness of other lighting technologies and initiatives. A summary of the results of the awareness investigation is displayed in Table 46 and shows that eight in ten participants and more than seven in ten non-participants are aware of LED technologies. Approximately half of

participants and more than a third of non-participants are also aware of the Energy Star fixture and recycling initiatives that are available to them.

Table 46: Awareness Overview

Technology	Participant (n=350)	Non-participant (n=342)
CFL	98%	79%
Specialty CFL	55%	33%
LED	80%	71%
ENERGY STAR® fixtures	46%	39%
Retailer Recycling Programs	49%	35%

Product Availability

Energy efficient lighting products are widely available, with all surveyed retailers reporting that they stock CFLs. Participating retailers reported selling proportionally more efficient products than non-participants. According to retailers, however, LED products make up only 4% and 2% of participant and non-participant sales, respectively.

Table 47: Bulb Types Sold as Reported by Retailers

What types of Bulbs are sold, by percent?	Participating Retailers (n=5)	Non-participating Retailers (n=5)
Incandescent	67%	76%
CFLs	21%	18%
LED	4%	2%
Other (Halogen, etc)	8%	5%

The 2003 evaluation found the averages of CFL sales to be 24% for participating retailers, 4.2% for non-participating retailers, and 4.8% overall. The current findings compare favorably considering that the other efficient technologies (LED and high efficiency halogen) were not readily available in 2003 and that the significant increase in CFL sales at non-participating retailers demonstrates a market shift.

Retailers were also asked to estimate the percentage of ENERGY STAR®-qualified compact fluorescents sold in their store. . As shown in Table 48 below, participating retailers and non-

participating retailers indicated very similar proportions, averaging around 85% Energy Star ® and 15% non-Energy Star®.

Table 48: CFL Types Sold as Reported by Retailers

CFLs with ENERGY STAR® Rating	Participating Retailers (n=5)	Non-Participating Retailers (n=4)
Energy Star ® CFLs	85%	87.5%
Non- Energy Star ® CFLs	15%	12.5%

Participant retailers were asked what percentage of Energy Star ® CFLs they sold qualified for the NH RESL coupon. Four responded indicated that most, if not all of the Energy Star ® CFLs sold meet NH qualifications while one responded that approximately half did[33].

All five of the participating retailers interviewed indicated that they sold specialty CFLs, whereas only three of the five non-participating retailers interviewed sold specialty CFLs. Retailers were also asked if they sold indoor or outdoor hard-wired fixtures, table lamps and torchieres and, of those, which were Energy Star®-rated. Table 49 below summarizes the retailers' responses.

[33] This last retailer is located near the state border and serves customers not eligible for the New Hampshire program.

Table 49: Retailer Reported Stocking

Reported Stocking	Participating Retailers (n=5)	Non-Participating Retailers (n=5)
Specialty CFL	5	3
Dimmable	5	3
3 - Way	3	3
Reflector	3	0
Globe	3	0
Candelabra	2	0
ES® Hard-wired CFL fixture (indoor or out)	0[34]	2
Non-ES® Hard-wired CFL fixture (indoor or out)	2	1
Non-CFL, ENERGY STAR® hard-wired fixtures	2	2
Non-CFL, Non-ENERGY STAR® fixtures	4	2
ES® CLF Torchieres & table lamps	1	0
Non-CFL Torchieres & table lamps	2	1

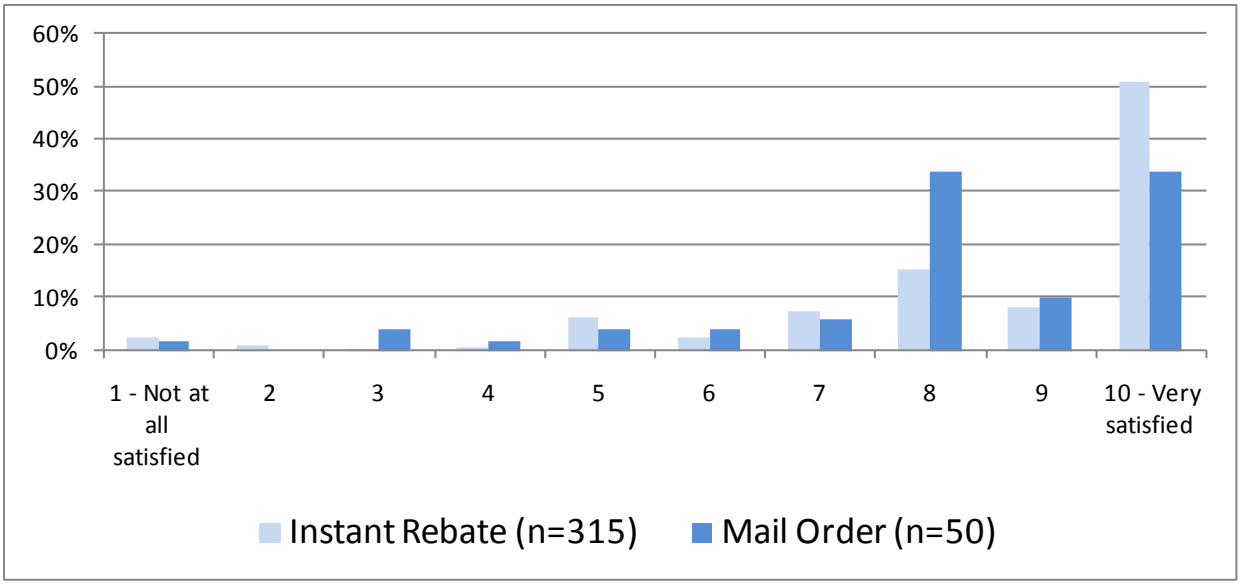
Stakeholder Satisfaction

Customers Customer Satisfaction

Customer satisfaction with the program overall was high, with 75% of instant rebate customer and 78% of mail order customers rating the program at 8 or better on a scale of 1 to 10, where 1 means "not at all satisfied" and 10 means "very satisfied."

[34] The reported absence of EnergyStar fixtures at participating retailers may be due to respondent confusion or lack of knowledge. We anticipate that the APT shelf surveys and other records will more accurately portray stocking patterns.

Figure 11: Participant Overall Program Satisfaction



Program participants were asked to rate their satisfaction with program products. On the same 1 to 10 scale customers offered ratings of 8 or greater at 71% for CFLs, 76.1% for fixtures, and 57% for LED lamps. Non-participants were also asked about their satisfaction with their most-recently purchased energy efficient lighting products. These respondents rated their satisfaction at 8 or greater 52% of the time for CFLs and 69% of the time for efficient lighting fixtures.

Figure 12: Product Satisfaction Ratings

Rating	CFL		Fixtures	
	Participant (n=309)	Non-Participant (n=239)	Participant (n=21)	Non-Participant (n=37)
1 - Not at all satisfied	1.3%	6.7%	0.0%	10.8%
2	0.3%	2.9%	0.0%	0.0%
3	0.6%	3.8%	0.0%	0.0%
4	1.6%	5.0%	0.0%	0.0%
5	6.8%	11.7%	4.8%	2.7%
6	6.5%	7.5%	0.0%	5.4%
7	11.7%	9.6%	19.0%	10.8%
8	22.3%	22.0%	9.5%	10.8%
9	14.9%	7.1%	19.0%	16.2%
10 - Very satisfied	33.7%	22.6%	47.6%	42.3%

Retailer Satisfaction

Participating retailers were asked to rate their satisfaction with program features on a scale of 1 through 5 with 1 meaning “not at all satisfied” and 5 meaning “very satisfied.” Table 50 below is a summary of their responses.

Table 50: Retailer Satisfaction

Program feature	n=	Average rating
Instant coupon	5	3.4
POP material	4	4
Training	2	4
Contribution to increasing sales	4	3
Rebate processing time	3	4.7

These results were based on a small sample, and should be considered in light of the following:

- The attitude of one retailer respondent can best be described as negative in all regards. The other four out of five retailers reported that they sell more eligible products due to program participation and value the program;

- Only two out of five respondents were aware of the training APT offers, highlighting the program challenge of staff turnover and the evaluation challenge of reaching knowledgeable respondents;

- Aside from the negative respondent, the two retailers who were aware of APT's role reported the highest level of satisfaction with their interactions with APT; and,

- Only three out of five respondents had any knowledge of post-sale coupon processing.

Accounting for the small sample and the presence of a generally dissatisfied respondent, the overall picture painted by the participating retailers is positive. The one detrimental aspect of the program, reported by two out of five in response to an open-ended question, was the administrative burden of coupon processing, which is not out of line with the program design parameters.

Market Snapshot

Customer

Most customers contacted through the CATI survey reported having at least one CFL installed in their homes. In total, 75 percent of non-participants and 93 percent of participants reporting having at least one CFL installed, as shown in Table 51.

Table 51: Self-reported Homes with CFLs Installed

CFLs Installed	Participants (n=350)	Non-Participants (n=342)
Yes	93%	75%
No	6%	24%
Don't know	1%	1%

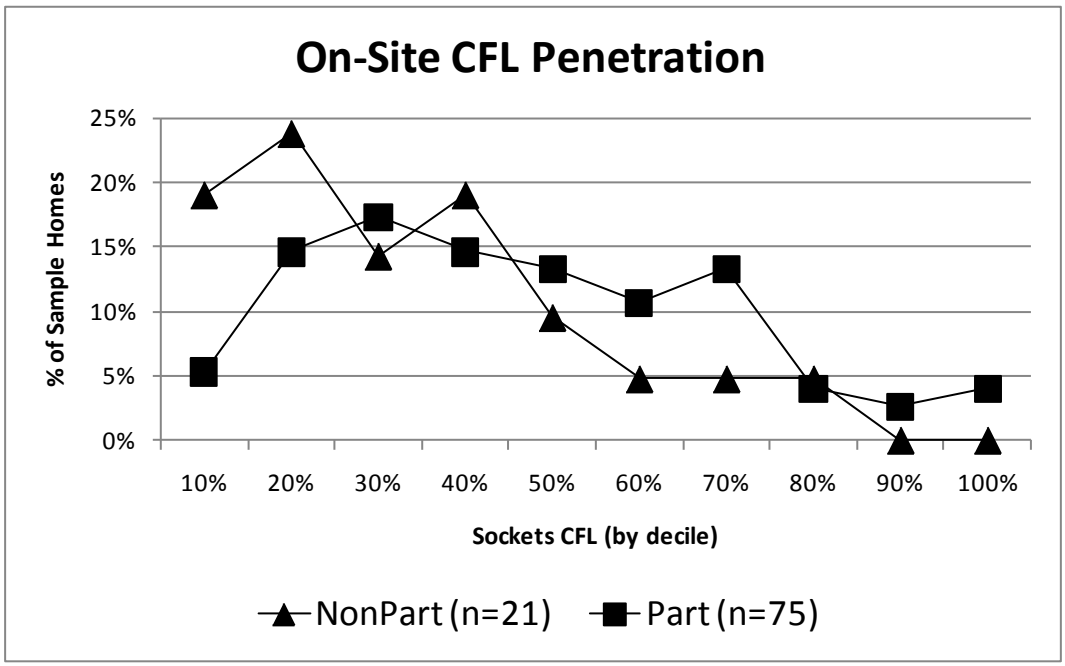
The on-site socket inventories found that all participant homes (n=75) had CFLs installed in at least one socket, and that all but one non-participant home (n=21) had at least one CFL installed. Table 52 below compares the high-level, unweighted findings of the on-site inventories by participant and non-participant.

Table 52: CFLs Installed Per On-Site Inventory

On-Site Socket Count Results	Sockets with CFL		
	Maximum	Average	Median
Participant (n=75)	94%	42%	38%
Non-Participant (n=21)	72%	29%	28%

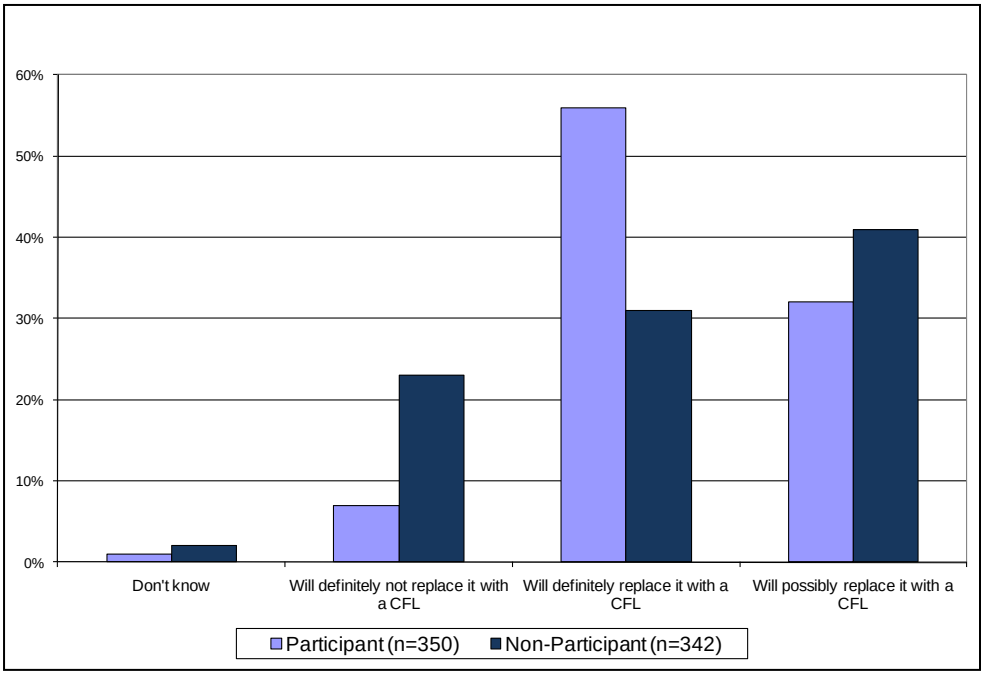
The distribution of CFLs by participant and non-participant is shown in Figure 13 below.

Figure 13: CFL Penetration per On-Site Inventory



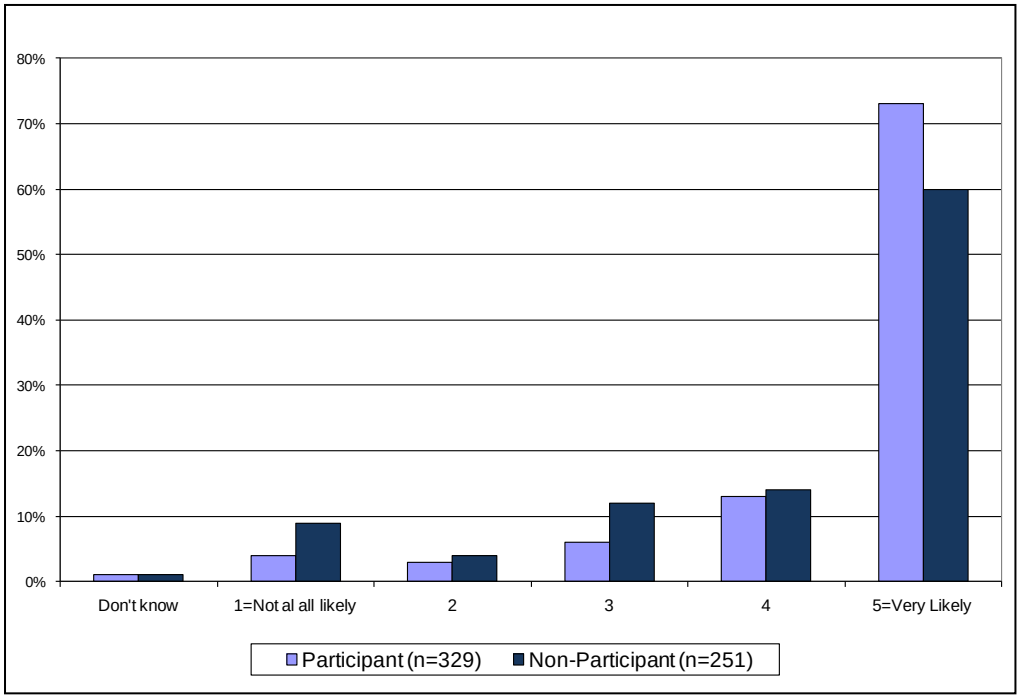
When asked whether they would replace their incandescent bulbs with CFLs when they burn out, more than half of participants indicated that they definitely would, while an additional third indicated that they possibly would (see Table 53). Among non-participants, 31 percent indicated they definitely would, and 41 percent possibly would.

Table 53: Likelihood of Replacing Existing Incandescents with CFLs on Burnout



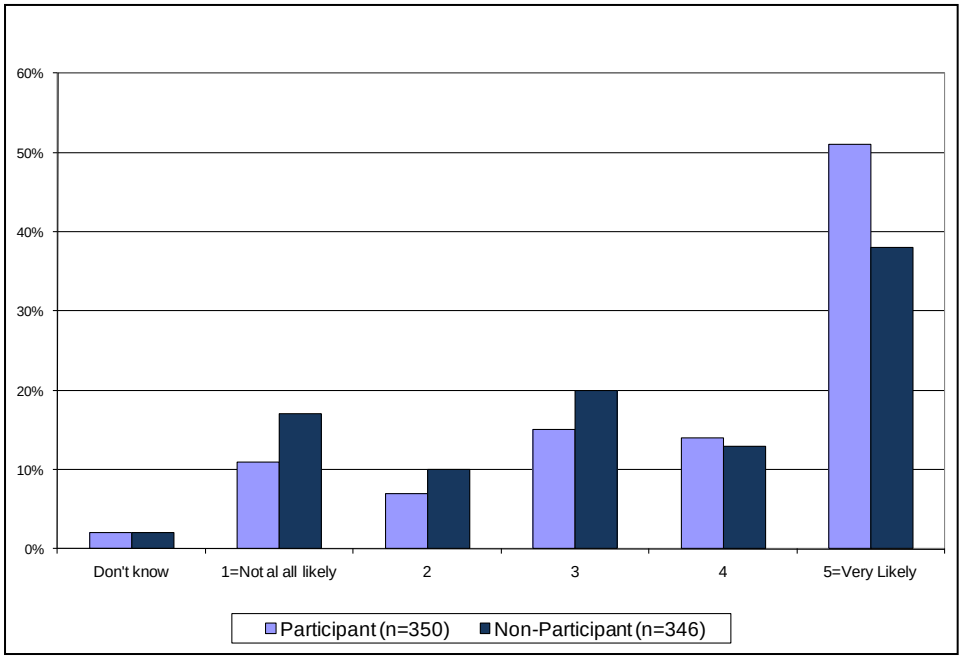
Respondents were asked a similar question regarding their current CFLs: How likely were they to replace their CFLs with new CFLs on burn out? Most respondents seem inclined to continue installing CFLs, with 86 percent of participants and 74 percent of non-participants responding with a 4 or 5, where 5 is very likely. Only 4 percent and 10 percent, respectively, indicated that they were not at all likely to replace with a CFL. Table 54 shows the complete results.

Table 54: Likelihood of Replacing Existing CFLs with CFLs on Burnout



When asked how likely they were to purchase CFLs in the next year, about half of participants and a quarter of non-participants indicated that they were very likely to purchase (see Table 55). Factors that could influence this response could include whether the respondent has replacement CFLs on hand already and how likely he believes it is that a CFL will burn out in the coming year.

Table 55: Likelihood of Purchasing Any CFLs in the Next Year



Specialty CFL products, largely non-existent in the market during the 2003 evaluation, have taken a substantial hold. With awareness of these products reported by 55% and 33% of participant and non-participant customers respectively, customers also report installation of these products at substantial rate, 59% for participant and 40% for non-participants.

Table 56: Self-reported Homes with Specialty CFLs Installed

Specialty CFL Awareness	Participants, n=115	Non-participants, n=45
Shaped like regular incandescent bulbs	31%	36%
Globe / sphere / vanity	20%	16%
U-shaped / tube shaped	18%	11%
Reflector / flood / spotlight	23%	20%
Candelabra / flame shape (for chandelier)	9%	
Colored CFL		2%
Plug-in base	2%	2%
Small screw base	1%	
3-way CFL	2%	
Dimmable CFL	1%	

Of the 250 non-participants who reported awareness of LED products, 41% also reported having at least one plug-in LED lighting device in their home as shown in Table 57. In particular, LED holiday lighting was reported to be prevalent in nearly half of respondent homes.

Table 57: Self-reported LED Types Installed at Homes

Types of LED Products Installed	Non-participant n=102
Holiday lights	46.1%
Nightlight	31.4%
LED bulb	9.8%
LED light fixture	9.8%
LED light string/under cupboard lighting	8.8%

Participants were asked a series of questions designed to determine the influence of the program on lighting purchase decisions (results in Table 58). Prior to participating in the program, most respondents were aware of CFLs and LEDs, but only 46 percent were aware of Energy Star® fixtures. Of those aware, many had purchased some form of high-efficiency lighting prior to recent program participation: 72% for CFLs, 45% for Energy Star® fixtures, and 32% for LED lighting.

Table 58: Program Influence on Lighting Purchase Decisions

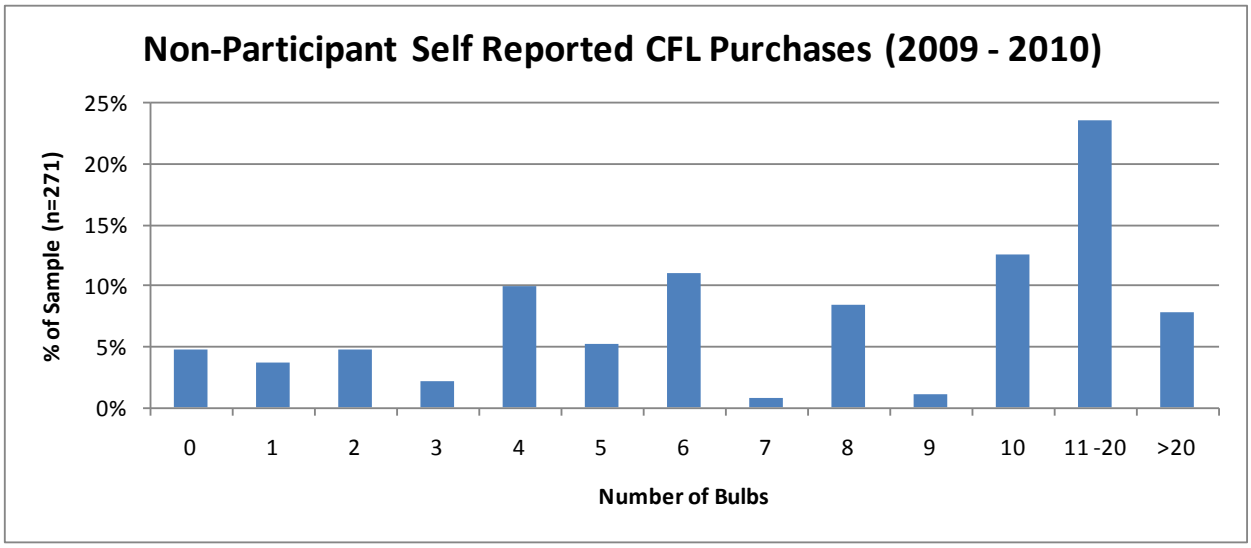
Lighting Product Type	Familiar with before program n=350	Purchased Before Participating in Program		Purchased After Program Purchase n=350	Program Influenced Additional Purchase	
	% Yes	n	% Yes	% Yes	n	% Yes
CFLs	91%	320	72%	52%	183	69%
ES fixtures or torchieres	46%	160	45%			
Indoor ES fixtures				14%	49	61%
Torchieres				8%	28	75%
Outdoor ES fixtures				9%	30	43%
LEDs	80%	281	32%	34%	118	33%

As shown in the table, a substantial portion of respondents attributed additional post-participation purchases to the program. Despite the levels of reported influence, it is difficult to quantify how tenable the link is between the program and these purchases. It is clear, however,

that the program is having a positive influence on some participant behaviors related to post participation purchases.

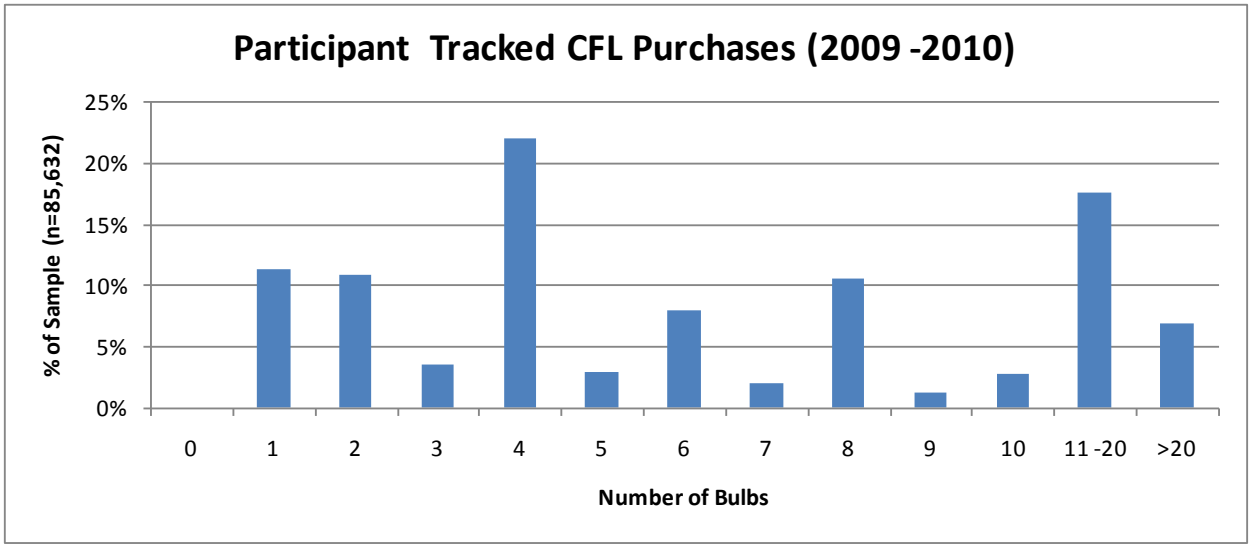
The NHsaves program is reaching and influencing non-participants as well. Roughly, four-fifths of non-participants reported that they had purchased CFLs at some point. Figure 14 displays the distribution of quantities reported purchased in the last two years. It is clear from the figure that many non-participating customers that are purchasing bulbs each year have done so in large quantities.

Figure 14: Non-Participant Reported CFL Purchases



The figure below shows the tracked participant purchases over the same time period in the same format. Figure 15 is not easily comparable to Figure 14 since one is based on self-reported purchases, while the other is based on tracking data that does not capture purchases outside the program.

Figure 15: Participant Tracked CFL Purchases



When asked, non-participants who purchased CFLs reported being aware of, and influenced by, program outreach efforts in their purchasing decision. Table 59 below shows the sources mentioned by non-participants (column labeled "n citing") and the percentage of those mentioning a source who also said they were influenced by that source ("% influenced").

Table 59: Non-Participant Awareness Sources

Source of RESL Awareness	n citing	% influenced
Bill insert	42	24%
Information from the store	34	41%
NH Saves Catalog	30	37%
Utility's website or NHSaves.com	19	37%
A Friend or Relative	15	53%
Home show or energy fair in your community or at work	13	62%
Somewhere else on the Internet	3	67%

Forty-one percent of non-participant purchasers (14 out of 34) reported that in-store information influenced 41% of their decisions to purchase. Unfortunately for program participation levels, only 14% of all non-participants (n=350) recalled seeing in-store displays or information about the instant coupon.

Slightly over a third of non-participants reported awareness of compact fluorescent fixtures. These respondents were asked about the likelihood, on a scale of 1 to 5 where 1 is "not at all

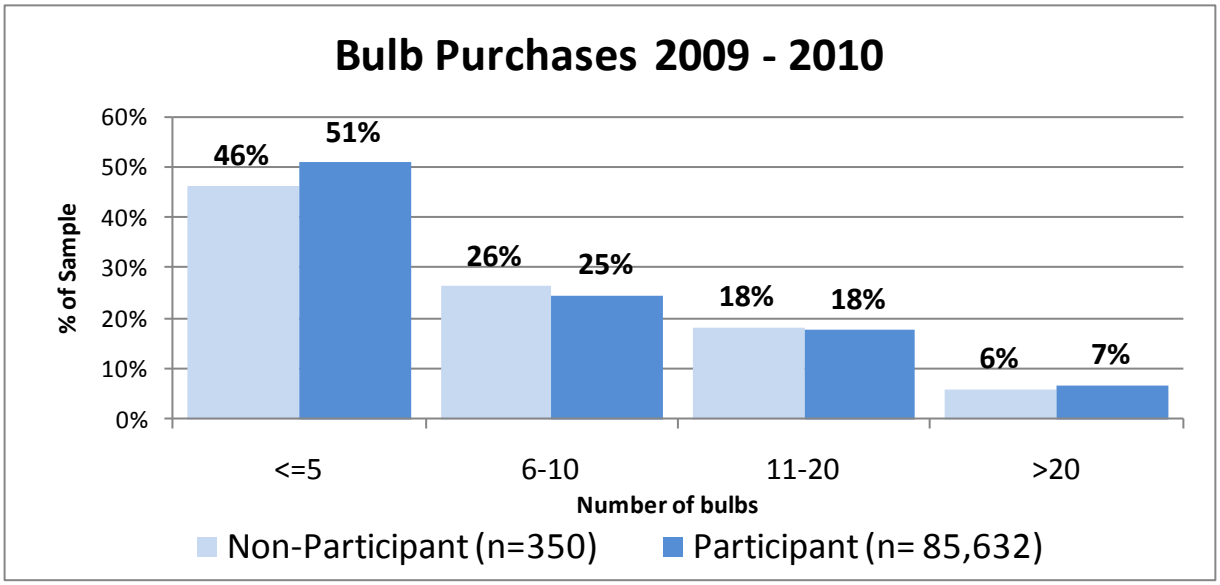
likely" and 5 is "very likely," of their purchasing a fixture in the coming year. Roughly 20% of them responded that it was likely, as shown in Table 60, below.

Table 60: Likelihood of Purchasing Compact Fluorescent Fixtures

Likelihood of Purchase in Coming Year	Non-participant n=134
5 - Very likely	13%
4	7%
3	20%
2	12%
1 - Not at all likely	45%
Don't know	3%

The figure below compares self-reported purchases of all CFLs by non-participants to the tracked purchases of program-qualified CFLs by participants.

Figure 16: Non-Participant and Participant CFL Purchases



This figure must be considered with the following facts in mind:

1. The differences in data collection methodology (self-report vs. tracked) are not accommodated in the figure;

2. The portion of non-participants that reported purchasing less than five bulbs includes those that reported having no CFLs in their home (26% of all respondents);

3. The on-site inventory that found that all but one non-participant household had CFLs installed; and,

4. A degree of uncertainty regarding the bulb counts in the database.

Despite these caveats, this comparison is supporting evidence that the market has substantially transformed since the 2003 evaluation. Other evidence includes:

- Non-participant purchases of CFLs were all but non-existent in 2003, compared to 74% of this segment now reporting purchases in the last two years;

- The average CFL saturation in participant homes in 2003 was 23.5% of available sockets, compared to 42% today for participants and 29% for non-participants: and,

- Overall retailer-reported sales of screw-in CFLs accounted for 4.8% of the market in 2003, compared to 19.5% today

Retailers

Non-participating retailers attributed high importance (average of 3.4 out of 5) to stocking Energy Star® branded products, and two report it is all they stock for CFLs. Three out of five non-participating retailers said they had not been contacted for program enrollment and expressed interest in future program participation. Retailers were asked about their expectations for CFL sales in the coming years. Their responses are shown in Table 61 below.

Table 61: Retailer Projections for Bulb Sales in the Upcoming Year

Bulb Type	Retailer Type: Participating (n=5) Non-Participating (n=5)	Frequency of Responses			
		Sales will Increase	Sales will Stay the Same	Sales will Decrease	Don't Know/ Refused
Incandescent	Participating	1	2	2	-
	Non-participant	2	3	-	-
CFLs	Participating	3	2	-	-
	Non-participating	3	2	-	-
CFLs, non-Energy Star®	Participating	-	3	-	2
	Non-participating	-	2	-	3
CFLs, Energy Star®	Participating	1	2	-	2
	Non-participating	1	4	-	-
LEDs	Participating	3	1	-	1
	Non-participating	3	2	-	-

Retailers that expected incandescent bulb sales to rise attributed this to hoarding of incandescent in response to the adoption of EISA legislation (see Section 4.2.6 below). Overall, retailers reported that a near universal expectations that sales of CFLs and LED lamps to increase or stay the same over the next year. With regard to LED lighting, the responding retailers noted that their projection was based on the expectation that pricing will remain relatively high in the near term.

Utility & Contractor Staff

Utility staff stated that they have seen a huge change in the market share of efficiency lighting products in the past decade. Prices have dropped significantly. The days of begging a retailer to put up 3 feet of materials have passed, and now these products are more likely to get bigger coverage automatically and perhaps even a dedicated aisle. Utility staff attributed this shift to customer demand and manufacturer development of CFLs that more closely match the desirable characteristics of incandescent bulbs, (.e.g. color temperature) and that fit in a wider range of applications (e.g. A-line bulbs and dimmable controlled).

However, despite these positive accomplishments, utility staff believe that out of 25 million lighting sockets in New Hampshire, they have touched only 20% of them, and that rebates are still necessary to move the market. As noted above (e.g. Table 52) the market appears to have shifted to a greater degree than perceived by program managers.

Contractor staff members reported that the ENERGY STAR® brand has had a very positive impact on efficient lighting products. With programs such as NHSaves, people have come to know of the Energy Star® name, the benefits provided thereby, and the qualified products listed. At first, retailers worried they were providing more benefit to NH Utilities than they were receiving, but that perception has shifted in recent years. The brand is getting out there, is visible and is helping to drive sales. This has led to an increased eagerness in retailers to participate in the program. Other benefits were reported, too, such as improved quality of products, a greater excitement for LEDs, and improved understanding of efficient lighting and product options. Since every customer uses lights, 100% of the market is within reach; market penetration and market acceptance, though not complete, is impressive, according to EFI.

4.2.6 Barriers & Opportunities

In this section, we address barriers and opportunities raised by stakeholders and deduced from analysis of the collected data. The research effort was targeted at developing data from which to estimate the likely effects of provisions of Energy Independence and Security Act of 2007 (EISA) related to this market sector, to gauge stakeholder perceptions of barriers, and to solicit their recommendations for program improvement.

EISA

Customer Perspective

With regard to lighting products, EISA compliance requirements are focused upstream of end-users. Retail customers are free to purchase and use whatever lighting products are available in their markets. Nonetheless, 59% of program participants and 49% of non-participants reported awareness of the legislation. Most respondents indicated that they would switch to a new type of light bulb when the traditional 100-watt incandescent bulbs were no longer available as shown in Table 62.

Table 62: Alternatives to 100-Watt Light Bulbs

Most likely response if 100-watt incandescent bulbs unavailable	Participant n=350	Non-participant n=350
Use lower wattage incandescent bulb	19%	33%
Switch to:		
CFL	45%	26%
LED	12%	9%
Halogen	2%	0%
Stockpile 100 watt incandescent bulbs	1%	2%
Don't know - undefined	21%	30%

In light of the fact that a substantial portion of respondents were unaware of the impending market change prior to the survey, the portion of end-use customers that were unable to define an alternative, roughly a third for participants and three-fifths for non-participants, indicates that market disruption is not likely to be felt by end-users assuming the rest of the market chain lives up to its potential.

Retailers

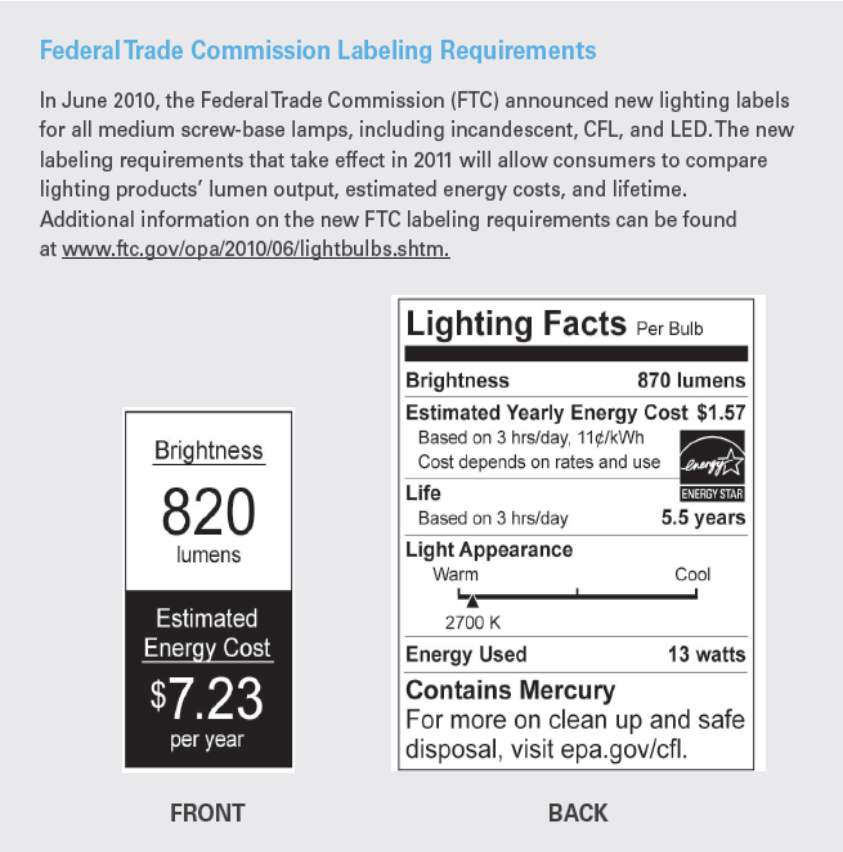
All 5 non-participating and 4 out of 5 participating retailers were aware of EISA provisions regarding 100-watt incandescent lamps. Most expected that sales of incandescent lamps would increase, as a result of customers hoarding and stockpiling, contrary to the behavior customers reported. Only two respondents predicted that there would be no change in customers' stocking practices. When asked if they had begun selling higher-efficiency incandescent lighting, such as halogen-IR lamps, two participating retailers responded that they had. None of the non-participant retailed had begun selling halogen-IR lamps and two of the five were not aware they existed.

Utility staff

Utility staff anticipate that education with regard to lighting choices will be important when 100-watt incandescent lamps are removed from the market. One objective will be to educate customers on current technologies to help avoid the anticipatory purchasing and hoarding of 100W bulbs observed in Europe. The utilities are developing bill inserts, an article for the NHSaves catalog and some information to appear on the utility websites as part of an educational campaign.

The Federal Trade Commission introduced new labeling requirements that took effect in 2011 that incorporates detailed information, including lumens, wattage and estimated yearly energy cost, as shown in Figure 17 The utilities believe this may be the proper way to introduce "lumens" to customers and will make it easier for consumers to compare lighting products. The NH Utilities are also anticipating an increase in the enhanced halogen product offerings and look forward to both more CFL choices and affordable LEDs entering the market.

Figure 17: Labeling Requirements for Lighting



Source: ENERGY STAR® CFL Market Profile Data Trends and Market Insights, U.S. Department of Energy, September 2010. From: http://www.energystar.gov/ia/products/downloads/CFL_Market_Profile_2010.pdf

Barriers

Customers

End-use customers reported that the primary barrier to increasing the number of CFLs in their homes was their perception of operating characteristics, including cold operation, color temperature, use with dimmer and three-ways switches, and fit in existing fixtures. While the technology has improved CFL performance on each of these indices, and substantial number of customers are aware of this fact, (see Table 45) the persistence of this perception is a substantial barrier, as shown in Table 63 below.

Table 63: Customer Barriers

Primary barrier to additional CFL installation	Participant n=339	Non-participant n=334
CFLs operating characteristics	28%	28%
Waiting for incandescent bulbs to burn out	19%	17%
All lights CFLs already/no more space to put more	13%	6%
CFLs are too expensive / cost too much	12%	15%
Dangerous/Contain mercury	4%	4%
Other	14%	19%
Don't know	5%	9%

Non-participants that reported being aware of the RESL Program through either the NHSaves catalog (n=79) or through a display at a retail (n=27) store were asked to cite their reasons for not participating using either of those channels. Roughly a third of each sample (28% and 30% respectively) simply reported no need for additional bulbs at this time, that they were waiting for incandescent to burn out. About a tenth of each sample (10% and 15% respectively) reported full penetration of efficient lighting in their homes. Only two respondents indentified the necessity of filling out a coupon as a barrier to participation, showing that this may be more significant as an operational for retailers than as a barrier for end-use customers.

Retailers

Two out of five non-participating retailers surveyed were unaware of the NH Utilities' program. Awareness is clearly a barrier to perception. This lack of awareness is more likely a result of staff turnover rather than any failure of program design or implementation due to the long tenure of the program, the magnitude of the outreach effort, and the expertise of the implementation team. The three retailer respondents who were aware of the program attributed non-

participation to the absence of customer demand, e.g. “we get older people who aren’t isn’t interested” and “they don’t fit well in our product line.” This latter respondent noted that they had “tried to get into a previous program but they said we were too small and they only wanted the big box stores.”

Contractors

The implementation contractors perceive the lack of customer knowledge as a key barrier. They note that there is an extensive range of efficient and program-eligible products on the market, but that customers may make decisions based on energy requirements (watts) instead of service provided (lumens). As part of program implementation they report that they have begun working to inform customers of this difference, Both the printed and on-line versions of the catalog contain “Lighting Facts” that explain the new labeling requirements and lighting characteristics.

APT was aware of some instances of negative customer feedback related to the quality of program-eligible specialty bulbs. The respondent expressed concern that customers may perceive program-eligibility as an endorsement of the quality and suitability of the products and that if they are dissatisfied with the product, they will be dissatisfied with the NH Utilities. APT suggested implementing a product guidance protocol on how to incentivize specialty bulbs based on customer feedback that they are already receiving.

Utility Staff

Utility staff reported the following barriers during the interviews:

- Product pricing – Although prices for CFL and LED technologies have come down, there is still a premium for these products.

- Product characteristics – The utility respondents cited the cold start, color temperature and mercury content of CFLs as barriers. We note that there are CFL products on the market that address the first two and the customer respondents did not expresses substantial concern regarding mercury (4% for both participant and non-participant customers).

- Market focus – Utility staff perceive that the upstream market investment in LED technology may result in corresponding slow-down in the investment of CFL technology, which accounts for 98% of the program savings.

- Messaging - Customers understand more about CFLs than in the past, but utility staff perceive that there is still a substantial knowledge gap.

Opportunities

Contractors

The APT respondent expressed interest in pilot testing an upstream program at one retail location based on retail price markdowns instead of in-store rebate coupons. They also noted that there are areas of the state, specifically in NHEC territory, where retail store enrollment could be expanded.

EFI noted that the mail-in rebate for fixtures, implemented in response to abuse at one large volume retail location that was not susceptible to changing its operating policy, "is not optimum." The representative explained "this approach is different, lighting is usually instant gratification or done upstream with a markdown, done on shelves."

Utility

Representatives of the NH Utilities expressed interest in expanding retailer enrollment at retail outlets that have been a challenge to engage, such as drugstores and grocery stores. These outlets are often not capable of, or willing to, adjust their internal processes to meet the data requirements of the program sponsors. Along the same line, the NH Utilities are also looking to increase collaboration with retailers' corporate offices to help overcome barriers to participation that local managers may face.

Retailer

Retailers who had participated in NH RESL suggested several improvements to the program:

- Offer rebates of variable dollar amounts for different products. Several retailers pointed out that $1 off rebates for basic bulbs were fine but essentially made no difference for more expensive specialty bulbs. They suggested rebates that were variable by price,

providing either a certain percentage discount or several dollars off what was spent- e.g., $3 off a purchase of $10 or more.

- Make CFL recycling more widely available. One retailer stated that he had previously participated in a CFL recycling program with the state. Since that ended, customers have been complaining about a lack of CFL recycling centers.

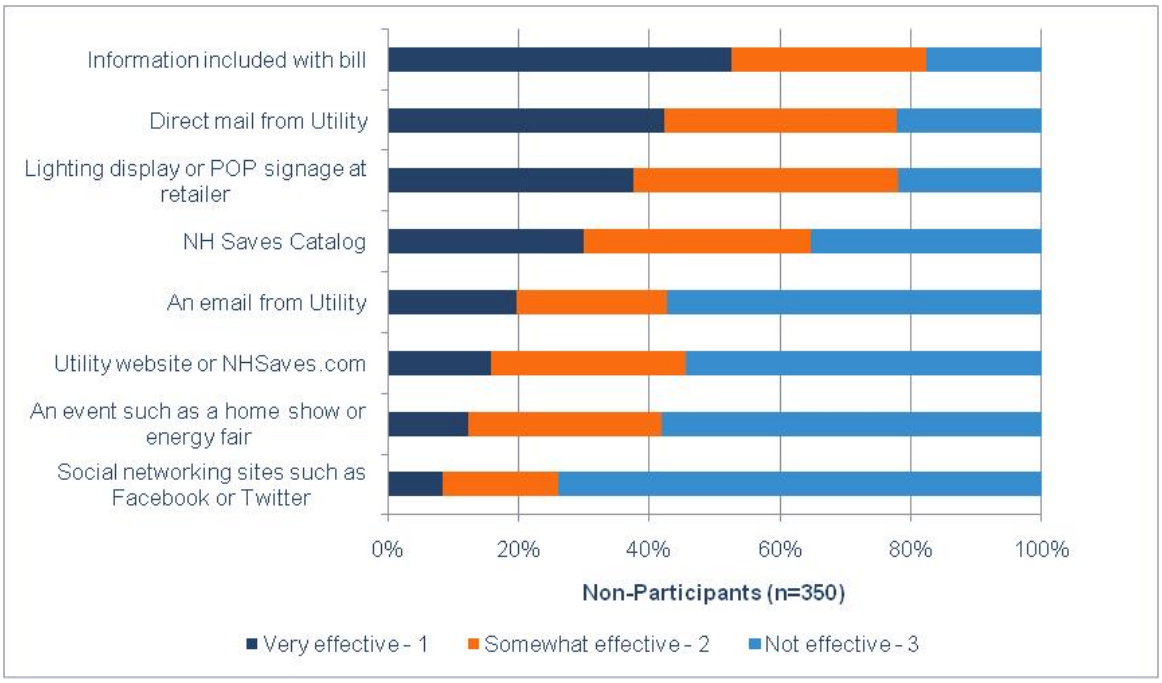
- Offer rebates for wider variety of products. Retailers mentioned that they are limited in terms of the number of specialty CFLs available, in particular dimmable CFLs.

Customer

Non-participant customer were asked which channels would be most effective at helping customers to learn about and understand the NH RESL Program. As shown in Figure 18 below, the top three methods in terms of effectiveness were bill inserts (52%), direct mail from the utility (42%) and in-store displays (37%). This is line with non-participant (n=108) reported hierarchy of awareness sources, with bill inserts at 58% and in-store displays at 25%[35]. Social media and events were not rated as effective marketing channels.

[35] The question sequence for awareness sources did not include the option of direct mail from the utility.

Figure 18: Effectiveness of Marketing Channels per Non-participants



5. Findings and Recommendations

Impact Evaluation

Using the findings of the on-site visits to NH RESL participant homes, we suggest the following assumptions and values be utilized in the determination of program impacts:

a. Discrepancies observed between the CFLs sold according to the tracking database and those counted at participant homes led us to conclude that the quantity of bulbs sold through the program was 34 percent greater than the quantity reported. In turn, KEMA and the NH Utilities scrutinized both 1) the on-site data collection practices to confirm or challenge those numbers, and 2) the tracking database, to pinpoint possible causes for the discrepancies. The on-site data were confirmed and the tracking database was found to contain some weaknesses that resulted in significant under-reporting of CFLs sold through the program.

   Recommendation: There are a couple of things the sponsors can do to minimize the need for this quantity adjustment in the future. The first is to place a renewed focus on the participating retailer-training program and ensure that each program representative visit to the retailers provides repeated and additional training on the proper use of the coupons and their import to the program process. We also recommend that the sponsors continue including the use of the new coupons that have a clearer explanation of the pack size associated with each coupon, which is expected to improve the tracking of program purchases.

b. According to on-site visits, the in-service rate of CFLs of 62.3 percent was 22 percent lower than the 80.3 percent value used to determine the ex ante annual program savings. More CFLs were found to be stored by residents than in years past. This is likely due to the increase over time of the ratio of multi-pack CFL sales to single CFL sales.

   Recommendation: Reduce the in-service rate of CFLs for program planning purposes to 62.3 percent.

c. The difference in wattages between the program CFLs and those bulbs replaced by the program, referred to as delta watts, were found to be 46.1W per CFL according to the on-site data analysis of this study. This value exceeds the estimated difference of

40.8W used for the 2009-2010 program assumptions by 11 percent and the current program difference of 31.5W by 45 percent.

Recommendation: Increase the delta watts to 46.1W per CFL for 2009-2010 program evaluation purposes. Going forward, this value could justifiably be used for planning purposes, although the impacts of the phasing-in of EISA requirements are still unknown and a smaller increase may prove more appropriate.

d. The hours of use measured at program products installed at 75 participant homes led to a reduction of the average hours per day to 2.0. This is 41 percent lower than the current program assumption of 3.4 hours of use per day. This finding is similar to those of other regional lighting studies in the United States and savings targets for energy efficient lighting programs across the country are being adjusted accordingly.

   Recommendation: Decrease the estimated hours of use to the weighted average of 2.0 hours for 2009-2010 program evaluation purposes and, going forward, for planning purposes.

e. While the summer on-peak coincidence factor was found to be unchanged at 7.6 percent, the winter on-peak coincidence factor was found to be 22.7 percent (previously 28.6 percent).

   Recommendation: Decrease the winter on-peak coincidence factor to 22.7 percent for 2009-2010 program evaluation purposes and, going forward, for planning purposes.

f. The above changes led to an overall 2009-2010 NH RESL program savings of 20,133,603 MWh that, when compared to the ex ante savings of 29,540,717 MWh, yields an overall realization rate of 68.2 percent.

g. The on-site visits showed that, on average, 28.1 percent of the residential lighting sockets contain CFLs in New Hampshire. This is in keeping with the upward trend of CFL usage in recent years that has been driven, in part, by national market growth.

Process Evaluation

Below we provide our key findings from the process evaluation work. We follow each finding with recommendations that we believe would further program goals and effectiveness.

n. Customers expressed high levels of satisfaction with program offerings and operations, marketing and outreach mechanisms, and product quality and performance. Point of purchase material, e.g. coupons and displays, the on-line presence and the physical catalog were all positively received.

Recommendation: The existing platform of program operations appears sufficiently designed to meet the changing requirements of the market. Overall, we find that the Residential Energy Star Lighting program is producing significant energy savings and suggest only incremental improvements that we believe will help it continue to evolve in effectiveness and performance.

o. The utilities and implementation contractors reported some ongoing pressure to adopt a markdown program design, but have reservations about the ramifications and practicality of such a change. The program design is optimized to meet the sponsors' expressed need for budget control, accountability and adaptability. Upstream program designs may be optimized to meet other needs, e.g. reducing the administrative burden and maximizing measure penetration, but carry several disadvantages. A high-level comparison of the program designs is provided below.

Table 64: Comparison of Rebate to Markdown Program Design

Attribute	Rebate Program - Downstream	Relative advantage					Markdown Program -
		+2	+1	Neutral	+1	+2	
Adminstrative burden placed on customers	Moderate to high					●	None
Adminstrative burden placed on retailers	Moderate to high					●	None to low
Ability to reliably assess savings	Moderate to high	●					None to low
Confidence in cost-effectiveness estimates	High		●				Low to moderate
Control of program budgets	Moderate to high		●				Moderate
Ratio of administrative to incentive cost	High				●		Low to moderate
Cost-effectiveness	Moderate			●			Moderate
Customer targetting	Precise	●					Loose
Control of eligible product list	Tight			●			Moderate
Ease of offering a wide range of products	Wide		●				Constrained
Ease of tracking throughput by location	Strong	●					Moderate

Recommendation: Absent a change in the regulatory regime or sponsor drivers, we do not recommend shifting to an upstream program. As one contractor noted ""If they're meeting their goals cost effectively then changing their approach may not have any particular value."

p. The retailer contractor reported receiving feedback from customers about dissatisfaction or satisfaction with specific products, but this information is not currently considered when decisions are made about which products are sponsors through the program. Customers may view the qualification of a product as an endorsement of the product quality, and if the product fails to meet their expectations in product quality, may have a negative impression of the program.

   Recommendation: Consider developing a means for gathering and disseminating available feedback on specific lighting products from customers.

q. The on-site inventory found at least one CFL installed in all participant homes and 95% of non-participant homes, while the CATI survey found lower rates of reported installation, 93% and 75% respectively. Non-participants reported awareness of the NH RESL program, approximately 28% percent, a relatively low level given the widespread penetration of the primary supported measure. This awareness gap makes the case for ongoing NH Utility intervention in the market, particularly in education and outreach.

   Recommendation: Continue efforts to educate consumers regarding energy–efficient lighting options, including instruction on using lumens and color profiles to select appropriate lighting products rather than watts in the near term. The NHsaves catalog and website provide useful platforms for this purpose as well as the general desire to continue to support LED technologies as they improve, become cheaper to purchase and move available.

r. Awareness of LED lamps is high, at 80% among participants and 71% among non-participants. This is substantially higher than customer awareness of specialty CFLs (at 55% and 33% respectively). In addition, LED lamps are experiencing a rapid decline in cost[36]. In short, there are signals that the market will be moving toward LED lighting technologies rapidly. In the interim, however, as standard CFL market saturation becomes greater, the success of capturing the remaining opportunities will increasingly become depended on building awareness of specialty CFLs.

[36] At the June 2012 NEEP Energy Efficiency Summit manufacturers reported that the price of screw-in LED lamps has declined from $50 each at the beginning of 2011, to a current price of $25, and it is anticipated that the threshold of $20 will be broken before the end of the year.

Recommendation: In light of market awareness, pricing, and EISA requirements, the program should considering ramping up its LED offerings as quickly as is prudent. We anticipate that existing program mechanisms can readily accommodate this effort.

Recommendation: In the interim, building specialty CFL awareness would greatly assist in continuing the saturation of CFLs into homes. Building awareness might include displays that illustrate the existence of candelabra based CFLs, the dimmability of CFLs or the capacity for CFLs with three way switching. The sponsors might also consider having video presentations on nhsaves.com that illustrate available specialty CFLs and show their capability in specialty applications.

s. Overall awareness of the NH RESL has dropped among non-participants from 40% in 2003 to 26% in 2011. However, participants report that outreach efforts are a substantial source of awareness. It appears that the NH RESL program may be a victim of its own success, and has become less visible, although possibly no less valuable, in the market.

   Recommendation: The effort to increase program awareness, specifically through bill inserts and point of purchase displays, should be maintained. These efforts may be complemented by direct mailings to targeted areas (e.g. low density retailer enrollment) or populations (e.g. home heating assistance eligible customers) to reach underserved markets.

t. As manufacturers race to have their new products on store shelves, sometimes the Energy Star® label is applied prior to certification. Customers are disappointed to learn that a new product that they purchased is not on the qualified product list. The lag in time of the product hitting the shelf and being added to the qualified product list presents a challenge to the program to keep up with the latest products and to maintain the positive impression of the program in the minds of the customers.

   Recommendation: Explore the ability of the implementation contractor to obtain information about new products slated to be introduced in retail stores to minimize the lag in updating the list of qualified products.

u. The utilities indicated a desire for improvement to the invoicing procedures from the hired contractors. The invoices are issued to the utilities on a calendar basis, i.e. twice

monthly, but the utilities would prefer to also have the invoices based on minimum dollar amounts to reduce the number of transactions the utility processes.

Recommendation: Establish guidelines for threshold dollar-amount invoices from the rebate/coupon processor and product fulfillment vendor.

v. Two out of five non-participating retailers were not aware of the program. Two out of the three non-participant retailers who were aware of the program reported that they had not been contacted to participate.

Recommendation 1: Established a schedule of revisits for all non-participating retailers, and, with the exception of chain stores where corporate decisions may be the barrier, consider adding an enrollment incentive to the retailer offering.

Recommendation 2: Build and maintain list of decision maker contacts at each retail location, and approach them for both program implementation issues and evaluation information.

Recommendation 3: Develop a marketing package to non-participant retailers that includes retailer case studies, these evaluation findings, information on likely market shifts from EISA impacts as seen from the broader national perspective utilities can bring.

w. The New Hampshire Residential Energy Star® Lighting database appears to be relatively well populated in the fields that are useful or necessary for evaluation purposes. Almost 79% of the fields are fully populated with the information they were intended to contain and almost 90% of the fields are at least 90% complete. However, any data gaps can have substantial impact on the accuracy of program accomplishment metric and evaluation effort. However, additional customer completion requirements are likely to result in reduced participation rates, increased customer dissatisfaction, and to adversely affect customer/retailer relationships.

Recommendation 1: The number of lamps per data entry record in some cases is not clear. We recommend that a field be added to the dataset explicitly stating the number of bulbs per record.

Recommendation 2: Program sponsors may consider complementing the program with a scalable retailer incentive mechanism based data completeness and accuracy. This

incentive may be either a carrot (additional funds for meeting objectives) or a stick (reduced payments for failure to meet objectives). The incentives might vary by data field in relation to the importance the sponsors place on each. For example, the customer phone number is primarily for evaluation purposes, and absence could be accommodated by providing future evaluation bidders an estimate of viable telephone numbers in the database during the RFP phase. Others may be critical to utility operations (e.g. load management) or economics, such as the number of bulbs in a multi-pack. The table below is offered as an example of the approach the sponsors might take.

Data Field	Importance	Threshold	Increment	Carrot	Stick
Number of bulbs	High	95% complete	1%	$10 for each 100 rebates that meet this threshold, plus $100 for each 1% over for the program year.	Rebate payment reduced by 5% for each 1% below
Customer phone	Low	90% complete	None	$50 per 1,000 rebates for the year	Rebate payment reduced by the lesser of $50 or 5% per invoice.

x. CFL technology has been widely adopted by both participant and non-participant populations as shown by both on-site investigation and telephone survey instruments. Participant purchases averaged 8.2 bulbs per sample point, compared to 7.6 bulbs per non-participant. The on-site found that the average participant home had CFLs in 42% of sockets, compared to 29% for non-participants. In short, while the market has been significantly transformed over time, there is still a measurable difference between participant and non-participant adoption.

Recommendation: Market continuity has great value, especially at this time of impending change. Even if there were definitive evidence that the market has been fully transformed, which this evaluation does not provide, we would recommend continuation of program efforts to provide a seamless transition for emerging technologies, preserve the relationship and infrastructure investments made over many years, and to allow for continuous improvement within program management and administration.

A. Interview Guide for Program Managers

B. Interview Guide for APT Implementation Contractor

C. Interview Guide for EFI Implementation Contractor

D. Survey Instrument for Participating Retailer Representatives

E. Survey Instrument for Non-participating Retailer Representatives

F. CATI Survey Instrument for Program Participants

G. CATI Survey Instrument for Non-participant Residential Customers

H. On-site Survey Instrument

I. EFI Tracking System Data Review Memo