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DUKE ENERGY OHIO EXHIBIT__________

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

FILE

In the Matter of the Application of Duke Energy Ohio, Inc., for Recovery of Program Costs, Lost Distribution Revenue and Performance Incentives Related to its Energy Efficiency and Demand Response Programs.	)))))	Case No. 13-753-EL-RDR

DIRECT TESTIMONY OF

ASHLIE J. OSSEGE

ON BEHALF OF

DUKE ENERGY OHIO, INC.

VOLUME 3 OF 3

March 28, 2013

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Process and Impact Evaluation of the Residential Smart $aver Energy Efficiency Products (CFLs) Program in Ohio

Final Report

Prepared for
Duke Energy
139 East Fourth Street
Cincinnati, OH 45201

September 28, 2012

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Executive Summary

Key Findings and Recommendations

This section presents the key findings and recommendations identified through this evaluation of Duke Energy's Ohio Residential Smart $aver Energy Efficiency Products Program. The program evaluation covers the period of time from July 1st 2010 through April 26th 2011 (n=243,393 participants. Table 1 presents the estimated overall ex post energy impacts from the engineering analysis.

Table 1. Estimated Overall Impacts

	Gross Savings	Net Savings
Annual Savings Per Bulb Distributed		
kWh	34.4	29.0
kW	0.0043	0.0036

The impacts in this table were calculated using engineering algorithms from Appendix G: Impact Algorithms. These estimates also take into account a participant's tendency to over-report operating hours. This is explained in further detail in the Self-Reporting Bias section. The net-to-gross ratio used to calculate net savings is 84.24%. Freeridership and spillover, the two components of the net-to-gross ratio, are calculated in their respective sections: Freeridership and Spillover. Market effects energy savings are not included in this program evaluation report and if present, are above and beyond those savings reported.

Significant Process Evaluation Findings

From the Management Interviews

- Overall, this program was highly successful in meeting its goals and is not experiencing significant problems. A member of Duke Energy's program management summarized it as "working wonderfully." The IVR and online platforms have performed well and exceeded all goals for increasing CFL participation with comparatively low levels of freeridership.
- Duke Energy wants to grow the portfolio to include specialty bulbs in their promotional offer. TecMarket Works agrees that this would be a reasonable change to the program's offerings.
- Consumer education is an area for potentially enhancing CFL acceptance and adoption.

From the Participant Surveys

- Overall program and CFL satisfaction levels are very high, and overall Duke Energy satisfaction is high.

- The direct mail CFL program in Ohio is doing an excellent job of targeting participants with little or no prior CFL use. More than half of all participants indicate that this is their first acquisition of CFLs.
- The desire to "save on utility costs" was the most influential factor in their decision to obtain CFLs via the program. "Desire to save energy" placed second.
- While the mean satisfaction rating for the tracking system is very high among users, a large majority of respondents did not use it and therefore it appears to not be a useful part of the CFL direct mail program.
- Three quarters of respondents indicated that the program has made them more likely to use CFLs in the future, indicating increasing levels of spillover well beyond what is measured in this study.
- The direct mail and coupon delivery methods rated the highest satisfaction levels by far. Respondents are much less likely to participate in a program that delivers CFLs through a community event, online vendor, or parking lot stand.
- While the two highest rated factors influencing bulb purchasing were energy savings and cost savings, factors often perceived as barriers to CFL adoption such as aesthetics, mercury content, and availability of dimmable bulbs were among the lowest rated factors.
- A CFL program that offers three-way bulbs had the highest levels of interest among all surveyed customer

From the Non-Participant Surveys

- Overall satisfaction with Duke Energy across all non-participants surveyed averaged 8.2 out of 10. A high score.
- The most popular reason for not participating in the program was because customers did not find the offer compelling enough to take action, indicating a potential need for customer education focusing on importance of action.
- Despite not participating in the program, nearly two thirds of the non-participants surveyed indicated that learning of Duke Energy's CFL program had increased their awareness about how to save energy by using CFLs. This suggests that the program is having an energy savings transformative effect on non-participants and increasing savings well beyond the levels documented in this study.
- The desire to save on utility costs and the desire to be environmentally responsible tied as the most influential factors on CFL purchases by non-participants, suggesting key marketing messages for non-participants.
- Among low income and standard income non-participants the direct-mail and coupon delivery methods were most favored while the online vendor option was the least desirable.

Significant Impact Evaluation Findings

- Mean wattage of a replaced incandescent is 63 watts.
    - See Impact Analysis on page 63.
- A first year installation rate of 63.5% was reported, with an ISR of 77.9%.
    - See In Service Rate (ISR) Calculation on page 65.

- Living/family room, master bedroom, and kitchen, in that order, are the three most popular room types for bulb replacements; together they make up 64% of all bulb installations.
  - See Figure 17 on page 65.
- Surveyed participants report slightly increased operating hours when switching from an incandescent to a CFL having a very small effect on energy savings.
  - See Survey Data on page 64.

Recommendations

Because the program is meeting its goals and running very effectively, and because the Duke Energy team has already acted upon suggestions given during the previous evaluation, the recommendations given here focus on increasing the effectiveness of future efforts rather than correcting any shortfalls in performance. With that in mind we suggest the following:

- Customers are interested in specialty bulbs and this seems a reasonable direction to change the promotional offer. Customers indicated that they were most interested in three-way bulbs, outdoor floods, and dimmable bulbs in close order. Dimmable and recessed bulbs are the most prevalent specialty bulbs currently in use among those surveyed. Taken together these findings indicate that dimmable bulbs hold the strongest combination of customer interest and market share. Focusing on dimmable bulbs, followed by three-way and outdoor floods appear to be a logical place to start.
- Because "saving on utility costs" and "saving energy" were the two most influential factors among both program participants and nonparticipants, Duke Energy may be able to increase program participation and CFL purchases by emphasizing the particular benefits.
- The program is doing a strong job of increased awareness among nonparticipants about how to save energy using CFLs. Continued marketing and consumer education may enhance acceptance and adoption of CFLs among this audience in the future.
- Because a high percentage of Duke Energy customers never acted upon the offer despite the stated interest, Duke Energy may be able to improve take rates among nonparticipants by using time limited offers to compel customers to take action.

Introduction and Purpose of Study

Summary Overview

This document presents the evaluation report for Duke Energy's Residential Smart $aver® Energy Efficiency CFLs Program as it was administered in Ohio. The evaluation was conducted by TecMarket Works, Matthew Joyce, and BuildingMetrics, Inc.

Summary of the Evaluation

The findings presented in this report were calculated using survey data from participants in the CFL campaigns as presented in Table 2 below.

Table 2. Evaluation Date Ranges

Evaluation Component	Sample Pull: Start Date of Participation	Sample Pull: End Date of EMV Sample	Dates of Analysis
Participant and Non-Participant Surveys	July 1st 2010	April 26th 2011	Surveys conducted from 12/6/11 through 4/3/12
Engineering Estimates	July 1st 2010	April 26th 2011	N/A

TecMarket Works conducted a phone survey with a random sample of 161 participants and 60 non-participants from Ohio between December 6th, 2011 and April 3rd, 2012. Surveyed participants fall into one of two income categories based on the Experian identifier that used Federal Poverty Guidelines[1] (and further confirmed[2] by the survey's demographic questions) provided by Duke Energy indicating the customer was a low income customer. Survey sampling targeted half low income customers, and half "standard" income participants.[3] This allows Duke Energy to understand if the transition for low income customers to IVR/Web was successful.

Low Income customers are estimated[4] to be 38% of the population in Ohio.

Surveyed participants were asked how many CFLs that were currently installed in light fixtures were ordered through Duke Energy's CFL direct mail program. Additional, more specific information was collected for a maximum of three bulbs. This information included the location of the installed CFL, the type and wattage of the bulb that it replaced, and the mean hours per

[1] U.S. Department of Health & Human Services 2012 HHS Poverty Guidelines.
[2] Confirmation process determined that 79.2% were correctly identified as Low Income and Standard Income. In view that conditions may change from year to year, this was determined acceptable for the purposes of classification for this report.
[3] In the past, Duke Energy Ohio has also offered the Agency Assistance Kit to low-income customers. In partnership with various local assistance agencies, qualifying customers could complete a survey to receive 12 compact fluorescent light bulbs. For their assistance in helping customers complete the survey, agencies received monetary compensation for each survey completed. The Residential CFL program now provides this service to all customers in Ohio through the automated IVR/Web platform.
[4] http://www.statehealthfacts.org/comparebar.jsp?ind=877&cat=1

day that it is in use. The decision to limit the number of CFLs about which to collect detailed information to three was made in the interest of time and evaluation cost, as the surveys are quite lengthy. The information gathered about the three CFLs is sufficient and provides statistically significant data. A separate sample of participants were sent e-mails or letters inviting them to take part in the survey online via Duke Energy's website, through which an additional 221 responses were collected from October 31st to November 28th, 2011.

To assess barriers to and interest in this program and other Duke Energy programs, TecMarket Works conducted phone surveys with a random sample of 60 non-participants (31 low income and 29 standard income customers) from Ohio between February 21st and April 3rd, 2012.

An impact analysis was performed for all CFLs by room type and can be seen in Table 47 and Table 48. However, it should be noted that individual room type samples are of insignificant size to achieve statistical relevance and are presented as anecdotal evidence. The impacts are based on an engineering analysis of the impacts associated with the self-reported installs identified through the participant surveys. The customer-reported hours of use were adjusted downward for the self-reporting bias, identified in a previous CFL study[5] that included a reconciliation between customer reported and lighting logger data. The reasons for the inclusion of the self-reporting bias is explained in the section "Self-Reporting Bias".

This report is structured to provide program impact estimations per bulb distributed as well as overall program savings based on an extrapolation of these results to the full participant population (participants from July 1st 2010 through April 26th 2011; n=243,393 participants).

[5] TecMarket Works and Building Metrics. "Ohio Residential Smart Saver CFL Program". June 29th, 2010. Pg. 35.

Description of Program

Duke Energy residential customers have the ability to 'opt-in' and order CFLs by responding to a direct mail campaign (campaign ID = 664), or by calling the IVR toll free number, or by logging into their account information in OLS (Online Services) (IVR and OLS campaign ID = 701). Customers are eligible for up to 15 CFLs (depending on past program participation).

The program was designed to provide on-demand ordering, while checking eligibility with program updates in the CFL tracker, Duke Energy's online order tracking system. The platform provided customers access to check the status of their CFL order from beginning to end (delivery to home).

Program Participation

Table 3. Program Participation

Program	Campaign	Participation Count From: July 1st, 2010 To: April 26th, 2011
Residential Smart $aver CFL	664	62,595
Residential Smart $aver CFL	701	180,798
Residential Smart $aver CFL	**TOTAL**	**243,393**

Methodology

Overview of the Evaluation Approach

This process evaluation had four components: management interviews, participant surveys, non-participant surveys, and an impact analysis based on engineering algorithms.

Study Methodology

Management Interviews

TecMarket Works conducted interviews with Duke Energy's Product Manager and with the Client Manager at Niagara Conservation, the vendor contracted to provide order tracking and bulb fulfillment from program inception until April of 2012.

Participant Surveys

This survey focused on customers who, according to program tracking records, responded to the CFL program marketing efforts by Duke Energy to receive free CFLs. The survey was conducted by phone by TecMarket Works' staff from a randomly generated sample of 243,393 customers who requested the CFLs, with 161 survey respondents responding to all of the survey questions. In addition, Duke Energy fielded an online version of the survey with 221 participants responding. The survey instrument can be found in Appendix B: Participant Survey Instrument.

Non-Participant Surveys

This survey focused on customers who recalled the promotion for the free CFLs but did not respond to the offer from Duke Energy. The survey was conducted by phone by TecMarket Works staff from a randomly generated sample from 261,522 non-participating customers, with 60 survey respondents responding to all of the survey questions. The survey instrument can be found in Appendix C: Non-Participant Survey.

Impact Analysis

Engineering algorithms taken from the Draft Ohio Technical Resource Manual (TRM) were used to estimate savings. These unit energy savings values were applied to customers in the engineering analysis sample.

Data collection methods, sample sizes, and sampling methodology

Management Interviews

Three management interviews were conducted with program implementation staff and management in order to capture their insights about the programs operations and challenges. We interviewed the Residential Account Manager (Marketing) and the Product Manager at Duke Energy, and the Marketing Manager for Utilities at GE. The interview instrument can be found in Appendix A: Management Interview Instrument.

Participant Surveys

A sample list of customer records was randomly pulled by TecMarket Works from a list of 243,393 participants (between the dates of August 31st, 2011 through April 28th, 2011) provided by Duke Energy. Surveys were conducted by telephone with 161 participants, and online surveys were completed with 221 participants. The survey instrument can be found in Appendix B: Participant Survey Instrument.

Non-Participant Surveys

A sample list of customer records was randomly pulled by TecMarket Works from a list of 261,522 customers that did not respond to the marketing efforts for the free CFLs Surveys were conducted by telephone. Sixty non-participants completed the survey. The survey instrument can be found in Appendix C: Non-Participant Survey.

Impact Analysis

Phone surveys were conducted with a random sample of 161 participants. Online surveys were answered by 221 people that were also selected at random.

Number of completes and sample disposition for each data collection effort

Management Interviews

Two out of two management representatives were contacted in 2012 for a 100% response rate.

Participant Surveys

From the sample list of customers, 882 participants were called between December 6th, 2011 and February 16th, 2012, and a total of 161 usable telephone surveys were completed yielding a response rate of 18.3% (161 out of 882). Surveys were completed by an additional 221 participants through an online survey.

Non-Participant Surveys

From the sample list of customers, 1,157 non-participants were called between February 21st, 2012 and April 3rd, 2012, and a total of 60 usable telephone surveys were completed yielding a response rate of 5.2% (60 out of 1,157).

Impact Analysis

A total of 161 participants answered the phone survey and 221 participants answered the online survey. The surveys asked the same questions and were combined for a total of 382 completed surveys.

Expected and achieved precision

Participant Surveys

The survey sample methodology had an expected precision of 90% +/- 5.3% and an achieved precision of 90% +/- 4.2%.

Non-Participant Surveys

The survey sample methodology had an expected precision of 90% +/- 10.6% and an achieved precision of 90% +/- 10.6%.

Impact Analysis

Engineering estimates rely on participant survey responses. Sampling procedures for the participant survey had an expected precision of +/- 5.3% at 90% confidence and an achieved precision of +/- 4.2%.

Description of baseline assumptions, methods and data sources

Baseline assumptions were determined through phone surveys with customers providing self-reported values of baseline lamp watts and operating hours. Robust data concerning HVAC system fuel and type was available from Duke Energy's Home Profile Database (appliance saturation survey type data) in Ohio. Interaction factors derived from this data were used in favor of deemed values from secondary sources as they recognize only Duke Energy customers and, therefore, more accurately represent the participant population. A breakdown of these factors by system and fuel type can be seen in Appendix G: Impact Algorithms.

Description of measures and selection of methods by measure(s) or market(s)

The program distributed CFLs exclusively. The Draft Ohio TRM's impact algorithms were enhanced with primary data and used to calculate energy savings. All customers are in the residential market.

Use of TRM values and explanation if TRM values not used

The HVAC interaction factors were developed using customer specific HVAC system information collected through Duke Energy's appliance saturation survey Ohio as they more accurately represent the participant population than the deemed values.

Threats to validity, sources of bias and how those were addressed

CFL installations and hours of operation were self-reported by the surveyed participants. There is a potential for social desirability bias[6] but the customer has no vested interest in their reported measure adoptions, therefore this bias is expected to be minimal. There is a potential for bias in the engineering algorithms, which was minimized through the use of building energy simulation models, which are considered to be state of the art for building shell and HVAC system analysis.

[6] Social desirability bias occurs when a respondent gives a false answer due to perceived social pressure to "do the right thing."

Management Interviews

Description of the Program

The Residential Smart $aver Energy Efficiency Products (CFL) Program began in 2010 and is designed to provide qualifying Duke Energy residential customers with up to 15 CFLs that are mailed directly to the customers' homes.

Initially the program offered customers six CFLs via coupon or a business reply card. The program then expanded by increasing both the incentive size and the range of message channels. The 2011 incentive offered customers up to a maximum of 15 CFLs at one time, shipped directly to their home, and utilized a wide variety of channels, including low cost/no cost options such as toll-free interactive voice recognition (IVR) and online ordering platforms.

The 2011 program was originally test-piloted in August 2010, and was initially limited only to customers who are Duke Energy employees to reduce operational risks associated with getting the program operating well before offering it to customers. The IVR number subsequently went viral as individuals posted it on web blogs, Facebook, Twitter, and other online social media (which also drove occasional television and radio reporting). This rapidly engaged the participation of Duke Energy's general public customers in September-December 2010 despite little targeted marketing of the program by Duke Energy during that time.

As the IVR went viral in the fall of 2010, the range of channels for the program expanded further. The online service account (OLS) that customers utilize for billing added a pop-up asking the customer if he/she wants free CFLs. Customers were eligible for up to 15 CFLs (minus the number redeemed from previous Duke Energy promotional campaigns), and could elect to accept fewer than the maximum if they preferred. Customers received the pop-up box only once in order to avoid annoying customers with repeated pop-ups. However, for those who chose "no thanks", the next time that they logged back in they received a small promotional message (that can click to pursue CFL offer) in the OLS advertising area.

Additional electronic channels included: a program website that enables customers to directly request CFLs, utility website promotions, Duke Energy state website promotions, Facebook advertising targeted by specific zip code areas, and email messages (for customers who previously opted in to receive email promotions). Other channels were also used to help drive traffic to the IVR and other electronic platforms. These other channels included: direct mail (customized with account number to make responding easier), bill insert promotions, marketing in some Spanish journals and magazines, and press releases. Duke used a unique URL for each message type and utilized Google Analytics to track each URL.

This program enabled customers to order on-demand and have the CFLs shipped directly to their home, and to track their order throughout the ordering/shipping process. Customers were told to allow either 4-6 weeks or 6-8 weeks for delivery, although most orders were actually delivered within 1-2 weeks. TecMarket Works considers delivery of web or phone CFL orders with 1-2 weeks a best practice.

Goals of the Program

Duke Energy's pre-launch Communication Plan for this program described the goal of this campaign as "to expand participation in the [CFL] program…[by marketing to each segment] where and how they prefer, and provide an easy way to order and receive bulbs." In other words, the overall goal was to increase CFL participation through new IVR and online ordering platforms with direct shipping to customers. Specific objectives included engaging customers who had not been previous coupon redeemers, reaching more total customers, and establishing cost-effective promotion platforms. Additionally, specific types of messages and channels were identified for particular target audiences, as outlined in Table 4.

Table 4. 2011 CFL Communication Plan Targets

Target Audience	Key Message	Channel
Budget Conscious Homeowners	Free Save money Get attention with CFL game because this segment includes a lot of online gamers	State landing page promos OLS promos Advantages of CFLs via CFL game Social media YouTube videos Blogger outreach
Sustaining Seniors	Free No risk Save money Overcome safety objections	Earned media State landing page promos OLS promos Bill message Envelope message Low income printed piece Postcard
Mainstream Families	Green message Save money	State landing page promos OLS promos Online CFL game Envelope messages Vehicle signage Blogger outreach Social Media YouTube videos
Financially Secure Traditionalists	Green message Save money	State landing page promos OLS promos Bill messages Envelope messages Postcard Vehicle signage
Financially Secure Homeowners	Green message Save money	State landing page promos OLS promos Bill messages Envelope messages Postcard Vehicle signage Searchability
Young Mobile Achievers	unspecified	Social media YouTube videos CFL game Searchability

Fulfillment

Niagara Conservation of Cedar Knolls, NJ was chosen to serve as Duke Energy's fulfillment contractor, providing a customer- and order-tracking database, bulb order processing and handling, shipping (via FedEx), and a call center for customer assistance with ordering difficulties, shipping issues, broken bulbs, and questions regarding the use of the CFLs. Niagara served in this capacity from program inception until April of 2012.[7]

In its arrangement with Niagara, Duke Energy agreed to an initial purchase of 8 million CFLs in May of 2010 for the first round. These bulbs were to be used to fulfill customer requests from all Duke Energy CFL programs. In March of 2011, a second round of nine million bulbs was purchased.

Under the original arrangement, business reply card orders were sent to Duke Energy for processing and in turn forwarded to Niagara in batches for fulfillment within nine business days. In its early days, this process was occasionally slowed by Duke Energy's need to manually scan and process the BRCs[8]. However, when the IVR and online ordering systems were incorporated, the process was streamlined and all new orders were sent directly to Niagara. The nine business day processing requirement remained in the service level agreement.

Bulb requests were compiled daily (weekly for BRCs) and sent to Niagara in electronic form for processing beginning the next day. Typical volume ranged from 2,000 to 20,000 customer bulb requests per day, and Niagara was required to be staffed to ensure sufficient labor for compiling the efficiency kits, which consisted of a branded cardboard box loaded with the appropriate number of CFLs, Duke Energy's marketing copy, additional collateral, and packing materials. Prior to fulfillment, all customer bulb requests were checked against the CFL tracker database to ensure customer eligibility based on the previous number of bulbs received through other Duke Energy program efforts.

Duke Energy coordinated closely with Niagara to ensure that the fulfillment vendor was informed in advance of new marketing efforts that were likely to increase bulb order volumes. Within normal volumes, customer orders were generally processed in a timely fashion. However, in August of 2011 Niagara was falling behind schedule, and by September of that year the backlog became problematic as bulb order volume shot upwards. During the week of September 4, 2011 alone, over 80,000 customers requested more than 1 million bulbs. Continued high demand during subsequent weeks added another million bulbs. This surge in demand was spurred in part by a direct mail campaign that achieved unusually high response rates and by the viral nature of the reaction by the customers. Without sufficient quantities of bulbs in stock, Niagara needed time to acquire additional CFL supplies. To mitigate any potential issues with customer satisfaction, Duke Energy shifted customer expectations by changing the bulb delivery time period from its original timeframe of 4-6 weeks to a new time period of 6-8 weeks. The additional time window enabled Niagara to source and stock additional CFLs and fulfill the bulb requests. The backlog, which extended for several weeks, was cleared by late autumn of 2011.

[7] While the management section of this evaluation covers activities extending into 2012, the M&V time period for the participant surveys described in other sections covers from July 1, 2010 through April 26, 2011,
[8] However, participant surveys indicate that customers were satisfied with the delivery time of the CFLs.

Customer and Order Tracking

Niagara Conservation was also responsible for developing and maintaining the database for tracking and coordinating all CFL program activity, including: the number of bulbs requested by customer, specific Duke Energy CFL program generating each request, customer address, dates of order and shipment, and shipping information concerning delivery, returns, and reasons for returns.

It took Niagara longer to develop the database than originally anticipated. Then Duke Energy required Niagara to make further changes to ensure that the correct data was being captured. With the bugs out of the software, the tracking system worked well for data capture, but it continued to have issues with its reporting functions, which were insufficient for generating accurate, timely, and on-demand reports as stipulated in the contract. Duke Energy then requested that Niagara make these changes as well. Niagara fixed the reporting issues by March of 2012, but by then Duke Energy was in the process of transitioning to a new fulfillment vendor.

Results and Evaluation

Overall, this program was highly successful in meeting its goals. A member of Duke Energy's program management summarized it as "working wonderfully." TecMarket Works agrees with this assessment. The IVR and online platforms have performed well and exceeded all goals for increasing CFL participation. Once established, these platforms have functioned very effectively at low/no cost. These platforms synchronize well with inventory management, and provide real-time tracking information to the customer about his/her order, and to Duke Energy regarding program performance (i.e., order files and program reports can be accessed nightly).

When the pilot first went viral, IVR was the primary mode of participation. As the OLS channel was established, that drew the greatest number of participants. Nonetheless, IVR and web-based platforms, in conjunction with the other channels promoting them, have also attracted considerable participation. Together these efforts created a powerful demand for the Duke Energy CFLs.

In summary, the program has been highly successful overall while it did experience some growing pains due to its rapid expansion, it and is now running well and not experiencing any problems. Some potential areas for further improvement/expansion have been identified. For instance, Duke Energy will explore additional creative marking ideas, perhaps adding new channels such as newspaper inserts, billboard advertisements, and possibly increased radio advertising. However, given the expansive range of channels already utilized by the current campaign, the potential impact of such additions is unclear.

Duke Energy also wants to grow the portfolio to include specialty bulbs in their promotional offer. They are currently developing a program that they intend to launch in late 2012 or early 2013. That program will offer a discount toward the purchase of CFL specialty bulbs rather than a free bulb incentive because of the higher cost of specialty CFLs. The exact discount will likely vary by type of specialty bulb, but those details are yet to be determined.

Consumer education is another area for potentially enhancing CFL acceptance and adoption. This includes explaining the new labeling, i.e., helping consumers understand the transition from wattage to lumens. Other education possibilities may include clarifying the savings benefits to the customers, as well as the overall environmental value of transitioning to CFLs. Education may also address common misconceptions about CFLs that deter adoption. Examples of common misconceptions include: no instant on, not meeting lifetime claims, not fitting some fixtures, stark color of the light, and safety issues such as risks of mercury contamination or fire.

Participant Surveys

This section presents the results of the surveys conducted with customers who participated in the CFL program.

Program Awareness

All of the participants responding to the survey (n=382) recall receiving the direct mail CFLs provided by Duke Energy. Of the 382 survey respondents, 176 were identified by Duke Energy in the participant database[9] as living in low income households and 206 were identified as not living in low income (labeled as standard herein) households.

Reasons for Participation

Phone survey participants were asked an open-ended question to give all the reasons that made them decide to take advantage of the CFL offer from Duke Energy. Web survey participants were asked to either choose the reason or reasons for participation from a list, or to enter a reason that was not provided.

All answers were codified into the following categories:

- Needed light bulbs
- To save energy
- To save money
- Because it was free
- To try CFLs
- It was environmentally correct
- Convenience
- CFL last longer than standard bulbs
- Other

The distribution of answers is shown in Table 5 in order of most to least mentioned reasons. The free CFLs, along with desire to save money and energy, were by far the most cited reasons for participating in the CFL program.

Table 5. Reasons for participation in the CFL direct mail program

Category	Low Income participants (N=176)		Standard Participants (N=206)		All survey respondents (N=382)	
	N	%	N	%	N	Weighted %
Because it was free	77	47.8%	110	49.8%	187	49.0%
To save energy	84	52.2%	100	45.2%	184	47.9%
To save money	78	48.4%	88	39.8%	166	43.1%
CFLs last longer	53	32.9%	51	23.1%	104	26.8%
To try CFLs	46	28.6%	56	25.3%	102	26.6%
Convenience	47	29.2%	49	22.2%	96	24.9%
It was environmentally correct	42	26.1%	43	19.5%	85	22.0%

9 Low-Income status was identified using Experian data.

Needed light bulbs	26	16.1%	24	10.9%	50	12.9%
Other	6	3.7%	12	5.4%	18	4.8%

Note: Survey respondents were allowed multiple responses

Promoting the Program

TecMarket Works surveyed program participants to determine if they had told anyone about the CFL program and, if so, how many people they told and how they told them. As shown in Table 6, 84% (weighted) reported telling others about the program. Not surprisingly, the percentages seen in the total population corresponded closely within the low income group (86%), as well as within the standard income group (83%).

Table 6. Participants who told others about the program

Did you tell others about the CFL program?	Low Income		Standard Income		Total Population	
	N	%	N	%	N	Weighted %
Yes	151	86%	171	83%	322	84%
No	23	13%	33	16%	56	15%
Don't Know	2	1%	2	1%	4	1%

When asked with whom they had spoken, 54% (weighted) of respondents reported talking about the program with family members, and 54% (weighted) of respondents indicated that they had spoken with friends. Interestingly though, respondents had a greater number of conversations with their friends (445) and co-workers (358) than they did with family members (330).

When considered by income level, low income and standard income participants also had more conversations among friends than with any other group. But low income customers spoke with more neighbors (207) than they did with family members (175) or co-workers (143). Table 7 compares these groups and their respective number of conversations.

Table 7. Type and number of people told about the CFL program

Did you tell others about the CFL program?	Low Income		Standard Income		Total Population	
	# of Participants	# of People Told	# of Participants	# of People Told	# of Participants	# of People Told
Family	107	175	103	155	210	330
Friends	99	229	109	216	208	445
Co-Workers	31	143	45	215	76	358
Neighbors	29	207	27	90	56	297
Other	6	31	16	34	22	65

Note: Survey respondents were allowed multiple responses

As seen in Table 8, among all income categories, word of mouth was the most prevalent means of communication. Email placed second, while various forms of social media, such as Facebook, Twitter and website forums came in a distant last.

Table 8. Methods of communicating about the program

	Word of mouth	Email	Facebook	Twitter	Web site forum	Other
Total Population	304	35	8	1	1	4
Low Income	139	20	4	0	1	4
Standard	165	15	4	1	0	0

Program Influence

Participants were also asked to rate the influence, on a 1-to-10 scale, that various factors had on their decisions to obtain CFLs through the Duke Energy program. According to those surveyed, the desire to "save on utility costs" had a weighted mean influence rating of 9.0, making it the most influential factor in their decision to obtain CFLs via the program. "Desire to save energy" placed second with a weighted mean influence score of 8.6. "Desire to be environmentally responsible" rounded out the top three most influential factors with a weighted mean score of 8.1. The remainder of the scores for each factor is noted in Table 9.

Table 9. Factors influencing decision to obtain CFLs

Factor	Low Income Mean Influence	Standard Mean Influence	Total Population Weighted Mean Influence
Your desire to save on utility costs	9.0	9.0	9.0
Your desire to save energy	8.5	8.7	8.6
Your desire to be environmentally responsible.	7.9	8.2	8.1
Friends or family by word of mouth	6.2	5.5	5.8
Duke Energy advertising on TV, Radio, or newspaper	4.4	4.3	4.3
The brand of CFLs offered by the program	4.7	4.1	4.3
Advertising on Duke Energy's Web site	4.1	3.7	3.9
Friends or family by email	3.5	2.8	3.1
Other non-Duke Energy advertising	3.5	2.7	3.0
Friends or family by social media such as Facebook	2.7	2.3	2.5
Duke Energy advertising on social media sites such as Facebook	2.5	2.2	2.3
Someone you don't know personally or a group that you follow on Facebook or Twitter	2.4	2.0	2.2

Figure 1 below compares participant influence ratings by income group. Standard and low income groups scored the same on their mean influence rating of "Desire to save on utility costs" with a mean score of 9.0. And only slight differences emerged on their ratings of the second most influential factor "Desire to save energy." Standard income participants rated it as an 8.7, while low income participants rated it marginally lower at an 8.5.

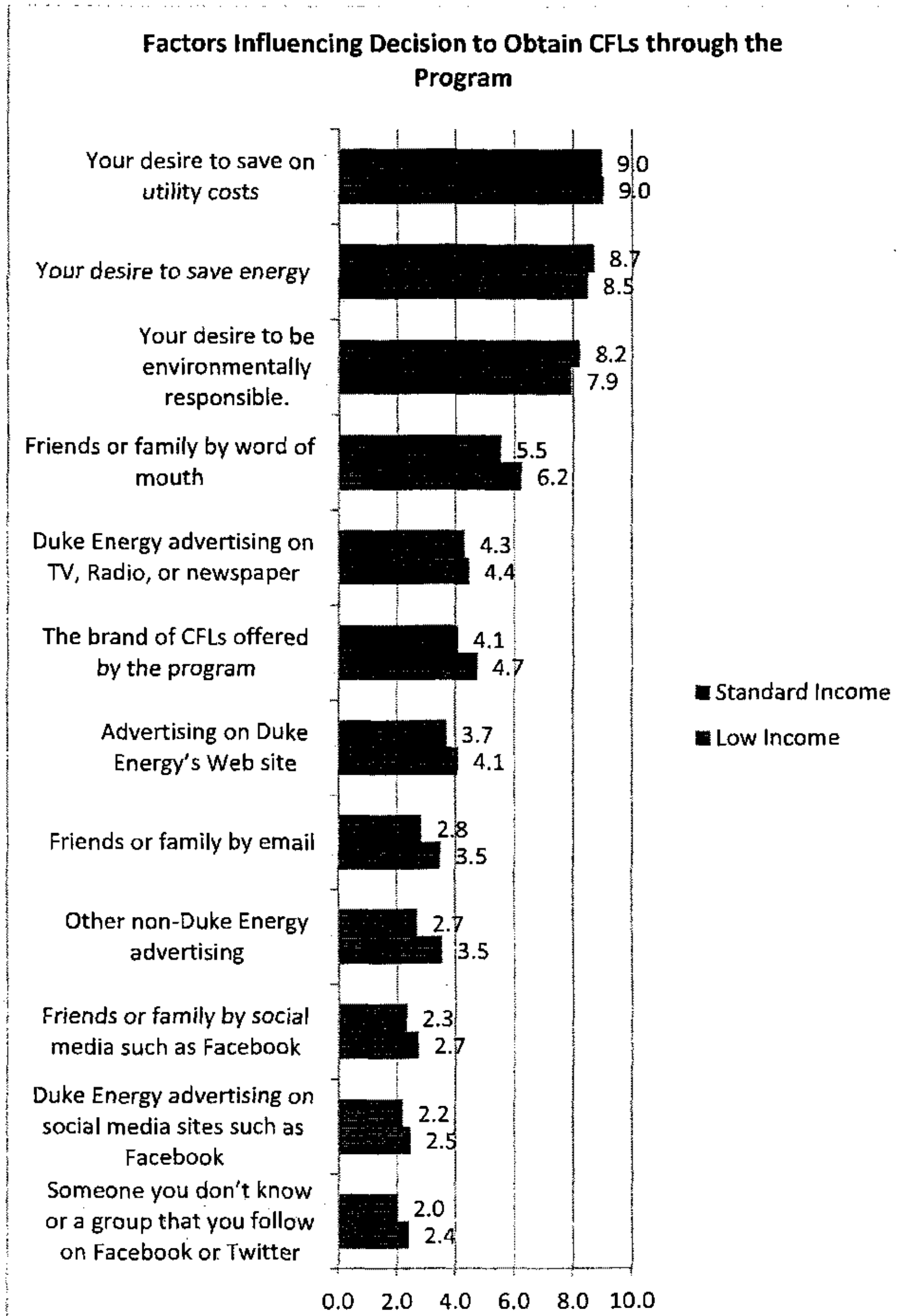


Figure 1. Mean influence score of factors influencing decision to obtain CFLs

Prior CFL Use

All survey respondents were asked how long they had been using CFLs before receiving CFLs from the Duke Energy CFL program. Responses included:

- Never purchased until now
- 1 year or less

- 1-2 years
- 2-3 year
- 3-4 years
- 4 or more years

As seen in Table 10 below, 17.3% (weighted) of all CFL program participants in Ohio indicate that they have purchased CFLs in the past two years or less and 55.7% (weighted) of all participants indicate that this is their first acquisition of CFLs. This data suggests that CFL saturation was low within the direct mail CFL participant population prior to the use of the Duke Energy CFL program. It also indicates that the direct mail CFL program in Ohio is doing an excellent job of targeting participants with little or no prior CFL use.

Table 10. Time since first purchase of CFLs

	Don't Know	Never acquired until now	1 year or less	1-2 Years	2-3 Years	3-4 Years	4 or more years
Low Income Participants, n=172	0.5%	57.7%	6.2%	10.8%	10.8%	6.2%	7.7%
Standard Participants, n=201	1.1%	54.5%	6.3%	11.1%	9.0%	5.8%	12.2.%
All Survey Respondents Weighted %, n=382	0.9%	55.7%	6.3%	11.0%	9.7%	6.0%	10.5%

Eligible Number of CFLs vs. Number CFLs Ordered

Overall, participants are ordering all the CFLs that the program allows. A very small minority of participants (3 low income and 4 standard participants out of the 382 survey participants - 1.8%) reported that they did not order all of the CFLs that they were eligible to receive through the direct mail CFL program. All seven respondents gave reasons why they did not order all the bulbs they were eligible to receive. Three respondents indicated that they had small houses or apartments and did not need the full amount of CFLs at the time of ordering. Two ordered some bulbs with plans to order more later in the year. One person was not aware of the number of available bulbs.

Program CFL Self-Reported Installation

TecMarket Works asked all participant survey respondents how many of the CFLs that they obtained through the CFL program were currently installed. Three-hundred seventy-three (373) of 382 participants (97.6%) reported that 2,659 program CFLs were currently installed for a weighted mean of 7.0 installed CFLs per all surveyed participants. One-hundred seventy-two (172) low income participants installed a mean of 7.2 CFLs, and 201 standard participants installed a mean of 6.8 CFLs.

Program CFL Removal

Of the 373 participants who had installed program CFLs, 83 respondents (22% weighted[10]) indicated that they had subsequently removed at least one program CFL from a working socket.

[10] 21% of Low Income, 22% of Standard

Forty-two (42) respondents gave specific reasons for their removal of program CFLs: 37 respondents removed program CFLs that had burned out, two respondents removed program CFLs for aesthetic reasons, two respondents removed CFLs because they were flickering, and one respondent removed a CFL because it was not dimmable.

CFL Order Tracking System

TecMarket Works asked all survey respondents who ordered their CFLs online if they were aware of the direct mail program's online order tracking tool which allows participants the option to check their CFL order status. Twenty-four percent (93 out of 382[11]) respondents indicated that they were aware of the order tracking tool. Of those who were aware of the system, 20 respondents (23% weighted[12]) indicated that they had used the online tool to track their order. The 20 respondents who reported using the system were asked to rate their satisfaction with the system on a 1-to-10 point scale with 1 indicating Very Unsatisfied and 10 indicating Very Satisfied. The weighted mean satisfaction rating for the online tracking tool is 9.1[13]. Two respondents gave a satisfaction score of less than eight. The respondent who gave a 7 stated that the tracking feature did not work on the first attempt, but worked fine on the second attempt. The respondent who gave a 6 said they were very satisfied.

The online order tracking system has a low awareness rate and a very low participation rate. While the mean satisfaction rating for the tracking system is very high among users, the low participation rate (n=20), even among those aware of the tool, indicates that a large majority of respondents do not currently find it to be a useful part of the CFL direct mail program.

Participant Satisfaction

Overall program and CFL satisfactions are very high, and overall Duke Energy satisfaction is high.

Program and CFL Satisfaction

Participants were asked to rate, on a 1-to-10 scale, their satisfaction with the ease of ordering their CFLs (weighted mean = 9.4), the delivery time of the CFLs (weighted mean = 9.0), the light quality of the CFLs obtained (weighted mean = 8.2), the overall quality of the CFLs obtained through the CFL program (weighted mean = 8.8), and the overall satisfaction with the CFL direct mail program (weighted mean = 9.5). The satisfaction means, stratified by income type, are shown in Figure 2, and the rating distributions for these categories are shown in Figure 3 through Figure 7.

Participants who rated their satisfaction for any category at a seven or lower were also asked a follow-up question as to the reason for their satisfaction level. These reasons are listed following each distribution.

[11] 29% of Low Income, 21% of Standard
[12] 19% of Low Income, 26% of Standard
[13] 9.2 mean Low Income, 9.0 mean Standard

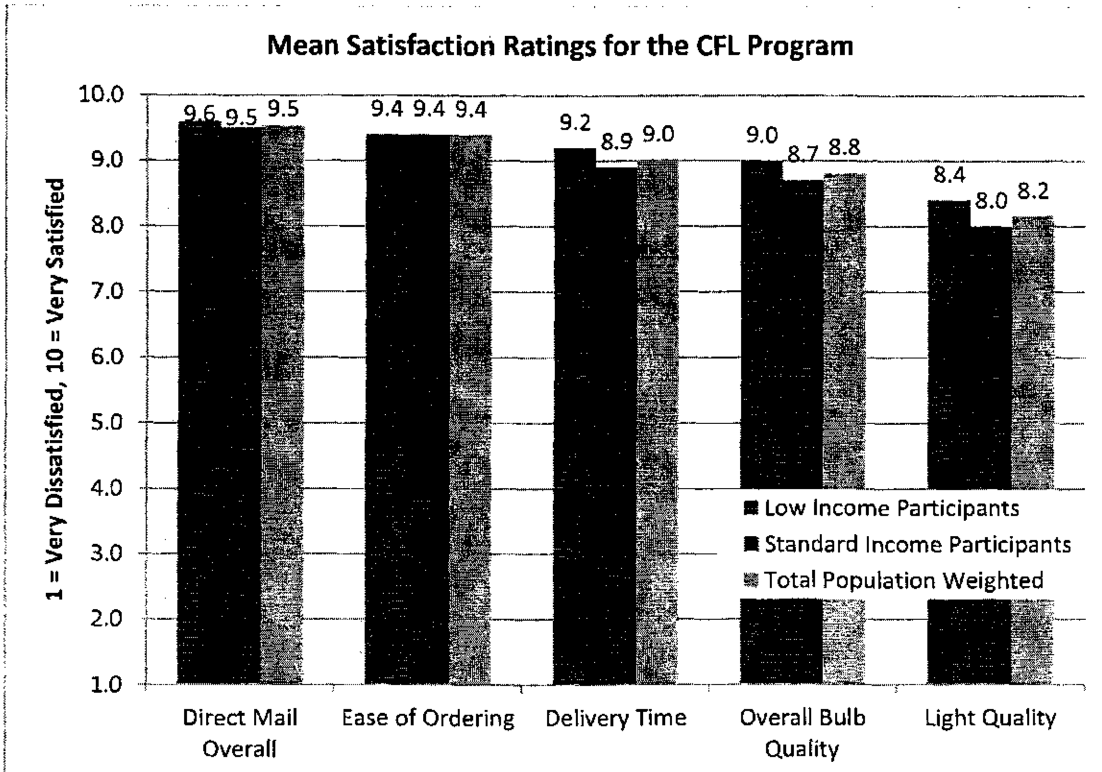


Figure 2. Mean Satisfaction Rating for CFL Direct Mail Program

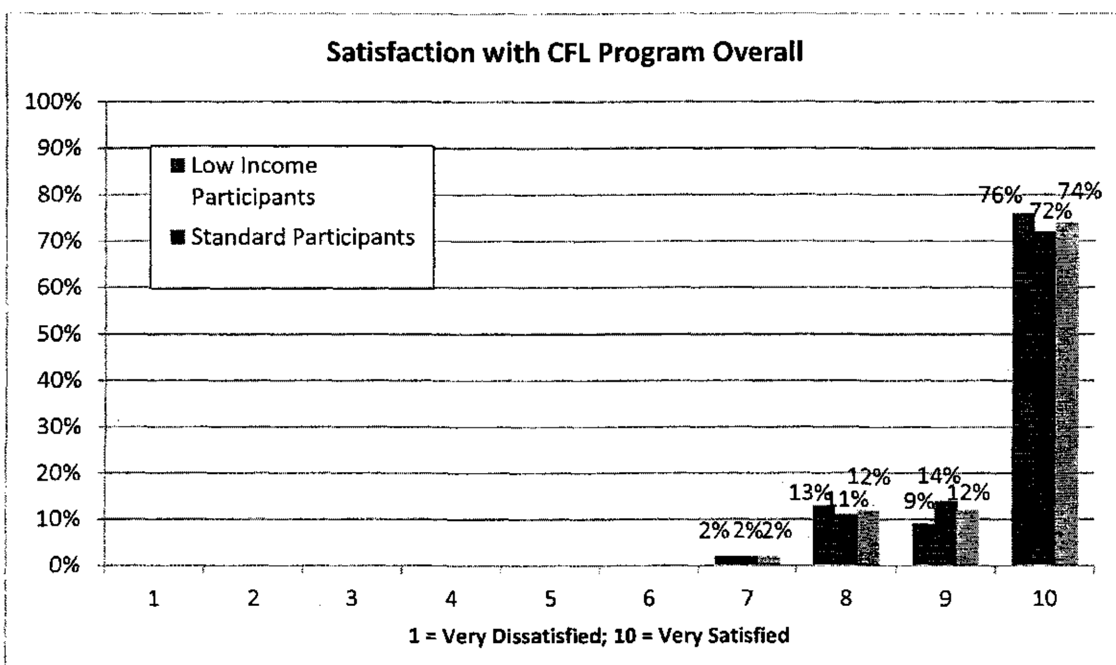


Figure 3. CFL Direct Mail Program Satisfaction Distribution

Reasons for program satisfaction ratings of seven or less:

- Never received my CFLs

- Would like to have received more than 3 bulbs
- Would like daylight or bright white bulbs
- Would like three-way bulbs

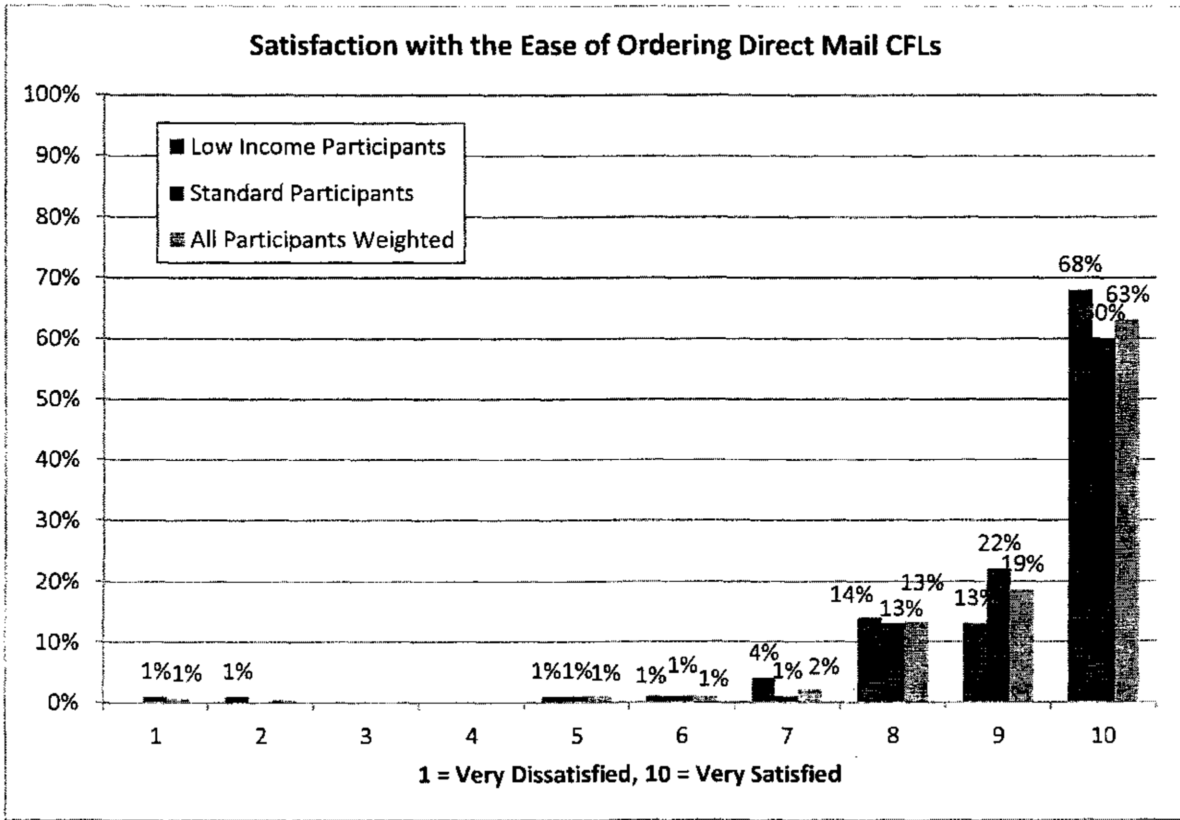


Figure 4. Ease of Ordering CFLs Satisfaction Distribution

Reasons given for ease of ordering ratings of seven or less:

- Mail in card would have taken less time than phone (n=2)
- Got frozen on the web site during ordering
- Ordering online would have been easier than the mail-in card
- It would have been easier to call and order than go online
- Long wait times on the phone; I had to try to place the order more than once
- Took too long to order by phone
- I had to talk to three different people to finally get the bulbs ordered
- Ordering them was easy, but I still haven't received them
- I had to wait 3 months to receive them

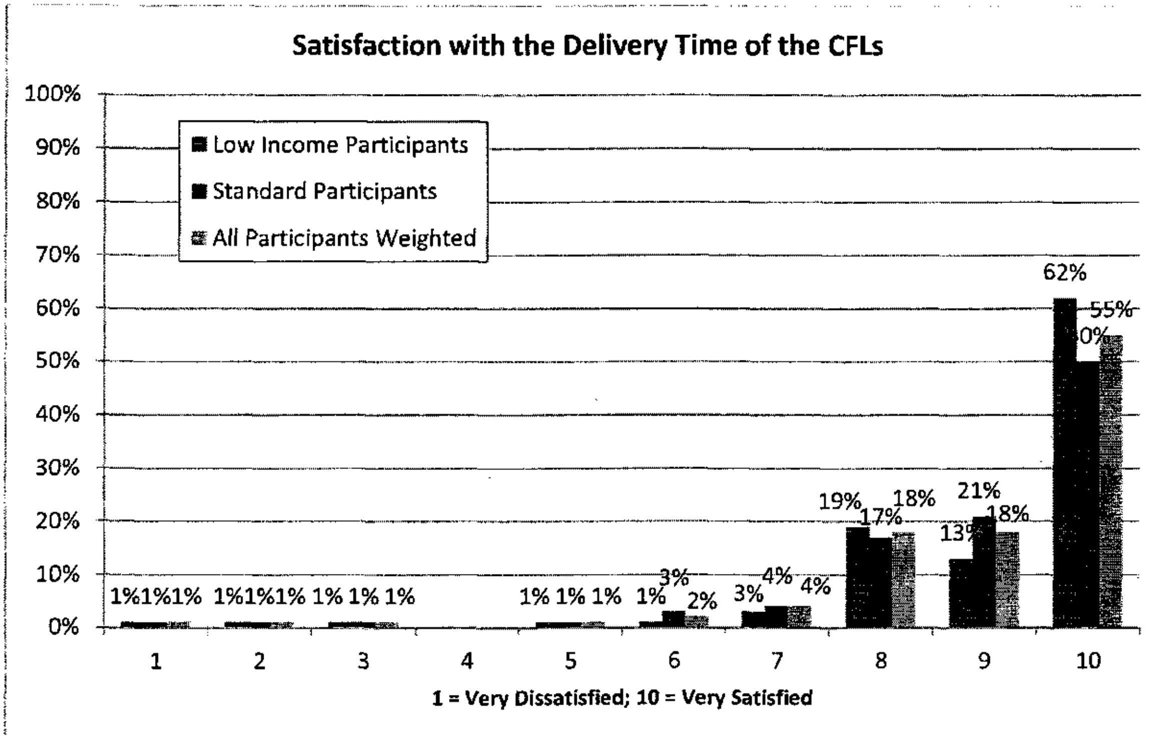


Figure 5. Delivery Time Satisfaction Distribution

Reasons given for delivery time ratings of seven or less:

- It took longer than expected (n=18)
- I never received my bulbs (n=3)
- It took so long I had forgotten about them (n=2)

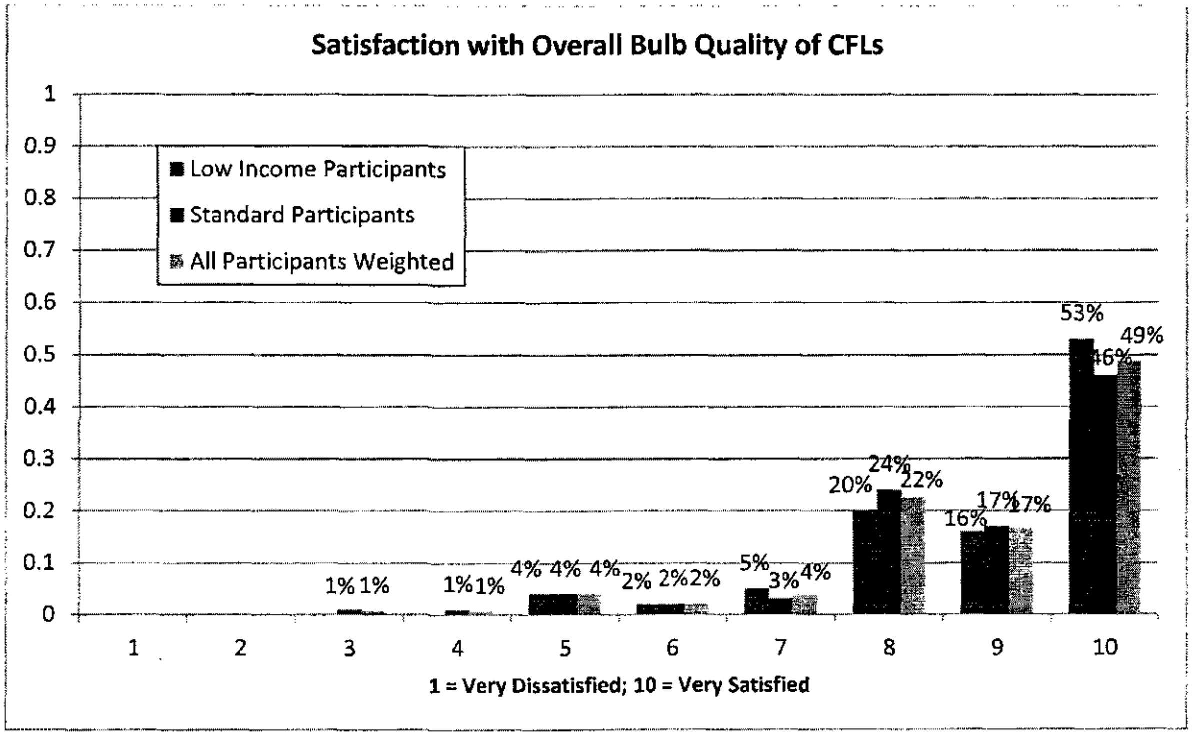


Figure 6. Overall Bulb Quality Satisfaction Distribution

Reasons for overall bulb quality ratings of seven or less:

- Bulbs burned out (n=5)
- Concerned about mercury/disposal (n=3)
- Not a convenient size for all fixtures
- They are a bit more difficult to handle and store

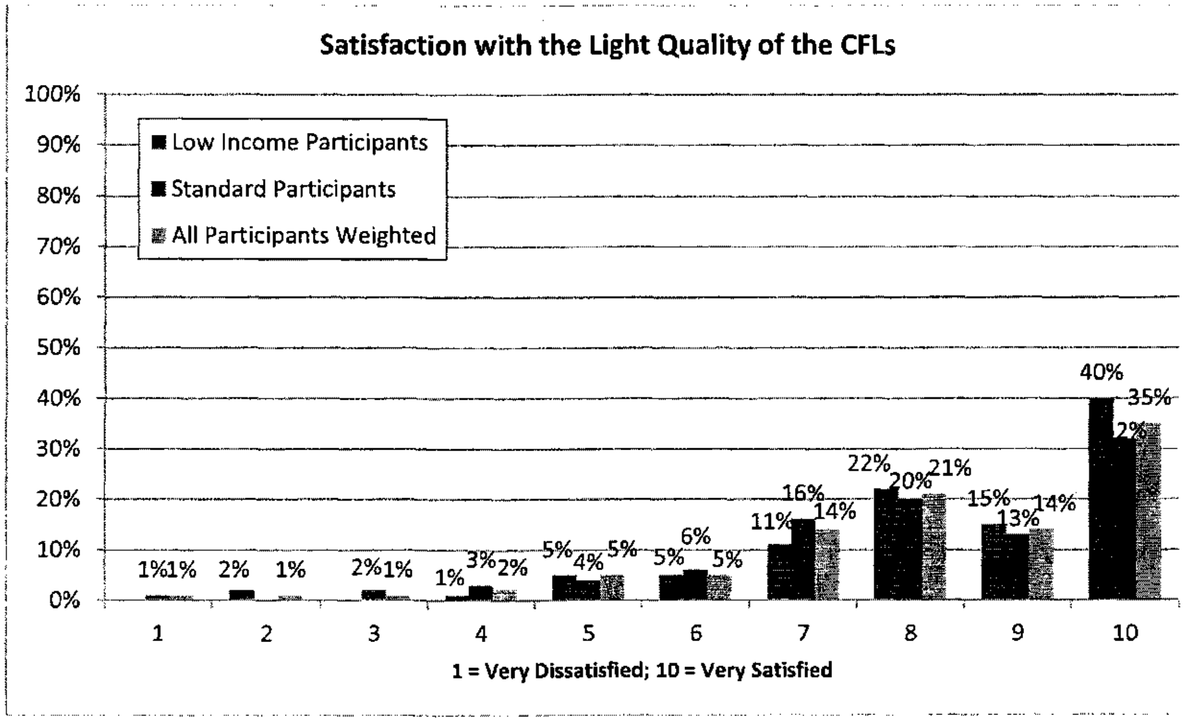


Figure 7. Light Quality of CFLs Satisfaction Distribution

- Reasons for light quality ratings of seven or less:
- Not bright enough (n=63)
- Take too long to warm up (n=24)
- Light is different from what I'm used to (n=4)
- Light is too harsh (n=3)
- Light is too yellow (n=2)
- Do not like the color (n=2)
- I prefer daylight CFLs
- Light has a strange hue
- When it's cold outside they barely give off any light at all

Duke Energy Satisfaction

Participants were also asked to rate, on a 1-to-10 scale, their satisfaction with Duke Energy overall (weighted mean=8.4). Mean ratings stratified by income type are show in Figure 8 and the satisfaction rating distribution for this category is shown in Figure 9.

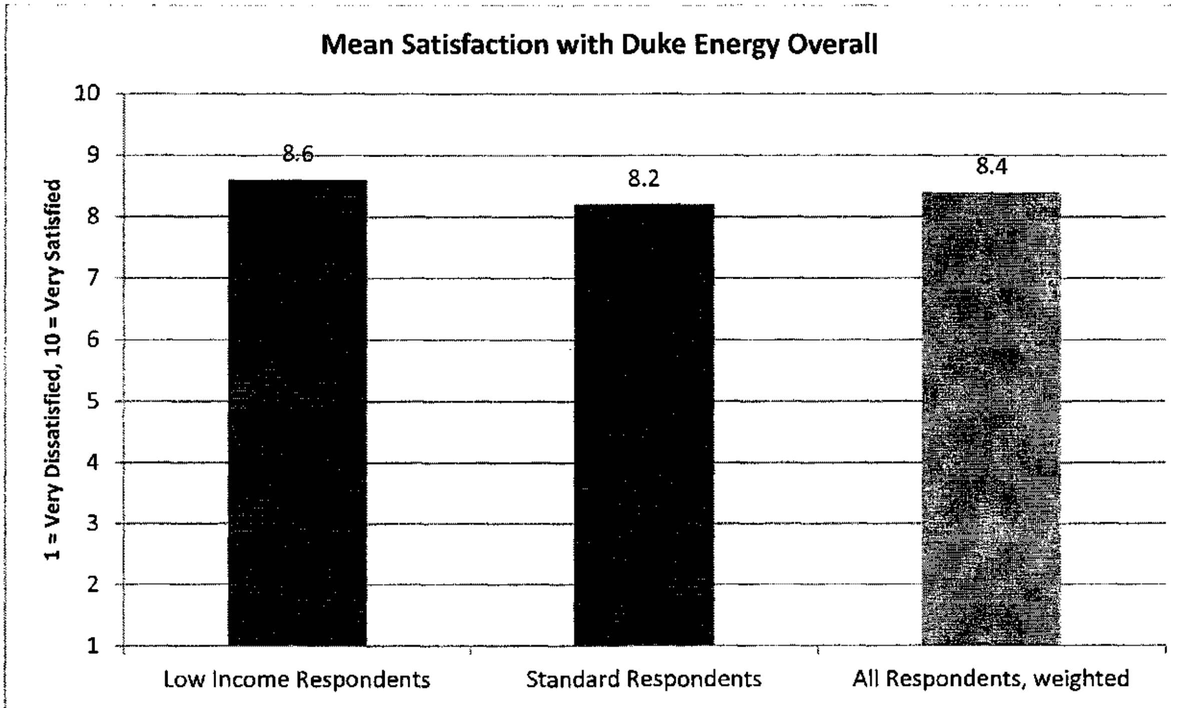


Figure 8. Duke Energy Mean Satisfaction

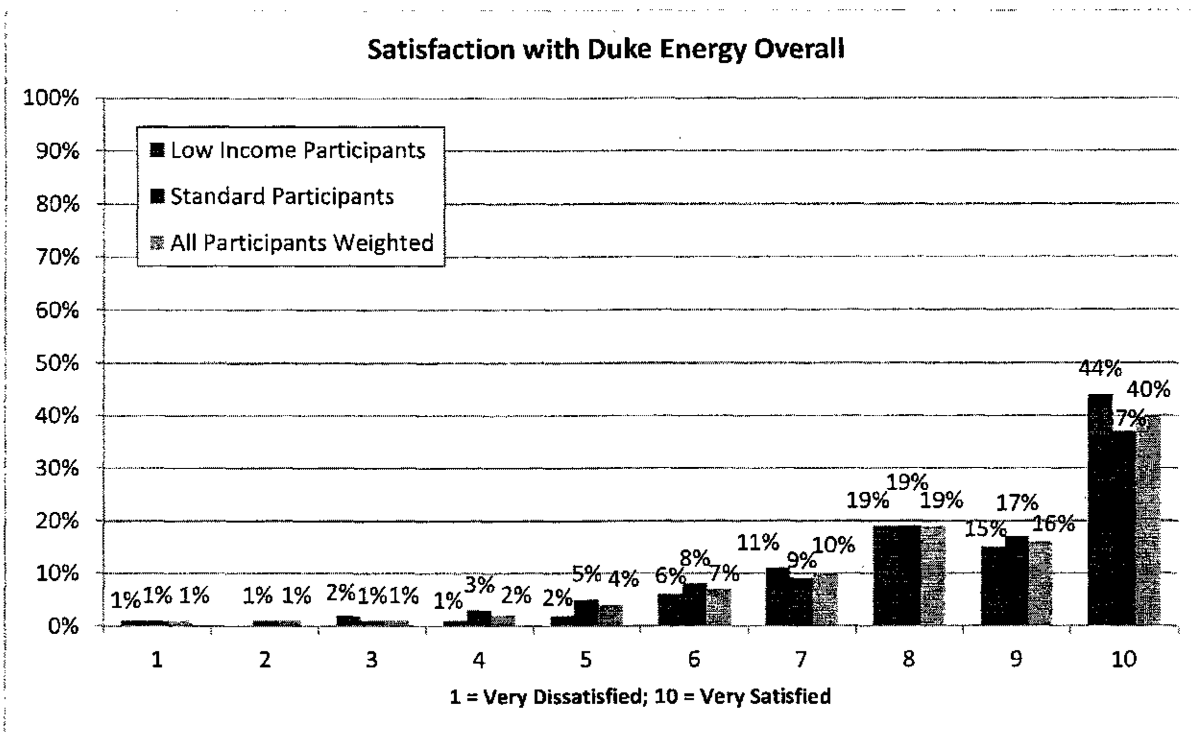


Figure 9. Duke Energy Satisfaction Distribution

Reasons for Duke Energy satisfaction ratings of seven or less from all surveyed participants:

- Rates are too high (n=46)
- Poor customer service (n=7)
- Too many outages (n=6)
- Outages take too long to correct (n=5)
- Do not think gas delivery fee is fair/appropriate for amount of gas used (n=4)
- Not enough flexibility with payment plans (n=4)
- Insufficient billing details/understandability (n=3)
- Inconsistent meter reading (n=2)
- Inconvenient meter reading (n=2)
- Not enough payment assistance during hardship (n=3)
- Using too many subcontractors and not accountable for work provided
- Generation costs are too high
- Do not use enough solar and renewable energy
- Would prefer to deal with someone local rather than someone based in North Carolina

In addition to rating their satisfaction on the 1-10 point scale described above, Ohio participants were also asked to rank their overall program satisfaction using the following response categories: Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied. The responses are summarized in Table 11 below.

Table 11. Overall Program Satisfaction

Response	Low Income		Standard Income		Total Population	
	N	%	N	%	N	Weighted %
Very Satisfied	154	88.0%	163	78.7%	317	82.2%
Somewhat Satisfied	14	8.0%	30	14.5%	44	12.0%
Neither Satisfied nor Dissatisfied	-	-	8	3.9%	8	2.4%
Somewhat Dissatisfied	-	-	1	0.5%	1	0.3%
Very Dissatisfied	-	-	-	-	0	0.0%
Don't Know/No Response	7	4.0%	5	2.4%	12	3.0%

After the surveyed respondent ranked their satisfaction, they were asked why they provided that ranking. Their responses are below, by response category:

Very Satisfied

- It was easy, free, and convenient. (n=132)
- CFLs save energy and money (n=70)
- Because they are free (n=64)
- I like the CFLs quality (n=35)
- I am pleased with the program (n=31)
- CFLs are long-lasting (n=27)
- Allow us to try a new product for free (n=7)

Somewhat Satisfied

- Because they are free (n=8)

- CFLs do not impress me (n=6)
- I am satisfied (n=6)
- It was easy, free, and convenient (n=6)
- I am concerned about mercury if they break (n=4)
- They are not bright enough (n=3)
- Because the bulbs burned out quickly (n=2)
- CFLs save energy and money (n=2)
- A Duke employee had to come to my house before they would give me the bulbs
- Because they came in the mail
- Duke should be doing this
- I had to talk to three people before the right person was reached and then the bulbs got ordered
- It is nice that Duke Energy is giving something back to the customers
- It took too long to get the bulbs
- We were not allowed to order bulbs for our business
- I wish they would include three-ways and Refrigerator-Stove bulbs
- I would rather have LED bulbs

Neither Satisfied nor Dissatisfied

- I don't like CFLs (n=2)
- There was nothing special about the program (n=2)
- They are not bright enough (n=2)
- It was supposed to save energy, but my bill keeps increasing every month
- I felt forced to participate since customer's bills presumably fund the program
- I am concerned about mercury if they break

Somewhat Dissatisfied

- The CFLs are supposed to last a long while; these have been burning out within a few months

DK/NS

- I have not yet received the CFLs

Future Use of CFLs

Surveyed participants were asked if their experience with the CFLs provided by the Duke Energy CFL program made it more or less likely that they would purchase and install CFLs in the future, and 290 out of the 382 respondents[14] (75% weighted) indicated that the program made them more likely to use CFLs in the future. These results suggest the program is having substantial longer-term participant spillover savings, well beyond the level of savings documented in this study. Their reasons are listed below.

Low Income Participant Responses

- Saving money (n=41)

[14] 79% Low Income, 73% Standard Income

- Long lasting (n=34)
- They are energy efficient (n=32)
- I had a good experience with these CFLs (n=20)
- Because I like the light (n=7)
- Better for the environment (n=6)
- Quality of the bulbs (n=5)
- Incandescents are being phased out (n=2)
- Because we will have to use them in the future
- CFLs are getting better
- The CFLs are cooler than old bulbs

Standard Participant Responses

- Saving energy and money (n=73)
- Long lasting (n=27)
- I had a good experience with these CFLs (n=22)
- I like CFLs (n=8)
- Incandescents are being phased out (n=8)
- Better for the environment (n=6)
- Light quality (n=5)
- The CFLs are cooler than old bulbs (n=2)
- Quality of the bulbs (n=2)
- LEDs cost too much

Eleven participants[15] (3% weighted) indicated that they were less likely to use CFLs as a result of their participation in the CFL program and provided the following reasons:

Low Income Responses

- Because of the poor light quality, and because I am scared the bulbs will explode or break.

Standard Participant Responses

- Not bright enough (n=4)
- Mercury (n=2)
- Disposal is a problem
- Light color
- Do not like anything about them
- Unsafe
- They take a while to warm up
- Not happy with the quality in comparison to "regular" bulbs
- Too expensive

[15] 1% Low Income, 5% Standard Income

CFL Program Interest

Survey respondents were asked a series of questions about the likelihood that they would participate in a CFL program given several different conditions. For the purpose of this series, respondents were split, beyond income bracket, into two separate groups.

Figure 10 shows a graphical comparison of the mean likelihood of participation responses between CFL program participants and non-participants. The data shows that, in general, participants in the CFL program are more likely to participate in future CFL programs.

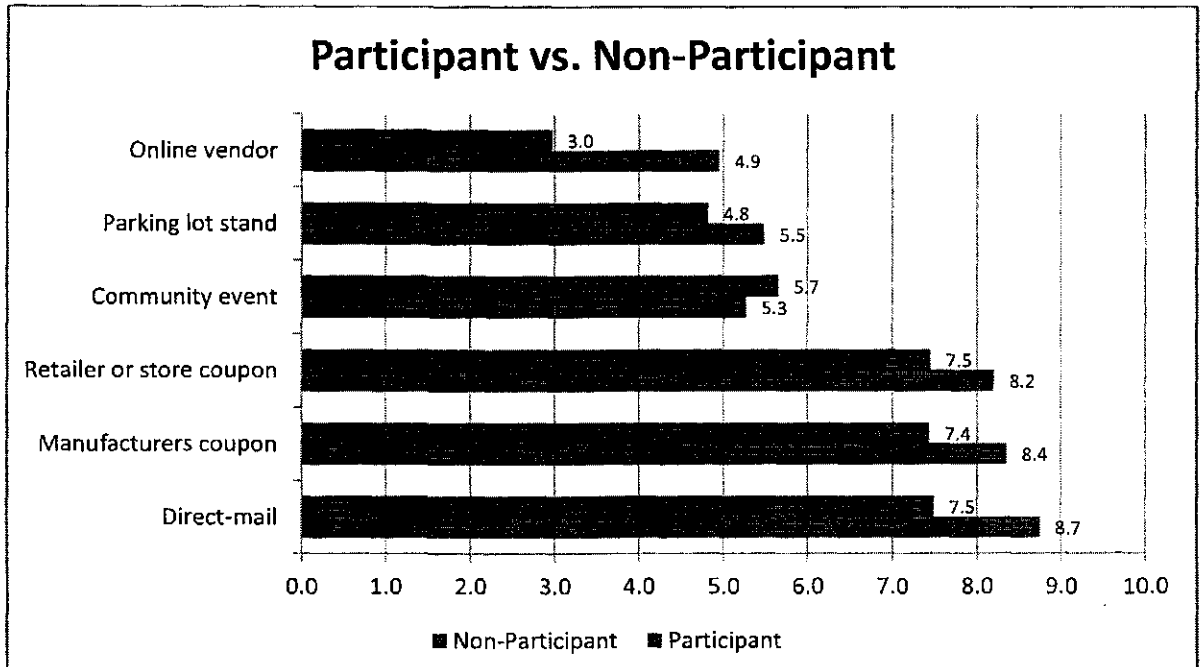


Figure 10. Likelihood of Participation Mean Responses, Participant vs. Non Participant

Light Bulb Characteristics

Surveyed participants were asked to rate the importance of specific bulb characteristics when making their bulb purchasing decisions. The results of these importance ratings are shown in Table 12. Responses were provided on a one to ten scale, where one is not at all important and ten is very important.

Table 12. Importance of Bulb Characteristics When Purchasing Bulbs

Bulb Characteristic	N	Low Income	Standard	Population Weighted Mean
Energy savings	381	9.2	9.2	9.2
Cost savings on your utility bill	381	9.2	9.2	9.2
Selection of wattage and light output levels available	381	8.7	8.8	8.8
Availability of the bulb in stores you normally shop	381	8.7	8.6	8.6
Purchase price of the bulb	382	8.6	8.5	8.5

Availability of utility programs or services that offer	381	8.4	8.0	8.2
Ease of bulb disposal	370	7.6	7.9	7.8
Speed at which the bulb comes up to full lighting level	381	7.2	7.4	7.3
Recommendations from the utility company	380	7.6	6.8	7.1
Mercury content of the bulb	370	6.9	6.8	6.8
Recommendations from family and friends	381	7.0	6.4	6.6
Ability to dim the lighting level	375	6.1	6.0	6.0
Attractiveness or appearance of the bulb	382	6.0	5.8	5.9

Interestingly, the "Selection of wattage and light output levels available" (8.8 weighted mean) and the "Availability of the bulb in stores you normally shop" (8.6 weighted mean) were rated higher than the "purchase price of the bulb" (8.5 weighted mean). The two highest rated factors were "Energy savings" (9.2 weighted mean) and "cost savings on your utility bill" (9.2 weighted mean). Factors often perceived as barriers to CFL adoption, such as aesthetics (5.9 weighted mean), mercury content (6.8 weighted mean), and availability of dimmable bulbs (6.0 weighted mean), were among the lowest rated categories. A graphical representation in ascending order of importance can be seen in Figure 11.

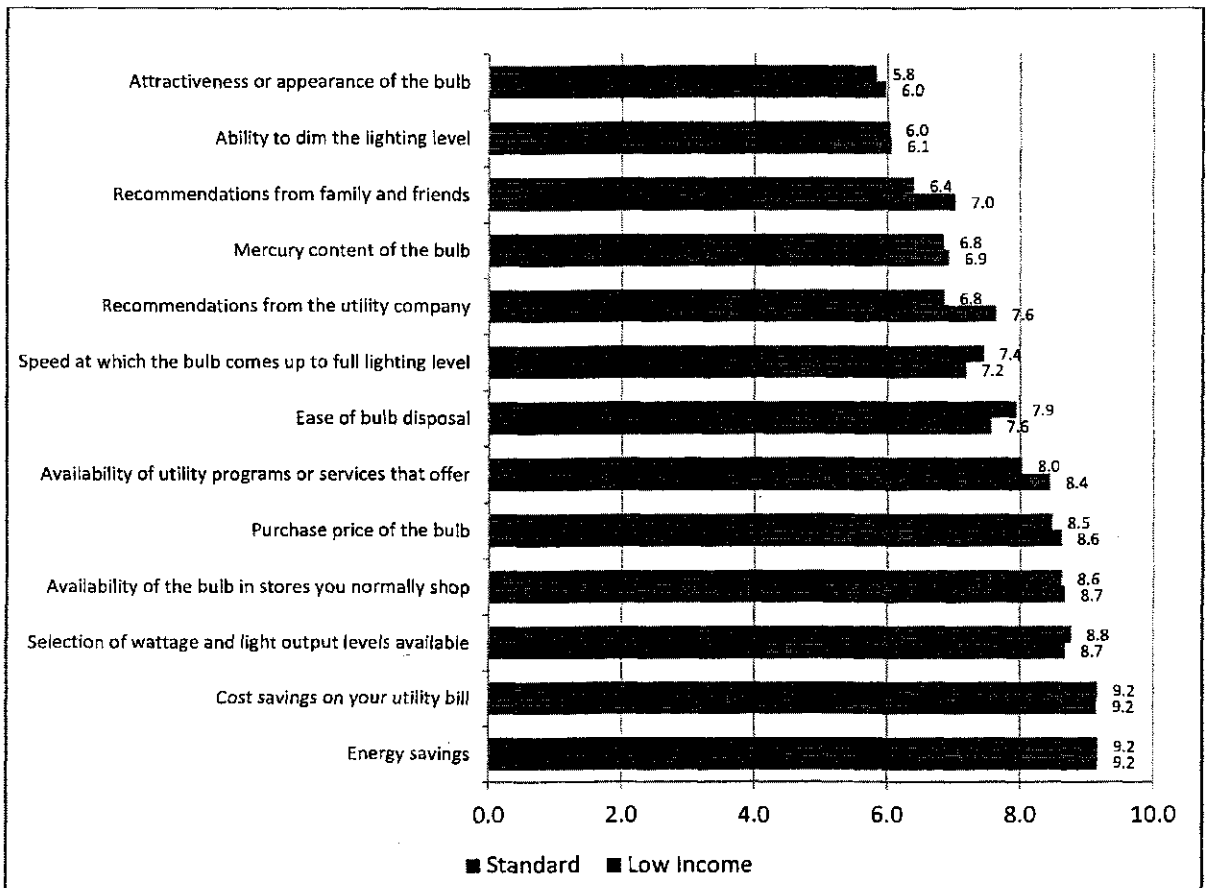


Figure 11. Importance of Bulb Characteristics by Income Group

Figure 12 shows a graphical comparison of the importance of the various bulb characteristics for the participant and non-participant populations. Participants rated all but three of the characteristics higher in importance than their non-participant counterparts.

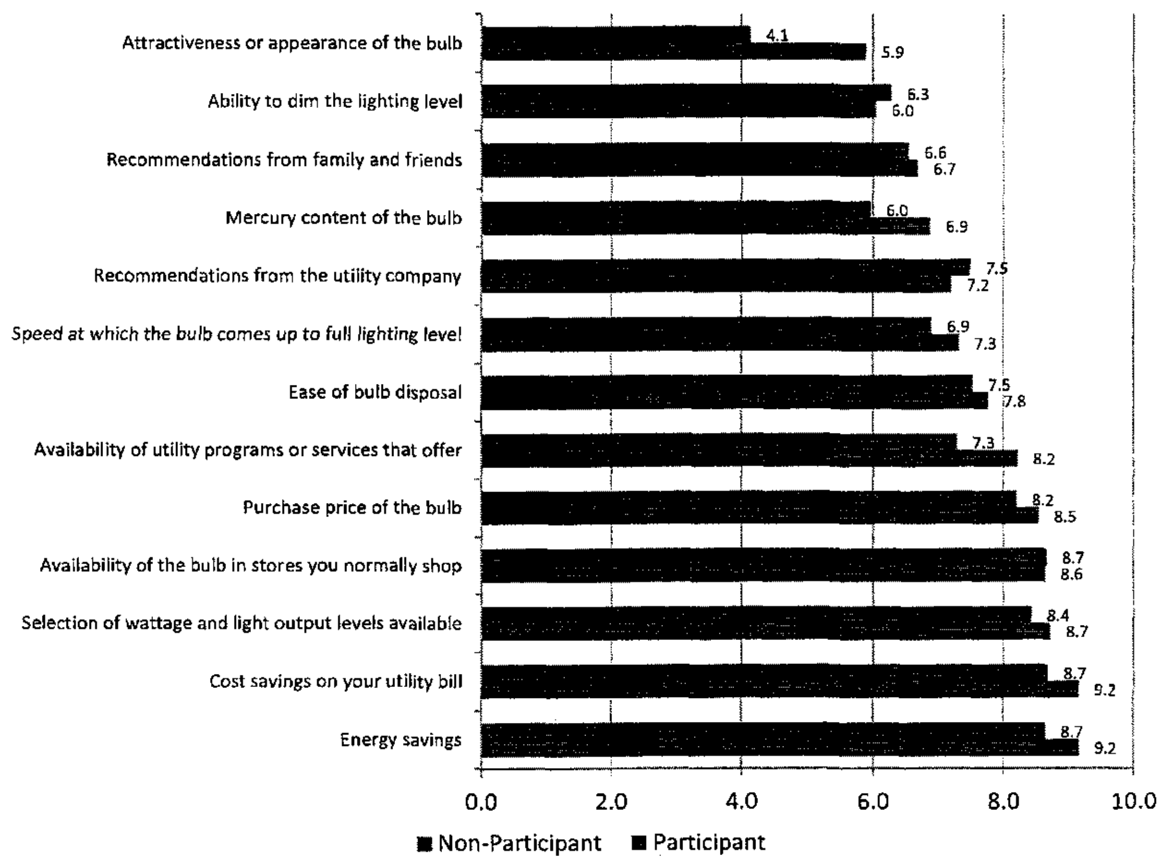


Figure 12. Importance of Bulb Characteristics, Participants vs. Non-Participants

What Participants Liked Most About the Program

Participants were asked what they liked most about the CFL program, and provided the following responses. Participants overwhelmingly liked that the CFLs were free and that the program was easy and convenient.

Low Income Responses

- It was easy, free and convenient (n=87)
- Because they are free (n=49)
- Saving energy and money (n=17)
- Everything (n=6)
- Quick delivery(n=5)
- Opportunity to try CFLs for free (n=4)
- CFLs are long-lasting (n=2)
- I like the CFLs' quality (n=2)

- Educational about CFLs

Standard Participant Responses

- Because they are free (n=110)
- Convenience (n=53)
- Ease of ordering (n=44)
- Opportunity to try CFLs for free (n=11)
- Saving energy (n=7)
- Quick delivery(n=7)
- Saving money (n=5)
- CFLs are long-lasting (n=4)
- Brand name CFLs (n=3)
- Duke's concern for customers (n=3)
- Educational about CFLs (n=2)
- It made me think about changing out all my light bulbs

What Participants Liked Least About the Program

Participants were asked what they liked least about the CFL program, and provided the following responses.

Low Income Responses

- I did not receive enough bulbs (n=6)
- It took too long to receive the bulbs (n=5)
- Taking this survey (n=4)
- Poor delivery service (n=3)
- Not bright enough (n=3)
- Bulbs burned out soon after installing (n=2)
- Need dimmable bulbs (n=2)
- The box the CFLs came in was bulky
- CFLs do not work well in my bathroom
- Delay in getting information
- Disposal of CFLs
- I am still waiting on the second order
- Need three-way bulbs
- Paperwork
- Duke should expand program to businesses
- Do not like CFLs
- Too much cardboard used in packing the bulbs
- Website froze

Standard Participant Responses

- I did not receive enough bulbs (n=12)
- It took too long to receive the bulbs (n=12)

- Limited choice of bulb wattage and types (n=9)
- Not bright enough (n=9)
- Do not like CFLs (n=6)
- The CFLs' mercury content (n=6)
- I didn't receive any instructions on how to safely dispose of CFLs (n=4)
- Time on phone (n=3)
- Didn't offer LEDs (n=2)
- Light quality (n=2)
- The poor quality of the CFLs (n=2)
- Switching to all CFLs did not lower my power bill (n=2)
- Bulbs burned out soon after installing
- Did not fit
- Mailman left the box on the porch with no notice of delivery
- The box the CFLs came in was bulky
- Taking this survey
- They take a while to warm up

Participation and Interest in Other Duke Energy Programs

TecMarket Works asked the CFL participants if they were participants of any of the following Duke Energy programs.

- Online Services
- Power Manager®
- Home Energy House Call
- Home Energy Comparison Report
- Personalized Energy Report
- Residential Smart $aver®

We also asked what their level of interest is in other Duke Energy programs (after providing a brief description of the program[16]) on a 1-to-10 scale with 1 indicating "not at all interested" and 10 indicating "very interested".

The most commonly reported program (20% weighted) they have participated in was "Online Services," which is a variation of the Personalized Energy Report in which customers can log into their Duke Energy accounts online and complete a survey about their home to receive recommendations for energy efficiency improvements that they can make. However, it should be noted that many of these customers may not have been aware of the survey and the report (and free CFLs) that they would receive for completing the survey, and instead believed that having on online account with Duke Energy meant the same thing as completing the survey and being a participant in the program.

[16] Please see questions 56a-56e in Appendix B: Participant Survey Instrument for the program descriptions provided to the customers.

With the similarity of the Personalized Energy Report and Online Services, we did not ask about their interest in Online Services.

The programs generating the highest levels of weighted mean interest were Residential Smart $aver (6.4), Personalized Energy Reports (6.4) and Home Energy House Call (6.3). While the amount of interest in one program or another varied by income group, for no program did survey respondents from either income group have more than 0.6 of a point difference, indicating relatively consistent levels of interest in all Duke Energy programs throughout the survey population.

As presented in Table 13 below participants of the CFL program typically are not participating in other Duke Energy programs, and have only a mild interest in them.

Table 13 . Participation and Interest in Other Duke Energy Programs

	Power Manager	Residential Smart $aver	Home Energy House Call	Home Energy Comparison Report	Personalized Energy Report	Online Services
# Participants Low Income	13	5	5	16	14	33
% Low Income	7%	3%	3%	9%	8%	18%
# Participants Standard	16	8	9	33	17	42
% Standard	8%	4%	5%	17%	9%	21%
# Total Participants	29	13	14	49	31	75
Total Weighted %	8%	4%	4%	14%	8%	20%
Mean Interest Low Income	3.9	6.0	5.9	5.6	6.3	NA
Mean Interest Standard Income	3.7	6.6	6.5	6.0	6.5	NA
Mean Interest Total Weighted	3.7	6.4	6.3	5.9	6.4	NA

Participants were also asked what other services Duke Energy could provide to help them improve their energy efficiency. The verbatim responses are below. Not all of the responses are about energy efficiency, but are included here for completeness.

Low Income Participant Responses

- Weatherization and insulation programs (n=12)
- Help with bills (n=6)
- Lower energy rates (n=5)
- Rebates for energy-efficient devices (n=5)
- I need a new door (n=3)
- Classes on energy efficiency (n=2)
- More free CFLs by mail (n=2)
- Work with landlords (n=2)
- Advising how to save money on the bill
- Brochures on energy saving tips

- Infrared heat loss detection to determine heat-conserving measures to be taken.
- Maybe a do-it-yourself section on home improvements on Duke's web site. A separate link that would take people to a page that would walk a novice through simple things that can really save money for them. Gaskets on outlets/switches, lighting timers and or motion switches, tips on programming their thermostats, that sort of thing. Surprising to me how many people actually don't know those things.
- Money back each month if you stay under a certain usage
- Duke could provide solar panels
- Reflective film for windows to cool rooms in the summer
- Senior discount rate
- Shrink wrap for windows
- Units to measure electric consumption of devices
- I need new windows
- I would like specialty light bulbs

Standard Participant Responses

- Lower energy rates (n=13)
- Rebates for energy-efficient devices (n=5)
- Home-energy inspections (n=4)
- Education about saving energy (n=3)
- Discount or free LEDs (n=2)
- More free CFLs (n=2)
- Weatherization help for elderly or low income customers (n=2)
- A program in which customers could pay a certain flat rate every month for their energy.
- Along with the energy saving programs now in place, Duke could offer a small discount to customers who own Duke stock. Money would be available to the customer in the form of stock purchases and the customer would be able to purchase stock from Duke without going through a broker.
- Assistance for single moms
- Build energy-efficient houses
- E-newsletter reminding us of energy saving tips
- Duke could provide a list of energy-efficient appliances
- Give customers a month free of service as a reward for paying all of their bills on time
- Money back each month if you stay under a certain usage
- More energy-efficiency supplies
- More online tools
- Duke should educate people about the disposal of CFLs.
- Recycle program for bulbs
- Solar cell rebate program
- Tips for apartment dwellers
- I need new windows

Interest in Specialty CFLs

Surveyed participants were asked to list the number of bulbs currently installed in their homes that are specialty bulbs. As a follow-up to that question, they were asked how many of the specialty bulbs are CFLs. The results are summarized in Table 16. There are a total of 4,879 specialty bulbs of various types installed in the homes of surveyed participants (2,246 low income and 2630 standard). Of these, 1,127 (23%) are specialty CFLs (528 low income and 599 standard). Across the entire survey population the most prevalent type of bulbs are dimmable bulbs. This holds true among low income households as well. However, recessed bulbs were the most prevalent specialty bulb for the standard population.

Table 14. Currently Installed Specialty Bulbs and CFLs

Bulb Type	N	Low Income, n=182		Standard, n=200		Population Total	
		Total	CFL	Total	CFL	Total	CFL
Dimmable		804	162	326	82	1130	244
Outdoor flood		231	52	293	95	524	147
Three-way		160	59	246	96	406	155
Spotlight		181	54	381	75	562	129
Recessed		304	75	604	146	908	221
Candelabra		388	89	479	56	867	145
*Other		178	37	301	49	479	86
TOTAL		2246	528	2630	599	4876	1127

When surveyed participants were asked to rate their interest in Duke Energy providing a direct mail specialty CFL program, their responses had a weighted average of 7.8 on a scale from one to ten, where one indicated no interest and ten indicated great interest. Low income and standard survey respondents were similarly interested in the proposition, as can be seen in the table below.

Table 15. Interest in Specialty CFL Program by Income Group (n=382)

Low Income	Standard	Weighted Population Average
8.0	7.6	7.8

After providing a rating of their general interest in specialty CFL programs, respondents were asked to indicate their interest in receiving specific types of specialty bulbs if they were to be offered in the future. As a follow-up, if they were interested, they were asked to include an estimate of how many hours per day they would use the bulb. Their responses are summarized in Table 16. Of the surveyed participants, the highest level of interest was in three way CFLs (54% weighted), and surveyed participants indicated that these bulbs would be used for a weighted average of 4.1 hours a day. The lowest level of interest was in candelabra CFLs, and they also would be used 4.1 hours per day on weighted average.

Table 16. Interest in Specific Specialty CFLs by Income Group (n=382)

Bulb Type	Low Income, n=182		Standard, n=200		Population Total	
	Percent Interested	Mean Hours of Use	Percent Interested	Mean Hours of Use	Weighted Percent Interested	Weighted Hours of Use
Dimmable	48.4%	4.5	45.0%	3.5	46.3%	3.9
Outdoor flood	46.2%	3.8	48.5%	4.3	47.6%	4.1
Three-way	54.9%	3.9	53.5%	3.9	54.0%	3.9
Spotlight	26.4%	2.3	35.5%	4.1	32.0%	3.4
Recessed	28.0%	3.9	30.0%	3.5	29.2%	3.7
Candelabra	18.7%	3.8	26.0%	4.3	23.2%	4.1

Non-Participant Surveys

The Residential Smart $aver CFL program, as implemented in Ohio by Duke Energy, gives Duke Energy residential customers the ability to 'opt-in' and order CFLs by responding to a direct mail piece (campaign = 664), or by calling the IVR toll free number, or by logging into their account information in OLS (Online Services) (IVR and OLS campaign = 701). Customers are eligible for up to 15 CFLs (depending on past program participation).

To assess barriers to, and interest in, program participation, TecMarket Works conducted phone surveys with a random sample of 60 non-participants, 31 low income and 29 standard customers, from Ohio between February 21, 2012 and April 3rd, 2012.

The non-participant survey was aimed at addressing the following key questions:

- Are customers aware of the program, and if yes, how did they learn of the program?
- What is their interest in participation and what are the reasons behind non-participation?
- What are some ways the program could try to increase participation?
- What is their current level of CFL usage?
- What is their interest in Duke Energy providing additional programs?
- What are the attitudes and actions surrounding energy use in this population?
- What are the demographic and household characteristics of this population? How do these characteristics compare to the participant population?

Program Awareness

Only four (7%) of the survey respondents (all four standard income) reported that they did not recall seeing information about the program. One person was unsure, and 55 (92%) remembered learning about the program through various sources, as summarized in the table below. The survey data contains some contradictory responses. Three of the five respondents who reported not being able to recall seeing information about the program, or that they weren't sure, also indicated that they learned of the program through an advertisement in their bill.

Table 17. Source of Program Information for Non-Participants (n=60)

How did you learn of the free CFL program?	*Count Low Income	*Count Standard	*Count Total
I got a brochure in the mail	15	13	28
Advertisement in my bill	8	12	20
From friend/family	4	4	8
Other	4	3	7

Note: Survey respondents were allowed multiple responses

The "other" responses are as follows:

- Duke Auditor
- People Working Cooperatively rep
- An ad in the bill and/or a brochure in the mail
- Co-worker
- Surveyor

Reasons for Non-Participation

Of the 60 non-participants surveyed, 10% (5 low income nonparticipants, 1 standard income participant) attempted to enroll in the free CFL program. As shown in Table 18, of those who attempted to enroll, one went to the Duke Energy website, three called the toll free number, one sent in the business reply card, and one could not recall. When asked why they were unsuccessful they gave the following replies:

- I never received the bulbs (n=3)
- Asked for my SS# and I didn't want to give that out
- Website errors

Table 18. Method of Enrollment Attempts among Non-Participants

	Duke Energy Web Site	Toll free number	Customer service number	Mail-in card	Other
Low Income	1	3	0	1	1
Standard	0	0	0	0	0
Total Population	1	3	0	1	1

When asked why they decided not to enroll in the program, respondents gave a variety of responses. Nineteen percent (weighted) of all non-participants surveyed said they did not understand the program, and 10% (weighted) claimed to already have CFLs in all the sockets that use them. These responses are shown in Table 19 below. However, it was the "Other" category that had the most respondents, 35 (57%, weighted) overall, with 17 low income and 17 standard respondents giving their own reasons for not participating. Of those "Other" reasons, 24% (weighted) of all respondents (9 low income and 7 standard) indicated that they did not enroll simply because they did not find the program compelling enough to take action.

Table 19. Reasons for Not Enrolling in the Program by Income Group

	Low Income n=31		Standard n=29		Total Population n=60	
	Number of Respondents	%	Number of Respondents	%	Number of Respondents	Weighted %
Did not understand program	5	16%	6	21%	11	19%
Already have CFLs in all sockets that use them	3	10%	3	10%	6	10%
Don't like CFLs	1	3%	4	14%	5	10%
Don't use CFLs	1	3%	4	14%	5	10%
Too much hassle	0	0%	4	14%	4	9%
Received CFLs in the past and thought I would be ineligible	1	3%	0	0%	1	1%
Other	17	55%	17	59%	35	57%

Note: Survey respondents were allowed multiple responses

The "other" responses were as follows:

- Didn't think about it/Not important enough to act (n=15)
- I didn't need any bulbs (n=2)
- I've been sick and in the hospital (N=2)
- Didn't know how to sign up (n=2)
- Cost to replace CFLs (n=2)
- Unaware of program (n=2)
- Didn't learn about it in time (n=2)
- I didn't think I was eligible
- Because nothing is ever free
- Bulbs not my responsibility
- Don't like people telling me what to do
- Safety concerns

As shown in Table 19, five (10%, weighted) of respondents indicated that they did not enroll because they do not like the CFLs, and another five (10%, weighted) said they didn't enroll because they don't use CFLs. Their reasons for not liking or using CFLs were:

- Not bright enough (n=6)
- Mercury disposal concerns (n=6)
- Don't like the color of the light (n=3)
- Too long to warm up (n=2)
- Too expensive

Program Promotion

Non-participants were asked if they had told anyone about the program and, if so, how many people they told and how they told them. As shown in Table 20 below, 12 (19%, weighted) of surveyed non-participants reported telling others about the program, compared to 47 (80%, weighted) who did not speak about the program. The percentages seen in the total population corresponded closely with the low income group (26%) as well as with the standard income group (14%). The 12 respondents who told other people discussed the program with 18 or more family, friends, and neighbors. All indicated that they informed others via word of mouth. Seven respondents (four low income and three standard) reported that those they spoke with had signed up for the program.

Table 20. Non-Participants Who Told Others About the Program by Income Group

Did you tell others about the CFL program?	Low Income n=31		Standard n=31		Total Population n=60	
	N	%	N	%	N	Weighted %

Yes	8	26%	4	14%	12	19%
No	22	71%	25	86%	47	80%
Don't Know	1	3%	0	0%	1	1%

Program Influence

Despite not participating in the program, nearly two thirds (64%, weighted) of non-participants surveyed indicated that learning of Duke Energy's CFL program had increased their awareness about how to save energy by using CFLs. This increase in awareness was slightly less common among standard non-participants at 17 (59%), compared to low income non-participants at 22 (71%). Table 21 displays the number responses by income group. These results suggest that the program also had a transformative effect on non-participants, increasing the level of energy savings beyond what is documented in this evaluation.

Table 21. Increase in Awareness of CFL Energy Savings Potential by Income Group

Response	*Low Income* n=31		*Standard Income* n=29		*Total Population* n=60	
	Number of Respondents	%	Number of Respondents	%	Number of Respondents	Weighted %
Yes	22	71%	17	59%	39	64%
No	5	16%	10	35%	15	28%
Don't Know/Not Sure	4	13%	2	7%	6	9%

Duke Energy's free CFL offer inspired 12 (19%, weighted) of the non-participants surveyed to purchase CFLs. The percentage of those reporting CFL purchases was higher among low income respondents (26%) than among standard income respondents (14%). The four standard income respondents said they had purchased a total 47 CFLs, while the eight low income respondents indicated that they had purchased 45 CFLs. Table 22 shows the number of responses by income group.

Table 22. CFL Purchases among Non-Participants

	Low Income n=31		Standard Income n=29		Total Population n=60	
	Number of Respondents	%	Number of Respondents	%	Number of Respondents	Weighted %
Yes	8	26%	4	14%	12	19%
No	20	65%	25	86%	45	78%
Don't Know/Not Sure	3	10%	0	0%	3	4%

Survey respondents were asked to rate the program's influence on their decision to purchase the CFLs on a ten point scale, where one means the Duke Energy CFL program was not at all influential on their decision to buy additional CFLs and a ten means that the program was very influential. The total population of 12 CFL purchasers gave a mean influence rating of 6.3. The mean influence rating among standard income participants was 5.5, compared to 6.8 among low income participants. This data can be seen in Table 24.

Non-participants were also asked to rate the influence of several factors on their decision to buy CFLs on the same ten point scale. The data, seen in Table 23, shows that "the desire to save on utility costs" topped the list with a weighted mean score of 9.9. "The desire to be environmentally responsible" placed second with a weighted mean score of 9.7, while "the brand of CFLs offered by the program" came in third with a score of 8.6. All other factors were comparatively inconsequential.

Table 23. Factors Influencing CFL Purchasing Decisions

	Low Income (n=8)	**Standard** (n=4)	**Total Population Weighted Mean** (n=24)
Your desire to save on utility costs	9.8	10.0	9.9
Your desire to be environmentally responsible.	9.9	9.5	9.7
The brand of CFLs offered by the program	9.6	8.0	8.6
Friends or family by email	3.0	5.8	4.7
Friends or family by word of mouth	4.9	3.8	4.2
Duke Energy advertising on TV, Radio, or newspaper	1.3	5.5	3.9
Other non-Duke Energy advertising	1.0	4.3	3.0
Duke Energy advertising on social media sites such as Facebook	1.0	3.0	2.2
Advertising on Duke Energy's Web site	1.0	2.5	1.9
Friends or family by social media such as Facebook	1.0	2.0	1.6
Someone you don't know personally or a group that you follow on Facebook or Twitter	1.0	2.0	1.6
Your desire to save energy	1.0	1.8	1.5

Figure 13 compares non-participant influence ratings by income group. Among standard non-participants, the highest rated influence factor was the desire to be environmentally responsible with a rating of 10 out of 10. Low income non-participants' top rated factor was the desire to save on utility costs, which scored a 9.9, edging out the desire to be environmentally responsible by one tenth of a point.

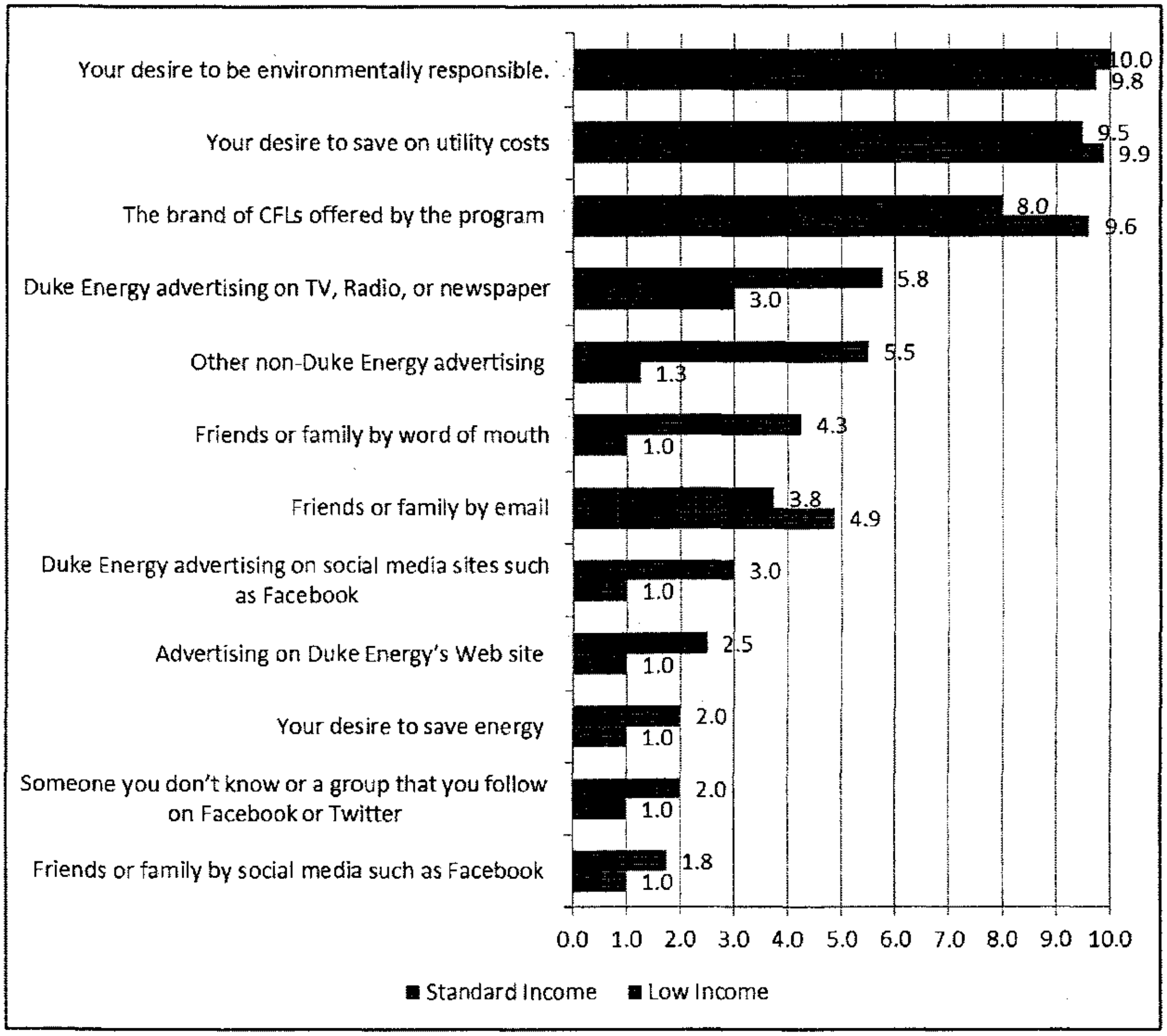


Figure 13. Factors Influencing CFL Purchasing Decisions by Income Group

When asked to rate their satisfaction with the CFLs they purchased on a scale from one to ten, where one is very dissatisfied and ten is very satisfied, satisfaction levels averaged 8.7 (weighted) for the total population of respondents. Low income CFL purchasers rated their satisfaction with a mean score of 9.5, and standard income purchasers rated their satisfaction with a mean score of 8. These ratings are displayed in Table 24.

Table 24. Program Influence and CFL Satisfaction

Population	Number of Respondents	Mean Influence Score	Mean Satisfaction with CFLs Purchased
Low Income	8	6.8	9.5

Standard	4	5.5	8
Total Population	12	6.0	8.7

Five of 15 (24%, weighted) of CFL purchasers bought their CFLs at Wal-Mart, while 3 out 15 (25%, weighted) bought their CFLs at Kroger's. The remainder of the list in Table 25 represents other locations where the nonparticipants decided shop for CFLs.

Table 25. Retail Store at Which CFLs Were Purchased

Store	Low Income N	Low Income Percent	Standard Income N	Standard Percent	Total Population N	Total Population Weighted Percent
Wal-Mart	5	63%	0	0%	5	24%
Kroger	2	25%	1	25%	3	25%
Home Depot	1	13%	3	75%	4	51%
Lowes	1	13%	1	25%	2	20%
Dollar Store	1	13%	0	0%	1	5%
Total	10*		5		15	

*Note: Some customers shopped at more than one store.

Customer Satisfaction

Respondents were asked to rate their overall satisfaction with Duke Energy on a scale from one to ten, where one is extremely dissatisfied and ten is completely satisfied. As seen in Table 26, the low income group indicated slightly higher satisfaction with Duke Energy. Overall satisfaction across all non-participants surveyed has a weighted average of 8.1 on a 10 point scale.

Table 26. Overall Satisfaction with Duke Energy by Income Group (n=60)

Low Income	Standard	Total Population Weighted Average
8.5	7.8	8.1

If a customer conveyed satisfaction commensurate with a rating of seven out of ten or less, they were prompted to provide feedback on potential means of improvement. Their responses are as follows:

- Lower the rates (n=3)

- Better inform their reps A rep gave me false information and they didn't apologize I had to call the commissioner on Duke If they would have apologized to me I would have been happy
- By opening more locations that offer direct person-to-person customer service
- Our bill is quite high even though I feel we use very little energy I also wonder if local construction somehow affects our bill I'm suspicious of Duke
- Duke has billed us double as a result of reading the meter incorrectly
- Duke's gas and electric rates are higher than those of Cinergy (previous energy provider)
- I dislike how I can't pay my bill when Duke comes to my house to shut off the power
- I do not like Duke pushing the bulbs and programs on me
- Duke should keep operational costs down so they can pass savings along to customer
- Long-time customers in good standing could have a locked in rate with no increases
- Duke should provide more information online about renewable energy
- When there were wind storms Duke had more trucks than men Duke does not have enough manpower and they are becoming too big of a company My power went out during the storms and it took them a week to get it back on
- Keep operational costs down so they can pass savings along to customer

Current CFL Use

Survey respondents were asked to rate the likelihood that they would use a CFL when there is a need to change a bulb in their home on a scale from one to ten, where one is not at all likely and ten is very likely. The results are summarized in Table 27. The survey shows that low income customers consider themselves to be more likely to replace a bulb with a CFL than standard customers.

Table 27. Likelihood of replacing bulbs with CFLs by Income Group (n=58)

Low Income	Standard	Total Population Weighted Mean
8.5	7.1	7.6

The survey also asked respondents that currently have CFLs installed in their homes to specify how many are installed in each room. Out of all 60 non-participants surveyed, 44 (72%, weighted) have at least one CFL currently installed in their home. One person was unsure, and 15 (26%, weighted) have none. As seen in Table 28, low income customers are more likely than standard customers to have at least one CFL in their home. This data suggests that the CFL market in Ohio is not yet saturated or transformed, and that energy saving opportunities still exists if these customers can be convinced to install CFLs or possibly LEDs via future programs.

Table 28. Percentage of Households With At Least One CFL (n=60)

Do you currently have any CFLs in your home?	Low Income	*Standard	Population Total
Yes	25 (81%)	19 (66%)	44 (72%)
No	6 (19%)	9 (31%)	15 (26%)

Note: One standard customer was unsure; does not add to 100%

A breakdown of CFL information by room type, wattage, and income is shown in Table 29. Across all 60 non-participants surveyed, there are a total of 354 CFLs currently installed throughout the various rooms in their homes, a weighted average of 5.92 bulbs per household. Low income households have a greater number of CFLs than standard households, 194 compared to 160, 55% of the total. Note that there are 31 low income households in the sample, and only 29 standard households. One of the standard respondents was unsure and thus removed, lowering the total standard households represented in the responses to this question to 28. This means that the standard household has a mean of 5.71 CFLs installed compared to the low income household, which has a mean of 6.26 CFLs installed. This is approximately a 10% difference.

Table 29. Number of CFLs Per Room by Wattage and Income (N=60)

Room Type	Low Income			Standard			Population Total		
	13W	20W	ALL	13W	20W	ALL	13W	20W	ALL
Living/family room	10	0	45	6	0	33	16	0	78
Dining room	0	0	14	2	0	9	2	0	23
Kitchen	5	5	28	3	3	24	8	8	52
Master bedroom	2	1	30	8	0	23	10	1	53
Other bedroom	5	1	21	10	0	13	15	1	34
Hall	1	2	6	5	0	13	6	2	19
Closet	1	0	4	1	0	1	2	0	5
Basement	0	0	13	4	1	8	4	1	21
Garage	3	0	3	0	0	0	3	0	3
Bathroom	1	8	24	17	0	26	18	8	50
Other	0	0	6	6	0	10	6	0	16
TOTAL	**28**	**17**	**194**	**62**	**4**	**160**	**90**	**21**	**354**

The "other" room types are as follows:

- Outside (n=7)
- Porch (n=6)
- Finished rec room in basement (n=2)
- Study

Current Non-CFL Use

Survey respondents were asked to estimate the number of bulbs currently installed in their homes that are not CFLs. As a follow-up to that question, they were asked how many of the non-CFL bulbs are typically used for more than two hours per day. The results are summarized in Table 30. Throughout the homes of all 60 non-participant survey respondents, there are a total of 755 non-CFL bulbs installed, a weighted mean of 13.83 bulbs per household. Standard households comprise the majority with 506 (67%) of these bulbs and a mean of 17.4 bulbs per household.

While there are roughly two times as many non-CFLs installed in standard households than in low income households, the numbers of non-CFLs that typically operate for more than two hours per day are approximately equal across both populations with a mean of 3.3 bulbs apiece.

Table 30. Non-CFLs Installed and Used for More Than Two Hours per Day (n=60)

Metric	Low Income		Standard		Population Total	
	Total	Mean	Total	Mean	Total	Weighted Mean
Non-CFLs	249	8.0	506	17.4	755	13.83
More than 2 hours/day	101	3.3	93	3.3	194	3.3

Energy Efficiency Improvements

Table 31 shows a breakdown of all of the energy efficiency improvements made by non-participants since April of 2011. The first four measures: appliances, windows, heating systems, and cooling systems are the more expensive measures. It follows that the standard customers were much more likely to implement them, a total of 28 (90%) measure adoptions from this category compared to only three (10%) from the low income customers. The less expensive measures were more or less equally likely to be taken by low income and standard customers alike. Low income customers installed slightly more, 49 (53%) compared to 43 (47%). Nine customers from each of the income brackets reported making no additional energy efficiency improvements, for a total of 18 (weighted mean = 30%).

Table 31. Number of Energy Efficiency Improvements by Income Group (n=60)

Measure	Low Income	Standard	Population Total
High efficiency appliances	3	7	10
Energy efficient windows	0	8	8
High efficiency heating system	0	8	8
High efficiency cooling system	0	5	5
Wall or ceiling insulation	5	5	10
Caulking	9	9	18
Faucet aerators	0	0	0
Outlet or switch gaskets	1	1	2
Low flow showerhead	8	10	18
Programmable thermostat	14	10	24
Weather stripping	12	8	20

In addition to the energy efficiency improvement data presented in Table 31, survey respondents were asked if they had changed any of their habits related to energy use. Out of all 60 non-participants surveyed, 39 (52%. weighted) indicated that their habits had changed. Of these 39 respondents, 16 (41%) were low income customers and 23 (59%) were standard customers, suggesting that standard customers are more likely to change their behavior as it relates to energy consumption. Respondents answering that they had changed their habits were asked to specify what about their behavior had changed. Their responses are summarized below:

- Set the thermostat higher in the summer and lower in the winter (n=13)
- I turn lights off (n=9)
- Turn off or unplug appliances (n=9)
- I have always tried to be energy efficient (n=6)
- Caulking, weather stripping and insulation (n=2)
- I drive less
- I got a new better-insulated door
- I have cut down on hot water use
- I use more space heaters
- Lowered the temperature on water heater
- Teaching children and grandchildren to be energy efficient
- We just built a house with energy-efficient upgrades

Light Bulb Characteristics

Surveyed non-participants were asked to rate the importance of specific bulb characteristics when making their bulb purchasing decisions. The results of these importance ratings are shown in Table 32. Responses were provided on a one to ten scale, where one is not at all important and ten is very important.

Table 32. Importance of Bulb Characteristics When Purchasing Bulbs

Bulb Characteristic	N	Low Income	Standard	Total Population Weighted Mean
Availability of the bulb in stores you normally	60	8.1	9.2	8.8
Cost savings on your utility bill	60	9.0	8.3	8.6
Energy savings	60	8.9	8.3	8.5
Selection of wattage and light output levels	60	8.1	8.8	8.5
Purchase price of the bulb	60	8.5	7.9	8.1
Ease of bulb disposal	53	6.8	8.2	7.7
Recommendations from the utility company	59	8.0	7.0	7.4
Availability of utility programs or services that	59	8.1	6.4	7.0
Speed at which the bulb comes up to full lighting	60	7.0	6.8	6.9
Recommendations from family and friends	60	6.2	6.9	6.6
Ability to dim the lighting level	60	5.8	6.8	6.4
Mercury content of the bulb	53	5.6	6.3	6.0
Attractiveness or appearance of the bulb	60	3.6	4.7	4.3

Interestingly, the availability of CFL bulbs in stores that participants normally shop (8.8 weighted mean) and the selection of wattage and light output levels available (8.5 weighted mean) were rated higher than the purchase price of the bulb (8.1 weighted mean). Cost savings on your utility bill and energy savings were also rated higher than purchase price. Factors often perceived as barriers to CFL adoption, such as aesthetics (4.3 weighted mean), mercury content (6.0 weighted mean), and availability of dimmable bulbs (6.4 weighted mean), were rated by survey participants as the three lowest categories. A graphical representation in ascending order of importance can be seen in Figure 14.

Overall, this suggests that the most important factors for continued CFL adoption and installation by Duke Energy customers is continued utility savings from the bulbs, an affordable price point, and the availability of a good selection of wattage and light output levels of bulbs either directly from Duke Energy or in stores where people normally shop.

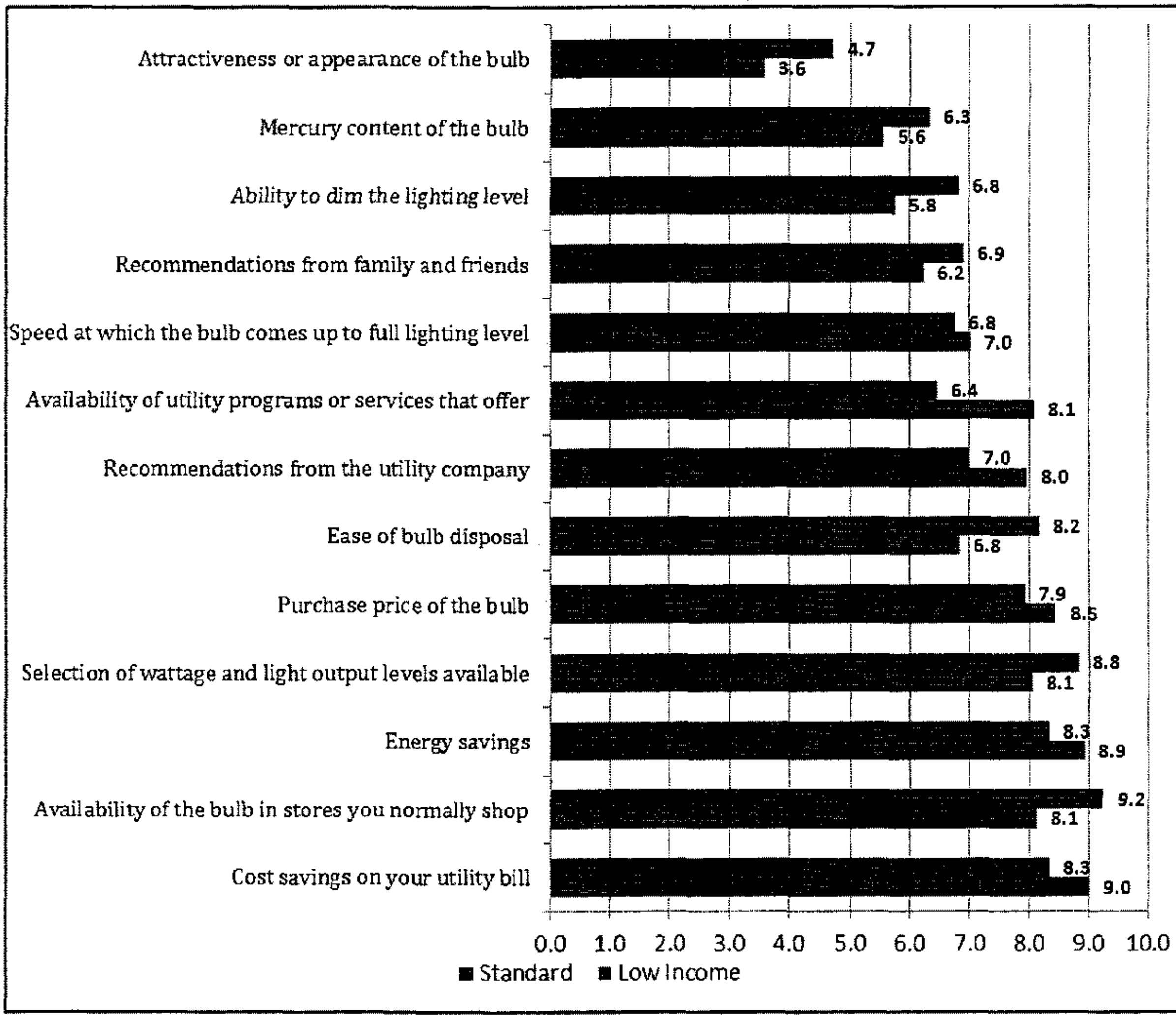


Figure 14. Importance of Bulb Characteristics by Income Group

Specialty CFLs

Survey respondents were asked to list the number of bulbs currently installed in their homes that are specialty bulbs. As a follow-up to that question, they were asked how many of the specialty bulbs are CFLs. The results are summarized in Table 33. There are a total of 629 specialty bulbs of various types installed in the homes of surveyed non-participants. Of these, 433 (69%) are located in standard households. Very few specialty bulbs are CFLs, only 12 (2%) across the entire surveyed population.

Table 33. Currently Installed Specialty Bulbs and CFLs

Bulb Type	N	Low Income		Standard		Population Total	
		Total	CFL	Total	CFL	Total	CFL
Dimmable	56	33	0	31	2	64	2
Outdoor flood	58	24	0	41	0	65	0
Three-way	58	21	5	27	0	48	5
Spotlight	57	6	0	7	0	13	0
Recessed	57	16	0	154	0	170	0
Candelabra	57	64	0	97	5	161	5
Other	18	32	0	76	0	108	0
TOTAL		**196**	**5**	**433**	**7**	**629**	**12**

The "other" bulb types and quantities are as follows:

- LED (n=51)
- Vanity (n=17)
- Fluorescent (n=16)
- Linear fluorescent (n=7)
- Infrared (n=7)
- Small fan bulbs (n=4)
- Halogen (n=2)
- Orange bulb

When surveyed non-participants were asked to rate their interest in Duke Energy providing a direct mail specialty CFL program, their responses had a weighted average a 6.5 on a scale from one to ten, where one indicated no interest and ten indicated great interest. Low income survey respondents were much more interested in the proposition than standard respondents as can be seen in Table 34.

Table 34. Interest in Specialty CFL Program by Income Group (n=59)

Low Income	Standard	Population Mean
7.7	5.8	6.5

After providing a rating of their general interest in specialty CFL programs, respondents were asked to indicate their interest in receiving specific types of specialty bulbs if they were to be offered in the future. As a follow-up, if they were interested, they were asked to include an estimate of how many hours per day they would use the bulb. Their responses are summarized in Table 35. There were a total of 75 interested responses from 30 different respondents across all of the specialty bulb types.

Table 35. Interest in Specific Specialty CFLs by Income Group (n=60)

Bulb Type	Low Income		Standard		Population Total	
	Interested	Hours of Use	Interested	Hours of Use	Interested	Weighted Hours of Use
Dimmable	4	3.17	12	3.89	16	3.6
Outdoor	2	12.00	11	7.78	13	9.4
Three-way	6	5.25	8	4.50	14	4.8
Spotlight	0	0	5	4.40	5	4.40
Recessed	2	0	5	6.33	7	3.9
Candelabra	5	4.50	8	4.17	13	4.3
*Other	2	0	5	4.20	7	2.6

*Four of the "other" bulb types were left blank

The "other" bulb types are as follows:

- Vanity
- Low mercury bulbs

Future CFL Purchases

Respondents were asked to consider their future CFL purchases and identify how many CFLs they would expect to purchase in the next year if CFLs were offered at a certain price compared to a standard (incandescent) bulb. The prices offered were:

- The same price as a standard bulb
- $1 more than a standard bulb
- $2 more than a standard bulb
- $3 more than a standard bulb

Table 36 shows the number of CFLs that survey respondents would purchase as the bulbs increase in price. As expected, the general trend is toward purchasing fewer CFLs as they become more expensive. Overall, the number of people that would buy at least one CFL decreases from 46 (80%, weighted), at the normal incandescent price, to 33 (50%, weighted) at a cost of three dollars more.

Table 36. Number of CFLs Purchased at Different Price Points by Income Group (n=60)

Income Group	Number of CFLs	Normal Incandescent Price	$1 More	$2 More	$3 More
Low Income	None	4	6	8	8
	1 to 3	4	4	2	7
	4 to 6	4	2	7	5
	7 to 9	2	7	5	4

	10 to 12	7	5	4	2
	13 or more	7	4	2	2
Standard	None	5	6	10	13
	1 to 3	2	4	4	5
	4 to 6	7	5	5	2
	7 to 9	5	5	2	3
	10 to 12	3	2	4	2
	13 or more	5	4	1	1
Population Total	None	9	12	18	21
	1 to 3	6	8	6	12
	4 to 6	11	7	12	7
	7 to 9	7	12	7	7
	10 to 12	10	7	8	4
	13 or more	12	8	3	3

Survey respondents were also asked how many CFLs they would purchase if the bulbs were free, but required a mail-in rebate form or an online rebate form. Table 37 shows that, on average, a customer would use the rebate to purchase a weighted average of 3.9 bulbs.

Table 37. Number of Rebated Bulbs by Income Group (n=27)

Low Income	Standard	Population Weighted Mean
3.2	4.3	3.9

Participation and Interest in Other Duke Energy Programs

Before being asked about their interest in participating in other Duke Energy programs, survey respondents were asked if they were currently participating in any. Survey responses are summarized in Table 38. Eight of the 60 non-participants surveyed indicated that they are current participants in ten programs. Of the eight people, two were low income.

Table 38. Current Participation in Duke Energy Programs (n=8)

Program Name	Low Income	Standard	*Current Participants
Power Manager	0	2	2
Residential Smart $aver	0	0	0
Home Energy House Call	0	0	0
Home Energy Comparison Report	2	3	5
Personalized Energy Report	0	2	2
Online Services	0	1	1

**Some customers are enrolled in multiple programs*

Respondents were then asked to rate their interest in Duke Energy providing these programs. Interest ratings were provided on a scale from one to ten, where one is not at all interested and ten is very interested. Mean responses by income group are shown in the table below.

Table 39. Interest in Participating in Duke Energy Programs by Income Group, n=60

Program Name	Low Income	Standard	Population Weighted Mean
Power Manager	2.9	4.3	3.8
Residential Smart $aver	4.3	5.4	5.0
Home Energy House Call	6.1	6.0	6.0
Home Energy Comparison Report	5.4	6.7	6.2
Personalized Energy Report	5.7	6.6	6.3

Among the non-participants surveyed, there is not an overwhelming interest in any one particular program. The Home Energy House Call, Home Energy Comparison Report, and Personalized Energy Report programs each received a weighted average interest rating of 6.0 or higher. The other two programs garnered less interest. A graphical comparison of the low income and standard groups can be seen in Figure 15. Standard respondents expressed more interest, on average, than did the low income group in all programs except the Home Energy House Call, where their interest trailed only marginally.

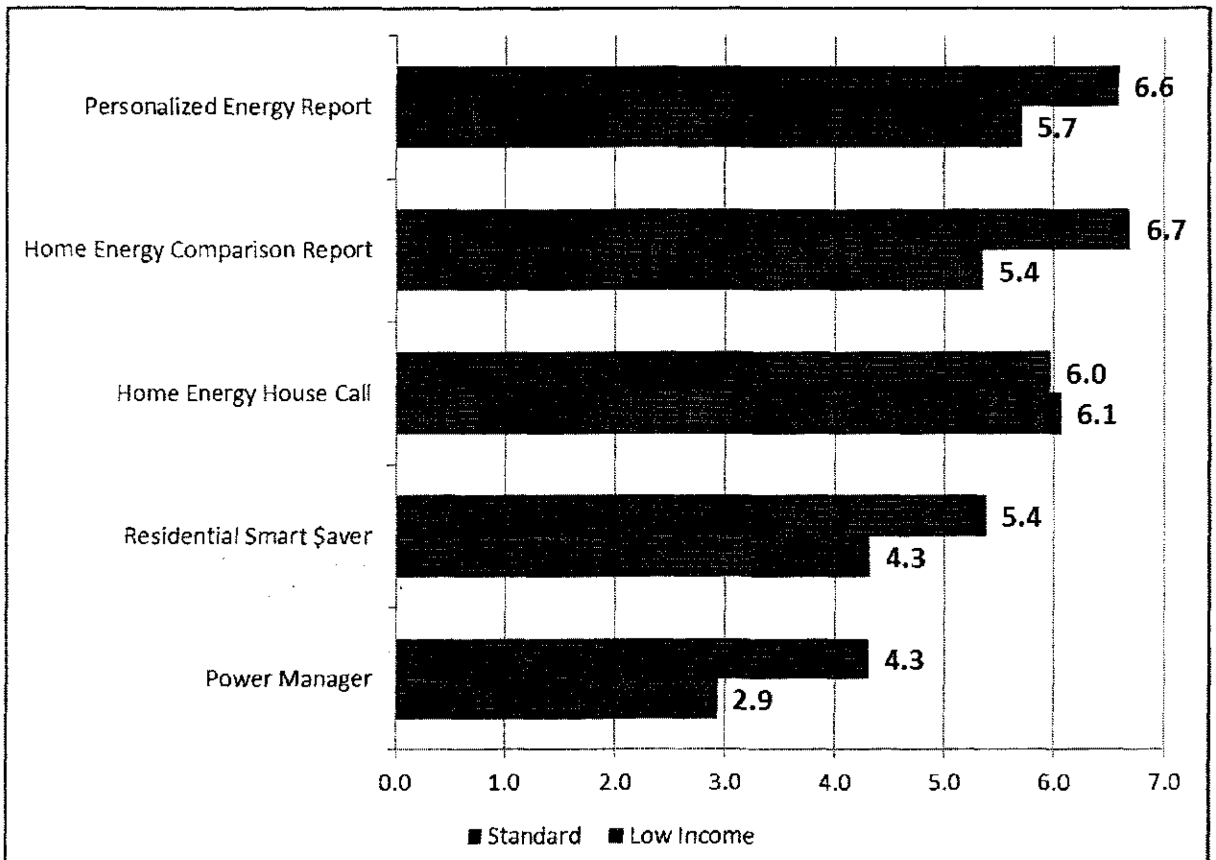


Figure 15. Program Interest by Income Group

TecMarket Works asked respondents why they believe that Duke Energy is providing free CFLs to their customers. Their responses are summarized in the table below, which shows that "other" was by far the most common response, with 28 (48%, weighted) respondents preferring to offer their own reason. The three most common of the provided multiple choice responses were: environmental issues, 16 (29%, weighted); saving customers money, 15 (23%, weighted); saving energy for economic reasons, 14 (22%, weighted). These responses were collected with a very similar, and much higher, frequency than the remaining two closed responses.

Table 40. Reasons Non-Participants Believe Duke Energy Distributes Free CFLs (n=60)

Why do you believe that Duke Energy is providing free CFLs to their customers?	Low Income N	Low Income %	Standard N	Standard %	Total N	Total Weighted %
Duke Energy wants to save their customers money	10	35%	5	16%	15	23%
Duke Energy wants to save energy for environmental	5	17%	11	36%	16	29%
Duke Energy wants to save energy for economic reasons	8	28%	6	19%	14	22%
Duke Energy wants to look good (Public Relations)	0	0%	4	13%	4	8%
The government is forcing Duke Energy to do it	1	35%	2	7%	3	18%
Other	12	41%	16	52%	28	48%

Note: Survey respondents were allowed multiple responses

The "other" responses were as follows:

- Duke Energy wants to make money (n=5)
- Because the bulbs use less power (n=3)
- To promote the switch from incandescents to CFLs (n=3)
- To raise environmental and energy awareness (n=3)
- To create goodwill towards Duke (n=2)
- To keep customer base (n=2)
- To get a kickback from the Democrats
- CFLs last longer than incandescents
- To help out the community

Net to Gross Analysis

Freeridership

TecMarket Works utilized a multiple question approach from the participant survey to estimate freeridership. The instrument was established to use a primary "gateway" question to assess freeridership and adjusted it based on the responses to questions about how many CFLs were in the homes prior to the program, and how many CFLs they would have purchased if the program had not provided them[17].

The gateway question asked survey respondents what their behavior would have been if the CFL direct shipment program had not been available. The four available responses were:

a.) bought the same number of CFLs at the same time
b.) bought fewer CFLs at the same time
c.) bought the same number of CFLs at a later time
d.) not bought any CFLs

The breakdown of responses to the gateway question can be seen in Table 42. Participants who indicated that they would have bought the same number of CFLs at the same time were assigned 100% freeridership. Participants answering that they would not have purchased any CFLs were assigned 0% freeridership.

Freeridership for participants who indicated that they would have bought fewer CFLs was determined by how many they said would have purchased in the absence of the program. All respondents were also asked to report the number of CFLs installed in their home prior to their participation in the direct mail CFL program. Each response to this question was converted to a freerider percentage. Quantities of pre-existing CFLs range from zero to 20.

The equivalent freerider CFLs (the number of CFLs that count toward freeridership) in the case of Table 41, where a customer has indicated they would have purchased CFLs at a later time, is the product of the freerider percentage and the number of CFLs received (from Table 41: A*B=C). The 200 standard participants who answered the questions received a total of 2,046 CFLs from the program. Participants' freeridership contribution is the quotient of the equivalent freerider CFLs and the total number of bulbs distributed to all participants who answered the net-to-gross question battery and the allocation based on their responses (from Table 42: C/2046=D).

Table 41. Freeridership for Surveyed Standard Participants Purchasing CFLs at a Later Time

Pre-existing CFLs	Freerider Percentage (A)	Number of respondents	Number of CFLs received (B)	Number of Freerider CFLs (C)
0	0	0	0	0
1	0	2	21	0

[17] Using participant surveys to assess freeridership is a current and accepted practice in the industry. Please see the Basic Approach method in the section titled "Participant Net Impact Protocol" in the California Energy Efficiency Evaluation Protocols, April 2006. TecMarket Works, et al.

2	0	10	132	0
3	0	3	21	0
4	0.25	1	12	3
5	0.25	3	39	9.75
6	0.25	2	12	3
7	0.5	0	0	0
8	0.5	1	6	3
9	0.5	0	0	0
10	0.75	2	9	6.75
11	0.75	0	0	0
12	0.75	0	0	0
13 or more	1	0	0	0
TOTAL		**24**	**252**	**25.5**

Table 42. Program Freeridership for Standard Participants

Gateway Question Response	Number of Respondents	Equivalent Freerider CFLs (C)	Freeridership Contribution (D)
Same # of CFLs at same time	23	176	8.60%
Same # of CFLS at later time	44	403	19.70%
Fewer CFLs at same time	53	25.5	1.25%
No CFLs	80	0	0.00%
TOTAL	**200**	**604.5**	**29.55%**

For those who said they would have purchased fewer bulbs at the same time, an allocation approach that assigns freeridership contribution as the percentage of the number of CFLs that a respondent said they would have purchased compared to the number of CFLs that they received via the program was used. The rest of the bulbs they received above the number that they had indicated they would have purchased are counted as non-freerider bulbs.

The freerider analysis approach for low income participants is not based on survey responses but instead is based on standard practice in the evaluation field to assume low income customers will not spend a significant amount of their limited resources on $3.00 light bulbs with or without the influence of the program. Based on this past practice, freeridership for low income participants is assumed to be zero. In Ohio, approximately 38% of residents fall into the low income category, set at 200% of the Federal Poverty Level. Total program freeridership is weighted accordingly and thus established at 18.32%.

0.38 * Low Income + 0.62 * Standard = 0.38 * 0% + 0.62 * 29.55% = 18.32%

Validity and Reliability of the Freerider Estimation Approach

The field of freeridership assessment as specified in the California Evaluation Protocols basic estimation approach requires the construction of questions that allow the evaluation contractor to estimate the level of freeridership. The basic approach used in this evaluation is based on the results of a set of freerider questions incorporated into participant survey instruments. The approach used in this assessment examines the various ways in which the program impacts the customer's acquisition and use of CFLs in their home, and allocates a freeridership factor for each of the types of responses contained in the survey questions. The allocation approach assigns high freeridership values to participants who would have acquired CFLs on their own and that factor is influenced by their past purchase behavior and their stated intent. Within the basic approach, the use of a structured freeridership assessment that partitions non-low-income responses into different categories and assigns a freerider value to each participant represents a best practice self-response approach. The scoring approach is proportional to the degree to which the standard income participant would have acquired and used CFLs on their own.

Spillover

TecMarket Works utilized three questions to calculate the amount of spillover.

Surveyed participants were asked how many CFLs, if any, they had purchased since receiving the free CFLs from the direct mail program. Participants who indicated they had purchased CFLs were asked how many of them they had installed. Participants were also asked to rate the influence of the program on their decision to purchase CFLs using a 1-to-10 scale, with one signifying no program influence and ten meaning that the program was very influential. Each customer's influence rating was converted to an influence factor for the purposes of calculating spillover. The conversion method, along with a breakdown of customer ratings, can be seen in Table 43.

Participants that were assigned 100% free ridership were automatically assigned zero percent spillover. The remaining participants' spillover was determined as the product of their influence factor and the number of CFLs purchased since their participation in the program. Standard income survey respondents with less than 100% freeridership purchased and installed a total of 142 CFLs after participating in the CFL direct mail program. The number of CFLs that count toward spillover is the product of the influence factor and the number of CFLs purchased and installed since participating (from Table 43: A*B=C). The 200 participants who answered the questions received a total of 2,046 CFLs from the program. Therefore, the spillover contribution is the quotient of the equivalent spillover CFLs and the total number of bulbs distributed to all participants who answered the net-to-gross question battery (from Table 43: C/2046=D). Three customers did not answer any questions in the net-to-gross question battery.

Spillover for low income participants is assumed to be zero. In Ohio, approximately 38% of residents fall into the low income category, set at 200% of the Federal Poverty Level. Total program spillover is weighted accordingly and thus established at 3.14%.

0.38 * Low Income + 0.62 * Standard = 0.38 * 0% + 0.62 * 5.06% = 3.14%

Table 43. Program Spillover

Influence Rating	Influence Factor (A)	Number of respondents	CFLs Purchased Since Participating (B)	Equivalent Spillover CFLs (C)	Spillover Contribution (D)
1	0.0	6	19	0	0.00%
2	0.1	1	2	0.2	0.01%
3	0.2	1	3	0.6	0.03%
4	0.3	0	0	0	0.00%

5	0.4	4	11	4.4	0.22%
6	0.6	2	8	4.8	0.23%
7	0.7	2	9	6.3	0.31%
8	0.8	3	6	4.8	0.23%
9	0.9	3	15	13.5	0.66%
10	1.0	17	69	69	3.37%
TOTAL		**39**	**142**	**103.6**	**5.06%**

The net to gross ratio is calculated as follows:

NTGR = (1-freeridership)*(1+spillover)
= (1 - 0.1832) * (1 + 0.0314)
= 0.8424

Total Discounting to be Applied = 1 - NTGR
= 1- 0.8424
= 0.1576
= 15.76%

Impact Analysis

Table 44 shows the savings per bulb distributed adjusted downward for the ISR of 77.9% and incorporating the self-reporting bias applied to the hours of use as well as the freeridership and spillover percentages computed from participants' survey responses. A mixture of 13-watt and 20-watt CFLs were distributed. Approximately 52% of the distributed bulbs were 13-watt and 48% were 20-watt.[18] Estimated energy savings were calculated using the weighted mean CFL wattage, 16.34. The mean wattage of a replaced bulb was 63 watts.

Table 44. Adjusted Impact: kWh and Coincident kW per Bulb Distributed

Metric	Low Income	Standard	*Weighted Overall Results
Population Weight	38%	62%	
Number of Bulbs	524	568	1,092
In Service Rate	77.0%	78.5%	77.9%
Gross kW per bulb	0.0043	0.0043	0.0043
Gross kWh per bulb	32.8	35.4	34.4
Freeridership rate	0%	29.55%	18.32%
Spillover rate	0%	5.06%	3.14%
Total Discounting to be applied to Gross values[19]	0%	25.99	15.76%
Net kW per bulb	0.0043	0.0035	0.0036
Net kWh per bulb	32.8	26.2	29.0
Measure Life[20]	5 years	5 years	5 years
Effective useful life net kWh per bulb	164	131	145

The in service rate, gross savings, freeridership, and spillover were calculated using a weighted average of the low income and standard populations with the weights in the Population Weight row. The total discount to be applied to gross values, as well as net savings, is not the result of a weighted average calculation. The total discount was determined from the weighted overall freeridership and spillover values: 1-[(1-18.32%)(1+3.14%)] = 15.76%. See total discounting equation beneath Table 43 on page 61 of this report for full calculation details. Net kW and kWh savings was then calculated using this newly obtained discount factor. Finally, the effective useful life net kWh per bulb is the product of the net kWh per bulb and the measure life.

Methodology

Primary data collected from survey participants was used to determine the number of CFL installations, mean wattage of bulb removed, and daily hours of use seen in Table 47. From the CFL installation data, the in service rate (ISR) was calculated using the algorithm in the In Service Rate (ISR) Calculation section on page 65. Next, the unadjusted self-reported daily hours of use were adjusted downward as described in the Self-Reporting Bias section on page 66. Finally, this data was combined as per Appendix G: Impact Algorithms to calculate gross savings per bulb.

[18] The participation database contains distribution information indicating the number of CFLs a participant received. If a customer received a 3-pack or 15-pack of CFLs, they received 2 or 8 13-watt CFLs, respectively. Participants receiving 6-, 8-, or 12-packs of CFLs received an equal number of 13-watt and 20-watt bulbs.

[19] NTGR= .8424. See total discounting equation beneath Table 46 on page 70 of this report for full calculation details

[20] Consistent with prior evaluations of CFL programs for Duke Energy, a measure life of five years was used for installed CFLs. No derate was performed for post-EISA years.

Survey Data

Participants were asked how many CFLs ordered through Duke Energy's CFL direct mail program were currently installed in light fixtures. Additional, more specific information was collected for a maximum of three bulbs, including the location of the CFL, the type and wattage of the bulb that it replaced, and the mean hours per day that it is in use. The compilation of this data is presented in Table 47 in its unadjusted form, that is before the self-reporting bias is applied to the hours of use. The adjusted values appear in Table 46.

Table 45. Unadjusted CFL Survey Data

Room Type	Number of Installations		Average Wattage of Bulb Removed		Average Daily Hours of Use (Old)		Average Daily Hours of Use (New)	
	LI	S	LI	S	LI	S	LI	S
Basement	14	28	61.64	65.74	1.68	4.00	1.75	3.98
Other bedroom	27	33	62.41	57.78	3.57	2.56	3.83	2.59
Dining room	31	36	63.56	59.65	4.47	3.29	5.18	3.29
Garage	7	12	50.19	67.08	1.36	1.25	1.36	1.25
Hall	24	28	53.03	59.33	4.73	4.29	5.13	4.29
Kitchen	88	85	66.23	64.97	4.81	5.65	5.17	5.68
Living/family room	162	169	68.26	65.06	4.58	5.77	4.83	5.83
Master bedroom	104	96	63.69	58.10	3.62	3.43	3.81	3.46
Bathroom	42	50	61.64	61.97	4.49	3.90	4.50	4.23
Closet	4	4	77.50	70.00	1.63	1.63	1.63	1.63
Other	21	27	58.61	69.40	3.99	5.28	4.00	5.44
AVERAGE/TOTAL	524	568	64.47	62.87	4.20	4.54	4.45	4.61

Figure 17 graphically shows the prevalence of CFL installations in each room type in ascending order. Living/family room, master bedroom, and kitchen, in that order, are the three most popular room types for bulb replacements; together they make up 64% of all bulb installations.

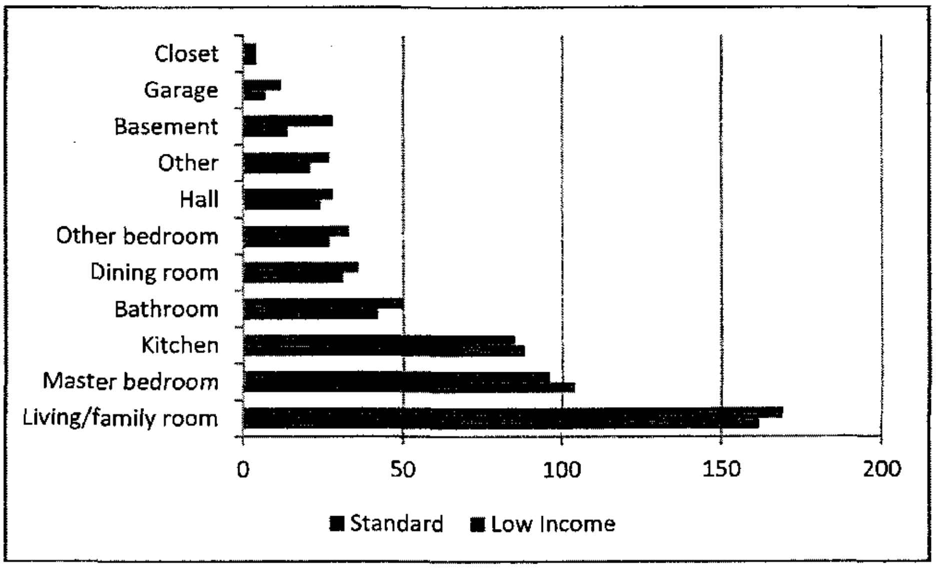


Figure 16. Number of CFL Installations by Room Type per Income Group

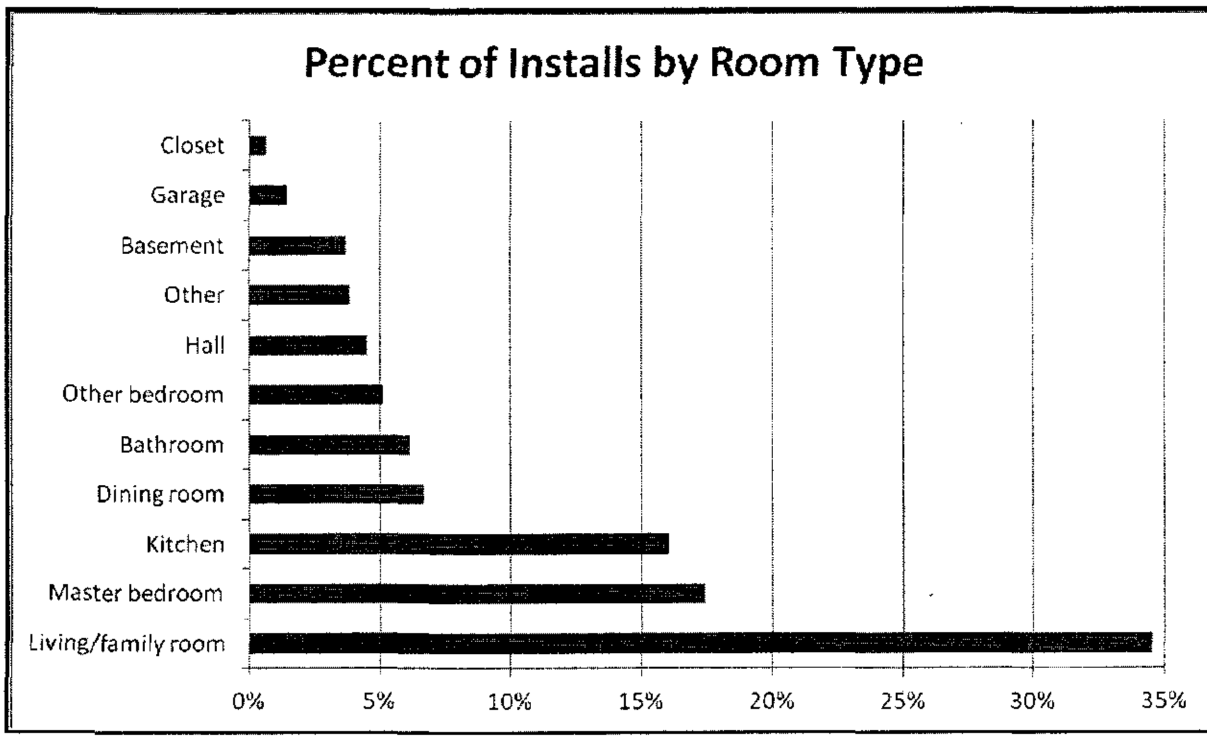


Figure 17. Percent of CFL Installations by Room Type

In Service Rate (ISR) Calculation

The data in the column headed "Number of Installations" of Table 45 represents the number of installations for which detailed information was collected, not the *total* number of installations. A total of 4,070 CFLs were distributed to survey participants, 2,024 to low income and 2,046 to standard customers. Low income respondents reported that 1,253 of them are currently installed in light fixtures, a first year ISR of 61.9%. Standard respondents reported that 1,320 of them are currently installed in light fixtures, a first year ISR of 64.5%. This yields a weighted average first year ISR of 63.5%. The ISR is calculated to be 77.9% using the following formula:

ISR = first year ISR + (43% * remainder) = **63.5% + (43% * 33.5%)** = **77.9%**

The remainder is the percentage of bulbs that are not installed in the first year (100% - 63.5% = 36.5%) less 3% for the 97% lifetime ISR[21]. In this case, the remainder is 33.5%. The 43% represents the percentage of the remainder that will replace an incandescent bulb rather than a CFL[22].

Self-Reporting Bias

Previous studies that have included both customer surveys and lighting loggers have shown that, comparing customers' self-reported hours of operation to the actual hours of operation, customers responding to the survey overestimated their lighting usage by about 40%[23]. As this study did not employ lighting loggers, there is no data with which to make a comparison for this program specifically. Consequently, the self-reported hours of use obtained from the survey were reduced by the 40% established in the Ohio Residential Smart $aver CFL Program report dated June 29th, 2010.

Impact Estimates

Customers were asked if they had increased or decreased their lighting usage since installing the CFLs they received through the program. This enabled the detection of a slight increase in hours of use going from an incandescent bulb to a CFL. Table 46 shows the unadjusted weighted mean hours of use values along with the updated weighted mean values after the self-reporting bias is applied. The final values for mean daily hours of use are 2.49 and 2.64 for low income compared to 2.69 and 2.73 for standard income, for incandescent bulbs and CFLs, respectively.

Table 46. Adjusted Mean Daily Hours of Use

Adjustment	Magnitude of Adjustment		Average Daily Hours of Use (Old)		Average Daily Hours of Use (New)	
	LI	S	LI	S	LI	S
Unadjusted	N/A	N/A	4.20	4.54	4.45	4.61
Self-Reporting Bias	40.82%	40.82%	2.49	2.69	2.64	2.73

Applying the adjustment to each individual room type allows a look at bulb savings by room type. Again, bulb savings at the room type level is an unreliable figure and should not be used in any calculations.

[21] As established in the Nexus Market Research, RLW Analytics, and GDS Associates study, dated January 20th, 2009: "New England Residential Lighting Markdown Impact Evaluation".

[22] As established in the Nexus Market Research, RLW Analytics, dated October 2004: "Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs", table 6-4 where 24 out of 56 respondents indicated that they did not purchase the CFLs as spares.

[23] TecMarket Works and Building Metrics. "Ohio Residential Smart Saver CFL Program". June 29th, 2010. Pg. 35.

Table 47. Adjusted CFL Survey Data with Gross Savings by Room Type for Installed Lamps for Low Income Participants

Low Income Room Type	Number of Installations	Average Wattage of Bulb Removed	Average Daily Hours of Use (Old)	Average Daily Hours of Use (New)	kWh per Bulb	kW per Bulb
Basement	14	61.64	0.99	1.04	16.1	0.0053
Other bedroom	27	62.41	2.12	2.27	34.5	0.0054
Dining room	31	63.56	2.64	3.06	42.8	0.0055
Garage	7	50.19	0.80	0.80	9.9	0.0040
Hall	24	53.03	2.80	3.03	35.9	0.0043
Kitchen	88	66.23	2.84	3.06	50.2	0.0058
Living/family room	162	68.26	2.71	2.86	50.2	0.0061
Master bedroom	104	63.69	2.14	2.25	36.1	0.0055
Bathroom	42	61.64	2.66	2.66	43.6	0.0053
Closet	4	77.50	0.96	0.96	21.3	0.0071
Other	21	58.61	2.36	2.37	36.2	0.0049

Table 48. Adjusted CFL Survey Data with Gross Savings by Room Type for Installed Lamps for Standard Participants

Standard Room Type	Number of Installations	Average Wattage of Bulb Removed	Average Daily Hours of Use (Old)	Average Daily Hours of Use (New)	kWh per Bulb	kW per Bulb
Basement	28	65.74	2.36	2.36	42.4	0.0058
Other bedroom	33	57.78	1.52	1.53	22.7	0.0048
Dining room	36	59.65	1.95	1.95	30.6	0.0051
Garage	12	67.08	0.74	0.74	13.6	0.0059
Hall	28	59.33	2.54	2.54	39.6	0.0050
Kitchen	85	64.97	3.35	3.36	58.9	0.0057
Living/family room	169	65.06	3.41	3.45	60.2	0.0057
Master bedroom	96	58.10	2.03	2.05	30.6	0.0049
Bathroom	50	61.97	2.31	2.50	37.1	0.0053
Closet	4	70.00	0.96	0.96	18.7	0.0063
Other	27	69.40	3.12	3.22	59.6	0.0062

Total Program Savings Extrapolation

Including both campaigns, there were a total of 243,393 participants from July 1st 2010 through April 26th 2011. These participants received 2,702,605 CFLs. This information is presented in Table 49. Multiplying the number of bulbs by the ISR yields the number of bulbs in service. The bulbs in service are then multiplied by the savings per bulb for the program to produce total annual program kW and kWh savings.

Table 49. Total Program Gross Savings Extrapolation

Campaign	Participation Count	Number of Bulbs	In Service	Gross kWh	Gross kW
664	62,595	375,570	292,569	12,919,608	1,615
701	180,798	2,327,035	1,812,760	80,050,004	10,006
TOTAL	**243,393**	**2,702,605**	**2,105,329**	**92,969,612**	**11,621**

Appendix A: Management Interview Instrument

Name: ____

Title: ____

Position description and general responsibilities:

____

____

____

We are conducting this interview to obtain your opinions about and experiences with Duke Energy's Ohio CFL program. We'll talk about the program and its objectives, your thoughts on improving the program, and the technologies the program covers. The purpose of this study is to capture the program's current operations as well as help identify areas where the program might be improved. Your responses will feed into a report that will be shared with Duke Energy and the state regulatory agency. We will not identify you by name, however, you may provide some information or opinions that could be attributed to you by virtue of your position and role in this program. If there is sensitive information that you wish to share, please warn me and we can discuss how best to include that information in the report.

The interview will take about an hour to complete. Do you have any questions for me before we begin?

Program Background and Objectives (15 min)

1. Please describe your role and scope of responsibility in detail.
2. How long have you been involved with this program? Has your role in this program changed during that time? (if so, how?)
3. Describe the evolution of the program. Why was the program created, and how has the program changed since it was it first started?
4. How/why was the current incentive approach chosen?
5. In your own words, please describe the program's objectives. (e.g. enrollment, energy savings, non-energy benefits)
6. Can you please walk me through the program's implementation, starting with how the program is marketed and how you target your customers, through how the customer participates and finishing with how savings are verified?

a. Marketing/Targeting: How & Who *(can you send a copy of the solicitations?)*

b. Enrollment/Participation

c. Rebate processing

d. Savings verification: How & Who

7. Of the program objectives you mentioned earlier, do you feel any of them will be particularly easy to meet, and why?

8. Which program objectives, if any, do you feel will be relatively difficult to meet, and why?

9. Are there any objectives you feel should be revised prior to the end of this program cycle? If yes, why?

Vendors (10 min)

10. Do you use any vendors or contractors to help implement the program?

    a. What responsibilities do they have?

    b. Are there any areas in which think they can improve their services?

11. *(If not captured earlier)* Please explain how activities of the program's vendors, customers and Duke Energy are coordinated.

    a. Do you think methods for coordination should be changed in any way? If so, how and why?

Rebates (15 min)

12. Describe your quality control and process for tracking participants, rebates, and other program data.

13. How effective is the current rebate program? *(and clarify standard for "effective")*

    a. How does it compare to other programs?

    b. What do you think should be changed, and why?

Contractor Training (5 min)

14. What contractors, if any, are involved with carrying out this program?

15. Do you have any suggestions for improving contractor effectiveness?

Improvements (10 min)

16. Are you currently considering any changes to the program's design or implementation?
    a. What are the changes?
    b. What is the process for deciding whether or not to make these changes?
17. Do you have suggestions for improvements to the program that would increase participation rates, or is Duke Energy happy with the current level of participation?
18. Do you have suggestions for increasing energy impacts *per participant*, given the same participation rates, or is Duke Energy happy with the current per participant impact?
19. Overall, what would you say about the program is working really well?
    a. Is there anything in this program you could highlight as a best practice that other utilities might like to adopt?
20. What area needs the most improvement, if any?
    a. (If not mentioned before) What would you suggest can be done to improve this?
21. Are there any other issues or topics we haven't discussed that you feel should be included in this report?
22. Do you have any supporting materials about the program that you could share with me? E.g., communication plan, program objectives, advertisement copy
23. Do you have any further questions for me about this study or anything else?
24. Whom else do you recommend that we interview?
25. Thank you!

Appendix B: Participant Survey Instrument

Use four attempts at different times of the day and different days before dropping from contact list. Call times are from 10:00 a.m. to 8:00 p.m. EST or 9-7 CST Monday through Saturday. No calls on Sunday.

SURVEY

Introduction

Note: Only read words in bold type.

Hello, my name is ___________. I am calling on behalf of Duke Energy to conduct a customer survey about the Duke Energy CFL Program. This was a program that provided free compact fluorescent light bulbs via direct mail. May I speak with _ please?

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

Call 1:	Date: _______	Time: _______	❑AM or ❑PM
Call back 2:	Date: _______	Time: _______	❑AM or ❑PM
Call back 3:	Date: _______	Time: _______	❑AM or ❑PM
Call back 4:	Date: _______	Time: _______	❑AM or ❑PM

❑ Contact dropped after fourth attempt.

We are conducting this survey to obtain your opinions about the Duke Energy CFL Program. Duke Energy's records indicate that you participated in the program by calling a toll-free number and receiving [#] CFLs. We are not selling anything. Your responses to our survey questions will be combined with other responses and used to help us make improvements to the program to better serve others. If you qualify for the survey it will take about 20-30 minutes, but when we are done with the survey I will confirm your address and we will send you $20 for your time.

Note: If this is not a good time, ask if there is a better time to schedule a callback.

1. **Do you recall participating in the CFL program?**

a. ❑ Yes, *begin* → *Skip to Q2.*
b. ❑ No, ↓
c. ❑ DK/NS ↓

This program was provided through Duke Energy. In this program, Duke Energy sent (#) CFLs directly to your household.

Do you remember participating in this program?

a. ❑ Yes, *begin* → *Go to Q2.*
b. ❑ No,
c. ❑ DK/NS

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

2. **How did you learn of the free CFL Program?**

   a. _ I visited Duke Energy's website
   b. _ From another Web Site (**which one?**)
   c. _ I got a brochure in the mail
   d. _ Advertisement in my bill
   e. _ Email from family/friend
   f. _ Email from a Duke Energy employee
   g. _ Paperless billing email
   h. _ From friend/family *(ask if through email, if so, select e above)*
   i. _ Social media (**which one?**__)
   j. _ CAP Agency (low income agency)
   k. _ Other Low income service: __
   l. _ Other:

3. **Why did you decide to take advantage of the offer?** (Select all that apply)
   a. I needed light bulbs
   b. To save energy
   c. Because it was free
   d. To save money
   e. To try CFLs
   f. It was environmentally correct
   g. Offer made it easy to get bulbs (convenient)
   h. The bulbs last longer than standard bulbs
   i. Other (please specify):

4. **Our records indicate that you ordered the free CFLs using (800 number/Web site/mail-in card), is this correct?**
   a. Yes
   b. No
   c. Don't Know

   4a. *If no to Q4*, **How did you order the CFLs**?

i. Automated 800 number
ii. Web Site
iii. Mail-in card
iv. Called customer service
v. Other (please specify)

5. **Which of the following statements best describes the level of success you had in completing your order for CFLs:**
   a. **You were successful at placing the order on your first attempt**
   b. **You had to make more than one attempt using the same method**
   c. **You had to make more than one attempt using different methods (which ones? ()**
   d. Don't remember
   e. Other:

6. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the <u>ease of ordering</u> your free CFLs.**

Very dissatisfied									very satisfied
1	2	3	4	5	6	7	8	9	10

If 7 or less, 6a. **Why were you less than satisfied with the ease of ordering?** __

If 7 or less, 6b. **Would you have preferred another method to order the free CFLs?**
   a. Yes (**which method?**)
   b. No
   c. Don't know

7. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the <u>delivery time</u> in ordering your free CFLs.**

Very dissatisfied									very satisfied
1	2	3	4	5	6	7	8	9	10

If 7 or less, 7a. **Why were you less than satisfied with the delivery time?** __

8. **Were you aware of the order-tracking feature that allowed you to check the progress of your CFL order?**

a. Yes
b. No

If yes to 8, **8a. Did you use the order-tracking feature?**

i. Yes
ii. No
iii. Don't Know

If yes to 8a, **8b. On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the <u>order-tracking</u> feature of the CFL program.**

very dissatisfied very satisfied
1 2 3 4 5 6 7 8 9 10

If 7 or less,. **Why were you less than satisfied with the order tracking feature?**

9. On a scale of 1 to 10 where 1 is not likely and 10 is very likely, how likely would you be to continue to buy and use CFLs in the future?

very unlikely very likely
1 2 3 4 5 6 7 8 9 10

10. How likely are you to use CFLs when there is a need to change a bulb in your home?

very unlikely very likely
1 2 3 4 5 6 7 8 9 10

11. On a scale of 1 to 10 where 1 is not likely and 10 is very likely, how likely would you be to tell friends and/or family about this offer?

very unlikely very likely
1 2 3 4 5 6 7 8 9 10

We would like to know if the direct mailing of CFLs to your home made you more likely or less likely to obtain and use CFLs compared to several other methods:

On a 1-to-10 scale with 1 being very unlikely and 10 being very likely, please rate your likelihood of participating in a CFL program that:

12. Offers free [or discounted] **CFLs by direct-mail sent to your home**

very unlikely very likely
1 2 3 4 5 6 7 8 9 10

13. Offers free [or discounted] **CFLs through a retailer or store coupon**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10

14. Offers free [or discounted] **CFLs through a manufacturers coupon that can be used at any store where that brand is sold**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10

15. Offers free [or discounted] **CFLs at a stand at a community event such as a fair**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10

16. Offers free [or discounted] **CFLs at a stand in a public parking lot**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10

17. Offers free [or discounted] **CFLs through an online vendor such as Amazon.com**

very unlikely very likely

1 2 3 4 5 6 7 8 9 10

On a 1-to-10 scale with 1 being *not at all important* and 10 being *very important*, please rate the importance of each of the following characteristics on choosing a light bulb for your home

18. Mercury content of the bulb

1 2 3 4 5 6 7 8 9 10 DK

19. Ability to dim the lighting level

1 2 3 4 5 6 7 8 9 10 DK

20. Speed of which the bulb comes up to full lighting level

1 2 3 4 5 6 7 8 9 10 DK

21. Purchase price of the bulb

1 2 3 4 5 6 7 8 9 10 DK

22. Availability of the bulb in stores you normally shop

1 2 3 4 5 6 7 8 9 10 DK

23. Selection of wattage and light output levels available

1 2 3 4 5 6 7 8 9 10 DK

24. Cost savings on your utility bill
1 2 3 4 5 6 7 8 9 10 DK

25. Energy savings
1 2 3 4 5 6 7 8 9 10 DK

26. Attractiveness or appearance of the bulb
1 2 3 4 5 6 7 8 9 10 DK

27. Recommendations from family and friends
1 2 3 4 5 6 7 8 9 10 DK

28. Recommendations from the utility company
1 2 3 4 5 6 7 8 9 10 DK

29. Availability of utility programs or services that offer the bulbs to you directly
1 2 3 4 5 6 7 8 9 10 DK

30. Ease of bulb disposal
1 2 3 4 5 6 7 8 9 10 DK

31. I'd like to talk about the CFLs you received from this program. Our records indicate that you received (#) CFLs, is this correct?
a. Yes
b. No
c. Don't Know

31a. *If no to Q31*, **how many CFLs did you receive?**
Enter response:

32. Did you order all of the bulbs that you were eligible to receive?
a. Yes
b. No
c. Don't know

If No, 32a. **Why not?** __

33. How many of the CFLs are now installed in light fixtures?
Enter response:

"Now I'm going to ask you about each bulb you put into a light fixture..."
(Repeat 34 a to e for up to 3 installed bulbs)

34. **For the** <first, second, third> **CFL, in which room was the bulb installed?**
a. Living/family room
b. Dining room
c. Kitchen
d. Master bedroom
e. Bedroom 2
f. Bedroom 3 or other bedroom
g. Hall
h. Closet
i. Basement
j. Garage
k. Other (specify_)

34a. **Was the bulb you removed a standard bulb or a CFL?**
a. Standard Incandescent
b. CFL
c. There was no bulb in the socket

34b. **How many watts was the old bulb that you took out?**
a. Less than 44
b. 45-70
c. 71-99
d. 100 or more

34c. **What did you do with the incandescent you removed?**
a) Recycled It
b) Threw it away
c) Stored it
d) Other....

34d. **On average, approximately how many hours per day is this light used?**
a. Less than 1
b. 1 to 2
c. 3 to 4
d. 5 to 10
e. 11 to 12
f. 13 to 24

34e. **Did the hours of use for this fixture increase, decrease or stay the same since you replaced the old bulb with the CFL?**
a. Increased (**how many hours?**_)
b. Decreased (**how many hours?**__)
c. Stayed the same

If less than 6 were installed:

35. What have you done with the remaining CFLs that were not installed?

a. Put them in storage/closet/shelf
b. Gave them away **(35a. To whom?)**-- *ask question 35b then skip to Q39*
c. Threw them out - *skip to Q39*
d. Recycled them - *skip to Q39*
e. Other

35b. **How many did you give away?** __ ❑ DK

If answered a. " Put them in storage" to question (35), ask (36-39)

36. **Do you plan on using the remaining CFLs in the next year?**

a. Yes
b. No 36a. **Why Not?** __
c. Maybe/DK

37. Thinking of the CFL bulbs you have stored for later use, what are the reasons that you have not installed these bulbs?

(Select all that apply)

a. I am waiting for my other standard bulbs to burn out
d. I am waiting for my other CFL bulbs to burn out
e. I already have CFLs installed everywhere they will fit
f. The other lamps or light fixtures in my home are on a dimmer and don't work with the CFLs
g. The CFL bulbs are too dim for the other locations where I could install them
h. I don't like the way the CFL bulbs look in some of my fixtures
i. Other (please specify):

38. How many standard incandescent bulbs do you have in storage to replace bulbs that burn out?

a. 0
b. 1
c. 2
d. 3
e. 4
f. 6
g. 7 – 11
h. 12+
i. DK/NS

39. How long do you think it will be before you will have used all of the free bulbs you received from the Duke Energy program?

a. 1 year or less

b. 12 to 24 months (2 years)
c. 25 to 36 months (3 years)
d. 37 to 48 months (4 years)
e. 49 to 60 months (5 years)
f. More than 5 years
g. dk/ns

40. **Have you removed any of the CFLs you installed that you received through the direct mail CFL program?**
   a. Yes (**How many?**__)
   b. No (*skip to Q42*)

41. *If yes to Q40*, **Why did you remove them?**
   a. Not bright enough
   b. Did not like the color of the light
   c. The light was too bright
   d. Too slow to start
   e. Burned out
   f. Not working properly
   g. Did not like appearance/shape of the bulbs
   h. Other (**Please specify**_)

42. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the light quality of your free CFLs.**

very dissatisfied									very satisfied
1	2	3	4	5	6	7	8	9	10

If 7 or less, 42a. **Why were you less than satisfied with the light quality?** __

43. **On a 1-to-10 scale with 1 being very dissatisfied and 10 being very satisfied, please rate your satisfaction with the overall bulb quality of your free CFLs.**

very dissatisfied									very satisfied
1	2	3	4	5	6	7	8	9	10

If 7 or less, 43a. **Why were you less than satisfied with the quality of the CFLs?** __

On a scale from 1-10, with 1 indicating that you were very dissatisfied, and 10 indicating that you were very satisfied, please rate your satisfaction with...

44. **the direct mail CFL program**

1 2 3 4 5 6 7 8 9 10

❑ Don't Know

If 7 or less (NC and SC only), **How could this be improved?** _

45. **...Duke Energy overall.**

1 2 3 4 5 6 7 8 9 10

❑ Don't Know

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

46. If you were rating your overall satisfaction with the CFL Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?

    a. Very Satisfied
    b. Somewhat Satisfied
    c. Neither Satisfied nor Dissatisfied
    d. Somewhat Dissatisfied
    e. Very Dissatisfied
    f. Refused
    g. Don't Know

47. Why do you give it that rating?

Response:

48. What did you like most about the direct mail CFL program?

Response:

49. What did you like least about the direct mail CFL program?

Response:

50. Before you received the free CFLs from Duke Energy, had you already installed CFLs in your home?

a) Yes (*ask question 50a*)
b) No
c) Don't Know

If yes to Q50
50a. **How many CFLs were you using in your home when you received the shipment from Duke Energy?**
___ Bulbs
___ Don't know / Not sure

51. **How many years have you been using CFLs**?
a) Never purchased until now
b) 1 year or less
c) 1 to 2 years
d) 2 to 3 years
e) 3 to 4 years
f) 4 or more years

52. If the CFL direct shipment program had not been available, would you have:
a. **Purchased the same amount of CFLs at the same time**
b. **Purchased fewer CFLs at the same time**
  i. *If b*, **How many? __**
c. **Purchased CFLs at a later time, or**
  i. *If c*, **When? __**
  ii. *If c*, **How many?__**
d. **Not purchased CFLs**

53. On a scale from 1-10, with 1 indicating that the factor was not at all influential, and 10 indicating that the factor was very influential, please rate the level of influence of the following factors on your decision to obtain CFLs through the Duke Energy program.

53a. **Duke Energy advertising on TV, Radio, or newspaper**

Not at all influential								very influential	
1	2	3	4	5	6	7	8	9	10

53b. **Advertising on Duke Energy's Web site**

Not at all influential								very influential	
1	2	3	4	5	6	7	8	9	10

53c. **Duke Energy advertising social media sites such as Facebook**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53d. **The brand of CFLs offered by the program**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53e. **Other non-Duke Energy advertising**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53f. **Friends or family by word of mouth**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53g. **Friends or family by email**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53h. **Friends or family by social media such as Facebook**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53i. **Someone you don't know personally or a group that you follow on Facebook or Twitter**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53j. **Your desire to save energy**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53k. **Your desire to save on utility costs**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

53l. **Your desire to be environmentally responsible.**

Not at all influential very influential

1 2 3 4 5 6 7 8 9 10

55. Did you tell anyone about the program?

a. Yes (*ask 55a and 55b*)
b. No
c. Don't know

55a. **Who did you tell?** *(add number to all that apply)*
  i. _Friends **(How many?)**
  ii. _Family **(How many?)**
  iii. _Co-workers **(How many?)**
  iv. _Neighbors **(How many?)**
  v. _Other **(How many?)**

55b. **How did you tell them?**
  i. Word of mouth
  ii. Email
  iii. Facebook
  iv. Twitter
  v. Web site forum
  vi. Other __

56. Did your experience with the CFLs provided by the Duke Energy Free CFL program make it more or less likely that you would purchase and install CFLs in the future?
  a. **More likely** *(ask 56a)*
  b. **Less likely** *(ask 56b)*
  c. **Neither more or less likely**

56a. **Why are you more likely to use CFLs in the future?**

56b. **Why are you less likely to use CFLs in the future?** __

57. Have you purchased any additional CFLs since receiving the free CFLs from Duke Energy?
  a. Yes – *ask 57a, 57b and 57c.*
  b. No – ask 57d.
  c. Don't Know

If yes to Q57, 57a. **How many did you purchase?** _

*If yes to Q57, 57*b. **How many of those are you currently using?**_

If yes to Q57, 57c.. **Using a 1 to 10 scale, with 1 meaning that the Duke program had no influence, and a 10 to mean that the Duke program was very influential, please rate the influence of the Duke Energy free CFL program on your decision to purchase additional CFLs.**

Not at all influential								very influential	
1	2	3	4	5	6	7	8	9	10

If no to Q57, ask 57d. **57d. On a 1-to-10 scale with 1 being very unlikely and 10 being very likely, please rate your likelihood of buying and using CFLs in the future:**

very unlikely									very likely
1	2	3	4	5	6	7	8	9	10

58. Considering future CFL purchases, how many CFL bulbs would you purchase in the next year if they were...

a. **The same price as standard bulbs ()**
b. **$1 more than standard bulbs ()**
c. **$2 more than standard bulbs ()**
d. **$3 more than standard bulbs ()**
e. **Free, but you had to mail in a rebate form to get your money back ()**
f. **Free, but you had to fill out a form online (__)**

59. What is your best estimate of the number of bulbs installed in your home that are not CFLs?

_

60. How many of these non-CFL bulbs are in sockets that are typically used for more than 2 hours a day?

61. Please list the number of bulbs currently installed in your home that are specialty bulbs such as dimmable bulbs, three-way bulbs, recessed, flood or directional lights, candelabra lights or other non-standard bulbs... *How many <a> do you have in your home?... how many <b>, etc.*

a. **_Dimmable bulbs**
b. **_Outdoor flood bulbs**
c. **_Three-way bulbs**
d. **_Spotlight bulbs**
e. **_Recessed bulbs**
f. **_Candelabra bulbs**
g. **_Other (specify)_**

62. For each of these specialty bulbs installed, how many are CFLs?

a. **_Dimmable CFLs**
b. **_Outdoor flood CFLs**
c. **_Three-way CFLs**
d. **_Spotlight CFLs**
e. **_Recessed CFLs**

f. **_Candelabra CFLs**
g. **_Other (specify)_**

63. On a scale from 1-10, with 1 indicating not at all interested and 10 indicating very interested, please rate your interest in Duke Energy providing a direct mail specialty CFL program that shipped discounted specialty bulbs directly to your home:

Not at all interested very interested
1 2 3 4 5 6 7 8 9 10

Please tell me if you would be interested in receiving the following types of CFLs if they were to be offered in the future...

64. Dimmable CFLs
a. Yes **(about how many hours per day would these bulbs be used?)**
b. No
c. Don't Know

65. Outdoor flood CFLs
a. Yes **(about how many hours per day would these bulbs be used?)**
b. No
c. Don't Know

66. Three-way CFLs
a. Yes **(about how many hours per day would these bulbs be used?)**
b. No
c. Don't Know

67. Spotlight CFLs
a. Yes **(about how many hours per day would these bulbs be used?)**
b. No
c. Don't Know

68. Candelabra CFLs
a. Yes **(about how many hours per day would these bulbs be used?)**
b. No
c. Don't Know

69. *(If responder indicated a different specialty bulb)* **Other _**
a. Yes **(about how many hours per day would these bulbs be used?)**
b. No
c. Don't Know

70. **Since you received the free CFLs from Duke Energy,**
    70a. **Have you purchased and installed any energy efficiency equipment (such as high efficiency appliances, windows or heating and cooling equipment?**
        i. Yes
        ii. No
        iii. Don't Know

    70b. **Have you made energy efficiency improvements in your home, such as...?**
        i. __Wall or ceiling insulation
        ii. __Caulking
        iii. __Faucet aerators
        iv. __Outlet or switch gaskets
        v. __Lowflow showerhead
        vi. __Programmable thermostat
        vii. __Weatherstripping
        viii. __None of these

    70c. **Have you changed any of your habits related to energy use?**
        i. Yes (*ask:* **Please specify:)**
        ii. No
        iii. Don't Know

71. **Please rate the influence of your experience with the Duke Energy CFL program regarding your decision to purchase additional equipment on your own on a scale from 1-10, with 1 indicating that the CFL program was not at all influential, and 10 indicating that the CFL program was very influential:**

Not at all influential								very influential	
1	2	3	4	5	6	7	8	9	10

72. **How often do you use the Duke Energy Web Site?**
    a. Often (once a month or more)
    b. Sometimes (less than once a month)
    c. Never

73. **Have you added any major electrical appliances to your home in the past year?**
    a. Yes
    b. No

74. **Are you aware of the ENERGY STAR label?**
    a. Yes
    b. No

75. **Do you typically look for the ENERGY STAR label when purchasing an appliance?**
    a. Yes
    b. No

76. **Do you typically buy appliances with the ENERGY STAR label?**
    a. Yes, all of the time
    b. Yes, some of the time
    c. No, never

77. **Why do you believe that Duke Energy is providing free CFLs to their customers**
    a. Duke Energy wants to save their customers money
    b. Duke Energy wants to save energy for environmental reasons
    c. Duke Energy wants to save energy for economic reasons
    d. Duke Energy wants to look good (PR)
    e. The government is forcing Duke Energy to do it
    f. Other (specify)

78. **Are you currently a participant in any of the following Duke Energy programs** (check all that apply):
    a. **Power Manager**
    b. **Residential Smart Saver**
    c. **Home Energy House Call**
    d. **Home Energy Comparison Report**
    e. **Personalized Energy Report**
    f. **Online Services**

For all programs not checked in Q78, ask the following question

On a scale from 1-10, with 1 indicating not at all interested and 10 indicating very interested, please rate your interest in Duke Energy providing the following programs:

78a. (Power Manager) **A program that provides bill credits in exchange for allowing Duke Energy to temporarily cycle your air conditioning unit during periods of high use**

Not at all interested								very interested	
1	2	3	4	5	6	7	8	9	10

78b. (Residential Smart Saver) **A program that provides rebates for energy efficient improvements to your house such as energy efficient heating and cooling units.**

Not at all interested								very interested	
1	2	3	4	5	6	7	8	9	10

78c. (Home Energy House Call) **A program in which an assessor comes to your house, suggests energy efficiency improvements, and Duke Energy provides certain low-cost improvement materials for free.**

Not at all interested								very interested	
1	2	3	4	5	6	7	8	9	10

78d. (Home Energy Comparison Report/) **A program that provides an ongoing comparison of your energy use with that of people who live in similar homes**

Not at all interested								very interested	
1	2	3	4	5	6	7	8	9	10

78e. (Personalized Energy Report) **A program that provides personalized energy analysis and ways to save energy and money by filling out a few questions about your home either online or by mail.**

Not at all interested								very interested	
1	2	3	4	5	6	7	8	9	10

79. What other services could Duke Energy provide to help improve home energy efficiency?
Response:

Finally, we have some general demographic questions...

80. In what type of building do you live?
a. Single-family home, detached construction
b. Single family home, factory manufactured/modular
c. Single family, mobile home
d. Row House
e. Two or Three family attached residence-traditional structure
f. Apartment (4 + families)---traditional structure
g. Condominium---traditional structure
h. OTHER
i. REFUSED
j. DON'T KNOW

81. What year was your residence built?
a. 1959 and before
b. 1960-1979
c. 1980-1989
d. 1990-1997
e. 1998-2000
f. 2001-2007

g. 2008-present
h. Don't Know

82. How many rooms are in your home (excluding bathrooms, but including finished basements)?

a. None
b. 1-3
c. 4
d. 5
e. 6
f. 7
g. 8
h. 9
i. 10 or more
j. DK/NS

83. Which of the following best describes your home's heating system?

a. None
b. Central forced air furnace
c. Electric Baseboard
d. Heat Pump
e. Geothermal Heat Pump
f. Other

84. How old is your heating system?

a. 0-4 years
b. 5-9 years
c. 10-14 years
d. 15-19 years
e. 19 years or older
f. Don't know
g. Do not have

85. **What is the primary fuel used in your heating system?**

a. Electricity
b. Natural Gas
c. Oil
d. Propane
e. Other

86. **What is the secondary fuel used in your primary heating system, if applicable?**

a. Electricity
b. Natural Gas
c. Oil

d. Propane
e. Other
f. None

87. Do you use one or more of the following to cool your home? *(Mark all that apply)*

a. None, do not cool the home
b. Heat pump for cooling
c. Central air conditioning
d. Through the wall or window air conditioning unit
e. Geothermal Heat pump
f. Other (specify?)

88. How many window-unit or "through the wall" air conditioner(s) do you use?

a. None
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7
i. 8 or more

89. **What is the fuel used in your cooling system?**

a. Electricity
b. Natural Gas
c. Oil
d. Propane
e. Other
f. None

90. How old is your cooling system?

a. 0-4 years
b. 5-9 years
c. 10-14 years
d. 15-19 years
e. 19 years or older
f. Don't know
g. Do not have

91. **What is the fuel used by your water heater?** *(Mark all that apply)*

a. Electricity

b. Natural Gas
c. Oil
d. Propane
e. Other
f. No water heater

92. **How old is your water heater?**
   a. 0-4 years
   b. 5-9 years
   c. 10-14 years
   d. 15-19 years
   e. More than19 years

93. **What type of fuel do you use for indoor cooking on the stovetop or range?** *(Mark all that apply)*
   a. Electricity
   b. Natural Gas
   c. Oil
   d. Propane
   e. Other
   f. No stovetop or range

94. **What type of fuel do you use for indoor cooking in the oven?** *(Mark all that apply)*
   a. Electricity
   b. Natural Gas
   c. Oil
   d. Propane
   e. Other
   f. No oven

95. **What type of fuel do you use for clothes drying?** *(Mark all that apply)*
   a. Electricity
   b. Natural Gas
   c. Oil
   d. Propane
   e. Other
   f. No clothes dryer

96. **About how many square feet of living space are in your home?** *(Do not include garages or other unheated areas)*

Note: A 10-foot by 12 foot room is 120 square feet
   a. Less than 500
   b. 500 – 999
   c. 1000 – 1499
   d. 1500 – 1999

e. 2000 – 2499
f. 2500 – 2999
g. 3000 – 3499
h. 3500 – 3999
i. 4000 or more
j. Don't know

97. Do you own or rent your home?

a. Own
b. Rent

98. **How many levels are in your home (not including your basement)?**

a. One
b. Two
c. Three

99. **Does your home have a heated or unheated basement?**

a. Heated
b. Unheated
c. No basement

100. **Does your home have an attic?**

a. Yes
b. No

101. **Are your central air/heat ducts located in the attic?**

a. Yes
b. No
c. Not applicable

102. **Does your house have cold drafts in the winter?**

a. Yes
d. No

103. **Does your house have sweaty windows in the winter?**

a. Yes
b. No

104. **Do you notice uneven temperatures between the rooms in your home?**

a. Yes
b. No

105. Does your heating system keep your home comfortable in winter?

a. Yes

b. No

106. Does your cooling system keep your home comfortable in summer?

a. Yes
b. No

107. Do you have a programmable thermostat?

a. Yes
b. No

108. What temperature is your thermostat set to on a typical summer weekday afternoon?

a. Less than 69 degrees
b. 69-72 degrees
c. 73-78 degrees
d. Higher than 78 degrees
e. Off
f. DK

109. What temperature is your thermostat set to on a typical winter weekday afternoon?

a. Less than 67 degrees
b. 67-70 degrees
c. 71-73 degrees
d. 74-77 degrees
e. Higher than 78 degrees
f. Off
g. DK

110. Do You Have a Swimming Pool or Spa?

a. Yes
c. No

111. Would a two-degree increase in the summer afternoon temperature in your home affect your comfort….

a. **Not at all**
b. **Slightly**
c. **Moderately, or**
d. **Greatly**

112. How many people live in this home?

a. 1
b. 2
c. 3
d. 4
e. 5
f. 6

g. 7
h. 8 or more

113. How many persons are usually home on a weekday afternoon?

a. 0
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7
i. 8 or more

114. Are you planning on making any large purchases to improve energy efficiency in the <u>next 3 years</u>?

a. Yes
b. No
c. Not sure

The following questions are for classification purposes only and will not be used for any other purpose than to help Duke Energy continue to improve service.

115. What is your age group?

a. 18-34
b. 35-49
c. 50-59
d. 60-64
e. 65-74
f. Over 74

116. Please indicate your annual household income.

a. Under $15,000
b. $15,000-$29,999
c. $30,000-$49,999
d. $50,000-$74,999
e. $75,000-$100,000
f. Over $100,000
g. Prefer Not to Answer

That completes our survey. As I mentioned at the start of the survey, we'd like to send you $20 for your time. Should we send it to <name> **at** <address>**?** *(note corrections in excel call tracking sheet)*

Thank you for your time and feedback today! (*Politely end call*)

Appendix C: Non-Participant Survey

If CFL non-participant, then contact for survey. Use four attempts at different times of the day and different days before dropping from contact list. Call times are from 10:00 a.m. to 8:00 p.m. EST or 9-7 CST Monday through Saturday. No calls on Sunday.

SURVEY

Introduction

Note: Only read words in bold type.

Hello, my name is ______. I am calling on behalf of Duke Energy to conduct a customer survey about compact fluorescent light bulbs. May I speak with ____________ please?

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

Call 1:	Date: __________	Time: ____________	❑AM or ❑PM
Call back 2:	Date: __________	Time: ____________	❑AM or ❑PM
Call back 3:	Date: __________	Time: ____________	❑AM or ❑PM
Call back 4:	Date: __________	Time: ____________	❑AM or ❑PM

❑ Contact dropped after fourth attempt.

We are conducting this survey to obtain your opinions about the Duke Energy and CFLs. We are not selling anything. Your responses to our survey questions will be combined with other responses and used to help us make improvements to Duke Energy's customer services. If you qualify for the survey it will take about 20 minutes, but when we are done with the survey I will confirm your address and we will send you $10 for your time.

May we begin the survey?

1. **Do you recall seeing or hearing about the free CFL program from Duke Energy?**

   1. ❑ Yes, *begin* → *Skip to Q3.*
   2. ❑ No,
   99. ❑ DK/NS

   (No / DK/NS →) **This program was provided through Duke Energy. In this program, through a web site or an 800-telephone number, Duke Energy offered you up to 15 CFLs by mail.**

Do you recall seeing or hearing information on this program?

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

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

2. **Did you receive CFLs through this program?**
   a. Yes
   b. No
   c. DK/NS

If yes to Q2, mark participant as ineligible for a non-participant survey and proceed with a participant survey.

3. **How did you learn of the free CFL Program?**

   m. ____ I visited Duke Energy's website
   n. ____ From another Web Site (**which one?**______)
   o. ____ I got a brochure in the mail
   p. ____ Advertisement in my bill
   q. ____ Email from family/friend
   r. ____ Email from a Duke Energy employee
   s. ____ Paperless billing email
   t. ____ From friend/family (ask if through email, if so, select e above)
   u. ____ Social media (**which one?**________)
   v. ____ CAP Agency (low income agency)
   w. ____ Other Low income service: ________________________
   x. ____ Other: ________________________

3a. On a scale of 1 to 10 where 1 is not likely and 10 is very likely, how likely are you to use CFLs when there is a need to change a bulb in your home?

very unlikely									very likely
1	2	3	4	5	6	7	8	9	10

4. **Do you currently have any CFLs installed in your home?**
   a. Yes
   b. No
   c. Don't Know

If yes 4a.

4a. Please list the location, quantity and wattage of all installed CFLs? *PROBE TO GET EXACT TYPE AND QUANTITY AND LOCATION*

Wattage 1: ________________	Quantity 1: _____	Location 1:___________
Wattage 2: ________________	Quantity 2: _____	Location 2:___________
Wattage 3: ________________	Quantity 3: _____	Location 3:___________
Wattage 4: ________________	Quantity 4: _____	Location 4:___________
	Enter response: ________________	

5. **Did you make any attempts to enroll in the free CFL program from Duke Energy?**
   a. Yes **(how many attempts?____)**
   b. No (skip to question 8)
   c. Don't Know (skip to question 8)

6. **How did you attempt to enroll?**
   a. ___Went to Duke Energy Web Site
   b. ___Called Toll free number
   c. ___Called Duke Customer service number
   d. ___Sent Mail-in card

7. **Why were you unsuccessful in enrolling?**
   a. Ineligible (already had full amount of bulbs) – *skip to Q9*
   b. Ineligible (**Why?**______________)– *skip to Q9*
   c. Web site error or difficulty – *skip to Q9*
   d. Automated phone error or difficulty – *skip to Q9*
   e. Mailed in form – never heard back – *skip to Q9*

8. **Why did you decide not to enroll in the Duke Energy free CFL program**?
   a. Too much hassle
   b. Do not use CFLs (*go to question 8a*)
   c. Do not want to give out personal information
   d. Do not have internet connection
   e. Prefer the former coupon program
   f. Like seeing the product firsthand
   g. Want to buy American
   h. Received CFLs in the past and thought I would be ineligible
   i. Already have CFLs in all sockets that use them
   j. Did not understand program
   k. Don't like CFLs (*go to question 8a*)
   l. Other (Specify________)

8a. Could you please tell me why you don't like/use CFLs (*check all that apply*)?

i. ___I don't like the color of the light
ii. ___They are too expensive
iii. ___Not bright enough
iv. ___They are too bright
v. ___Take too long to "warm up"
vi. ___I don't like appearance/shape of CFLs
vii. ___Mercury/disposal concerns
viii. ___I require specialty bulbs for my lighting
ix. ___Landlord has incandescent bulbs installed
x. ___Other: ________________________

9. **Did you tell anyone about the program?**
   d. Yes (*ask 23a and 23b*)
   e. No
   f. Don't know

9a. **Who did you tell?** *(add number to all that apply)*

vi. ____Friends **(How many?)**
vii. ____Family **(How many?)**
viii. ____Co-workers **(How many?)**
ix. ____Neighbors **(How many?)**
x. ____Other **(How many?)**

9b. **How did you tell them?**

i. Word of mouth
ii. Email
iii. Facebook
iv. Twitter
v. Web site forum

9c. Did they sign up and receive free CFLs?

i. Yes
ii. No
iii. Don't know

10. **Would you say that learning of the Duke Energy CFL direct mail program increased your awareness of how you could save energy by using compact fluorescent light bulbs?**

   a. Yes
   b. No
   c. DK

11. **Did the free CFL offer inspire you to purchase CFLs?**
    a. Yes (**How many?**________) – *skip to question 12*
    b. No – *ask question 10a*

12. **We now want to ask you about how influential the Duke Energy CFL direct mail program was to your decision to purchase and install additional CFLs.**

    Using a 1 to 10 scale, with 1 means that your experience with the Duke Energy CFL direct mail program was Not at all Influential on your decision to buy additional CFLs and a 10 means that the Duke Energy CFL direct mail program was Very Influential in your decision, please rate the influence of the Duke Energy CFL direct mail program on your decision to purchase additional CFLs.

    very dissatisfied very satisfied
    1 2 3 4 5 6 7 8 9 10

13. **On a scale from 1-10, with 1 indicating that you were very dissatisfied, and 10 indicating that you were very satisfied, please rate your satisfaction with CFL(s) that you have purchased.**

    very dissatisfied very satisfied
    1 2 3 4 5 6 7 8 9 10

    If 7 or less, 12a. **Why were you dissatisfied with the CFLs?**

    ____
    ____

14. **At which store or Web site did you purchase the CFLs?** ___________

On a scale from 1-10, with 1 indicating that the factor was not at all influential, and 10 indicating that the factor was very influential, please rate the level of influence of the following factors on your decision to buy CFLs:

15a. **Duke Energy advertising for CFLs on TV, Radio, or newspaper**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15b. **CFL advertising on Duke Energy's Web site**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15c. **Duke Energy CFL advertising on social media sites such as Facebook**

Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15d. **The brand of CFLs purchased or obtained**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15e. **Other non-Duke Energy advertising for CFLs**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15f. **Friends or family by word of mouth**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15g. **Friends or family by email**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15h. **Friends or family by social media such as Facebook**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15i. **Someone you don't know personally or a group that you follow on Facebook or Twitter**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15j. **Your desire to save energy**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15k. **Your desire to save on utility costs**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

15l. **Your desire to be environmentally responsible.**
Not at all influential very influential
1 2 3 4 5 6 7 8 9 10

16. **Since April of this year,**

a. **Have you purchased and installed any energy efficiency equipment (such as high efficiency appliances, windows or heating and cooling equipment?**

i. ❑ Yes
ii. ❑ No
iii. ❑ Don't Know

b. **Have you made energy efficiency improvements in your home, such as?**

i. _____**Wall or ceiling insulation**
ii. _____**Caulking**
iii. _____**Faucet aerators**
iv. _____**Outlet or switch gaskets**
v. _____**Lowflow showerhead**
vi. _____**Programmable thermostat**
vii. _____**Weatherstripping**
viii. _____**None of these**

c. **Have you changed any of your habits related to energy use?**

i. ❑ Yes
ii. ❑ No
iii. ❑ Don't Know

On a 1-to-10 scale with 1 being very unlikely and 10 being very likely, please rate your likelihood of participating in a CFL program that:

17. **Offers free CFLs by direct-mail**

very unlikely								very likely	
1	2	3	4	5	6	7	8	9	10

18. **Offers free CFLs through a retailer coupon**

very unlikely								very likely	
1	2	3	4	5	6	7	8	9	10

19. **Offers free CFLs through a manufacturers coupon**

very unlikely very likely
1 2 3 4 5 6 7 8 9 10

20. **Offers free CFLs at a stand at a community event such as a fair**
very unlikely very likely
1 2 3 4 5 6 7 8 9 10

21. **Offers free CFLs at a stand in a public parking lot**
very unlikely very likely
1 2 3 4 5 6 7 8 9 10

22. **Offers free CFLs through an online vendor such as Amazon.com**
very unlikely very likely
1 2 3 4 5 6 7 8 9 10

23. On a 1-to-10 scale with 1 being not at all important and 10 being very important, please rate the importance of each of the following characteristics on choosing a light bulb for your home

23a. **Mercury content of the bulb**
1 2 3 4 5 6 7 8 9 10 DK

23b. **Ability to dim the lighting level**
1 2 3 4 5 6 7 8 9 10 DK

23c. **Speed of which the bulb comes up to full lighting level**
1 2 3 4 5 6 7 8 9 10 DK

23d. **Purchase price of the bulb**
1 2 3 4 5 6 7 8 9 10 DK

23e. **Availability of the bulb in stores you normally shop**
1 2 3 4 5 6 7 8 9 10 DK

23f. **Selection of wattage and light output levels available**
1 2 3 4 5 6 7 8 9 10 DK

23g. **Cost savings on your utility bill**
1 2 3 4 5 6 7 8 9 10 DK

23h. **Energy savings**

1 2 3 4 5 6 7 8 9 10 DK

23i. **Attractiveness or appearance of the bulb**

1 2 3 4 5 6 7 8 9 10 DK

23j. **Recommendations from family and friends**

1 2 3 4 5 6 7 8 9 10 DK

23k. **Recommendations from the utility company**

1 2 3 4 5 6 7 8 9 10 DK

23l. **Availability of utility programs or services that offer the bulbs to you directly**

1 2 3 4 5 6 7 8 9 10 DK

23m. **Ease of bulb disposal**

1 2 3 4 5 6 7 8 9 10 DK

24. **What is your best estimate of the number of bulbs installed in your home that are not CFLs?**

____

25. **How many of these non-CFL bulbs are in sockets that are typically used for more than 2 hours a day?**

______

26. **Please list the number of bulbs currently installed in your home that are specialty bulbs such as dimmable bulbs, three-way bulbs, recessed, flood or directional lights, candelabra lights or other non-standard bulbs…** *How many <a> do you have in your home?... how many <b>, etc.*
    h. ____**Dimmable bulbs**
    i. ____**Outdoor flood bulbs**
    j. ____**Three-way bulbs**
    k. ____**Spotlight bulbs**
    l. ____**Recessed bulbs**
    m. ____**Candelabra bulbs**
    n. ____**Other (specify)____________**

27. **For each of these specialty bulbs installed, how many are CFLs?**
    h. ____**Dimmable CFLs**
    i. ____**Outdoor flood CFLs**

j. ____**Three-way CFLs**
k. ____**Spotlight CFLs**
l. ____**Recessed CFLs**
m. ____**Candelabra CFLs**
n. ____**Other (specify)**____________

28. **On a scale from 1-10, with 1 indicating not at all interested and 10 indicating very interested, please rate your interest in Duke Energy providing a direct mail specialty CFL program:**

Not at all interested								very interested	
1	2	3	4	5	6	7	8	9	10

Please tell me if you would be interested in receiving the following types of CFLs if they were to be offered in the future...

29. **Dimmable CFLs**
    d. Yes **(about how many hours per day would these bulbs be used?___)**
    e. No
    f. Don't Know

30. **Outdoor flood CFLs**
    d. Yes **(about how many hours per day would these bulbs be used?___)**
    e. No
    f. Don't Know

31. **Three-way CFLs**
    d. Yes **(about how many hours per day would these bulbs be used?___)**
    e. No
    f. Don't Know

32. **Spotlight CFLs**
    d. Yes **(about how many hours per day would these bulbs be used?___)**
    e. No
    f. Don't Know

33. **Candelabra CFLs**
    d. Yes **(about how many hours per day would these bulbs be used?___)**
    e. No
    f. Don't Know

34. *(if responder indicated a different specialty bulb)* **Other _**
    d. Yes **(about how many hours per day would these bulbs be used?___)**
    e. No

f. Don't Know

35. **Considering future CFL purchases, how many CFL bulbs would you purchase in the next year if they were…**
    a. **The same price as standard bulbs (___)**
    b. **$1 more than standard bulbs (___)**
    c. **$2 more than standard bulbs (___)**
    d. **$3 more than standard bulbs (___)**
    e. **Free, but you had to mail in a rebate form to get your money back (___)**

36. **How often do you use the Duke Energy Web Site?**
    a. Often (once a month or more)
    b. Sometimes (less than once a month)
    c. Never

37. **Have you added any major electrical appliances to your home in the past year?**
    a. Yes
    b. No

38. **Are you aware of the ENERGY STAR label?**
    a. Yes
    b. No.

39. **Do you typically look for the ENERGY STAR label when purchasing an appliance**?
    a. Yes
    b. No

40. **Do you typically buy appliances with the ENERGY STAR label**?
    a. Yes, all of the time
    b. Yes, some of the time
    c. No, never

41. **Why do you believe that Duke Energy is providing free CFLs to their customers?**
    g. ___Duke Energy wants to save their customers money
    h. ___Duke Energy wants to save energy for environmental reasons
    i. ___Duke Energy wants to save energy for economic reasons
    j. ___Duke Energy wants to look good (PR)
    k. ___The government is forcing Duke Energy to do it
    l. ___Other (specify)

42. **Are you currently a participant in any of the following Duke Energy programs** (check all that apply):
    g. ___**Power Manager**
    h. ___**Residential Smart Saver**
    i. ___**Home Energy House Call**
    j. ___**Home Energy Comparison Report**
    k. ___**Personalized Energy Report**
    l. ___ **Online Services**

For all programs not checked in Q59, ask the following question

On a scale from 1-10, with 1 indicating not at all interested and 10 indicating very interested, please rate your interest in Duke Energy providing the following programs:

42a. (Power Manager) **A program that provides bill credits in exchange for allowing Duke Energy to temporarily cycle your air conditioning unit during periods of high use**

Not at all interested very interested
1 2 3 4 5 6 7 8 9 10

42b. (Residential Smart Saver) **A program that provides rebates for energy efficient improvements to your house such as energy efficient heating and cooling units.**

Not at all interested very interested
1 2 3 4 5 6 7 8 9 10

42c. (Home Energy House Call) **A program in which an assessor comes to your house, suggests energy efficiency improvements, and Duke Energy provides certain low-cost improvement materials for free.**

Not at all interested very interested
1 2 3 4 5 6 7 8 9 10

42d. (Home Energy Comparison Report/) **A program that provides an ongoing comparison of your energy use with that of people who live in similar homes**

Not at all interested very interested
1 2 3 4 5 6 7 8 9 10

42e. (Personalized Energy report) **A program that provides personalized energy analysis and ways to save energy and money by filling out a few questions about your home either online or by mail.**

Not at all interested very interested
1 2 3 4 5 6 7 8 9 10

43. I'm going to read a statement. On a scale from 1-10, with 1 indicating that you strongly disagree, and 10 indicating that you strongly agree, please rate the following statement.

Overall I am satisfied with Duke Energy.

1 2 3 4 5 6 7 8 9 10 ❑ Don't Know

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

____

44. **If you were rating your overall satisfaction with the CFL Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?**

h. Very Satisfied
i. Somewhat Satisfied
j. Neither Satisfied nor Dissatisfied
k. Somewhat Dissatisfied
l. Very Dissatisfied
m. Refused
n. Don't Know

44a. **Why do you give it that rating?**
Response: ____

Finally, we have some general demographic questions...

45. In what type of building do you live?

a. Single-family home, detached construction
b. Single family home, factory manufactured/modular
c. Single family, mobile home
d. Row House
e. Two or Three family attached residence-traditional structure
f. Apartment (4 + families)---traditional structure
g. Condominium---traditional structure
h. OTHER
i. REFUSED
j. DON'T KNOW

46. What year was your residence built?

i. 1959 and before
j. 1960-1979
k. 1980-1989
l. 1990-1997

m. 1998-2000
n. 2001-2007
o. 2008-present
p. Don't Know

47. How many rooms are in your home (excluding bathrooms, but including finished basements)?

k. None
l. 1-3
m. 4
n. 5
o. 6
p. 7
q. 8
r. 9
s. 10 or more

48. Which of the following best describes your home's heating system?

g. None
h. Central forced air furnace
i. Electric Baseboard
j. Heat Pump
k. Geothermal Heat Pump
l. Other

49. How old is your heating system?

a. 0-4 years
b. 5-9 years
c. 10-14 years
d. 15-19 years
e. More than 19 years
f. Don't know
g. Do not have

50. **What is the primary fuel used in your heating system?**

f. Electricity
g. Natural Gas
h. Oil
i. Propane
j. Other

51. **What is the secondary fuel used in your primary heating system, if applicable?**

a. Electricity
b. Natural Gas

c. Oil
d. Propane
e. Other
f. None

52. Do you use one or more of the following to cool your home? ***(Mark all that apply)***

a. ___None, do not cool the home
b. ___Heat pump for cooling
c. ___Central air conditioning
d. ___Through the wall or window air conditioning unit
e. ___Geothermal Heat pump
f. ___Other (specify?______)

53. How many window-unit or "through the wall" air conditioner(s) do you use?

j. None
k. 1
l. 2
m. 3
n. 4
o. 5
p. 6
q. 7
r. 8 or more

54. **What is the fuel used in your cooling system?**

a. Electricity
b. Natural Gas
c. Oil
d. Propane
e. Other
f. None

55. How old is your cooling system?

h. 0-4 years
i. 5-9 years
j. 10-14 years
k. 15-19 years
l. 19 years or older
m. Don't know
n. Do not have

56. **What is the fuel used by your water heater?** *(Mark all that apply)*

g. ___Electricity
h. ___Natural Gas
i. ___Oil
j. ___Propane
k. ___Other
l. ___No water heater

57. **How old is your water heater?**
   f. 0-4 years
   g. 5-9 years
   h. 10-14 years
   i. 15-19 years
   j. More than 19 years

58. **What type of fuel do you use for indoor cooking on the stovetop or range?** *(Mark all that apply)*
   a. ___Electricity
   b. ___Natural Gas
   c. ___Oil
   d. ___Propane
   e. ___Other
   f. ___No stovetop or range

59. **What type of fuel do you use for indoor cooking in the oven?** *(Mark all that apply)*
   a. ___Electricity
   b. ___Natural Gas
   c. ___Oil
   d. ___Propane
   e. ___Other
   f. ___No oven

60. **What type of fuel do you use for clothes drying?** *(Mark all that apply)*
   g. ___Electricity
   h. ___Natural Gas
   i. ___Oil
   j. ___Propane
   k. ___Other
   l. ___No clothes dryer

62. **About how many square feet of living space are in your home?** ***(Do not include garages or other unheated areas)***
Note: A 10-foot by 12-foot room is 120 square feet
   k. Less than 500
   l. 500 – 999
   m. 1000 – 1499

n. 1500 – 1999
o. 2000 – 2499
p. 2500 – 2999
q. 3000 – 3499
r. 3500 – 3999
s. 4000 or more
t. Don't know

63. Do you own or rent your home?
a. Own
b. Rent

64. **How many levels are in your home (not including your basement)?**
a. One
b. Two
c. Three

65. **Does your home have a heated or unheated basement?**
a. Heated
b. Unheated
c. No basement

66. **Does your home have an attic?**
a. Yes
b. No

67. **Are your central air/heat ducts located in the attic?**
a. Yes
c. No
d. Not applicable

68. **Does your house have cold drafts in the winter?**
a. Yes
b. No

69. **Does your house have sweaty windows in the winter?**
a. Yes
b. No

70. **Do you notice uneven temperatures between the rooms in your home?**
a. Yes
b. No

71. Does your heating system keep your home comfortable in winter?
a. Yes

b. No

72. Does your cooling system keep your home comfortable in summer?

a. Yes
b. No

73. Do you have a programmable thermostat?

c. Yes
d. No

74. What temperature is your thermostat set to on a typical summer weekday afternoon?

g. Less than 69 degrees
h. 69-72 degrees
i. 73-78 degrees
j. Higher than 78 degrees
k. Off
l. DK

75. What temperature is your thermostat set to on a typical winter weekday afternoon?

a. Less than 67 degrees
b. 67-70 degrees
c. 71-73 degrees
d. 74-77 degrees
e. Higher than 78 degrees
f. Off
g. DK

76. Do You Have a Swimming Pool or Spa?

a. Yes
b. No

77. Would a two-degree increase in the summer afternoon temperature in your home affect your comfort….

a. Not at all
b. Slightly
c. Moderately, or
d. Greatly

78. How many people live in this home?

a. 1
b. 2
c. 3
d. 4
e. 5

f. 6
g. 7
h. 8 or more

79. How many persons are usually home on a weekday afternoon?
a. 0
b. 1
c. 2
d. 3
e. 4
f. 5
g. 6
h. 7
i. 8 or more

80. Are you planning on making any large purchases to improve energy efficiency in the next 3 years?
a. Yes
b. No
c. Not sure

The following questions are for classification purposes only and will not be used for any other purpose than to help Duke Energy continue to improve service.

81. What is your age group?
g. 18-34
h. 35-49
i. 50-59
j. 60-64
k. 65-74
l. Over 74

82. Please indicate your annual household income.

a. **Under $15,000**
b. **$15,000-$29,999**
c. **$30,000-$49,999**
d. **$50,000-$74,999**
e. **$75,000-$100,000**
f. **Over $100,000**
g. **Prefer Not to Answer**

That completes our survey. As I mentioned at the start of the survey, we'd like to send you $10 for your time. Should we send it to <name> **at** <address>**?**

Thank you for your time and feedback today! (*Politely end call*)

Appendix E: Scan of CFL Box Insert and Online Offer Screenshots

A SMALL CHANGE CAN
MAKE A BIG DIFFERENCE

Duke Energy®

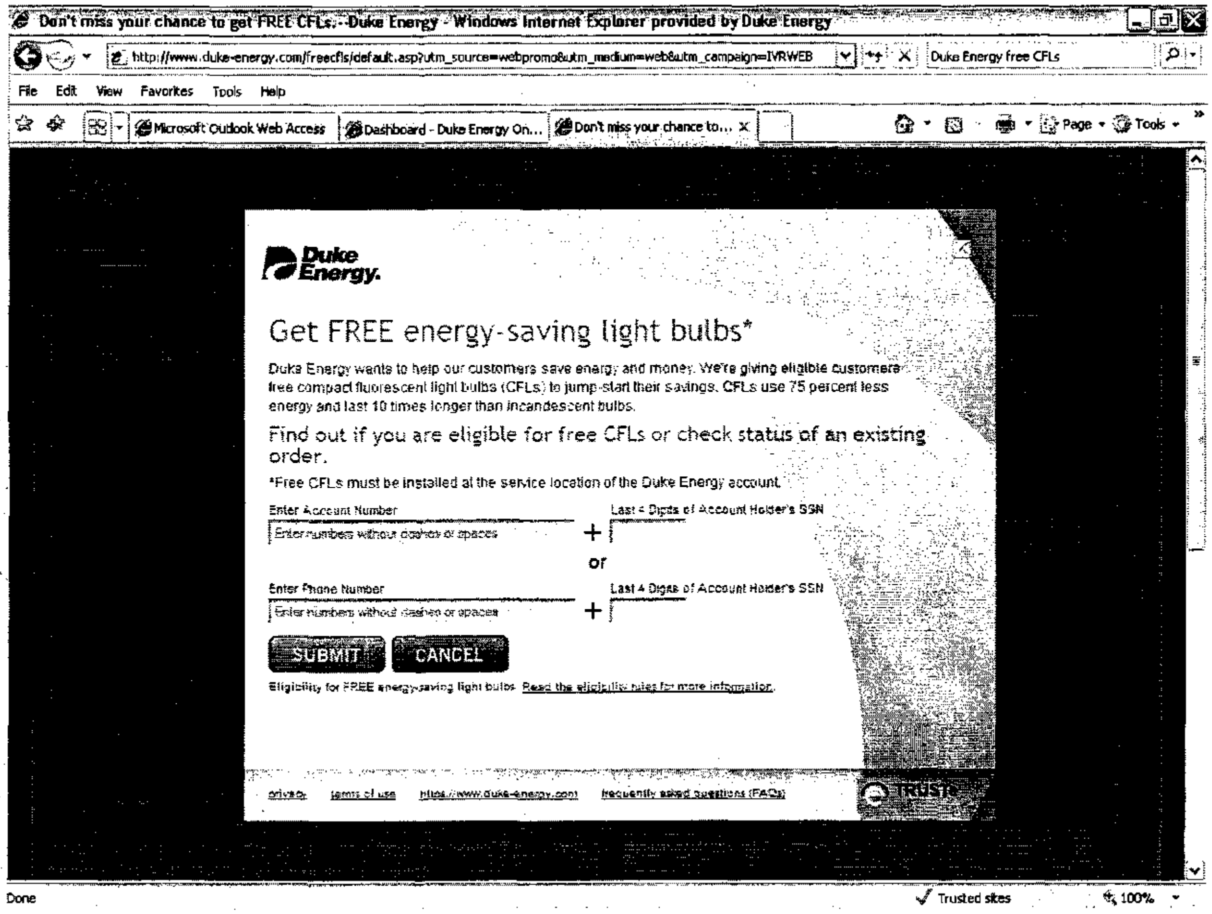
Thank you for participating in Duke Energy's compact fluorescent light (CFLs) energy savings program. Working together we can make a difference. Through your involvement you can reduce your energy use, save money and help the environment.

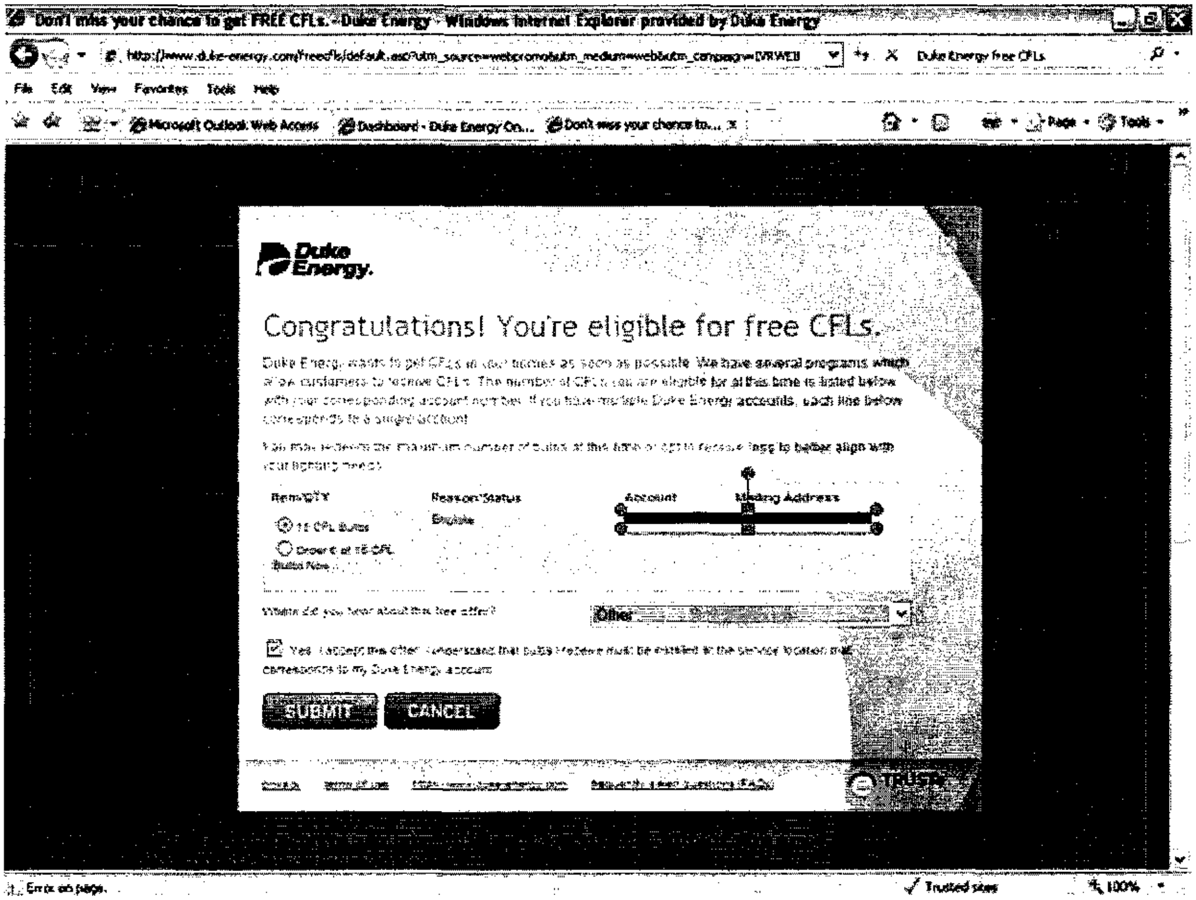
One of the quickest and easiest things you can do is replace your home's most used incandescent light bulbs with the enclosed ENERGY STAR® rated CFLs. Don't wait until your incandescent lights burn out; replace them today to start saving money.

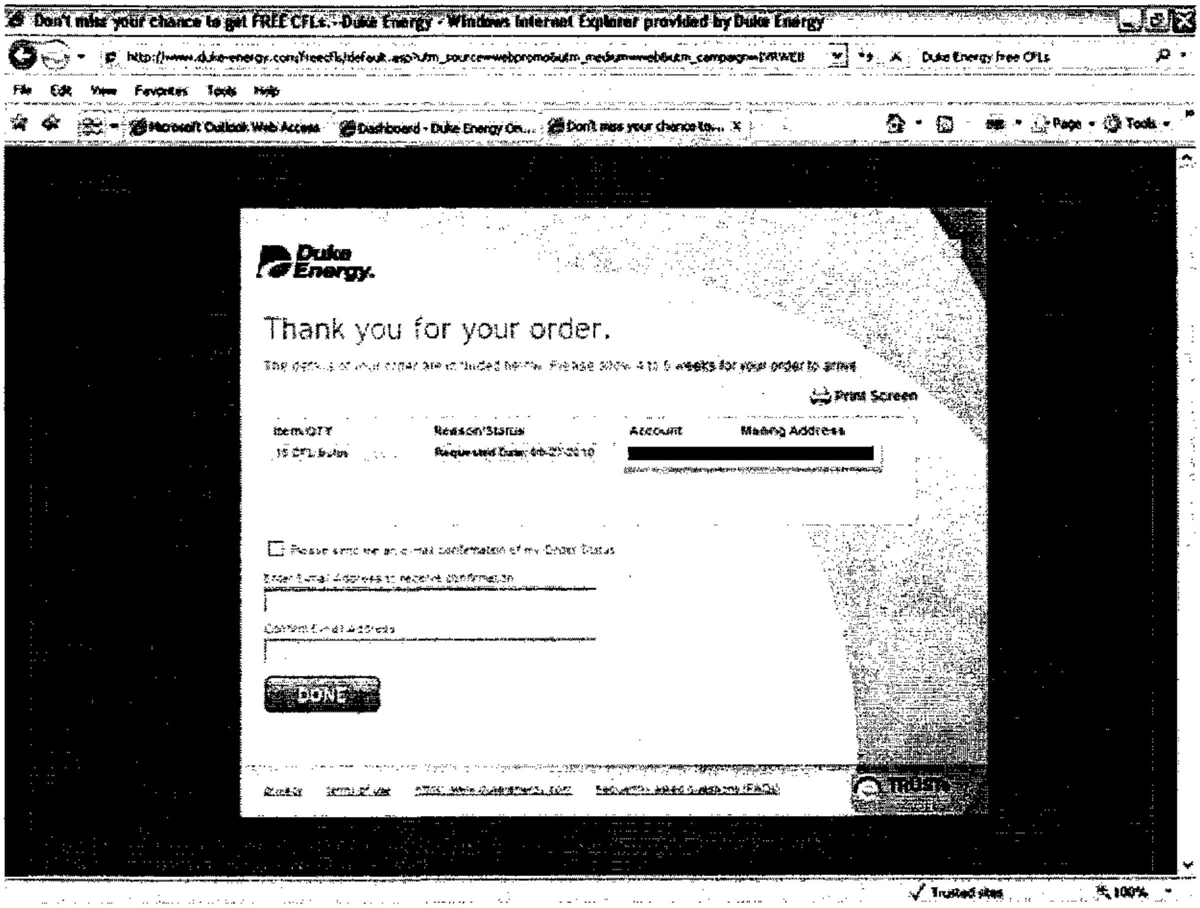
CFL bulbs help you:

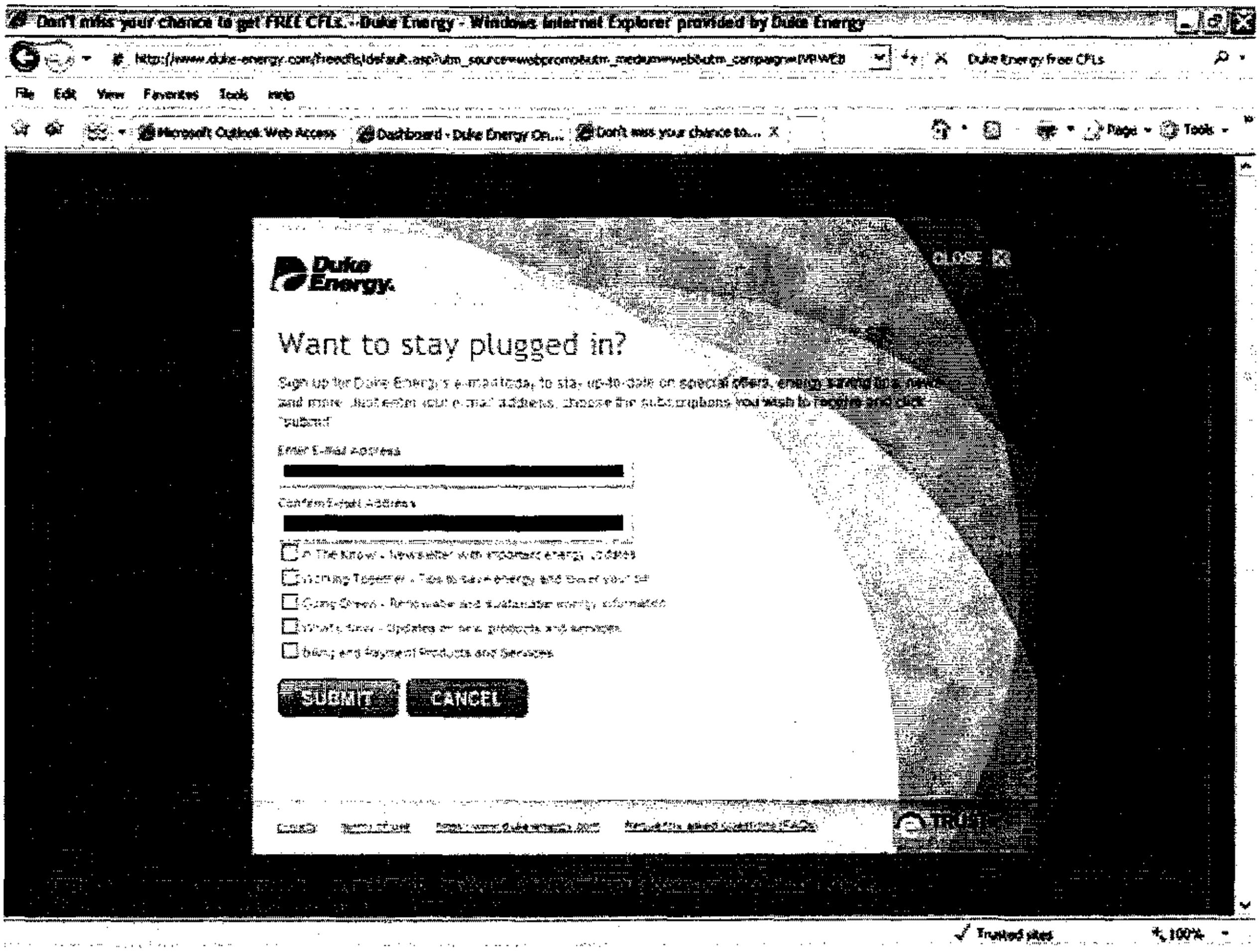
- **Save money.** Just one ENERGY STAR qualified CFL can save approximately $30 or more in electricity costs over its lifetime. Plus CFLs produce about 75 percent less heat, so they're safer to operate and can reduce the energy costs associated with cooling your home.
- **Save time.** CFL bulbs are convenient to use in hard-to-reach and high-use fixtures. Because CFLs last six to 10 times longer, you save time and effort in replacing burned out bulbs.
- **Save the environment:** A qualified CFL bulb prevents more than 400 pounds of greenhouse gas emissions over its lifetime.

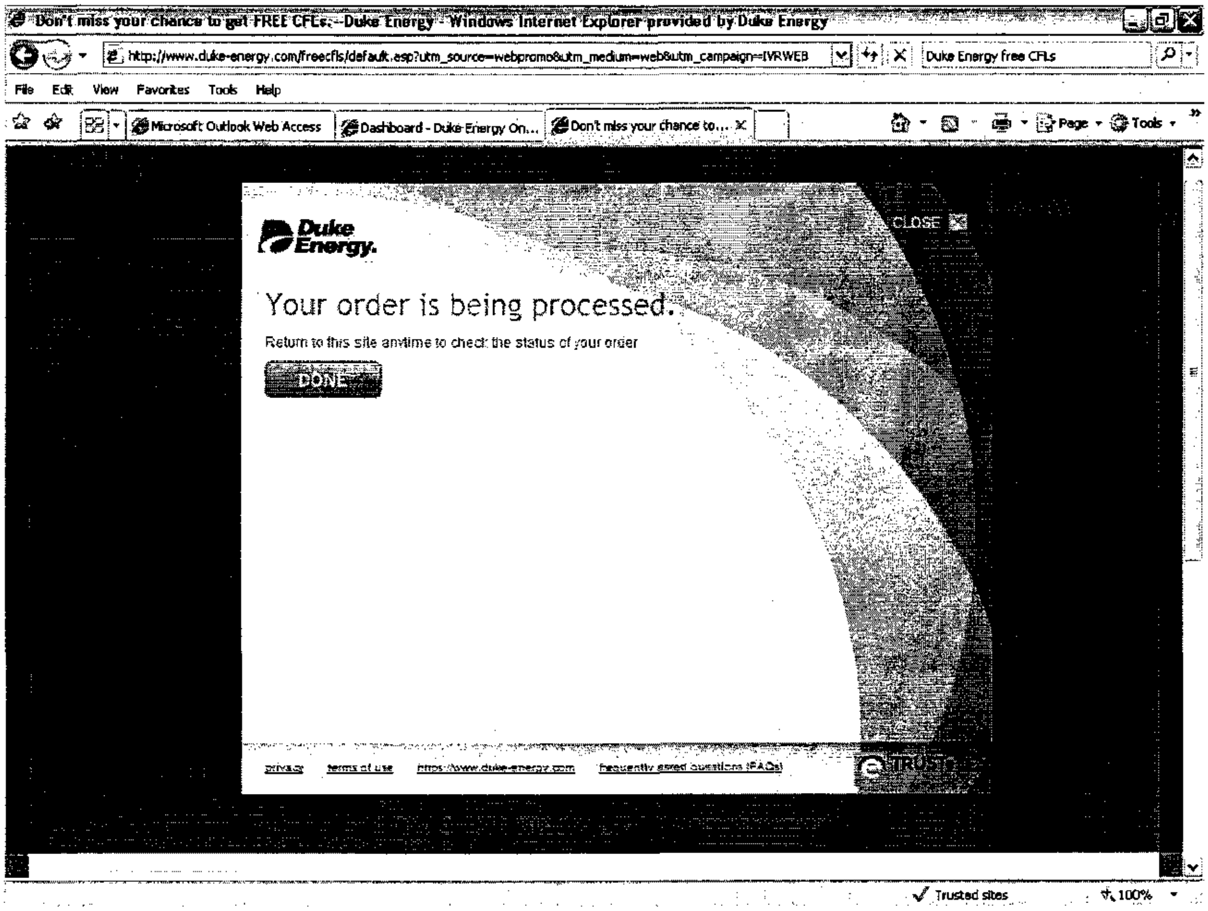
Visit **www.duke-energy.com** for more on CFLs and their disposal. If you have questions about the contents of this kit, please call Niagara Conservation at 800-292-7687.

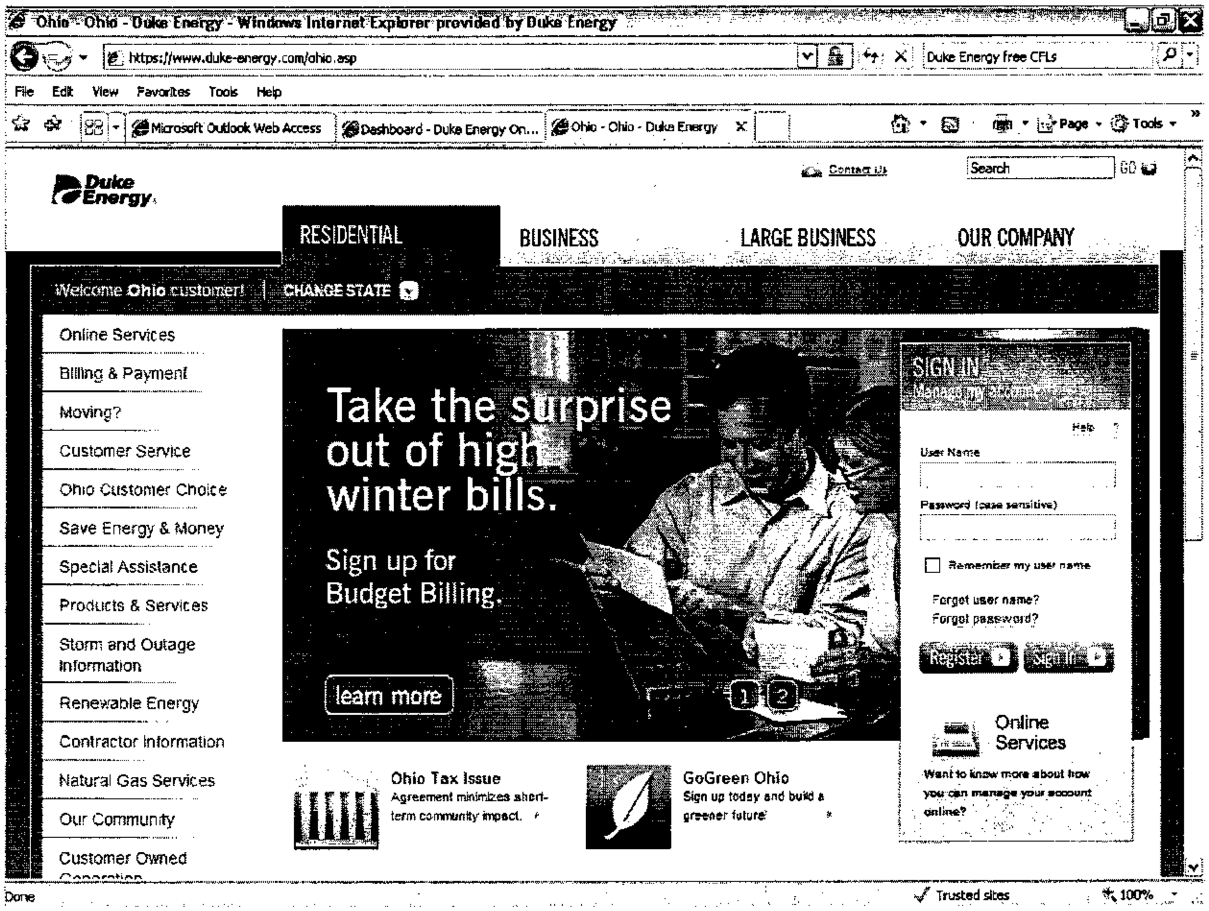

Don't miss your chance to get FREE CFLs - Duke Energy - Windows Internet Explorer provided by Duke Energy
http://www.duke-energy.com/freecfls/default.asp?utm_source=webpromo&utm_medium=web&utm_campaign=IVRWEB
Duke Energy free CFLs
File Edit View Favorites Tools Help
Microsoft Outlook Web Access
Dashboard - Duke Energy On...
Don't miss your chance to...
Page Tools
Duke Energy.
Get FREE energy-saving light bulbs*
Duke Energy wants to help our customers save energy and money. We're giving eligible customers free compact fluorescent light bulbs (CFLs) to jump-start their savings. CFLs use 75 percent less energy and last 10 times longer than incandescent bulbs.
Find out if you are eligible for free CFLs or check status of an existing order.
*Free CFLs must be installed at the service location of the Duke Energy account.
Enter Account Number
Last 4 Digits of Account Holder's SSN
or
Enter Phone Number
Last 4 Digits of Account Holder's SSN
SUBMIT
CANCEL
Done
Trusted sites
100%


Don't miss your chance to get FREE CFLs. - Duke Energy - Windows Internet Explorer provided by Duke Energy
Duke Energy.
Congratulations! You're eligible for free CFLs.
Account
Other
SUBMIT
CANCEL


Don't miss your chance to get FREE CFLs - Duke Energy - Windows Internet Explorer provided by Duke Energy
Duke Energy.
Thank you for your order.
Print Screen
Item/QTY
Reason/Status
Account
Mailing Address
[redacted]
DONE


Don't miss your chance to get FREE CFLs - Duke Energy - Windows Internet Explorer provided by Duke Energy
File Edit View Favorites Tools Help
Duke Energy.
CLOSE
Want to stay plugged in?
SUBMIT
CANCEL
Trusted sites
100%


Don't miss your chance to get FREE CFLs.--Duke Energy - Windows Internet Explorer provided by Duke Energy
http://www.duke-energy.com/freecfls/default.asp?utm_source=webpromo&utm_medium=web&utm_campaign=IVRWEB
Duke Energy free CFLs
File Edit View Favorites Tools Help
Microsoft Outlook Web Access
Dashboard - Duke Energy On...
Don't miss your chance to...
Page Tools
Duke Energy.
CLOSE
Your order is being processed.
Return to this site anytime to check the status of your order
DONE
privacy
terms of use
https://www.duke-energy.com
frequently asked questions (FAQs)
Trusted sites
100%


Ohio - Ohio - Duke Energy - Windows Internet Explorer provided by Duke Energy
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Page Tools
Duke Energy
Contact Us
Search
GO
RESIDENTIAL
BUSINESS
LARGE BUSINESS
OUR COMPANY
Welcome Ohio customer!
CHANGE STATE
Online Services
Billing & Payment
Moving?
Customer Service
Ohio Customer Choice
Save Energy & Money
Special Assistance
Products & Services
Storm and Outage Information
Renewable Energy
Contractor Information
Natural Gas Services
Our Community
Customer Owned
Take the surprise out of high winter bills.
Sign up for Budget Billing.
learn more
SIGN IN
Help
User Name
Password (case sensitive)
Remember my user name
Forgot user name?
Forgot password?
Register
Sign In
Online Services
Want to know more about how you can manage your account online?
Ohio Tax Issue
Agreement minimizes short-term community impact.
GoGreen Ohio
Sign up today and build a greener future
Done
Trusted sites
100%

Appendix F: Household Characteristics and Demographics

Type of Housing * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Type of Housing	Apartment (4 + families)---traditional structure	Count	22	11	33
		% of Total	5.0%	2.5%	7.5%
	Condominium---traditional structure	Count	20	4	24
		% of Total	4.5%	.9%	5.4%
	DK/NS	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Duplex/two-family	Count	8	0	8
		% of Total	1.8%	.0%	1.8%
	Multi-family building (3 or more units)	Count	43	0	43
		% of Total	9.7%	.0%	9.7%
	Other	Count	0	1	1
		% of Total	.0%	.2%	.2%
	Single family home, factory manufactured/modular	Count	0	3	3
		% of Total	.0%	.7%	.7%
	Single family, mobile home	Count	10	4	14
		% of Total	2.3%	.9%	3.2%
	Single-family home, detached construction	Count	269	33	302
		% of Total	60.9%	7.5%	68.3%
	Townhouse	Count	5	0	5
		% of Total	1.1%	.0%	1.1%
	Two or Three family attached residence-traditional structure	Count	4	4	8
		% of Total	.9%	.9%	1.8%

Total	**Count**	382	60	442
	% of Total	86.4%	13.6%	100.0%

Year Built * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Year Built	**1959 and before**	**Count**	103	17	120
		% of Total	23.3%	3.8%	27.1%
	1960 to 1979	**Count**	98	12	110
		% of Total	22.2%	2.7%	24.9%
	1980 to 1989	**Count**	35	5	40
		% of Total	7.9%	1.1%	9.0%
	1990 to 1997	**Count**	32	5	37
		% of Total	7.2%	1.1%	8.4%
	1998 to 2000	**Count**	18	2	20
		% of Total	4.1%	.5%	4.5%
	2001 to 2007	**Count**	33	3	36
		% of Total	7.5%	.7%	8.1%
	2008 to present	**Count**	8	1	9
		% of Total	1.8%	.2%	2.0%
	DK/NS	**Count**	55	15	70
		% of Total	12.4%	3.4%	15.8%
Total		**Count**	382	60	442
		% of Total	86.4%	13.6%	100.0%

Number of Rooms (excluding bathrooms but including finished basement) * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Number of Rooms (excluding bathrooms but including finished basement)	**1 to 3**	**Count**	38	6	44
		% of Total	8.6%	1.4%	10.0%
	10 or more	**Count**	46	4	50
		% of Total	10.4%	.9%	11.3%
	4	**Count**	36	9	45
		% of	8.1%	2.0%	10.2%

		Total			
	5	Count	58	13	71
		% of Total	13.1%	2.9%	16.1%
	6	Count	74	13	87
		% of Total	16.7%	2.9%	19.7%
	7	Count	56	5	61
		% of Total	12.7%	1.1%	13.8%
	8	Count	52	7	59
		% of Total	11.8%	1.6%	13.3%
	9	Count	21	3	24
		% of Total	4.8%	.7%	5.4%
	None	Count	1	0	1
		% of Total	.2%	.0%	.2%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Home Heating System * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Home Heating System	Boiler	Count	2	0	2
		% of Total	.5%	.0%	.5%
	Central forced air furnace	Count	275	47	322
		% of Total	62.2%	10.6%	72.9%
	DK/NS	Count	5	1	6
		% of Total	1.1%	.2%	1.4%
	Electric Baseboard	Count	23	8	31
		% of Total	5.2%	1.8%	7.0%
	Electric Baseboard and window unit	Count	1	0	1
		% of Total	.2%	.0%	.2%

Fireplace, Heat pump and Baseboard	Count	1	0	1
	% of Total	.2%	.0%	.2%
Gas boiler and steam	Count	1	0	1
	% of Total	.2%	.0%	.2%
Gas boiler baseboard	Count	1	0	1
	% of Total	.2%	.0%	.2%
Gas heat	Count	3	0	3
	% of Total	.7%	.0%	.7%
Geothermal Heat Pump	Count	0	1	1
	% of Total	.0%	.2%	.2%
Heat Pump	Count	41	0	41
	% of Total	9.3%	.0%	9.3%
Heat pump and Propane	Count	2	0	2
	% of Total	.5%	.0%	.5%
Heat pump, Electric Baseboard and Central forced air	Count	0	1	1
	% of Total	.0%	.2%	.2%
Hot water	Count	6	1	7
	% of Total	1.4%	.2%	1.6%
None	Count	4	1	5
	% of Total	.9%	.2%	1.1%
Oil fired hot water heat	Count	1	0	1
	% of Total	.2%	.0%	.2%
Oil furnace	Count	4	0	4
	% of Total	.9%	.0%	.9%
Propane	Count	3	0	3
	% of Total	.7%	.0%	.7%
Radiator	Count	4	0	4
	% of Total	.9%	.0%	.9%
Steam	Count	2	0	2

		% of Total	.5%	.0%	.5%
	Wood stove/fireplace	Count	3	0	3
		% of Total	.7%	.0%	.7%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Age of heating system * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Age of heating system		Count	4	0	4
		% of Total	.9%	.0%	.9%
	0 to 4 years	Count	90	10	100
		% of Total	20.4%	2.3%	22.6%
	10 to 14 years	Count	61	9	70
		% of Total	13.8%	2.0%	15.8%
	15 to 19 years	Count	31	7	38
		% of Total	7.0%	1.6%	8.6%
	5 to 9 years	Count	71	8	79
		% of Total	16.1%	1.8%	17.9%
	DK/NS	Count	71	21	92
		% of Total	16.1%	4.8%	20.8%
	more than 19 years	Count	54	5	59
		% of Total	12.2%	1.1%	13.3%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Primary fuel used in heating system * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Primary fuel used in heating system		Count	4	0	4
		% of Total	.9%	.0%	.9%
	Diesel #2 fuel	Count	0	1	1
		% of Total	.0%	.2%	.2%
	DK/NS	Count	13	3	16
		% of Total	2.9%	.7%	3.6%

	Electricity	Count	113	21	134
		% of Total	25.6%	4.8%	30.3%
	Natural Gas	Count	217	31	248
		% of Total	49.1%	7.0%	56.1%
	Oil	Count	14	2	16
		% of Total	3.2%	.5%	3.6%
	Oil and Propane	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Propane	Count	18	2	20
		% of Total	4.1%	.5%	4.5%
	Water	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Wood	Count	1	0	1
		% of Total	.2%	.0%	.2%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Secondary fuel used in primary heating system * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Secondary fuel used in primary heating system		Count	4	0	4
		% of Total	.9%	.0%	.9%
	All of the above	Count	1	0	1
		% of Total	.2%	.0%	.2%
	DK/NS	Count	4	0	4
		% of Total	.9%	.0%	.9%
	Electricity	Count	64	4	68
		% of Total	14.5%	.9%	15.4%
	Heat Pump	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Natural Gas	Count	19	1	20
		% of Total	4.3%	.2%	4.5%
	Not applicable	Count	271	55	326

		% of Total	61.3%	12.4%	73.8%
	Pellet stove	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Propane	Count	7	0	7
		% of Total	1.6%	.0%	1.6%
	Wood	Count	9	0	9
		% of Total	2.0%	.0%	2.0%
	Wood and Heat Pump	Count	1	0	1
		% of Total	.2%	.0%	.2%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Home Cooling System * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Home Cooling System	Central air conditioning	Count	233	29	262
		% of Total	52.7%	6.6%	59.3%
	Central air conditioning and Fans	Count	3	6	9
		% of Total	.7%	1.4%	2.0%
	Central air conditioning and Free standing unit	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Central air conditioning and Geothermal heat pump	Count	2	0	2
		% of Total	.5%	.0%	.5%
	Central air conditioning and Open windows	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Central air conditioning and Through the wall or window	Count	10	0	10
		% of Total	2.3%	.0%	2.3%
	Central air conditioning, Geothermal heat pump and Fans	Count	0	1	1
		% of	.0%	.2%	.2%

		Total			
	Central air conditioning, Through the wall, Fans and Open windows	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Fans	Count	1	1	2
		% of Total	.2%	.2%	.5%
	Heat pump and Central air conditioning	Count	8	1	9
		% of Total	1.8%	.2%	2.0%
	Heat pump for cooling	Count	26	2	28
		% of Total	5.9%	.5%	6.3%
	Heat pump, Central air conditioning, Open windows	Count	1	0	1
		% of Total	.2%	.0%	.2%
	None, do not cool the home	Count	9	2	11
		% of Total	2.0%	.5%	2.5%
	Through the wall or window air conditioning unit	Count	85	16	101
		% of Total	19.2%	3.6%	22.9%
	Through the wall or window air conditioning unit and Fans	Count	0	2	2
		% of Total	.0%	.5%	.5%
	Through the wall or window air conditioning, Fans and Open windows	Count	1	0	1
		% of Total	.2%	.0%	.2%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Number of window cooling units * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Number of window cooling units		Count	7	0	7
		% of Total	1.6%	.0%	1.6%
	1	Count	52	10	62
		% of Total	11.8%	2.3%	14.0%
	2	Count	37	6	43
		% of Total	8.4%	1.4%	9.7%

	3	Count	14	0	14
		% of Total	3.2%	.0%	3.2%
	4	Count	4	2	6
		% of Total	.9%	.5%	1.4%
	5	Count	2	0	2
		% of Total	.5%	.0%	.5%
	8 or more	Count	1	0	1
		% of Total	.2%	.0%	.2%
	DK/NS	Count	1	0	1
		% of Total	.2%	.0%	.2%
	None	Count	264	42	306
		% of Total	59.7%	9.5%	69.2%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Cooling System Fuel * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Cooling System Fuel		Count	7	0	7
		% of Total	1.6%	.0%	1.6%
	DK/NS	Count	1	3	4
		% of Total	.2%	.7%	.9%
	Electricity	Count	341	54	395
		% of Total	77.1%	12.2%	89.4%
	Freon	Count	2	0	2
		% of Total	.5%	.0%	.5%
	Natural Gas	Count	23	2	25
		% of Total	5.2%	.5%	5.7%
	None	Count	8	1	9
		% of Total	1.8%	.2%	2.0%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Age of cooling system * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	

		Count	12	0	12
		% of Total	2.7%	.0%	2.7%
Age of cooling system	0 to 4 years	Count	106	9	115
		% of Total	24.0%	2.0%	26.0%
	10 to 14 years	Count	56	9	65
		% of Total	12.7%	2.0%	14.7%
	15 to 19 years	Count	18	5	23
		% of Total	4.1%	1.1%	5.2%
	19 years or older	Count	35	1	36
		% of Total	7.9%	.2%	8.1%
	5 to 9 years	Count	97	9	106
		% of Total	21.9%	2.0%	24.0%
	DK/NS	Count	55	24	79
		% of Total	12.4%	5.4%	17.9%
	Do not have	Count	3	3	6
		% of Total	.7%	.7%	1.4%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Water Heater Fuel * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Water Heater Fuel	DK/NS	Count	23	12	35
		% of Total	5.2%	2.7%	7.9%
	Electricity	Count	138	20	158
		% of Total	31.2%	4.5%	35.7%
	Electricity and Natural Gas	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Natural Gas	Count	211	27	238
		% of Total	47.7%	6.1%	53.8%
	None	Count	6	0	6
		% of Total	1.4%	.0%	1.4%
	Oil	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Propane	Count	2	1	3
		% of Total	.5%	.2%	.7%
Total		Count	382	60	442

	% of Total	86.4%	13.6%	100.0%

Age of water heater * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Age of water heater		Count	6	0	6
		% of Total	1.4%	.0%	1.4%
	0 to 4 years	Count	119	19	138
		% of Total	26.9%	4.3%	31.2%
	10 to 14 years	Count	56	8	64
		% of Total	12.7%	1.8%	14.5%
	15 to 19 years	Count	23	2	25
		% of Total	5.2%	.5%	5.7%
	5 to 9 years	Count	85	11	96
		% of Total	19.2%	2.5%	21.7%
	DK/NS	Count	76	18	94
		% of Total	17.2%	4.1%	21.3%
	more than 19 years	Count	17	2	19
		% of Total	3.8%	.5%	4.3%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Stovetop/Range Fuel * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Stovetop/Range Fuel	Electricity	Count	276	40	316
		% of Total	62.4%	9.0%	71.5%
	Electricity and Natural Gas	Count	0	1	1
		% of Total	.0%	.2%	.2%
	Natural Gas	Count	99	19	118
		% of Total	22.4%	4.3%	26.7%
	No stovetop or range	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Propane	Count	6	0	6
		% of Total	1.4%	.0%	1.4%
Total		Count	382	60	442

		% of Total	86.4%	13.6%	100.0%

Over Fuel * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Over Fuel	Electricity	Count	285	41	326
		% of Total	64.5%	9.3%	73.8%
	Electricity and Natural Gas	Count	0	1	1
		% of Total	.0%	.2%	.2%
	Natural Gas	Count	91	18	109
		% of Total	20.6%	4.1%	24.7%
	No oven	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Propane	Count	5	0	5
		% of Total	1.1%	.0%	1.1%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Clothes Dryer Fuel * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Clothes Dryer Fuel	DK/NS	Count	1	1	2
		% of Total	.2%	.2%	.5%
	Electricity	Count	290	37	327
		% of Total	65.6%	8.4%	74.0%
	Natural Gas	Count	56	11	67
		% of Total	12.7%	2.5%	15.2%
	No clothes dryer	Count	33	11	44
		% of Total	7.5%	2.5%	10.0%
	Propane	Count	2	0	2
		% of Total	.5%	.0%	.5%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Square feet of living space (excluding garages and other unheated areas) * CFL IVR Crosstabulation

			CFLs	Total

			1 Participant	2 Non-participant	
		Count	0	1	1
		% of Total	.0%	.2%	.2%
Square feet of living space (excluding garages and other unheated areas)	1000 to 1499	Count	83	6	89
		% of Total	18.8%	1.4%	20.1%
	1500 to 1999	Count	54	5	59
		% of Total	12.2%	1.1%	13.3%
	2000 to 2499	Count	31	6	37
		% of Total	7.0%	1.4%	8.4%
	2500 to 2999	Count	19	2	21
		% of Total	4.3%	.5%	4.8%
	3000 to 3499	Count	15	0	15
		% of Total	3.4%	.0%	3.4%
	3500 to 3999	Count	8	0	8
		% of Total	1.8%	.0%	1.8%
	4000 or more	Count	10	2	12
		% of Total	2.3%	.5%	2.7%
	500 to 999	Count	41	3	44
		% of Total	9.3%	.7%	10.0%
	DK/NS	Count	117	35	152
		% of Total	26.5%	7.9%	34.4%
	Less than 500	Count	4	0	4
		% of Total	.9%	.0%	.9%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Own or Rent * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	

		Count	0	1	1
		% of Total	.0%	.2%	.2%
Own or Rent	Own	Count	276	40	316
		% of Total	62.4%	9.0%	71.5%
	Rent	Count	106	19	125
		% of Total	24.0%	4.3%	28.3%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Number of floors in home * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Number of floors in home		Count	0	1	1
		% of Total	.0%	.2%	.2%
	1	Count	187	32	219
		% of Total	42.3%	7.2%	49.5%
	2	Count	150	23	173
		% of Total	33.9%	5.2%	39.1%
	3	Count	45	4	49
		% of Total	10.2%	.9%	11.1%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Basement Heat * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Basement Heat		Count	0	1	1
		% of Total	.0%	.2%	.2%
	Heated	Count	187	28	215
		% of Total	42.3%	6.3%	48.6%
	No basement	Count	131	21	152
		% of Total	29.6%	4.8%	34.4%
	Unheated	Count	64	10	74
		% of Total	14.5%	2.3%	16.7%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Attic * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Attic		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	178	32	210
		% of Total	40.3%	7.2%	47.5%
	Yes	Count	204	27	231
		% of Total	46.2%	6.1%	52.3%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Central air/heat ducts located in the attic * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Central air/heat ducts located in the attic		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	171	29	200
		% of Total	38.7%	6.6%	45.2%
	Not applicable	Count	176	21	197
		% of Total	39.8%	4.8%	44.6%
	Yes	Count	35	9	44
		% of Total	7.9%	2.0%	10.0%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Comfort Series

Does your house have cold drafts in the winter? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Does your house have cold drafts in the winter?		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	169	34	203
		% of Total	38.2%	7.7%	45.9%

	Yes	Count	213	25	238
		% of Total	48.2%	5.7%	53.8%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Does your house have sweaty windows in the winter? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Does your house have sweaty windows in the winter?		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	274	46	320
		% of Total	62.0%	10.4%	72.4%
	Yes	Count	108	13	121
		% of Total	24.4%	2.9%	27.4%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Do you notice uneven temperatures between the rooms in your home? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Do you notice uneven temperatures between the rooms in your home?		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	134	31	165
		% of Total	30.3%	7.0%	37.3%
	Yes	Count	248	28	276
		% of Total	56.1%	6.3%	62.4%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Does your heating system keep your home comfortable in winter? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	

		Count	0	1	1
		% of Total	.0%	.2%	.2%
Does your heating system keep your home comfortable in winter?	No	Count	57	3	60
		% of Total	12.9%	.7%	13.6%
	Not applicable	Count	1	0	1
		% of Total	.2%	.0%	.2%
	Yes	Count	324	56	380
		% of Total	73.3%	12.7%	86.0%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Does your cooling system keep your home comfortable in summer? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Does your cooling system keep your home comfortable in summer?		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	43	6	49
		% of Total	9.7%	1.4%	11.1%
	Not applicable	Count	11	4	15
		% of Total	2.5%	.9%	3.4%
	Yes	Count	328	49	377
		% of Total	74.2%	11.1%	85.3%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Do you have a programmable thermostat? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Do you have a programmable thermostat?		Count	0	1	1

		% of Total	.0%	.2%	.2%
	No	Count	170	29	199
		% of Total	38.5%	6.6%	45.0%
	Yes	Count	212	30	242
		% of Total	48.0%	6.8%	54.8%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

What temperature is your thermostat set to on a typical summer weekday afternoon? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
What temperature is your thermostat set to on a typical summer weekday afternoon?		Count	0	1	1
		% of Total	.0%	.2%	.2%
	69 to 72 degrees	Count	109	20	129
		% of Total	24.7%	4.5%	29.2%
	73 to 78 degrees	Count	141	11	152
		% of Total	31.9%	2.5%	34.4%
	DK/NS	Count	36	14	50
		% of Total	8.1%	3.2%	11.3%
	Higher than 78 degrees	Count	14	2	16
		% of Total	3.2%	.5%	3.6%
	Less than 69 degrees	Count	36	8	44
		% of Total	8.1%	1.8%	10.0%
	Off	Count	46	4	50
		% of Total	10.4%	.9%	11.3%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

What temperature is your thermostat set to on a typical winter weekday afternoon? * CFL IVR Crosstabulation

			CFLs		Total
			1	2 Non-	

			Participant	participant	
What temperature is your thermostat set to on a typical winter weekday afternoon?		Count	0	1	1
		% of Total	.0%	.2%	.2%
	67 to 70 degrees	Count	187	22	209
		% of Total	42.3%	5.0%	47.3%
	71 to 73 degrees	Count	73	16	89
		% of Total	16.5%	3.6%	20.1%
	74 to 77 degrees	Count	17	4	21
		% of Total	3.8%	.9%	4.8%
	DK/NS	Count	24	3	27
		% of Total	5.4%	.7%	6.1%
	Higher than 78 degrees	Count	9	4	13
		% of Total	2.0%	.9%	2.9%
	Less than 67 degrees	Count	66	8	74
		% of Total	14.9%	1.8%	16.7%
	Off	Count	6	2	8
		% of Total	1.4%	.5%	1.8%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Do you have a swimming pool, spa or hot tub? * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Do you have a swimming pool, spa or hot tub?		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	351	56	407
		% of Total	79.4%	12.7%	92.1%
	Yes	Count	31	3	34
		% of Total	7.0%	.7%	7.7%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

A two-degree increase in the summer afternoon temperature in your home affect your comfort.... * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
A two-degree increase in the summer afternoon temperature in your home affect your comfort....		Count	0	1	1
		% of Total	.0%	.2%	.2%
	DK/NS	Count	26	5	31
		% of Total	5.9%	1.1%	7.0%
	Greatly	Count	38	9	47
		% of Total	8.6%	2.0%	10.6%
	Moderately	Count	60	6	66
		% of Total	13.6%	1.4%	14.9%
	Not at all	Count	113	29	142
		% of Total	25.6%	6.6%	32.1%
	Slightly	Count	145	10	155
		% of Total	32.8%	2.3%	35.1%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Number of people living in home * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Number of people living in home		Count	0	1	1
		% of Total	.0%	.2%	.2%
	1	Count	88	20	108
		% of Total	19.9%	4.5%	24.4%
	2	Count	146	16	162
		% of Total	33.0%	3.6%	36.7%
	3	Count	50	8	58
		% of Total	11.3%	1.8%	13.1%
	4	Count	46	6	52

		% of Total	10.4%	1.4%	11.8%
	5	Count	32	3	35
		% of Total	7.2%	.7%	7.9%
	6	Count	13	2	15
		% of Total	2.9%	.5%	3.4%
	7	Count	5	3	8
		% of Total	1.1%	.7%	1.8%
	8 or more	Count	1	1	2
		% of Total	.2%	.2%	.5%
	Prefer Not to Answer	Count	1	0	1
		% of Total	.2%	.0%	.2%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Number of people usually home on a weekday afternoon * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Number of people usually home on a weekday afternoon		Count	0	1	1
		% of Total	.0%	.2%	.2%
	0	Count	67	6	73
		% of Total	15.2%	1.4%	16.5%
	1	Count	164	25	189
		% of Total	37.1%	5.7%	42.8%
	2	Count	102	17	119
		% of Total	23.1%	3.8%	26.9%
	3	Count	23	2	25
		% of Total	5.2%	.5%	5.7%
	4	Count	15	3	18
		% of Total	3.4%	.7%	4.1%
	5	Count	5	0	5
		% of Total	1.1%	.0%	1.1%
	6	Count	4	0	4

		% of Total	.9%	.0%	.9%
	Prefer Not to Answer	Count	2	6	8
		% of Total	.5%	1.4%	1.8%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Planning to make a large purchase to improve energy efficiency in the next 3 years * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Planning to make a large purchase to improve energy efficiency in the next 3 years		Count	0	1	1
		% of Total	.0%	.2%	.2%
	No	Count	207	33	240
		% of Total	46.8%	7.5%	54.3%
	Not sure	Count	117	14	131
		% of Total	26.5%	3.2%	29.6%
	Yes	Count	58	12	70
		% of Total	13.1%	2.7%	15.8%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Age Group * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Age Group		Count	0	1	1
		% of Total	.0%	.2%	.2%
	18 to 34	Count	59	9	68
		% of Total	13.3%	2.0%	15.4%
	35 to 49	Count	108	15	123
		% of Total	24.4%	3.4%	27.8%
	50 to 59	Count	90	9	99
		% of Total	20.4%	2.0%	22.4%

	60 to 64	Count	26	6	32
		% of Total	5.9%	1.4%	7.2%
	65 to 74	Count	60	10	70
		% of Total	13.6%	2.3%	15.8%
	Over 74	Count	29	8	37
		% of Total	6.6%	1.8%	8.4%
	Prefer Not to Answer	Count	10	2	12
		% of Total	2.3%	.5%	2.7%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Annual Household Income * CFL IVR Crosstabulation

			CFLs		Total
			1 Participant	2 Non-participant	
Annual Household Income		Count	0	1	1
		% of Total	.0%	.2%	.2%
	$15,000-$29,999	Count	64	12	76
		% of Total	14.5%	2.7%	17.2%
	$30,000-$49,999	Count	57	10	67
		% of Total	12.9%	2.3%	15.2%
	$50,000-$74,999	Count	79	8	87
		% of Total	17.9%	1.8%	19.7%
	$75,000-$100,000	Count	35	3	38
		% of Total	7.9%	.7%	8.6%
	Over $100,000	Count	27	4	31
		% of Total	6.1%	.9%	7.0%
	Prefer Not to Answer	Count	71	9	80
		% of Total	16.1%	2.0%	18.1%
	Under $15,000	Count	49	13	62
		% of Total	11.1%	2.9%	14.0%
Total		Count	382	60	442
		% of Total	86.4%	13.6%	100.0%

Appendix G: Impact Algorithms

CFLs

General Algorithm

Gross Summer Coincident Demand Savings

$$\Delta kW = ISR \times units \times \left[\frac{Watts_{base} - Watts_{ee}}{1000}\right] \times CF \times (1 + HVAC_d)$$

Gross Annual Energy Savings

$$\Delta kWh = ISR \times units \times \left[\frac{(Watts \times HOU)_{base} - (Watts \times HOU)_{ee}}{1000}\right] \times 365 \times (1 + HVAC_c)$$

where:

ΔkW	= gross coincident demand savings
ΔkWh	= gross annual energy savings
units	= number of units installed under the program
$Watts_{ee}$	= connected load of energy-efficient unit = 16.34
$Watts_{base}$	= connected (nameplate) load of baseline unit(s) displaced
HOU	= Mean daily hours of use (based on connected load)
CF	= coincidence factor = 0.1
$HVAC_c$	= HVAC system interaction factor for annual electricity consumption = -0.0058
$HVAC_d$	= HVAC system interaction factor for demand = 0.167

The coincidence factor for this analysis was taken as the mean of the coincidence factors estimated by PG&E and SCE for residential CFL program peak demand savings. The PG&E and SCE coincidence factors are combined factors that consider both coincidence and diversity, thus the diversity factor for this analysis was set to 1.0

$HVAC_c$ - the HVAC interaction factor for annual energy consumption depends on the HVAC system, heating fuel type, and location. The HVAC interaction factors for annual energy consumption were taken from DOE-2 simulations of the residential prototype building described at the end of this Appendix. The weights were determined through appliance saturation data from the Home Profile Database supplied by Duke Energy.

Covington, KY

Heating Fuel	Heating System	Cooling System	Weight	HVACc
Other	Any except Heat Pump	Any except Heat Pump	0.0029	0.079
		None	0.0002	0

Any	Heat Pump	Heat Pump	0.0760	-0.16
Gas Propane Oil	Central Furnace	None	0.0111	0
		Room/Window	0.7571	0.079
		Central AC		0.079
Electricity	Electric baseboard/ central furnace	None	0.0046	-0.45
		Room/Window	0.1433	-0.36
		Central AC		-0.36
N one	None	Any	0.0049	0
Total Weighted Mean			1	-0.0058

$HVAC_d$ - the HVAC interaction factor for demand depends on the cooling system type. The HVAC interaction factors for summer peak demand were taken from DOE-2 simulations of the residential prototype building described at the end of this Appendix.

Covington, KY

Cooling System	HVACd
None	0
Room/Window	.17
Central AC	.17
Heat Pump	.17

Prototypical Building Model Description

The impact analysis for many of the HVAC related measures are based on DOE-2.2 simulations of a set of prototypical residential buildings. The prototypical simulation models were derived from the residential building prototypes used in the California Database for Energy Efficiency Resources (DEER) study (Itron, 2005), with adjustments make for local building practices and climate. The prototype "model" in fact contains 4 separate residential buildings; 2 one-story and 2 two-story buildings. The each version of the 1 story and 2 story buildings are identical except for the orientation, which is shifted by 90 degrees. The selection of these 4 buildings is designed to give a reasonable mean response of buildings of different design and orientation to the impact of energy efficiency measures. A sketch of the residential prototype buildings is shown in Figure 18.

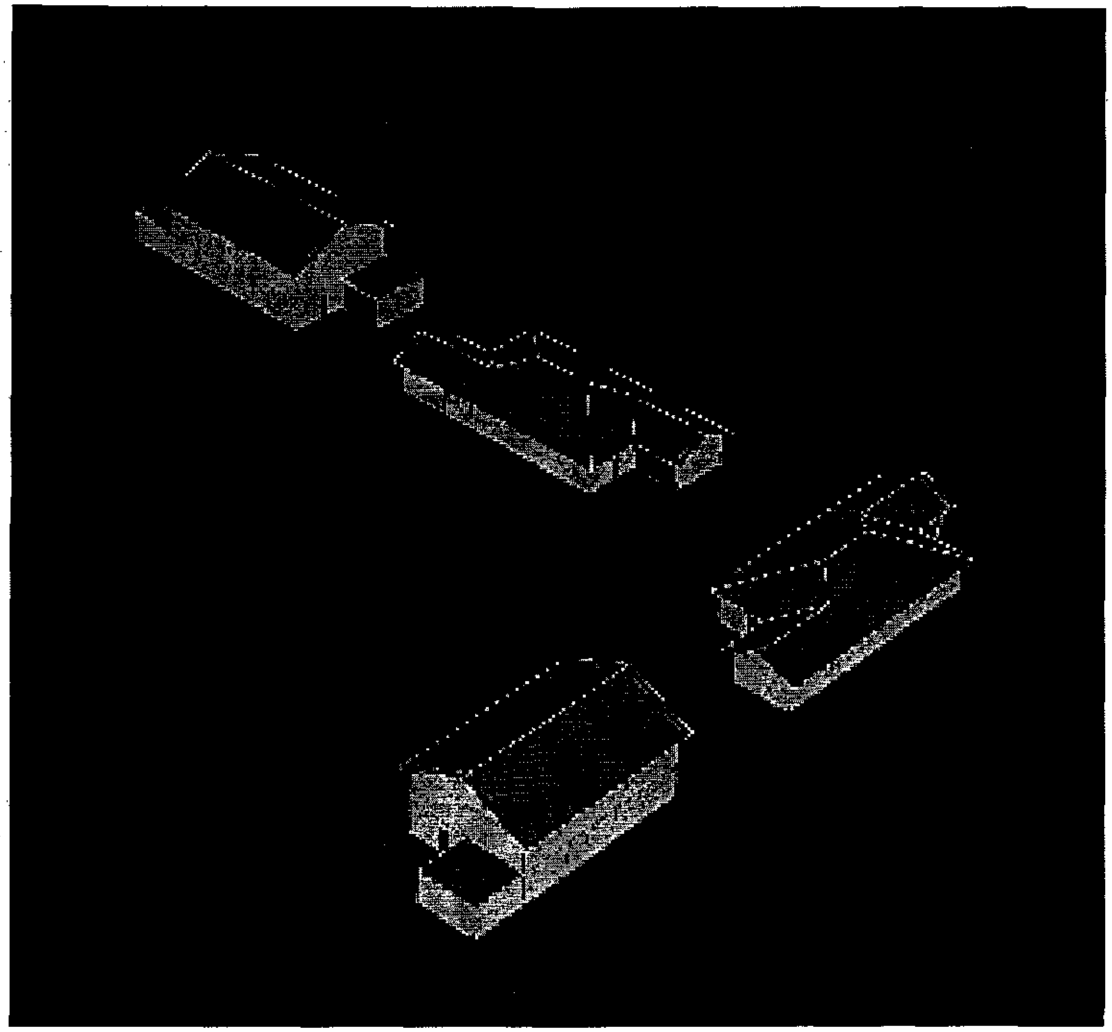

Figure 18. Computer Rendering of Residential Building Prototype Model

The general characteristics of the residential building prototype model are summarized below:

Residential Building Prototype Description

Characteristic	Value
Conditioned floor area	1 story house: 1465 SF 2 story house: 2930 SF
Wall construction and R-value	Wood frame with siding, R-11
Roof construction and R-value	Wood frame with asphalt shingles, R-19
Glazing type	Single pane clear
Lighting and appliance power density	0.51 W/SF mean
HVAC system type	Packaged single zone AC or heat pump
HVAC system size	Based on peak load with 20% oversizing. Mean 640 SF/ton
HVAC system efficiency	SEER = 8.5
Thermostat setpoints	Heating: 70°F with setback to 60°F Cooling: 75°F with setup to 80°F

Characteristic	Value
Duct location	Attic (unconditioned space)
Duct surface area	Single story house: 390 SF supply, 72 SF return Two story house: 505 SF supply, 290 SF return
Duct insulation	Uninsulated
Duct leakage	26%; evenly distributed between supply and return
Cooling season	Covington – April 27th to October 12th
Natural ventilation	Allowed during cooling season when cooling setpoint exceeded and outdoor temperature < 65°F. 3 air changes per hour

References

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

Appendix H: DSMore Table

Impacts ⇨ / Technology ⇩	Product code	State	EM&V gross savings (kWh/unit)	EM&V gross kW (customer peak/unit)	EM&V gross kW (coincident peak/unit)	Unit of measure	Combined spillover less freeridership adjustment	EM&V net savings (kWh/unit)	EM&V net kW (customer peak/unit)	EM&V net kW (coincident peak/unit)	EM&V load shape (yes/no)	EUL (whole number)
CFLs		Ohio	34.4	0.0430	0.0043	lamp	15.76%	29.0	0.0362	0.0036	no	5
Program wide			**34.4**	**0.0430**	**0.0043**		**15.76%**	**29.0**	**0.0362**	**0.0036**		**5**

Appendix I: Required Savings Tables

The required table showing measure-level participation counts and savings is below.

Measure	Participation Count	Verified Per unit kWh impact	Verified Per unit kW impact	Gross Verified kWh Savings	Gross Verified kW Savings
CFLs	243,393	34.4	0.0043	92,969,612	11,621

Impact Evaluation and Review of the 2011 PowerShare® Program in Ohio

Final Report

Prepared for
Duke Energy
139 East Fourth Street
Cincinnati, OH 45201

November 12, 2012

Submitted by:

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Table of Contents

Executive Summary

Introduction and Purpose of Study

This document presents the evaluation report for Duke Energy's PowerShare® Program as it was administered in Ohio.

Duke Energy performed the calculations and conducted the impact analysis, and Integral Analytics (a TecMarket Works' Subcontractor) conducted the review of the methodology and results.

Summary of the Evaluation

The impact analysis of the PowerShare program was conducted by Duke Energy. The basic approach for determining the impacts, capabilities, and profit and loss (i.e., P&L, the MW values used for revenue recovery under Save-A-Watt, SAW) involves combining actual weather data with hourly load data from all enrolled customers, collected for the previous month(s), as appropriate. A regression model is developed using the combined data to provide an estimate of what the load would have been for the customer, absent an event. This is compared to the actual customer load to determine the impacts from the event.

Evaluation Objectives

The purpose of this evaluation is two-fold. The first objective is to summarize the actual kW and expected peak normal kW impacts determined by Duke Energy for 2011. The second objective is to determine if the approach used by Duke Energy in estimating these impacts as well as the capacity values are consistent with commonly accepted evaluation principles.

Recommendations

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and it should result in accurate estimates of Event impacts (i.e., settlement with customers, M&V results for an event, capability values, and P&L values).
In general, the model specifications in all the processes includes the key determinates of energy usage, so there is little likelihood of any bias in the results from omitted variables. One particularly noteworthy feature is that Duke Energy uses an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches. In addition, using a multivariate regression model in the Capabilities, P&L, and M&V processes is generally preferred over approaches that are based on average loads from a pre-event period.

In addition, the technical approach used by Duke Energy in developing settlement calculations for the customer day-ahead Pro forma load (PFL) and the M&V event impacts are very well thought out and developed. The use of multiple methods and determining the Best of Breed (BoB) in the PFL is noteworthy in that it assures that the most accurate approach will be used in developing the PFL – a step which, to the best of our knowledge, is not used by any other entity.

In addition, there appears to be no direct link between the customer payments (based on the day-ahead PFL) and the overall program impacts (based on the M&V and Capability process). Since the day-ahead PFL is based on the BoB approach, while the other processes are based on regression models, it may be that there is a marked difference between the two estimates of load impacts. Therefore, it is our recommendation that Duke Energy investigate a mechanism that will produce all the required reports for customers, internal use, and regulatory requirements, using a single, unified process for the PFLs and the other reports. An example might be to store the day ahead PFLs associated with an event for developing the Capability and M&V processes for appropriate programs.

Relatedly, it is not clear why there are so many different processes involved. While it is obvious that a distinction be made between actual weather and peak normal weather, it is not clear why that requires two distinct processes. It seems possible to combine the Capability and M&V process into one process, where the regression models are estimated once, and for the weather sensitive customers, estimates of both actual and weather normal impacts are estimated from the same model (just using different weather values). In addition, for Ohio, there does not appear to be any substantial difference between the Capability and P&L process, so these two can be combined. Therefore, our recommendation is that Duke Energy reviews the need for each process to see if they are truly required. In terms of P&L process results, the use of these results may be appropriate in the revenue recovery process but that is best addressed by Duke Energy and the state regulatory entities.

Description of Program

The Ohio PowerShare Program is a program designed to reduce electric demand within the transmission and distribution system during periods of high energy prices or when electric supplies are nearing critical supply levels (emergency conditions). In both these situations, the PowerShare program allows Duke Energy to purchase load reduction from their customers by paying their commercial and industrial customers to reduce their energy demand, thus increasing the available energy supply.

During periods of high energy costs it can be less expensive for all ratepayers to pay program participants to reduce consumption than it would be to purchase high cost power off an economically stressed market. Likewise, when energy suppliers are limited, such as in the summer with hot and humid week-day periods when most customers turn on their air-conditioning systems, there may not be enough power to supply all energy needs. In these instances, it can become necessary to compensate customers for shutting down the equipment that increases demand. PowerShare is designed to help in these conditions by reducing electric use during critical times.

There are two distinct program options under PowerShare:

- **CallOption** – CallOption is a combined emergency and economic-based program although customers can choose to enroll for emergency event participation only. Enrollment requires customers to commit to shift a predetermined amount of kW during each Emergency event to the level specified in their PowerShare agreement. Curtailment is implemented when the PJM Interconnection, LLC (PJM) determines an event is necessary. Participants must curtail during emergency events. [Note that customers who have selected an alternate generation service provider can only participate in emergency events.] Participation in economic-based program options requires a load shift during the specified event, but a buy-through provision allows customers to continue operating if they are willing to pay the market price for power that they designated they would reduce. Customers can choose the number of events in which to participate among multiple levels offered at the beginning of each year.
- **QuoteOption** Participation allows customers to take part in voluntary curtailment periods on a per event basis. To qualify for the credits, customers must designate a load reduction amount on the My Duke Energy web site. Customers are compensated on the load curtailed, multiplied by the price posted. Curtailment is initiated at Duke Energy's discretion and notification is typically provided one business day in advance. Credits are paid for load curtailed during each event, but there are no monthly incentives.

Overview of the Evaluation Approach

The impact analysis for the PowerShare programs was conducted by Duke Energy staff and evaluated by Integral Analytics staff. The results presented in this report include a review by Integral Analytics of the impact evaluation methodology and results.

The evaluation of the PowerShare program must meet a diverse set of goals. Specifically, after each event, the level of load reduction must be calculated for each participant. If the participant is on a firm service level reduction agreement, the determination is made if they reduced load from wherever their load would have been absent the event, a baseline, to their actual load during the event period. Another key feature of a firm service level agreement is to determine if the customer's load is at or below the firm service level during the event hours, regardless of the amount of load reduction provided. If the customer is on a fixed reduction agreement, the evaluation calculates the difference between the baseline and the actual load during the control period to see if the agreed amount of reduction was achieved.

Credits or penalties for events, using PFLs, are calculated within the Energy Profiler Online (EPO) system for PowerShare and recorded on the customer's utility bill. In addition, the results of the various evaluations are used to develop reports for the system operator, load availability projections, summer curtailment projections for state level planning, and event load reduction analysis.

A further complication is that an economic control event can be called on any non-holiday, non-weekend day and therefore, the PFL calculation must be available on each of these days. The control season runs all year for emergency events; however, economic events, although possible outside the summer season, tend to be limited to the summer season. Regardless of the date, the evaluation needs to be able to assess the load data of all participants so that Duke Energy can calculate the amount of load reduction that is achieved at any time.

These requirements have resulted in an extensive evaluation procedure. This evaluation procedure consists of the following tasks:

Table 1. PowerShare Evaluation Procedures

Process	Purpose	Frequency
Day-ahead PFLs	Settlement with customers and emergency event load reduction estimates	Every weekday
Monthly Capabilities	Internal Reporting and input into P&L process	Monthly
Profit and Loss (P&L)	Regulatory filings for revenue recovery	Monthly as needed with year-end true-up
M&V	Reporting actual impacts of events to regulatory bodies.	Monthly if an event occurred in the prior month

Other processes which are done on an as-needed basis include event day analysis and generator tests.

A high-level overview of each process in Table 1 is given below.

Day-Ahead PFLs

This process, as the name implies, creates the day-ahead pro forma (i.e., estimated assuming no control events) load shapes (PFL) specific to each customer.

The estimation of the PFL involves using 12 weeks (84 days) of historical load and weather data (eliminating NERC holidays, event days, generator test days (for generator customers only) and any days identified as quiet periods from the analysis) to produce hourly predicted load shapes for the next thirty days based upon forecasted weather for each region.

The estimation of the PFL involves using five different estimation approaches:

- Hourly regression,
- PJM average method,
- MISO average method,
- Last two days average, and a
- Hybrid method.

A summary of each approach is presented below.

Hourly Regression

In this method, hourly energy is regressed on a set of Fourier variables, weather variables and monthly dummies (if appropriate). An autoregressive (AR) process is fit to the error terms. This AR process has lags at 1, 24 and 25. The same model is re-fit except that weather variables are excluded. Then an F-test is performed to see if weather is a significant explanatory factor and the appropriate model results are used for further calculations.

PJM Method

This method is based on the method PJM uses to calculate CBLs for settlement. It calculates an average load shape based on the high 4 of 5 days selected by the method. Those 5 days are selected from a 45 day window of days. Only weekdays are considered. The initial set of days is the most recent 5 days in the window. If the average usage on any day in the 5 days is less than 25% of the overall average for the 5 days, that day is dropped and a replacement selected. This loop is repeated until there are 5 days, none of whose average usage is less than 25% of the average usage. The 4 days with the highest usage are selected from this group and the average load shape is calculated using those 4 days.

MISO Method

The MISO method is similar to the PJM method. The differences are the MISO method uses 10 days, there are no exclusions for low usage and all 10 days are used to calculate the load shape.

Last Two Days Method
For this method, the load shape is calculated based upon the most recent past two weekdays hourly load shapes.

Hybrid Method
This method first performs a regression of the daily energy usage for a customer. The explanatory variables are binary variables for day of the week, a daily weather variable, monthly dummies (if appropriate) and interactions between the weather variables and binary variables. The model is fit using an AR(7) process. As with the hourly regression, the model is re-fit without the weather variables and an F-test performed to determine the appropriate model. Once the predicted daily energy has been determined it is spread over the hours of the day using the load shape from the PJM method after that load shape has been normalized by the total energy under the shape.

Best-of-Breed (BoB)
For each customer, the "best" method is chosen to produce the final day-ahead baseline estimates. This is done by comparing the predicted load from each method to the actual load for the five days that went into the PJM method at an hourly, daily, and total level. Specifically:

- For the hourly value, the absolute value of each hourly difference between the predicted and actual load is summed across all five days.
- For the daily value, the difference for each hour is summed for each day, then the absolute value is summed across the five days.
- For the total the difference in each hour for all five days is calculated for all five days, then summed and the absolute value is taken.

The best method is chosen based on each methods relative performance of these differences. If a method is the best for at least two values, then the PFL from that method is used. Otherwise, the PFL from the method which produced the lowest hourly variance is used.

Capability, P&L, and M&V

The steps involved in the calculation of the monthly reports of Capability, P&L, and M&V are all similar, and therefore will be discussed as a group. In addition, for PowerShare Quote Option, the Capability and P&L processes are not performed since they are not relevant to the program. For PowerShare CallOption and for the M&V process for PowerShare Quote Option, hourly load data from all enrolled customers is collected for the previous month. Data is treated similarly but with a few exceptions such as the modeling of quiet periods. Days when participants have reduced load, due to a maintenance shutdown for example, are excluded or specifically modeled depending on the process.

These data are combined with the actual weather for that month. A regression model is developed using the combined data similar to the hourly regression model discussed in the day-ahead PFL calculations discussed above. Specifically, the regression equation relates the customer's hourly electricity load to:

- A Fourier transform of hour of the day
- A Fourier transform of hour of the week
- A Fourier transform of hour of the month
- Temperature Humidity Index
- Binary variables for holidays and quiet periods, if appropriate
- Interactions between the Fourier transforms and the other variables

An F-test is calculated for each customer to determine if weather is a significant explanatory variable (unless weather is explicitly excluded). If so, then the estimated parameters are used to create predicted loads using peak normal weather conditions for the Capability and P&L processes, while the M&V process uses actual weather. Thus, the PFLs from the Capability and P&L processes represent weather normal loads, while the PFLs from the M&V process are representative of the actual load the customer would have consumed absent an event.

Table 2. Differences across Capabilities, P&L, and M&V processes

Process	Days Eliminated	Weather Data
Capabilities	Event and Generator Test	Peak Normal
P&L	Event	Peak Normal
M&V	Event and Generator Test	Actual Weather

Evaluation Findings

Load Impact Results

Based on the evaluation performed by Duke Energy staff following the procedures discussed above, the resulting PowerShare impacts during 2011 are produced from the M&V process and should be viewed as the actual load reduction impacts achieved on event days in 2011. The values in the table are adjusted for line losses and can be interpreted as load reduction at the generator.

Table 3. PowerShare Program M&V Impacts, 2011 Ohio System

Date	Hour Ending	EDT/EST	PS CallOption (MW)	PS QuoteOption (MW)	PowerShare Total (MW)
06/07/2011	12	EST	2		2
06/07/2011	13	EST	2.3		2.3
06/07/2011	14	EST	2.1		2.1
06/07/2011	15	EST	1.9		1.9
06/07/2011	16	EST	1.6		1.6
06/07/2011	17	EST	1		1
06/07/2011	18	EST	0.7		0.7
06/07/2011	19	EST	0.5		0.5
06/08/2011	12	EST	1.6		1.6
06/08/2011	13	EST	1.8		1.8
06/08/2011	14	EST	1.7		1.7
06/08/2011	15	EST	1.7		1.7
06/08/2011	16	EST	1.5		1.5
06/08/2011	17	EST	1.5		1.5
06/08/2011	18	EST	1.2		1.2
06/08/2011	19	EST	1		1
07/12/2011	12	EST	1.7		1.7
07/12/2011	13	EST	1.7		1.7
07/12/2011	14	EST	2.2		2.2
07/12/2011	15	EST	1.8		1.8
07/12/2011	16	EST	1.1		1.1
07/12/2011	17	EST	0.9		0.9
07/12/2011	18	EST	0.2		0.2
07/12/2011	19	EST	0		0
07/21/2011	12	EST	1.7		1.7
07/21/2011	13	EST	1.8		1.8
07/21/2011	14	EST	2		2
07/21/2011	15	EST	2		2

07/21/2011	16	EST	1.8		1.8
07/21/2011	17	EST	1.3		1.3
07/21/2011	18	EST	0.8		0.8
07/21/2011	19	EST	0.6		0.6
07/22/2011	12	EST	1.7		1.7
07/22/2011	13	EST	2		2
07/22/2011	14	EST	2		2
07/22/2011	15	EST	2.2		2.2
07/22/2011	16	EST	1.8		1.8
07/22/2011	17	EST	1.2		1.2
07/22/2011	18	EST	0.7		0.7
07/22/2011	19	EST	0.3		0.3
07/28/2011	12	EST	1.4		1.4
07/28/2011	13	EST	1.7		1.7
07/28/2011	14	EST	1.8		1.8
07/28/2011	15	EST	1.8		1.8
07/28/2011	16	EST	1.9		1.9
07/28/2011	17	EST	1.4		1.4
07/28/2011	18	EST	1		1
07/28/2011	19	EST	0.6		0.6
08/02/2011	12	EST	2		2
08/02/2011	13	EST	2.1		2.1
08/02/2011	14	EST	1.9		1.9
08/02/2011	15	EST	1.9		1.9
08/02/2011	16	EST	1.4		1.4
08/02/2011	17	EST	0.9		0.9
08/02/2011	18	EST	0.6		0.6
08/02/2011	19	EST	0.4		0.4

Based on the evaluation performed by Duke Energy staff following the procedures discussed above and on peak normal weather, the resulting 2011 PowerShare P&L impacts and 2011 Summer Capability are produced from the P&L and Capability process. The P&L value should be viewed as the average of 12 monthly values that represent the summer capability of participants enrolled in the program during each month throughout the year. The Capability value should be viewed as the load reduction capability of enrolled participants through the summer of 2011. These values are presented in Table 4.

Table 4. PowerShare Program Summer Capability, 2011 Ohio

Program	Number of Participants	Capability Adjusted for Losses
PowerShare CallOption Ohio	75	97.9 MW

Table 5. PowerShare 2011 OhioP&L Values

Measure	CallOption 0_5	CallOption 5_5	CallOption 10_5	CallOption 15_5	Average
Economic Events	0	5	10	15	
Emergency Events	5	5	5	5	
Jan-11	35,579	2,276			37,856
Feb-11	35,579	2,276			37,856
Mar-11	35,579	2,276			37,856
Apr-11	35,579	2,276			37,856
May-11	35,579	2,276			37,856
Jun-11	53,201	1,609			54,811
Jul-11	53,201	1,609			54,811
Aug-11	53,201	1,609			54,811
Sep-11	53,201	1,609			54,811
Oct-11	53,201	1,609			54,811
Nov-11	53,201	1,609			54,811
Dec-11	53,201	1,609			54,811
Average	45,859	1,887			47,746

Review of Approach

Overall, the technical approach used by Duke Energy in developing the customer PFL and the event impacts are very well thought out and developed. The use of multiple methods and determining the Best of Breed (BoB) in the PFL is noteworthy in that it assures that the most accurate approach will be used in developing the PFL – a step which, to the best of our knowledge, is not used by any other entity.

In general, the model specifications in all the processes includes the key determinates of energy usage, so there is little likelihood of any bias in the results from omitted variables. One particularly noteworthy feature is that they use an extensive history to estimate the model, rather than relying on only a handful of days as is common in many utilities which use less rigorous approaches. In addition, using a multivariate regression model in the Capabilities, P&L, and M&V processes is generally preferred over approaches that are based on average loads from a pre-event period.

The one concern we have is that there are multiple processes that essentially measure the same thing. For example, the PFL and M&V processes both measure the impacts for a specific event day (i.e., the effect of the event on load shapes). Likewise, the P&L and Capability processes are essentially both measuring the peak normalized load reduction capability of participants. This appears to be inefficient, as well as confusing, as it is not clear what the actual estimate of impacts is for the program without considerable explanation. Of note, Duke Energy describes the P&L value as follows:

- The PowerShare programs allow the company to reduce load at any point during the year during an emergency. Because of that, the Company recognizes revenue ratably over a 12 month period based on the current summer capability for that month. (Said another way, the Company multiplies its current kW summer capability times the avoided cost of capacity per kW / 12.) The Company accordingly reports its 12-month average summer capability in regulatory true up proceedings for the PowerShare program.

In addition, there appears to be no direct link between the customer payments (based on the day-ahead PFL) and the overall program impacts (based on the M&V and Capability process). Since the day-ahead PFL is based on the BoB approach while the other processes are based on regression models, it may be that there is a marked difference between the two estimates of load impacts.

Therefore, it is our recommendation that Duke Energy investigates a mechanism that will produce all the required reports for customers, internal use, and regulatory requirements, using a single, unified process for the PFLs and the other reports. An example might be to store the day ahead PFLs associated with an event for developing the Capability and M&V processes for appropriate programs.

Relatedly, it is not clear why different processes must be involved. While there appears to be a specific purpose for each process, there may be efficiencies captured by consolidating the processes. While it is obvious that a distinction be made between actual weather and peak normal weather, it is not clear why that requires two distinct processes. It seems possible to combine the Capability and M&V process into one process, where the regression models are estimated once, and for the weather sensitive customers, estimates of both actual and weather normal impacts are estimated from the same model (just using different weather values). In addition, a difference between the Capability and P&L process is that the P&L includes customers who have enrolled after the beginning of summer or potentially participated during the beginning of the year but terminated their participation prior to the summer. Duke Energy clearly wants to capture these enrollments and collect revenues for them during the current year. However, it is our opinion that the P&L process may overstate or understate the actual capability of the program, if for example you are talking about the capability of the program during the summer of 2011. Therefore, our recommendation is that the impacts should be based on the Capability calculations, and Duke Energy should review the need for each process to see if they are truly required. In terms of P&L process results, the use of these results may be appropriate in the revenue recovery process but that is best addressed by Duke Energy and the state regulatory entities.

Overall, based on our review, Duke Energy's impact evaluation is a very complete and innovative approach, and it should result in accurate estimates of event impacts.

Process Evaluation of the Power Manager Program in Ohio:

An Analysis of Participant Surveys after Power Manager Events

Final Report

Prepared for
Duke Energy
139 East Fourth Street
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February 22, 2013

Submitted by

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Executive Summary

Significant Findings from Participant Surveys

- Only 46% of participants surveyed are aware that Power Manager has been activated since they joined the program. More than half of participants don't know how to tell if the device is activated. Among those that could name a reason for their awareness of Power Manager activation events, the most often cited reasons were "home temperature rises" followed by "air conditioner shuts down".
- More than 70% of participants were at home during the Power Manager activation event or non-event high temperature day which triggered the survey.
- Among participants surveyed who were home during a Power Manager activation event, only 24% were aware that the activation had occurred. Although there was no Power Manager activation for the Non-Event surveys, 6% of these participants believed an event had occurred. This difference is statistically significant, but most participants in both groups said they "don't know" if there was an activation or not.
- Among participants who were at home and were able to give comfort ratings for "before" and "during" the event or non-event high temperature day, 30% of those in the Event group reported a decline in comfort ratings, compared to only 5% of those in the Non-Event group.
- The amount of the decline in comfort ratings was also larger during activation events: On a 10-point scale, the Event participants' mean comfort fell by 0.8 overall during the activation event, versus a miniscule decline that rounds off to 0.0 in the Non-Event group. Among only those participants who reported a decline in comfort, the average decline was 2.7 for the Event group and 1.0 for Non-Event participants.
- Sixteen participants (11% of 140 surveyed) were not the original occupant who joined the program and had a Power Manager device installed. These participants were significantly more likely to be aware of device activation since joining the program by moving into a home with Power Manager (69% aware vs. 44% of original occupants who joined the program), and those in the Event group were much more likely to be aware of the recent activation event (67% vs. 18% of original occupants at home during the event). 50% of these participants who were in the Event group reported a decline in comfort during the event, but the sample size is not large enough to conclude that this is significantly higher than the 27% of original occupants in the Event group who reported a decline in comfort.
- When participants whose comfort declined were asked to describe the cause of their decrease in comfort on the day of the activation event or non-event high temperature day, 85% of Event participants blamed "rising temperatures", while only 8% blamed the Power Manager activation. Among Non-Event participants (for whom there was no device activation), 100% blamed rising temperatures and none blamed Power Manager.
- The age of the participants' air conditioner unit and the outdoor high temperature have some effect on declines in comfort, but not as much effect as the presence of a Power Manager activation event.

- During the activation event or non-event high temperature day, 12% of Event participants adjusted their thermostat settings, compared to 16% of Non-Event participants. Overall, 40% of participants turned on fans, which was the most common action taken.
- Satisfaction with this program is high: mean satisfaction ratings on a 10-point scale (where 10 is "most satisfied") were 8.4 among both Event and Non-Event participants. Using the same scale, participants were also willing to recommend the program with mean scores of 8.3 for Events and 8.1 for Non-Events. Satisfaction with Duke Energy overall was similarly high, with mean scores of 8.4 for Events and 8.2 for Non-Events.
- Participants surveyed who were not the original occupant who joined the program were more likely to be dissatisfied with the program: 25% said they were "very" or "somewhat" dissatisfied, compared to just 1% of original occupants giving those ratings.

Introduction and Purpose of Study

The purpose of this process study was to evaluate participant behavior, awareness of, and satisfaction with Duke Energy's Power Manager® Program as it was administered in Ohio.

Summary of the Evaluation

The evaluation was conducted by TecMarket Works. The survey instruments were developed and administered by TecMarket Works.

Researchable Issues

1. Determine what percentage of program participants are aware of the occurrence of individual program events.

2. Determine whether customer comfort or discomfort during a Power Manager event is affecting participant behavior.

3. Determine overall participant satisfaction with the Power Manager program.

Description of Program

Power Manager is a voluntary residential program, available to homeowners with qualified central air conditioning (AC). On days where energy demand and/or energy costs are expected to be high, Duke Energy has permission from Power Manager participants to cycle their air conditioning off and on for a period of time.

The Power Manager program allows customers to select which load reduction target they would be willing to achieve, either 1.0 kW or 1.5 kW. During an event, customers in the 1.5 kW option would have their air conditioner cycled off for a few minutes longer in each half hour than the 1.0 kW customers. Events may be called on non-holiday weekdays during the months of May through September.

Within Duke Energy Ohio's portfolio, Power Manager is currently the only residential demand response program[1]. The Power Manager program plays a key role in capacity planning; every year, Power Manager management provides an estimate as to how much capacity it can provide during the summer season, and this information is taken into account by the capacity planners.

Program Participation

Power Manager Program	Year-end 2012 Participation
Customers	40,787
Devices	43,250

[1] Not including pilot programs.

Methodology

TecMarket Works conducted after-event phone surveys (event surveys) to collect participant information for this evaluation. The survey was maintained in a "ready-to-launch" status until notified of a control event affecting switches used by Duke Energy. The surveys were launched as soon as possible following the end of the control event (at 5pm Eastern) and continued over a 27 hour period[2] with all call attempts made during regular surveying hours (10:00 a.m. to 8:00 p.m. Eastern Standard Time, Monday through Saturday). For example, if a control event occurred on a Monday, calling hours for that particular event were:

- Monday 5pm-8pm Eastern
- Tuesday 10am-8pm Eastern

Event surveys followed events occurring on June 20, June 21, June 28, July 5 and July 6. TecMarket Works surveyed a total of 65 participants in Ohio. The survey can be found in Appendix A: Event Survey Instrument.

Before we asked the participants about the event, we inquired if they knew that there was a control event within the last 7 days so that we could understand if they are able to identify when a control event had occurred. The surveyor then notified the customer that they had just had a control event which had begun at *<start hour of control>* and ended at *<end hour of control>*. This allowed the participants to immediately recall the time period of the event and be able to respond to questions regarding the impact of that event on their use of their air conditioner and allow recollection of other actions taken, as well as the impact of the event on their comfort. Once informed of the event that had just occurred, the survey also assessed satisfaction with the program at the point of an event.

TecMarket Works also called Power Manager participants on hot days without control events to conduct the same survey (with slight wording alterations, as shown in red text in Appendix B: Non-Event Survey Instrument). This survey was conducted on six different non-event days of at least 91°F. The heat index was also considered in determining a non-event day. On and following the high temperature dates of July 16, July 18, July 25, July 31, August 2 and August 16, TecMarket Works surveyed at total of 75 Power Manager participants.

The schedule of Power Manager event days and non-event high temperature days used for this survey in Ohio is shown in Table 1, along with the high temperatures and heat indexes for those dates.

[2] The first Power Manager activation events of 2012 occurred on June 20 and 21, and the original plan was to survey for 51 hours after the event. However, after these initial events TecMarket Works decided to reduce the survey window to 27 hours, for two reasons: so that surveys would be spread throughout the cooling season (instead of all completed early in the season), and because respondent recollections would be more accurate if surveyed closer to the event date. The June 21 Event surveys ran until June 23, the only time surveys were completed more than 27 hours after a device activation event in Ohio.

Table 1. Schedule of Events and Non-Event High Temperature Days in Ohio

Event ID	Type	Date	Event Hours	Date of Survey	High temp	Heat Index
OH-event1	Event	20-Jun-12	2:30 to 5pm	20-Jun-12	91	93
OH-event1	Event	20-Jun-12	2:30 to 5pm	21-Jun-12		
OH-event2	Event	21-Jun-12	2:30 to 6pm	21-Jun-12	92	93
OH-event2	Event	21-Jun-12	2:30 to 6pm	22-Jun-12		
OH-event2	Event	21-Jun-12	2:30 to 6pm	23-Jun-12		
OH-event3	Event	28-Jun-12	2:30 to 6pm	28-Jun-12	104	107
OH-event3	Event	28-Jun-12	2:30 to 6pm	29-Jun-12		
OH-event4	Event	5-Jul-12	2:30 to 6pm	5-Jul-12	99	103
OH-event4	Event	5-Jul-12	2:30 to 6pm	6-Jul-12		
OH-event5	Event	6-Jul-12	2:30 to 6pm	6-Jul-12	101	105
OH-event5	Event	6-Jul-12	2:30 to 6pm	7-Jul-12		
OH-nonevent1	non	16-Jul-12	NA	16-Jul-12	95	99
OH-nonevent1	non	16-Jul-12	NA	17-Jul-12		
OH-nonevent2	non	18-Jul-12	NA	18-Jul-12	95	105
OH-nonevent2	non	18-Jul-12	NA	19-Jul-12		
OH-nonevent3	non	25-Jul-12	NA	25-Jul-12	94	108
OH-nonevent3	non	25-Jul-12	NA	26-Jul-12		
OH-nonevent4	non	31-Jul-12	NA	31-Jul-12	92	95
OH-nonevent4	non	31-Jul-12	NA	1-Aug-12		
OH-nonevent5	non	2-Aug-12	NA	2-Aug-12	91	94
OH-nonevent5	non	2-Aug-12	NA	3-Aug-12		
OH-nonevent6	non	16-Aug-12	NA	16-Aug-12	91	92
OH-nonevent6	non	16-Aug-12	NA	17-Aug-12		

Data collection methods, sample sizes, and sampling methodology

Participant Event and Non-Event Surveys

All surveys were conducted by phone with randomly selected program participants. A total of 80 Event surveys and 80 Non-Event surveys were targeted for completion.

Number of completes and sample disposition for each data collection effort

Participant Event Surveys

From the sample list of customers, 371 participants were called between June 20, 2012 and July 7, 2012, and a total of 65 usable telephone surveys were completed yielding a response rate of 17.5% (65 out of 371). [3]

[3] Fourteen interviews were also completed following a test event on September 12, but these are not reported in this study (since it was not a normal demand-driven Power Manager event).

Participant Non-Event Surveys

From the sample list of customers, 501 participants were called between July 16, 2012 and August 17, 2012, and a total of 75 usable telephone surveys were completed yielding a response rate of 15.0% (75 out of 501).

Expected and achieved precision

Participant Event Surveys

The survey sample methodology had an expected precision of 90% +/- 9.2% and an achieved precision of 90% +/- 10.2%.

Participant Non-Event Surveys

The survey sample methodology had an expected precision of 90% +/- 9.2% and an achieved precision of 90% +/- 9.5%.

Threats to validity, sources of bias and how those were addressed

There is a potential for social desirability bias[4] but the customer has no vested interest in their reported program participation, so, this bias is expected to be minimal.

Snapback and Persistence

The theoretical additional energy and capacity used by customers that may occur from implementing an energy efficiency product is often called "snapback." There is little to no literature or snapback analysis within the evaluation industry that has been able to identify a snapback condition.

In this process evaluation, survey participants were asked if they had adjusted the thermostat on their air conditioner during an event or non-event cycle. Three event participants and three non-event participants reported setting a lower thermostat temperature during the cycle. (See *Thermostat Adjustments* on page 25.)

[4] Social desirability bias occurs when a respondent gives a false answer due to perceived social pressure to "do the right thing."

Participant Surveys

TecMarket Works surveyed current Power Manager participants in order to better gauge their awareness of Power Manager events and their perception of discomfort caused by Power Manager curtailment events.

TecMarket Works conducted the surveys regarding each event during a 27-hour window[5] beginning at 5 p.m. EST on the day that a curtailment event occurred and ending at 8 p.m. EST the day after the curtailment event. Calling hours were 10 a.m.- 8 p.m. EST. Following events occurring on June 20, June 21, June 28, July 5 and July 6, TecMarket Works surveyed a total of 65 participants in Ohio. The Event survey protocol is located in Appendix A: Event Survey Instrument.

In order to control for customer perceptions and experiences not caused by Power Manager curtailment events, TecMarket Works also surveyed participants referencing days on which the heat index was high enough to trigger a curtailment event, but on which no curtailment event actually occurred. On and following the high temperature dates of July 16, July 18, July 25, July 31, August 2 and August 16, TecMarket Works surveyed at total of 75 participants in Ohio. The high temperature Non-Event survey is located in Appendix B: Non-Event Survey Instrument.

Home Occupancy During Power Manager Activation

TecMarket Works asked Event respondents whether they were home during the actual event timeframe (typically 2:30-6:00pm EST) and asked Non-Event survey respondents if they were home at 3pm EST on the date of the high temperature. The results in Figure 1 and Figure 2 show that 78.5% (51 out of 65) of Event and 68.0% (51 out of 75) of Non-Event survey respondents were home during these times.

[5] Surveys were fielded for 51 hours the activation event of June 21. All other Event surveys were fielded within 27 hours of the activation event.

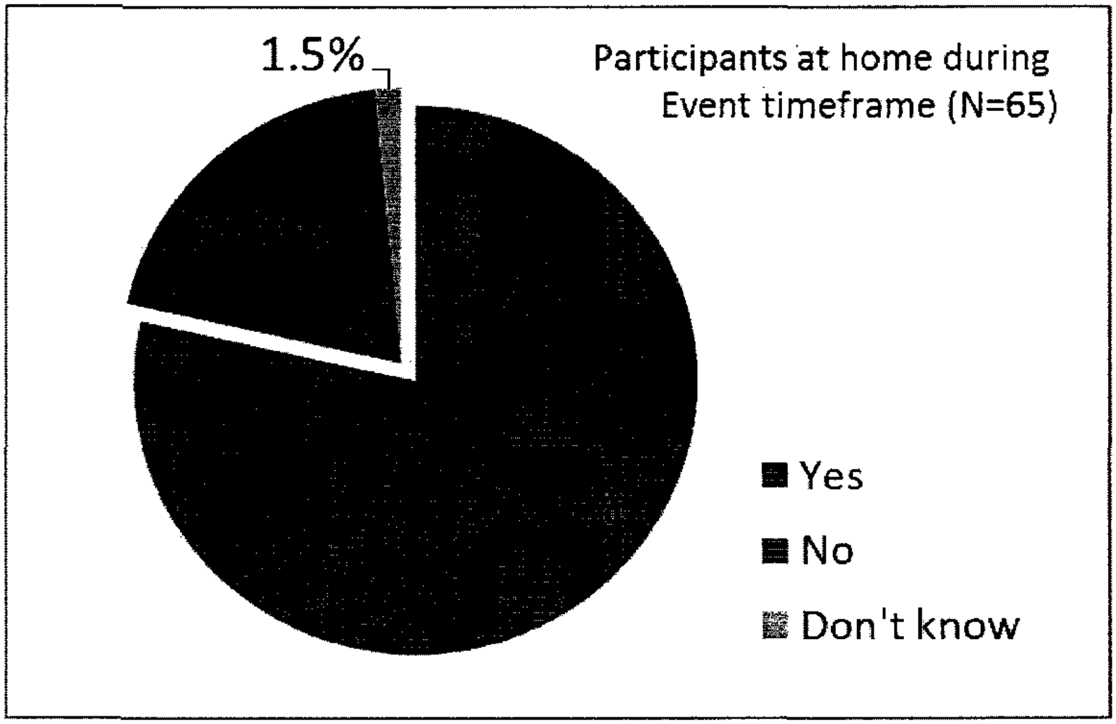

Figure 1. Event Participants at Home During Event Timeframe (N=65)

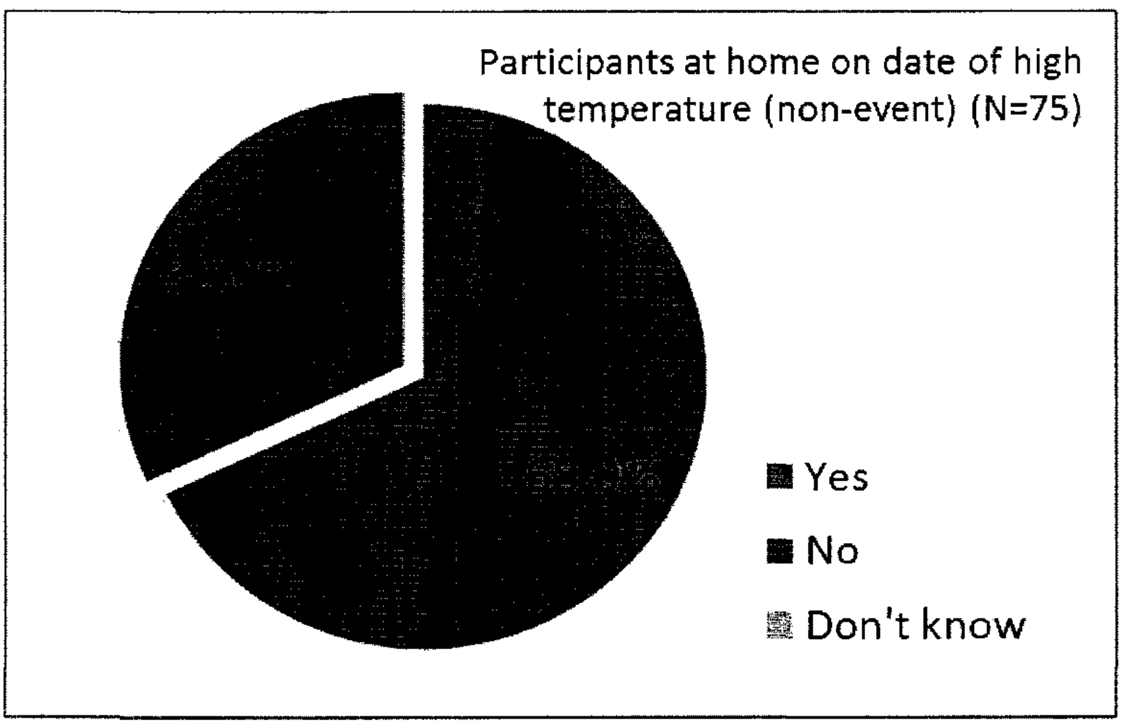

Figure 2. Non-Event Participants at Home on Date of High Temperature (N=75)

General Awareness of Device Activations

In order to gauge awareness of the Power Manager device activation, TecMarket Works first asked Event and Non-Event participants if they were aware of a device activation occurring since they had joined the program. The results in Figure 3 show that roughly half of participants surveyed were aware that an activation had occurred at some point since their enrollment, while roughly half were unaware of whether an activation had occurred or not. Participants in the Non-Event group were more likely to be aware that an activation had occurred (52.0% or 39 out of 75, versus 40.0% or 26 out of 65 Event participants; this difference is statistically significant at $p<.10$ using student's t-test). Only a handful of participants were sure that Power Manager had not been activated (1.5% of Event participants or 1 out of 65, and 4.0% of Non-Event participants or 3 out of 75).

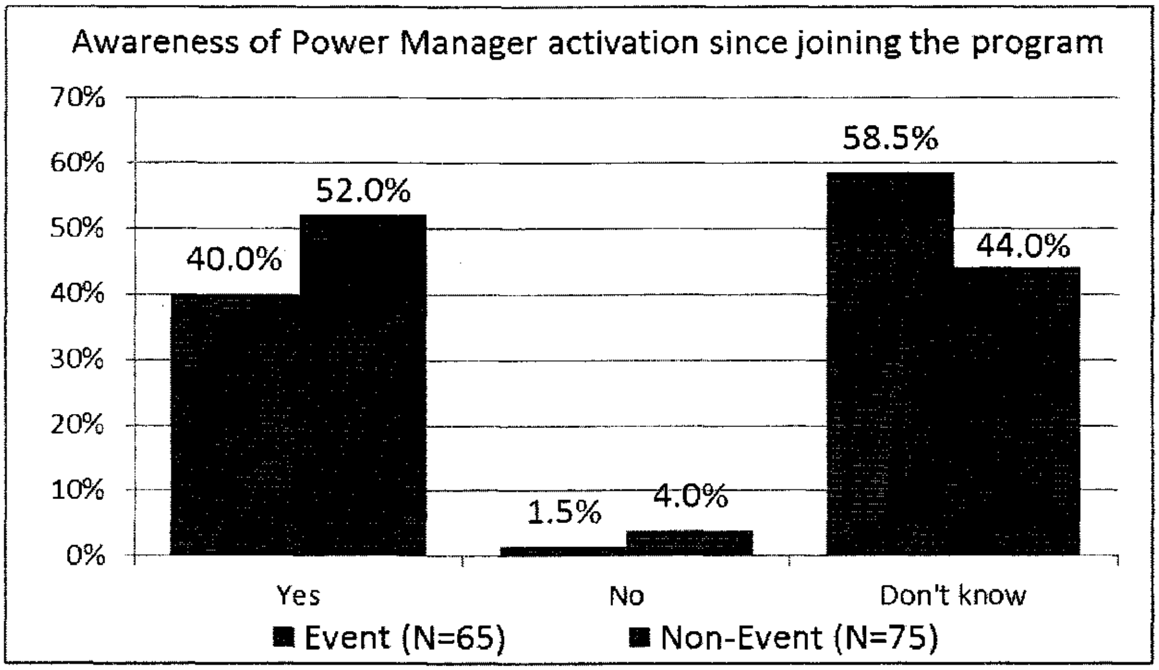

Figure 3. Awareness of Power Manager Activation Since Enrolling in the Program

TecMarket Works followed up the initial awareness question by asking participants an open-ended question as to how they knew that the Power Manager device had been activated. Over half of participants stated that they did not know how to tell if the Power Manager device had been activated, as seen in Table 2. For both Event and Non-Event participants, the most commonly mentioned indicator of Power Manager activation was "home temperature rises", followed by "air conditioning shuts down", though the latter reason was more likely to be mentioned by Event participants (15.4% or 10 out of 65, compared to 8.0% or 6 out of 75 Non-Event participants; this difference is significant at $p<.10$ using student's t-test). Event participants were also more likely to mention "fan goes into cycling mode" (6.2% or 4 out of 65, compared to 0.0% or 0 out of 75 Non-Event participants; this difference is significant at $p<.05$ using student's t-test).

Table 2. Reasons for Awareness of Activation

	Percentage of times mentioned by...		
	Event Participants (N=65)	Non-Event Participants (N=75)	Difference
Home temperature rises	20.0%	17.3%	2.7%
AC shuts down	15.4%	8.0%	7.4%
The light on the meter is on	3.1%	5.3%	-2.2%
Bill credits	1.5%	5.3%	-3.8%
Fan goes into cycling mode	6.2%	0.0%	6.2%
Non-bill contact from Duke Energy (mailer, phone, employee)	3.1%	2.7%	0.4%
The light on the AC unit flashes	1.5%	1.3%	0.2%
Breaker or power outage / voltage drop	1.5%	2.7%	-1.2%
Expect it to activate when it is hot outside	1.5%	0.0%	1.5%
Lower bills	0.0%	1.3%	-1.3%
Unique response (see below)	0.0%	1.3%	-1.3%
Don't know	60.0%	57.3%	2.7%

Note: Multiple responses were allowed per participant

One Non-Event participant offered a unique response to this question:

- "*There was a date a year or two ago that I noticed it was activated. This year - not sure - compressor has been working harder since we lost several shady ash trees to the emerald ash borer.*"

Event participants' reasons for awareness of Power Manager activation are broken out separately in Figure 4 for those who were aware that Power Manager had been activated since they joined the program, who were not aware, and who "don't know" if they were aware. The sole Event participant who believe that Power Manager has not been activated since they joined the program stated that they "don't know" how to tell if Power Manager is activated (100% or 1 out of 1).

Among Event participants who were not sure if Power Manager had been activated, 76.3% (29 out of 38) say they "don't know" how to tell if Power Manager has been activated, though 10.5% (4 out of 38) mentioned "home temperature rises" and 7.9% apiece (3 each out of 38) mentioned "the air conditioning shuts down" and "fan goes into cycling mode". Event participants who were aware that Power Manager has been activated since they joined the program were far less likely to not be able to give a reason for their awareness (only 34.6% or 9 out of 26 "don't know" how to tell when Power Manager activates), and the most frequently mentioned reasons for their awareness are "home temperature rises" (34.6% or 9 out of 26) and "air conditioning shuts down" (26.9% or 7 out of 26).

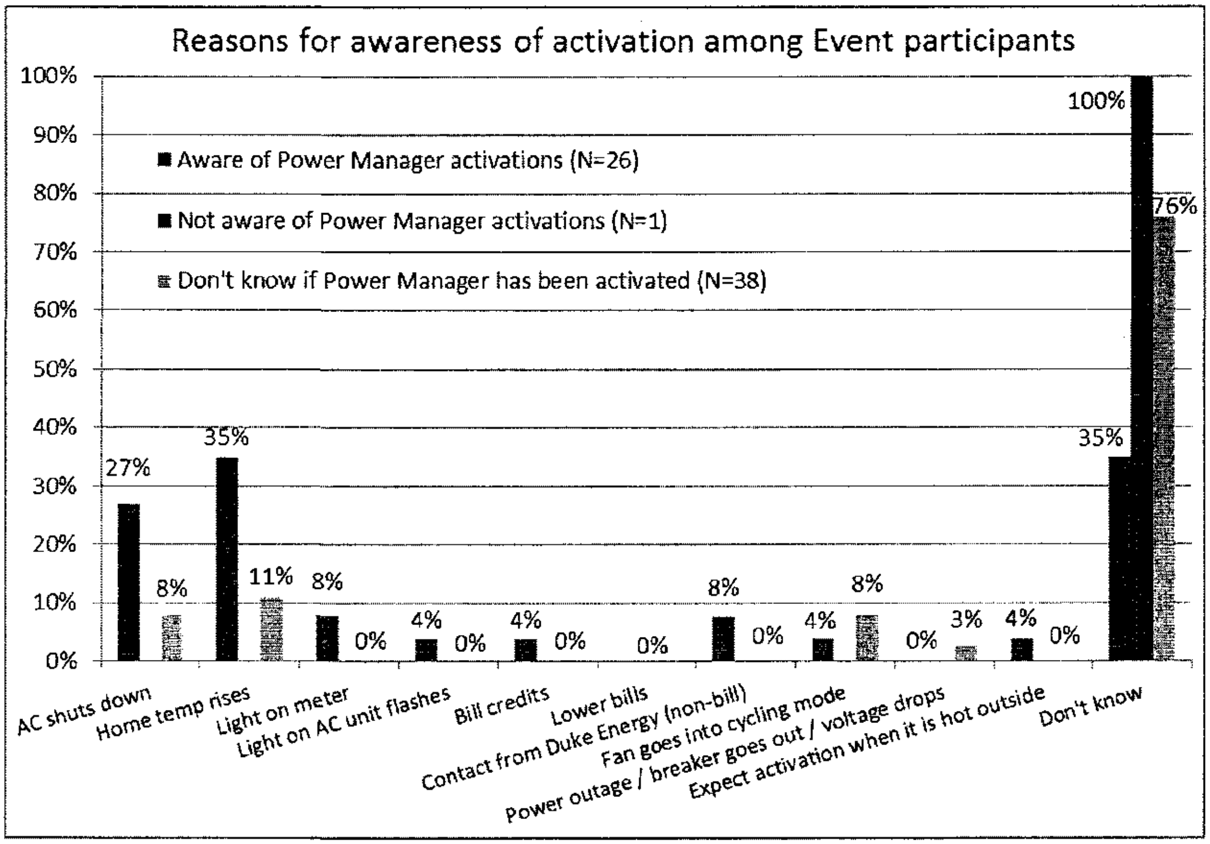

Figure 4. Reasons for Awareness of Power Manager Activation Among Event Participants
Note: Multiple responses were allowed per participant.

Non-Event participants' reasons for awareness of Power Manager activation are broken out separately in Figure 5 for those who were aware that Power Manager had been activated since they joined the program, who were not aware, and who "don't know" if they were aware. Figure 5 show a similar pattern to that of Event participants. All of the Non-Event participants who believe that Power Manager has not been activated since they joined the program state that they "don't know" how to tell if Power Manager is activated (100% or 3 out of 3); nobody in this subgroup offered any other response to the question.

Among Non-Event participants who were not sure if Power Manager had been activated, 82% (27 out of 33) say they "don't know" how to tell if Power Manager is activated, though 9% (3 out of 33) mentioned "bill credits". Non-Event participants who were aware that Power Manager has been activated since they joined the program were far less likely to not be able to give a reason for their awareness (only 33% or 13 out of 39 "don't know" how to tell when Power Manager activates), and the most frequently mentioned reasons for their awareness are "home temperature rises" (31% or 12 out of 39), "air conditioning shuts down" (13% or 5 out of 39) and "the light on the meter" (10% or 4 out of 39).

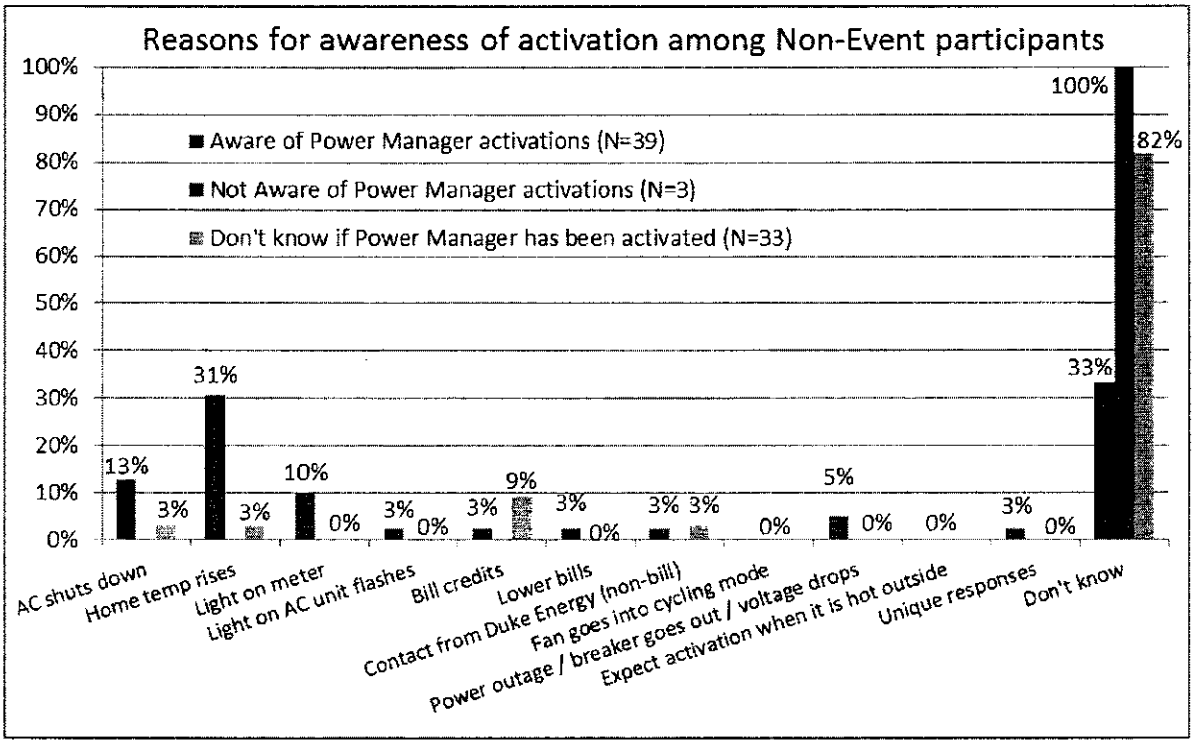

Figure 5. Reasons for Awareness of Power Manager Activation Among Non-Event Participants

Note: Multiple responses were allowed per participant

Awareness of Activation and Monthly Billing

Table 3 shows differences in awareness of Power Manager activation according to whether participants receive their monthly energy bills by e-mail or regular mail. Participants who get their bills by e-mail are somewhat more likely to say they don't know how to tell if Power Manager is activated (66.7% or 32 out of 48, versus 53.9% or 48 out of 89 for participants who receive their bills by mail; this difference is statistically significant at $p<.10$ using student's t-test). Participants who get bills by e-mail were also less likely to mention air conditioning shutting down as the reason why they know Power Manager has been activated (6.3% or 3 out of 48, versus 14.6% or 13 out of 89 participants who receive bills by mail; this difference is also statistically significant at $p<.10$ using student's t-test).

Table 3. Awareness of Activation: Mail Versus E-mail

	Receive monthly bills by ...	
	Mail (N=89)	**E-mail (N=48)**
Aware of Power Manager activation since joining the program	49.4%	41.7%
How can you tell when Power Manager is activated?		
Home temperature rises	16.9%	20.8%
AC shuts down	14.6%	6.3%

Bill credits	5.6%	0.0%
Lower bills	1.1%	0.0%
Don't know	53.9%	66.7%

Note: Event and Non-Event participant results are combined in this table. Three participants were excluded from this table because they receive their bills through both mail and e-mail, their bills are sent to a third party, or they didn't know how they receive their bills.

Table 4 compares awareness of Power Manager activation among participants who review their Duke Energy bills regularly (more than half the time) versus those who do not (less than half the time, never and "don't know"). Participants who review their bills more than half the time are significantly more likely to be aware that Power Manager has been activated since they joined the program (52.1% or 49 out of 94, versus 34.8% or 16 out of 46 among those who check their bills less than half of the time; this difference is statistically significant at $p<.05$ using student's t-test). Participants who check their bills more often were also more likely to mention bill credits as the source of their awareness, although only a small number mentioned bill credits as a source of awareness (5.3% or 5 out of 94, versus none of the participants who review their bills less than half the time; this difference is statistically significant at $p<.10$ using student's t-test).

Table 4. Awareness of Activation: Reviewing Monthly Bills

	Review the details of Duke Energy bill...	
	Every month / more than half the time (N=94)	**Less than half the time / never / don't know (N=46)**
Aware of Power Manager activation since joining the program	52.1%	34.8%
How can you tell when Power Manager is activated?		
Home temperature rises	18.1%	19.6%
AC shuts down	11.7%	10.9%
Bill credits	5.3%	0.0%
Lower bills	1.1%	0.0%
Don't know	56.4%	63.0%

Note: Event and Non-Event participant results are combined in this table.

Awareness of Power Manager Device Activation in the Past Seven Days

TecMarket Works then asked both Event and Non-Event participants who were home during the event (or high temperature non-event) whether they were aware of their Power Manager device being activated in the past seven days. Although in the case of the Non-Event participants, such activation had not occurred[6]. These results are shown in Figure 6 and Figure 7.

[6] Non-Event surveys were always fielded at least 10 days after an actual Power Manager activation, so there were no cases where a Non-Event high temperature day coincided with a Power Manager Event.

As seen in Figure 6, just 23.5% (12 out of 51) of Event participants were aware of a Power Manager activation, and 13.7% (7 out of 51) believed there had been no activation at all, while the majority of 62.7% (32 out of 51) did not know whether an activation had occurred or not.

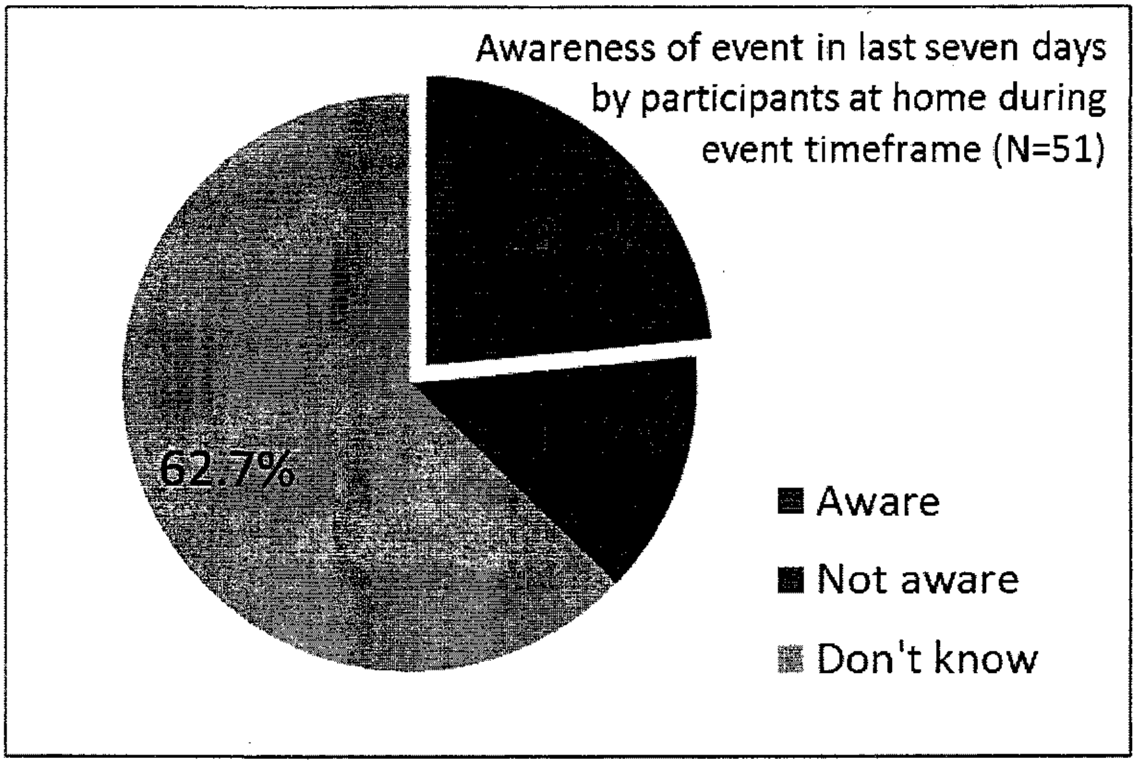

Figure 6. Awareness of Activation in Past Seven Days by Event Participants at Home (N=51)

Figure 7 indicates that compared to Event participants, a significantly smaller percentage (6.0% or 3 out of 50) of Non-Event participants believed there had been a Power Manager activation in the past seven days (statistically significant at $p<.05$ using student's t-test). A larger number of Non-Event participants (14.0% or 7 out of 50) correctly stated that there had been no Power Manager event in the past seven days, while the vast majority of Non-Event participants (80.0% or 40 out of 50) said they could not tell if there had been a Power Manager activation or not.

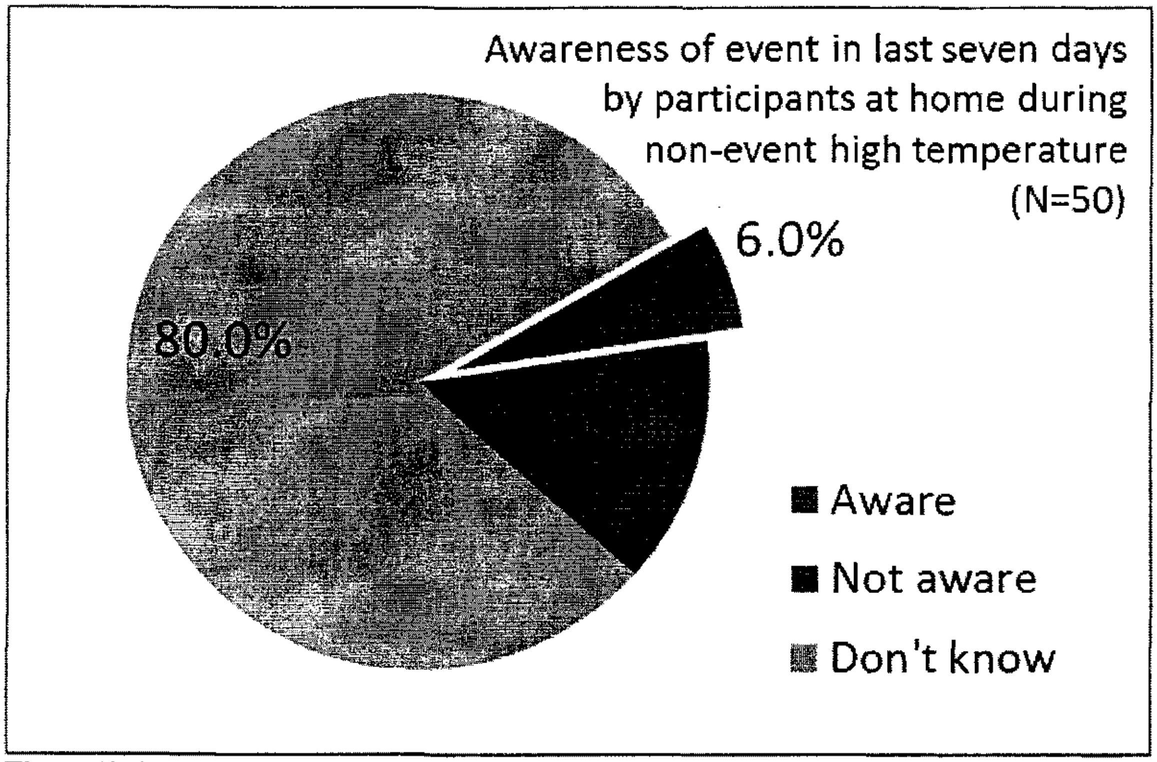

Figure 7. Awareness of Event in Last Seven Days by Non-Event Participants at Home (N=50)

TecMarket Works also asked participants who were not at home during the event timeframe (or high temperature non-event day) whether they were aware of a Power Manager device activation. As shown in Figure 8, only 15.4% (2 out of 13) of Event participants not at home during an event thought that a Power Manager activation had occurred. Figure 9 shows that an even lower 4.2% (1 out of 24) of Non-Event participants who were not at home thought that a Power Manager activation had occurred. For both Event and Non-Event participants, there are no statistically significant differences in activation awareness between those at home and those not at home, indicating that participants are equally unlikely to notice a Power Manager activation event whether they are at home or not.

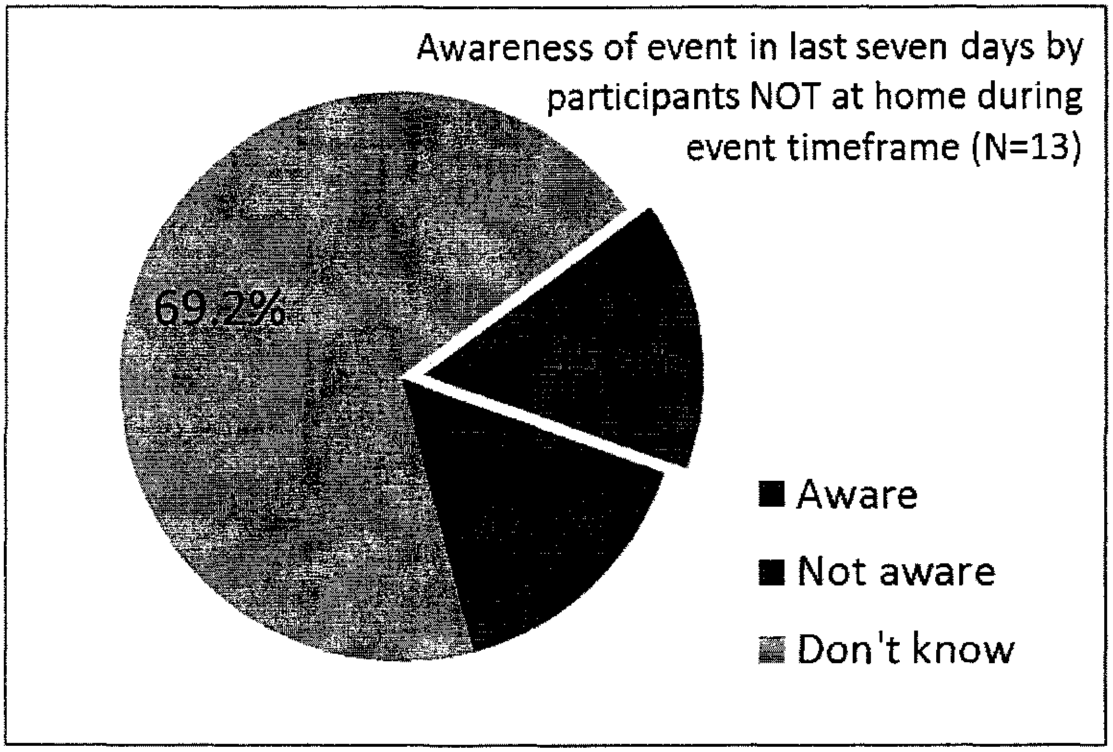

Figure 8. Awareness of Activation in Past Seven Days by Event Participants NOT at Home (N=13)

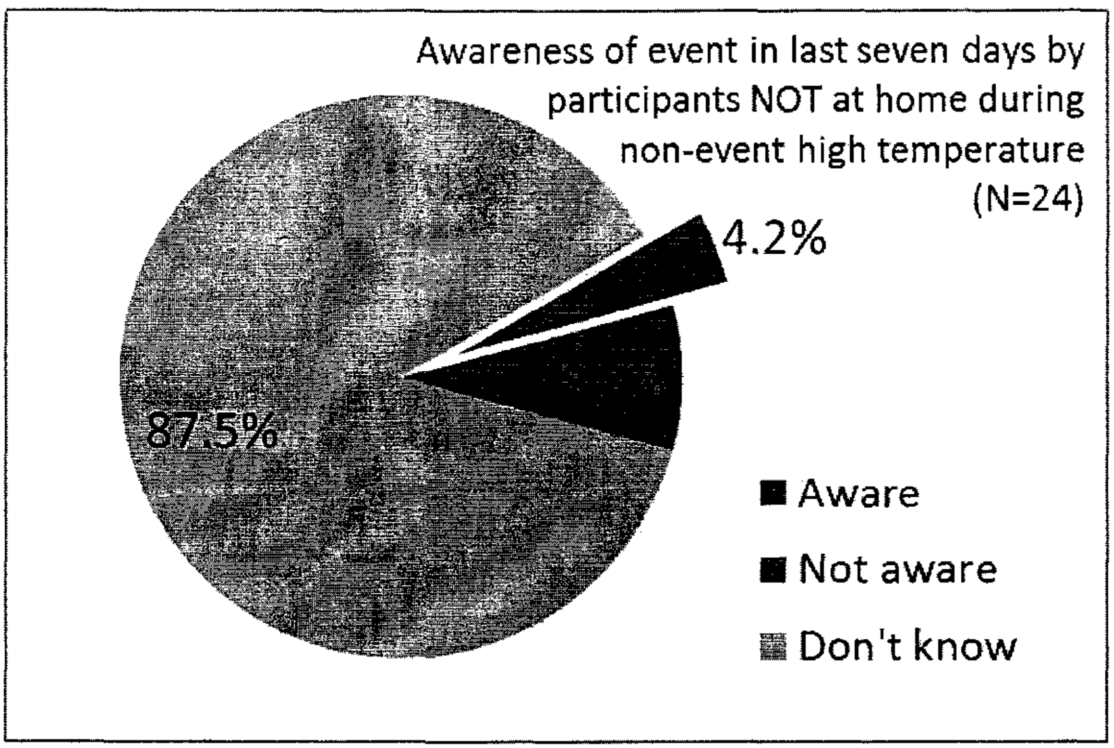

Figure 9. Awareness of Event in Last Seven Days by Non-Event Participants NOT at Home (N=24)

Changes in Comfort and Comfort Drivers

The next part of the survey for both Event and Non-Event participants dealt with any perceived change in comfort being ascribed to a Power Manager activation and whether there were other drivers of that comfort change beyond the activation.

TecMarket Works asked two comfort related questions to the 51 Event participants and 50 Non-Event participants who indicated that they or a family member were home during the event or high temperature. The first question asked for the participant to rate their level of comfort before the activation or time of high temperature on a 1-to-10 scale with one being very uncomfortable and ten being very comfortable. TecMarket Works then asked participants to rate their comfort level during the event or time of high temperature using the same scale.

Figure 10 below shows that although the majority of both Event and Non-Event survey respondents indicated no change in their comfort level during the Power Manager activation or time of high temperature, those who were surveyed after an actual Power Manager event were significantly more likely to notice a decrease in comfort (30.2% or 13 out of 43 Event participants' comfort ratings declined, compared to just 4.7% or 2 out of 43 Non-Event participants; this difference is significant at $p<.05$ using student's t-test).

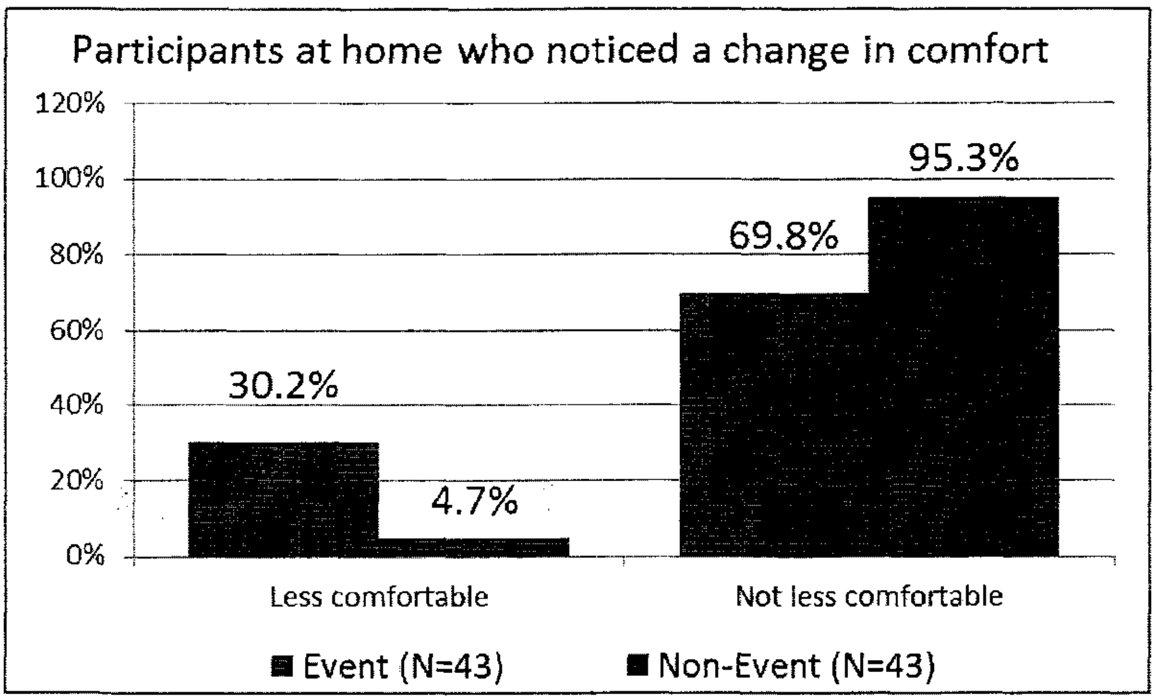

Figure 10. Comfort Change Perception by Participants at Home
Note: Only respondents who answered both comfort rating questions are included in this table.

Table 5 shows the mean ratings for before and during the event or high temperature as well as the high, low and mean differences for Event and Non-Event participants. While there is no significant decline in comfort ratings from before (9.09) to during (9.07) among Non-Event participants (for whom there was no Power Manager event), there is a significant decline in comfort for Event participants (whose air conditioning was cycled off by Power Manager on a high temperature day). Event participants' comfort ratings fell from 8.84 before the event (not significantly different from Non-Event participants' pre-event comfort) down to 8.07 after, which represents a statistically significant decline for Event participants, and is significantly lower than the comfort level reported by Non-Event participants during a high temperature non-event day (both differences are significant at p<.05 using ANOVA).

Table 5. Comfort Rating Differences for Events and Non-Events by Customers at Home

	Event (N=43)	Non-Event (N=43)
Mean comfort rating before event or high temperature day	8.84	9.09
Mean comfort rating during event or high temperature day	8.07	9.07
Mean difference of ratings	-0.77	-.02
Highest difference (among those who became less comfortable)	6	1
Lowest difference (among those who became less comfortable)	1	1

Note: Only respondents who answered both comfort rating questions are included in this table.

Table 6 shows the range of comfort decline among those respondents who reported a decline in comfort. The range of reported comfort decline was much higher for Event participants: Event participants' comfort ratings declined by as much as 6 points on a 10-point scale, while Non-Event participants who reported lower comfort ratings never went down by more than 1 point (both of these two Non-Event participants reported that their comfort only declined from 10 to 9 on a 10-point scale). Whereas the 13 Event participants who reported a decline in comfort reported an average comfort level of only 6.00 during the Power Manager activation event (significantly lower than the comfort rating of Non-Event participants at p<.05 using ANOVA).

Table 6. Comfort Rating Differences for Events and Non-Events Among Those Who Reported Their Comfort Level Declined During Event or High Temperature Day

	Event (N=13)	Non-Event (N=2)
Mean of pre-event comfort rating	8.69	10.00
Mean of rating during event or high temperature	6.00	9.00
Mean difference of ratings	2.69	1.00
Comfort rating declined by 1 point	15.4%	100.0%
Comfort rating declined by 2 points	46.2%	0.0%
Comfort rating declined by 3 points	15.4%	0.0%
Comfort rating declined by 4 points	7.7%	0.0%
Comfort rating declined by 5 points	7.7%	0.0%
Comfort rating declined by 6 points	7.7%	0.0%

Note: Only respondents whose comfort ratings declined during the event/high temperature day are included in this table.

Power Manager Activation When the Device Was Installed by Previous Occupants

According to data provided by Duke Energy, 16 participants surveyed in Ohio were not the original occupants when the Power Manager device was installed at their property (10.8% or 7 out of 65 Event participants and 12.0% or 9 out of 75 Non-Event participants). As shown in Table 7, participants who are not the original occupant to join the Power Manager program are more aware of device activation (68.8% or 11 out of 16, versus 43.5% or 54 out of 124 for original occupants; this difference is statistically significant at $p<.05$ using student's t-test). They are also more likely than original occupants to cite rising temperature, air conditioning shutting down and bill credits as the reason for their awareness of activation (all differences statistically significant at $p<.05$ or better using student's t-test), and are significantly less likely to not be able to tell when it is activated (only 31.3% or 5 out of 16 "don't know", compared to 62.1% or 77 out of 124 original occupants; this is also statistically significant at $p<.05$ using student's t-test).

Table 7. Awareness of Activation: Power Manager Installed by Previous Occupant

	Not the original occupant who signed up for Power Manager (N=16)	Original occupant who signed up for Power Manager (N=124)
Aware of Power Manager activation since joining the program	68.8%	43.5%
Home temperature rises	37.5%	16.1%
AC shuts down	31.3%	8.9%
Bill credits	12.5%	2.4%
Lower bills	0.0%	0.8%
Don't know	31.3%	62.1%

Note: Event and Non-Event participant results are combined in this table.

Eleven of the 16 participants in this survey who were signed up for Power Manager by previous occupants were at home during the event or non-event high temperature day surveyed. These participants were more likely to be aware that Power Manager was activated on recent event dates, and also somewhat more likely to report a decline in comfort, as reported in Table 8. Two-thirds (66.7% or 4 out of 6 Event participants at home during the event) of the participants who were not the original occupants were correctly aware that a Power Manager activation event had occurred, compared to only 17.8% (8 out of 45) of original occupants (this difference is significant at $p<.05$ using student's t-test). Half (3 out of 6) of the Event participants who were not original occupants also reported a decline in comfort, though due to the small sample size this is not a statistically significant difference from the 27.0% (10 out of 37) of original occupants reporting a decline in comfort during an event. One of the five (20.0%) Non-Event participants who was not the original occupant also believed Power Manager had been activated though it had not been (not significantly different from the 4.4% or 2 out of 45 Non-Event original occupants who also incorrectly believed it had been activated). None of the five Non-

Event non-original occupants surveyed reported a decline in comfort during the non-event high temperature day.

Table 8. Power Manager Installed by Previous Occupant: Awareness of Activation in Past Seven Days

	Not the original occupant who signed up for Power Manager	Original occupant who signed up for Power Manager
Base: Event participants at home during event	**N=6**	**N=45**
Aware of activation in past 7 days (Power Manager was activated)	66.7%	17.8%
Base: Event participants at home during event who answered both comfort questions	**N=6**	**N=37**
Decline in comfort during event	50.0%	27.0%
Base: Non-Event participants at home during high temperature day	**N=5**	**N=45**
Aware of activation in past 7 days (Power Manager was not activated)	20.0%	4.4%
Base: Non-Event participants at home during high temperature day who answered both comfort questions	**N=5**	**N=38**
Decline in comfort during non-event high temperature day	0.0%	5.3%

Participant Perceptions Relative to Comfort Change

TecMarket Works asked participants who noted a change in comfort during the event or non-event timeline an open-ended question as to what they believe caused the change in comfort. The responses are shown below in Figure 11.

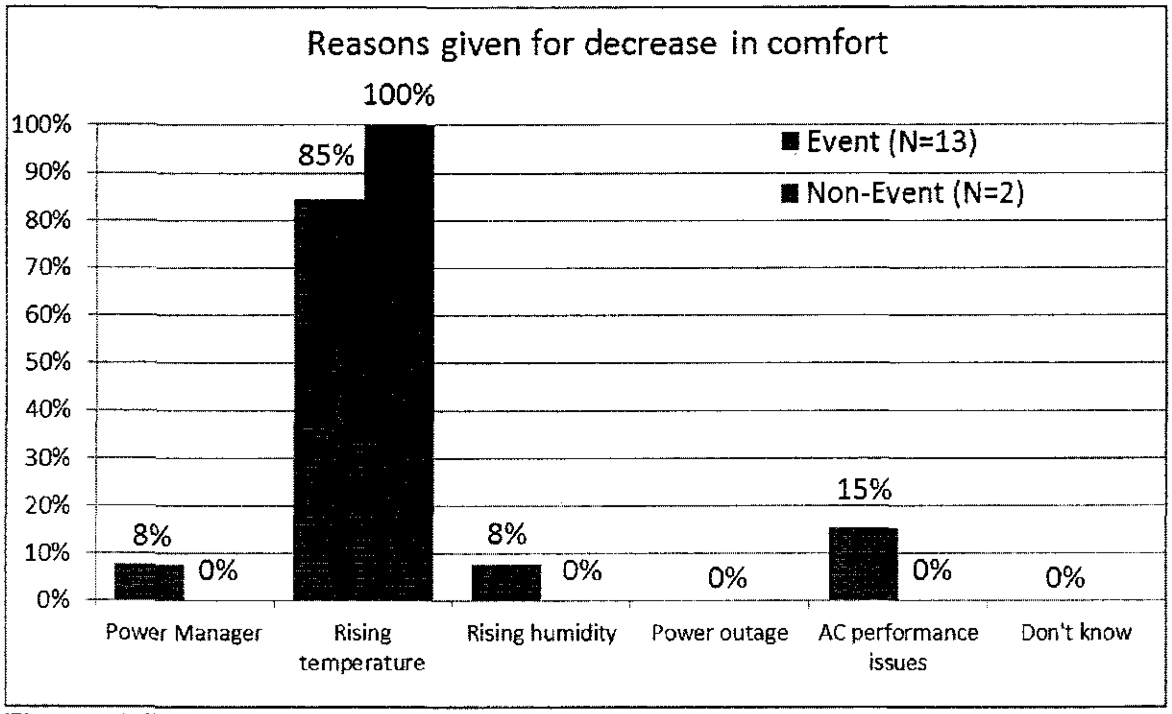

Figure 11. Reasons for Comfort Change
Note: Only respondents whose comfort ratings declined during the event/high temperature day are included in this table.

Figure 11 shows that the vast majority of Event and Non-Event participants who reported a decrease in their comfort level during an event or high temperature day attribute their change in comfort to the rising temperature (84.6% or 11 out of 13 Event participants, and 100% or 2 out of 2 Non-Event participants).

Very few Event participants (7.7% or 1 out of 13) and none of the Non-Event participants (0 out of 2) cited Power Manager as contributing to their decline in comfort. A larger number of Event participants (15.4% or 2 out of 13) attributed their change in comfort to performance issues with their air conditioning unit.

Power outage was not mentioned as a factor contributing to comfort change by any respondents.

This data – along with the data from Figure 6 showing that only 23.5% of Event participants were aware of an event occurring in the past seven days – suggests there is uncertainty among many participants as to how Power Manager affects their air conditioner and home comfort level. That is, many participants may be unaware that the Power Manager device is causing the changes they feel in comfort.

Decreases in Comfort and Age of Air Conditioning Units

The only participant in Ohio who blamed Power Manager for their decrease in comfort has an air conditioning unit between 13 and 20 years old. The two Event participants who blamed performance issues with their air conditioner units also both have units between 13 and 20 years old. Among the eleven Event participants who blamed rising outdoor temperatures for their decline in comfort, a majority (6 out of 11) have AC units less than 6 years old, two have units 7 to 12 years old and three have units 13 to 20 years old. The two Non-Event participants who noticed a decline in comfort have air conditioners aged 7 to 12 years and over 20 years old and both blamed rising outdoor temperatures.

Behaviors During Event Activation

TecMarket Works asked several questions regarding behavior associated with a Power Manager device activation.

Thermostat Adjustments

Participants who indicated that they or a family member had been home during the time of the event or high temperature non-event day were asked if they had adjusted their thermostat during that time.

Six Event participants (11.8% of 51 at home during the event) stated that they adjusted their thermostats: Three turned their thermostats down by 2 to 4 degrees, one turned their thermostat up by 5 degrees, and two made short-term adjustments that ultimately left the thermostat settings where they were before the event. The average change for these six Event respondents was down 0.7 degrees.

Eight Non-Event participants (15.7% of 51 at home during the high temperature day) stated that they had adjusted their thermostats: three turned their thermostats down by 2 to 5 degrees, four turned their thermostats up by 2 to 4 degrees, and one did not know what changes were made to their thermostat settings. The average change for the seven Non-Event respondents who gave specific thermostat settings was up 0.3 degrees.

Use of Fans and Other Ways to Keep Cool

Participants who indicated that they or a family member had been home during the time of the event or high temperature period were then asked if they had turned on any fans during that time period. This was the most common response to high temperatures reported by respondents; the results are shown in Table 9.

Table 9. Did You or Your Family Turn on a Fan During Event or High Temperature?

	Event (N=51)	Non-Event (N=51)
Yes	41.2%	39.2%
No	56.9%	58.8%
Don't Know	2.0%	2.0%

Participants were also asked an open-ended question as to whether they did anything else to keep cool during the timeframe of the Power Manager device activation or high temperature. A majority of both Event (64.7% or 33 out of 51) and Non-Event participants (60.8% or 31 out of 51) stated that they did nothing else (or nothing at all) in response to the device activation or high temperature. The remaining responses (all mentioned by fewer than 10%) are included in Table 10.

Table 10. Other Activities Participants Took to Cool Down

	Event (N=57)	Non-Event (N=51)
Continued normal activities / nothing different	64.7%	60.8%
Moved to a cooler part of the house	7.8%	5.9%
Drank water / cool drinks	7.8%	5.9%
Cooled off with water (shower, sprinkler, hose, pool)	5.9%	7.8%
Closed blinds / shades	7.8%	3.9%
Opened windows	0.0%	2.0%
Left the house & went somewhere cool	0.0%	3.9%
Wore less clothing	0.0%	3.9%
Keep doors shut / use other doors to keep heat out	3.9%	0.0%
Close certain vents	3.9%	0.0%
Stayed indoors	2.0%	3.9%
Reduce activity level	2.0%	0.0%
Leave HVAC fan turned on	2.0%	2.0%
Turn on room / window AC	0.0%	0.0%
Don't know / refused	2.0%	3.9%

None of the Ohio participants who were at home (0 out of 51 Event and 0 out of 51 Non-Event) indicated that they had used any room or window air conditioners to keep cool or to compensate for the Power Manager device activation.

Age of Air Conditioner and Change in Comfort Levels During Event

TecMarket Works asked participants for the age of their air conditioner. The distributions are shown below in Figure 12.

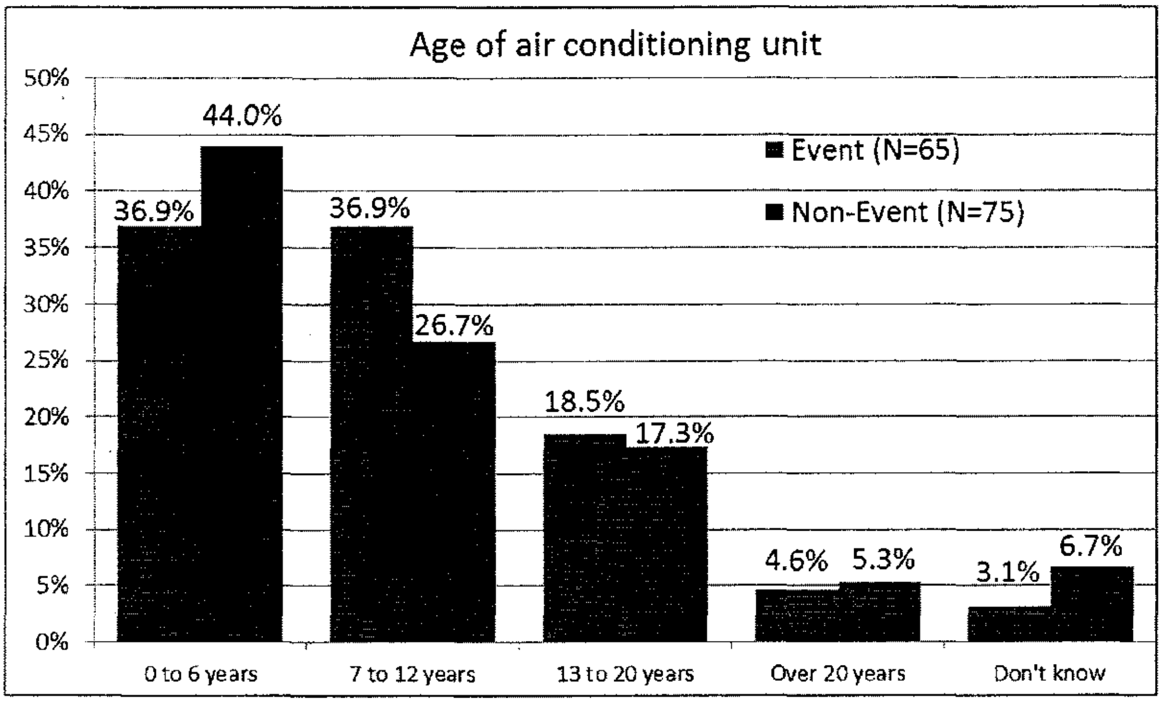

Figure 12. Air Conditioner Age

Figure 13 shows mean comfort ratings by age of air conditioner. There is no statistically significant relationship between age of air conditioner and comfort levels before or during an event or high-temperature day.

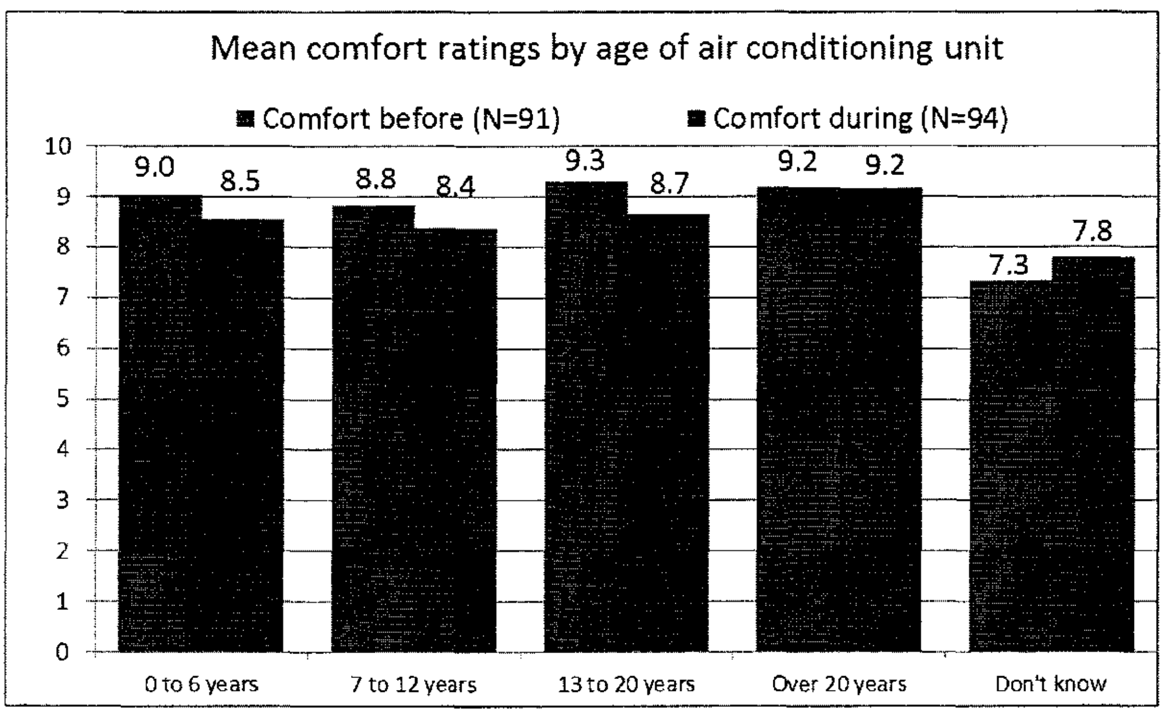

Figure 13. Mean Comfort Ratings by Air Conditioner Age

Note: Only respondents who were at home during an event or high temperature day gave comfort ratings.

The distribution of air conditioner ages is similar between Event and Non-Event participants, with over 70% of air conditioners in both groups being less than 12 years old (as seen in Figure 12). Cross-tabulating air conditioner age with comfort, and using age of air conditioner to predict a decrease in comfort (using a simple linear regression), yields the following line chart (Figure 14).

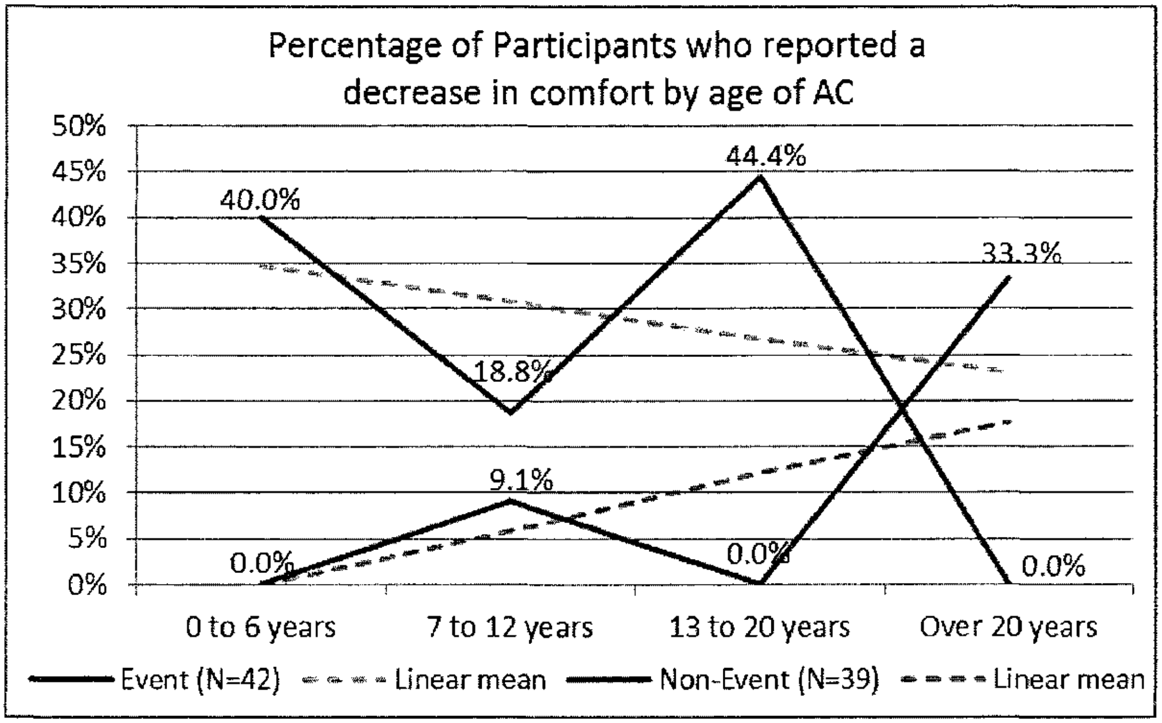

Figure 14. Comfort Decline vs. Air Conditioner Age

In Figure 14 the linear means (regression lines[7]) for the two survey subgroups show that age of air conditioner has no significant effect on discomfort during Power Manager activation events (the dotted blue line is relatively flat), while age of air conditioner does play a role in discomfort on hot days for the Non-Event group (the dotted red line has a positive slope: discomfort rises with the age of the air conditioner unit). The effect of air conditioner age on comfort levels is not quite statistically significant for Non-Event participants: Age of AC unit explains 7.0% of variance (R-squared) in change in comfort, and the overall significance level is p=.105 using ANOVA, which falls just short of the p<.10 level of statistical significance. For Event participants, age of AC unit explains 0.6% of variance (R-squared) in change in comfort and is not significant (p=0.640)..

[7] Two regressions were run separately and plotted together, one for Event participants and one for Non-Event participants (dotted lines). Both regression models predict the percent of participants noticing a decline in comfort using only the age of air conditioner. Actual percentages noticing a decline in comfort by age of AC unit are also plotted for Event and Non-Event participants (solid lines).

However, while age of air conditioner unit is a significant predictor of discomfort for Non-Event participants, recall from Figure 10 that activation of Power Manager on event days causes discomfort for significantly more Event participants overall (this is also indicated in Figure 14 because the dotted blue line is always higher than the dotted red line). One interpretation of these results is that Power Manager neutralizes the advantage of newer air conditioners when it is activated – or in other words, older air conditioner units are less affected by Power Manager activation (because they are less effective in the first place).

Figure 15 shows a similar analysis using the same model but predicting the amount of decline in comfort ratings (rather than whether or not there was a decline in comfort ratings[8]). The result for Non-Event participants in consistent with other findings: There is much less decline in comfort ratings on high temperature non-event days, and the Non-Event participants who do report a decline in comfort tend to have older AC units (among Non-Event participants with an AC unit more than 20 years old, comfort ratings declined an average of 0.33 points on a 10-point scale during high temperature days included in this survey, while among those with AC units less than 6 years old there was no reported decline in comfort at all).

However the result for Event participants is less intuitive, since this model predicts that the older the AC unit is, the *smaller* their decline in comfort will be on Event days (participants with AC units less than 6 years old reported their comfort declined by 1.00 points, versus 0.00 points for those with AC units more than 20 years old). However, this seems consistent with the proposition that older air conditioner units are less affected by Power Manager activation (because they are less effective in the first place). If older AC units don't keep people as comfortable in the first place, then they have "less comfort to lose" during Power Manager Events.

[8] Two regressions were run separately and plotted together, one for Event participants and one for Non-Event participants (dotted lines). Both regression models predict the change in comfort ratings on a 10-point scale using only the age of air conditioner. Actual mean decline in comfort rating points (on a 10-point scale) by age of AC unit are also plotted for Event and Non-Event participants (solid lines).

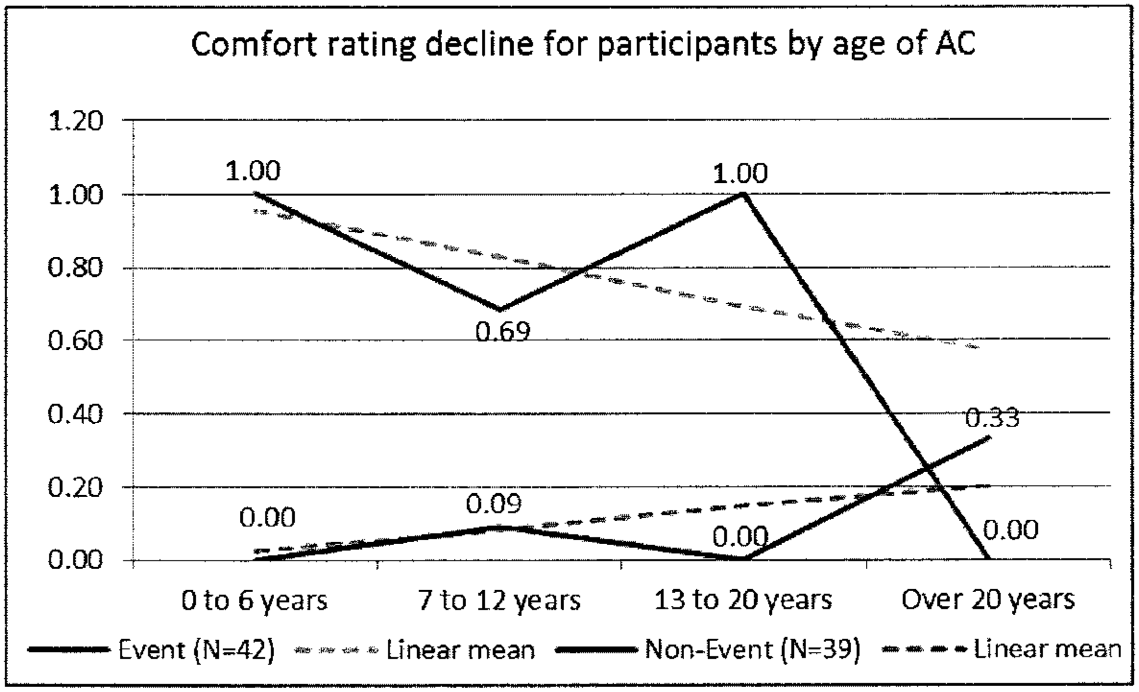

Figure 15. Comfort Ratings Point Decline vs. Air Conditioner Age

Age of Air-Conditioner and Change in Comfort Levels During Event: Controlling for Outdoor High Temperatures

TecMarket Works also used regression analysis to predict changes in comfort level taking both age of air conditioner and the high temperature on the event day (or non-event high temperature day) into account[9]. This analysis allows us to separate the effects of the outdoor temperature and the age of the air conditioner unit; the results are shown in Figure 16.

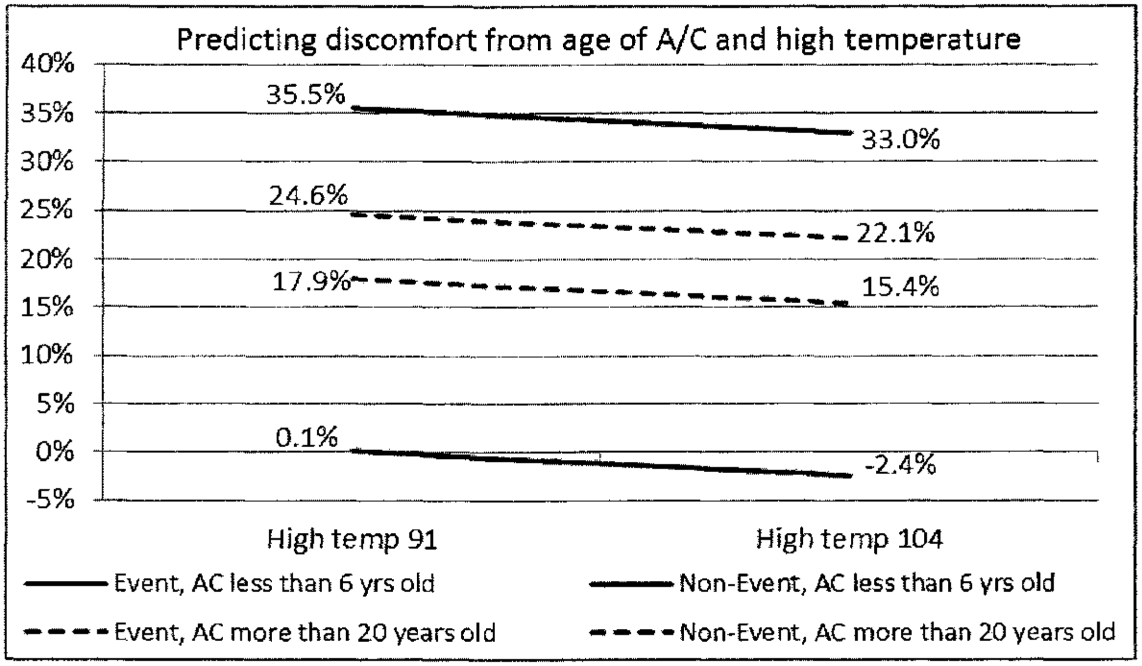

Figure 16. Comfort Change vs. Air Conditioner Age and High Temperature

Figure 16 further indicates that the age of the air conditioner unit is related to increasing discomfort for Non-Event participants, but has less effect on comfort changes for Event participants – even when controlling for differences in outdoor temperature. Among households with an air conditioner 6 years old or less (solid lines), hardly any Non-Event participants are predicted to notice a change in comfort level (0.1% at 91 degrees, negative[10] 2.4% at 104 degrees). In contrast, Event participants with AC units less than 6 years old are much more likely to report a decline in comfort (predicted 33.0% to 35.5%). However, among households with air conditioners at least 20 years old (dotted lines), the difference in predicted discomfort between Event (predicted 22.1% to 24.6%) and Non-Event (predicted 15.4% to 17.9%) participants is much smaller.

The fact that the two blue lines are closer together, while the two red lines are farther apart, is another indication that the age of the AC unit has less effect on comfort ratings for participants during a Power Manager activation event. Furthermore, the differences between predicted levels

[9] One regression was run, predicting the percent of participants noticing a decline in comfort using the following predictors: outdoor high temperature, age of AC unit, Event vs. Non-Event, and an interaction term for Event-by-age-of-air-conditioner. The interaction term allows the effect of age of air conditioner to vary for Event and Non-Event participants. The chart only plots the predicted regression lines (not the actual distributions).

of discomfort at 91 degrees and 104 degrees (about 2.5%) are less than the differences predicted at different levels of age of AC (about 18% for Non-Events), or for Event vs. Non-Event (7% to 35%). This indicates that the effect of outdoor temperature is less of a factor in participant comfort compared to the age of their AC unit and whether or not Power Manager was activated.

The standardized coefficients[11] from the regression model also indicate that temperature is less important than age of AC or the occurrence of Power Manager events: Temperature had the least effect (beta=-0.021) of any predictors in the model, while the presence of a Power Manager event had the most (beta=0.512), and age of air conditioner had the second-largest effect (beta=0.143).

The regression model in Figure 16 explains 12.6% of the variance (R-squared) in comfort decline, and overall is significant at $p<.05$ using ANOVA (the only individual predictor that is significant by itself in this model is Event vs. Non-Event at $p<.05$).

Curtailment kWh Option and Change in Comfort Levels During Event

In Ohio, Power Manager participants have the option to sign up for either of two levels of curtailment: 1.0 kWh or 1.5 kWh. The larger option offers a higher bill credit to the participant, but also requires a longer "cycle" or activation period and a longer time period that the participant would be without the A/C compressor running during event activation.

TecMarket Works surveyed both 1.0 kWh and 1.5 kWh option participants:

- Ten Event respondents were signed up for the 1.5 kWh option, and seven of these were at home during the event and answered all the questions about comfort level before and during the event. Of those seven respondents, three (42.9%) reported a decline in comfort. Among the 36 Event respondents who signed up for the 1.0 kWh option, were home during the event, and answered all of the comfort questions, the rate reporting a decline in comfort was 27.8% (10 out of 36). The effect of the program option on comfort is not statistically significant for Event participants.

- Twelve Non-Event respondents were signed up for the 1.5 kWh option, and six of those respondents reported being home at the time of high temperature and answered all the questions about comfort level. Of these six respondents, two (33.3%) reported a decrease in comfort. However none (0.0%) of the 34 Non-Event participants who signed up for the 1.0 kWh option, were home during the high temperature non-event day, and answered all of the comfort questions reported a decline in comfort. The effect of the program option on comfort level is statistically significant for Non-Event participants ($p<.05$ using student's t-test), however since there really was no Power Manager event for this group, their decline in comfort could not have been caused by Power Manager being activated.

[10] There were no Non-Event participant surveys conducted for days when the temperature was 99 degrees or higher. Since this is a linear regression, the model can predict negative percentages for values outside the range of observed data. (Though logically, the number of participants who say their comfort level declined cannot be less than 0%).
[11] The standardized coefficient (also known as Beta) is rescaled so that variance equals 1.0. This allows the effect of variables scaled in different units (such as years and degrees) to be compared with each other.

Respondent Satisfaction and Willingness to Recommend the Program

Participants' satisfaction with the Power Manager program is high with an overall mean of 8.42 on a 10-point scale with "1" being not at all satisfied and "10" being very satisfied, and half (50.0% or 70 out of 140) of participants rating their satisfaction with Power Manager a "10 out of 10". Event respondents' mean satisfaction with Power Manager is 8.42 while the mean for Non-Event respondents is 8.41. The distribution of ratings is shown in Figure 17 below.

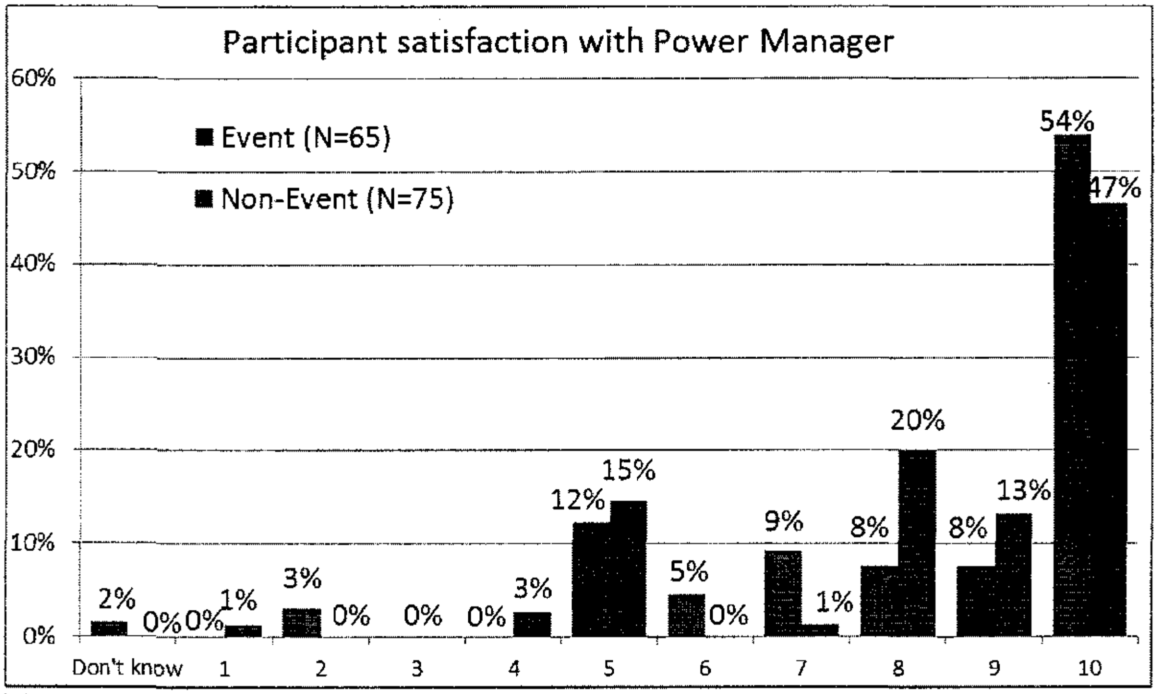

Figure 17. Distribution of Power Manager Satisfaction Ratings

Ohio respondents were additionally asked to rate their satisfaction with Power Manager using a 5-point Likert scale, as seen in Figure 18. Overall, 64.3% (90 out of 140) said they were "very" or "somewhat satisfied" with the program, versus only 3.6% (5 out of 140) who said they were "very" or "somewhat dissatisfied" with Power Manager, and 5.7% (8 out of 140) who could not give a rating (don't know or refused). There are no significant differences in satisfaction between Event and Non-Event participants.

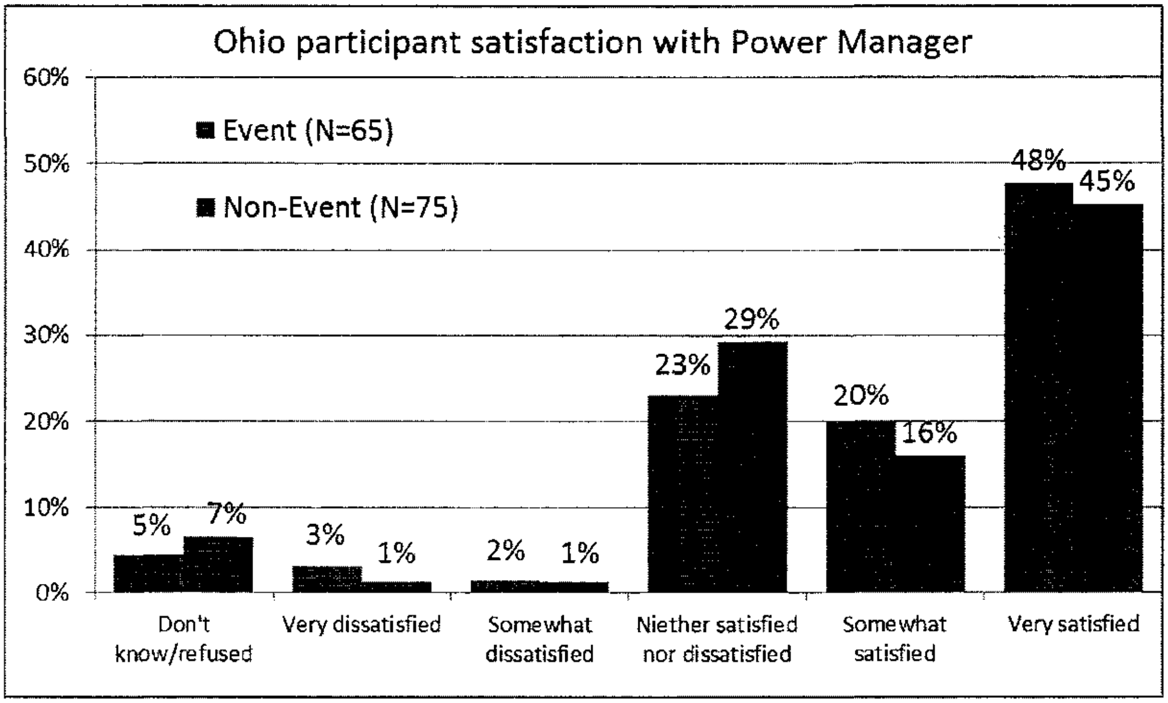

Figure 18. Distribution of Power Manager Satisfaction Ratings (Ohio scale)

Participants in the survey were also asked to rate the likelihood that they would recommend Power Manager to a friend or colleague on a 10-point scale where "1" means "very unlikely" and "10" means "very likely". Half (49.3% or 69 out of 140) of participants surveyed rated their likelihood of recommending the program at "10 out of 10", and the mean rating for likelihood of recommending the program was 8.19 overall. By subgroups, the mean recommendation rating was 8.35 among Event participants and 8.05 among Non-Event participants. Responses to this question are shown in Figure 19.

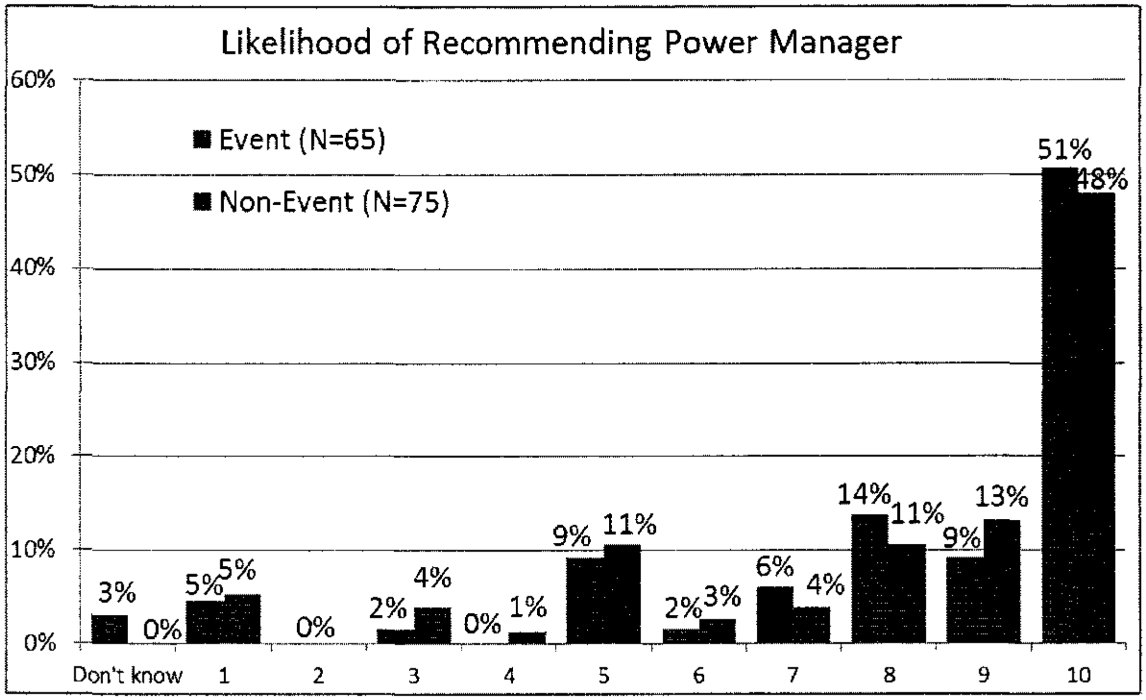

Figure 19. Distribution of Likelihood Ratings for Recommending Power Manager

Participants' overall satisfaction with Duke Energy is also high with an overall mean of 8.28 on a 10-point scale with "1" being not at all satisfied and "10" being very satisfied. Event respondents' mean satisfaction with Duke Energy is 8.43 while the mean for Non-Event respondents is 8.16. The distribution of ratings is shown in Figure 20 below.

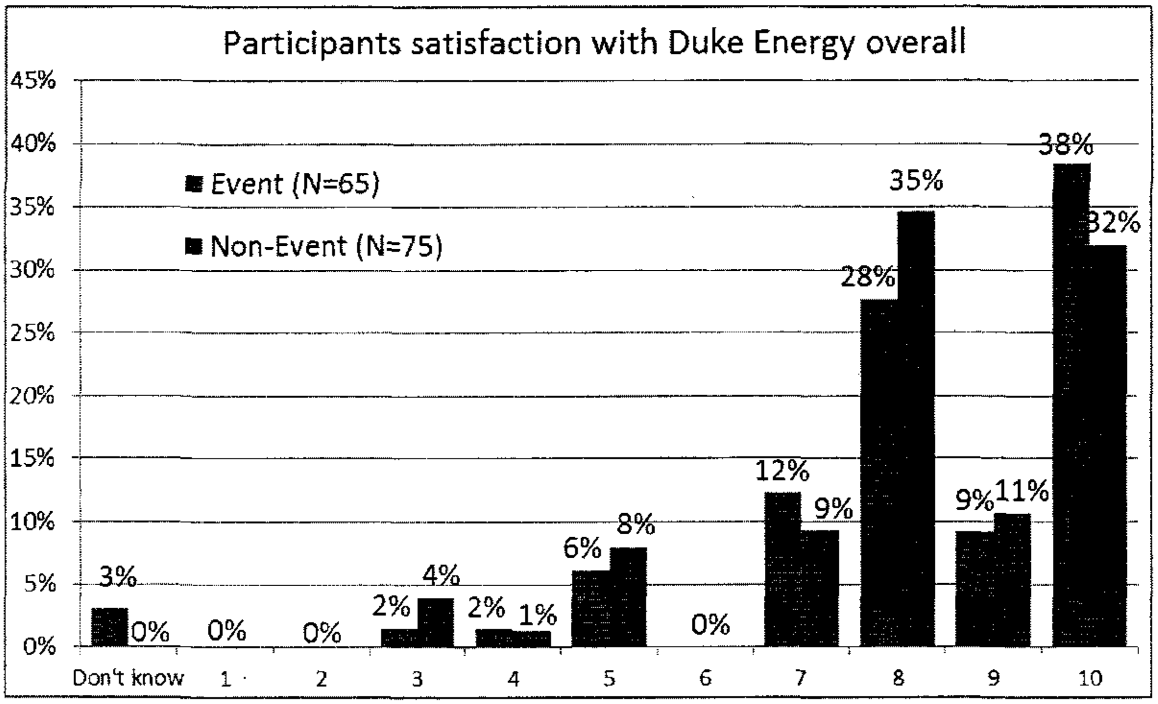

Figure 20. Distribution of Duke Energy Overall Satisfaction Ratings

Satisfaction with Power Manager When the Device Was Installed by Previous Occupants

Sixteen participants surveyed (11.4% of 140) were not the occupant of their home when Power Manager was installed. The overall mean satisfaction ratings of participants who "inherited" the device from a previous owner were not significantly lower than for those who joined the program themselves. Table 11 shows the mean ratings for these three questions.

Table 11. Power Manager Installed by Previous Occupant: Awareness of Activation in Past Seven Days

Mean ratings on 10-point scale (10 is highest, 1 is lowest)	**Not the original occupant who signed up for Power Manager (N=16)**	**Original occupant who signed up for Power Manager (N=124)**
Satisfaction with Power Manager	7.81	8.50
Likelihood of recommending Power Manager to a friend or colleague	8.06	8.20
Satisfaction with Duke Energy	8.56	8.25

Note: Event and Non-Event participants are combined in this table.

Figure 21 shows the complete distribution for participant satisfaction with Power Manager. Though the means are not significantly different, 31.3% (5 out of 16) of participants who inherited a previous installation rated the program a "5" or lower on a 10-point scale, compared to just 15.3% (19 out of 124) of those who joined the program themselves (this difference is significant at p<.10 using student's t-test).

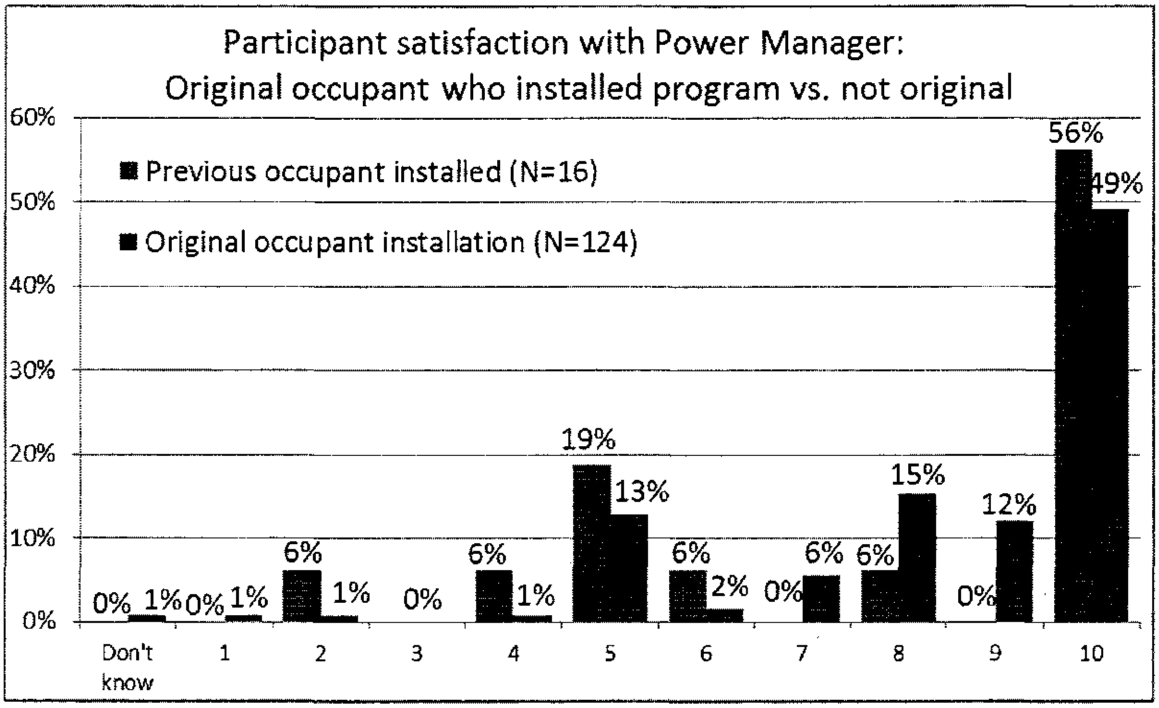

Figure 21. Satisfaction with Power Manager Program by Installing Occupant
Note: Event and Non-Event participants are combined in this chart.

Participants in Ohio were also asked to rate their satisfaction with Power Manager on a 5-point Likert scale; these responses can be seen in Figure 22. About one in four of the participants who moved into a home where Power Manager was previously installed (25.0% or 4 out of 16) said they were "somewhat dissatisfied" or "very dissatisfied" with Power Manager, compared to just 0.8% (1 out of 124) among those who joined the program themselves. The difference in distributions of satisfaction scores between current and previous installations using this ratings scale is statistically significant at the p<.01 level using Pearson's Chi-Square test.

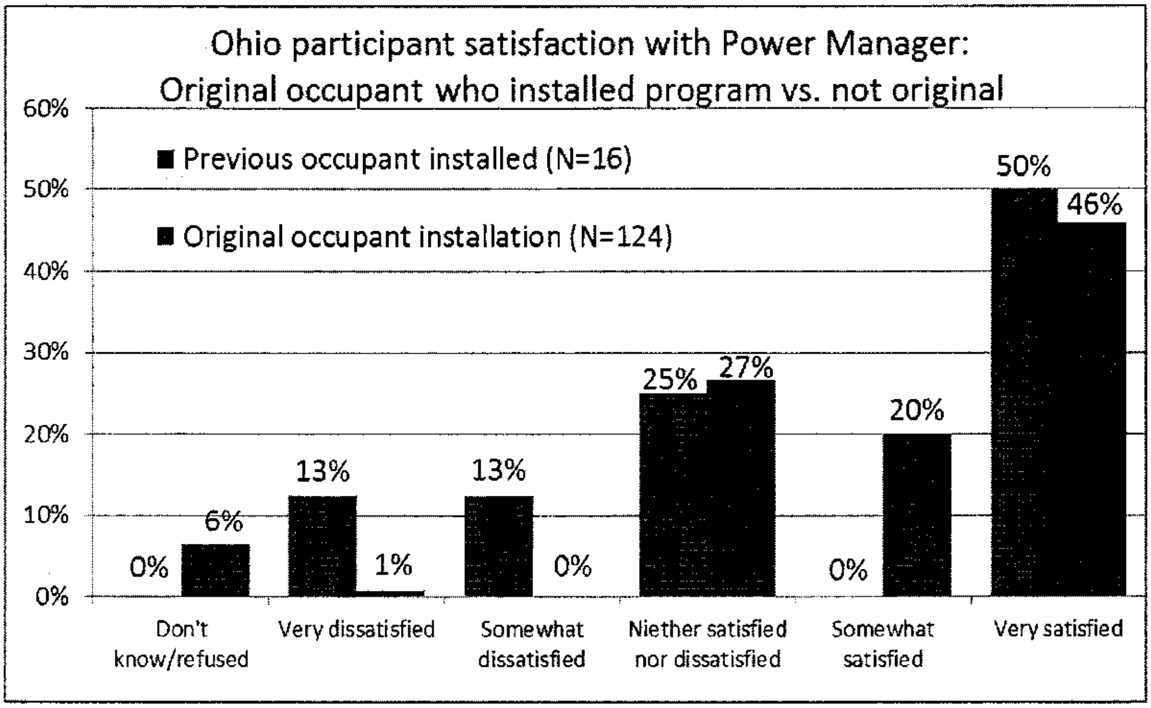

Figure 22. Satisfaction with Power Manager Program by Installing Occupant (Ohio Scale)
Note: Event and Non-Event participants are combined in this chart.

Exploring Factors that Affect Comfort Ratings

High Temperature Correlations with Comfort Levels

There is no significant overall correlation (Pearson Correlation = -0.059) between a surveyed participant's comfort level before the event or high temperature day and the temperature[12] on the day in question, regardless of whether there was an event or not . This indicates that people are comfortable in their homes with their temperature settings before an event or high temperature day. However, there is a significant correlation (Pearson Correlation = -0.249 and statistically significant at the $p<.05$ level) between a surveyed participant's comfort level and the temperature during the event or high temperature period. This indicates that the hotter it is outside on event days (or high temperature non-event days), the less comfortable respondents are in their homes.

Finally, looking at reported change in comfort levels compared to the high temperature for the day in question reveals no significant correlation (Pearson Correlation = 0.142). This indicates that the outdoor temperature by itself is not a significant factor determining whether a Power Manager participant will become less comfortable during an event or high temperature day.

[12] Heat Index is very highly correlated with High Temperature (Pearson Correlation = 0.824 which is significant at $p<.01$), and in most cases High Temperature correlates slightly higher with measures of respondent comfort than Heat Index does. Therefore only High Temperature correlations are reported in this section.

Comfort Ratings by High Temperature

Figure 23 and Figure 24 show mean comfort ratings before and during Power Manager events and non-event high temperature days by the outdoor high temperature on that day (the schedule of events and non-events and corresponding high temperatures and heat index readings can be found in Table 1). As seen previously (such as in Figure 10), non-event high temperature days have little effect on participants' comfort levels (small differences between red and blue bars at every temperature level), while Power Manager activation events do cause a significant decrease in comfort ratings.

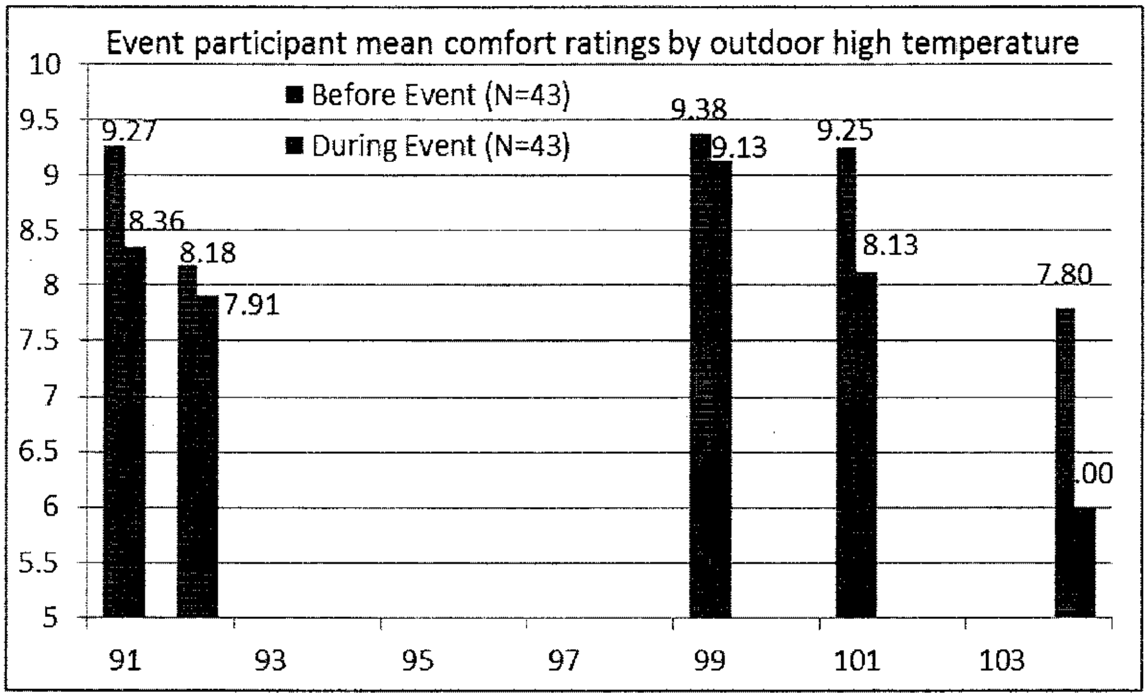

Figure 23. Comfort Ratings Before and During Events by Outdoor High Temperature (N=43)

Note: Only respondents who were at home during the event and who provided both comfort ratings are included in this chart.

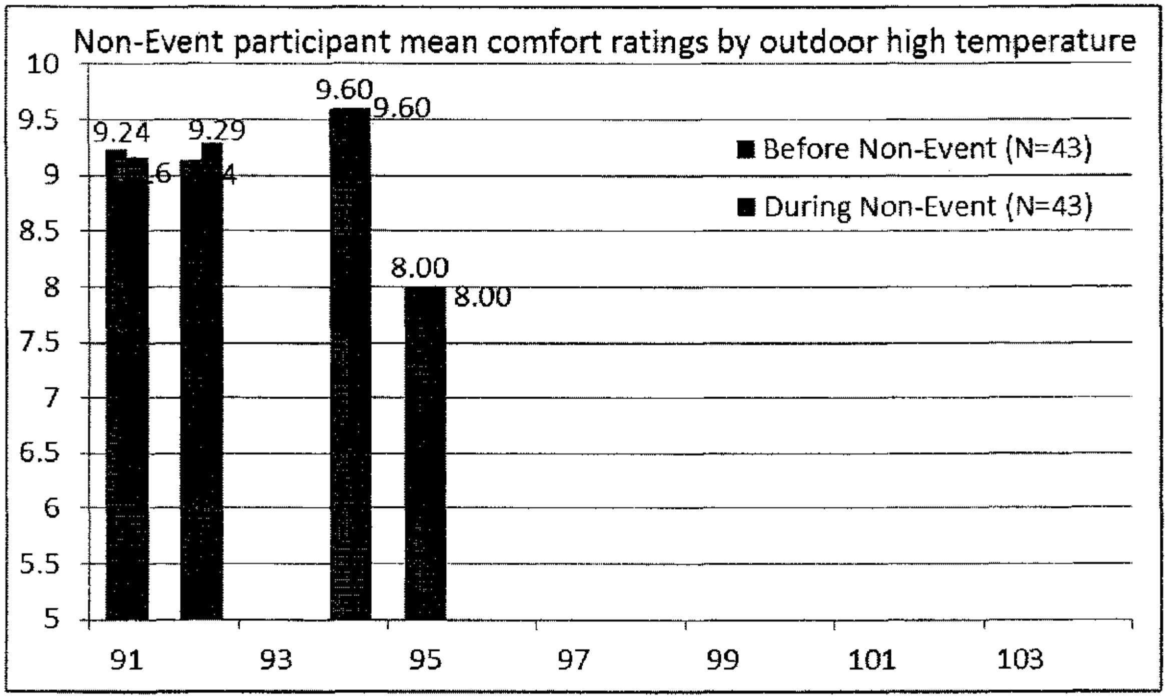

Figure 24. Comfort Ratings Before and During Non-Events by Outdoor High Temperature (N=43)

Note: Only respondents who were at home on the non-event high temperature day and who provided both comfort ratings are included in this chart.

Figure 25 and Figure 26 show the same mean comfort ratings by three outdoor high temperature ranges. Power Manager activation events decrease comfort at every temperature level, though the decrease is smallest on 92 to 98 degree days (and larger on cooler or hotter days). For Event participants, the decline in mean comfort ratings is statistically significant when outdoor temperature is 91 or less (at p<.10 level using student's t-test) and when the temperature is 99 or higher (at p<.05 level). The decline in comfort ratings for Event participants on 92-98 degree days is not statistically significant.

As seen previously (such as in Figure 10), non-event high temperature days have little effect on participants' comfort levels.

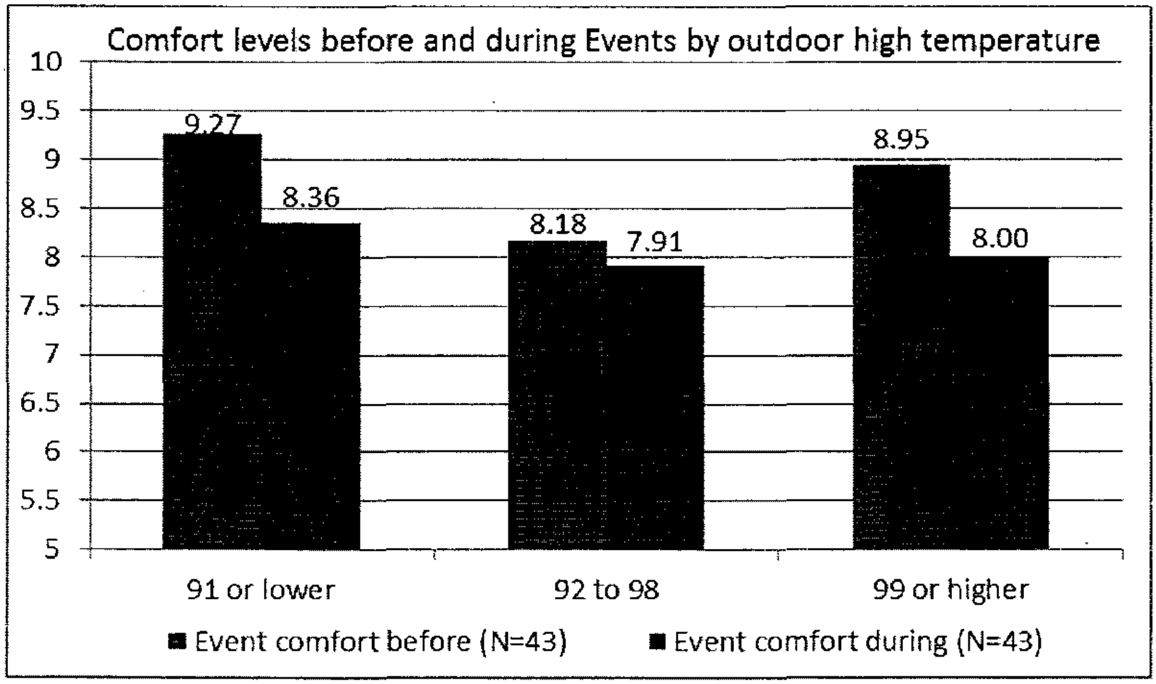

Figure 25. Comfort Ratings Before and During Events by Outdoor High Temperature (N=43)

Note: Only respondents who were at home during the event and who provided both comfort ratings are included in this chart.

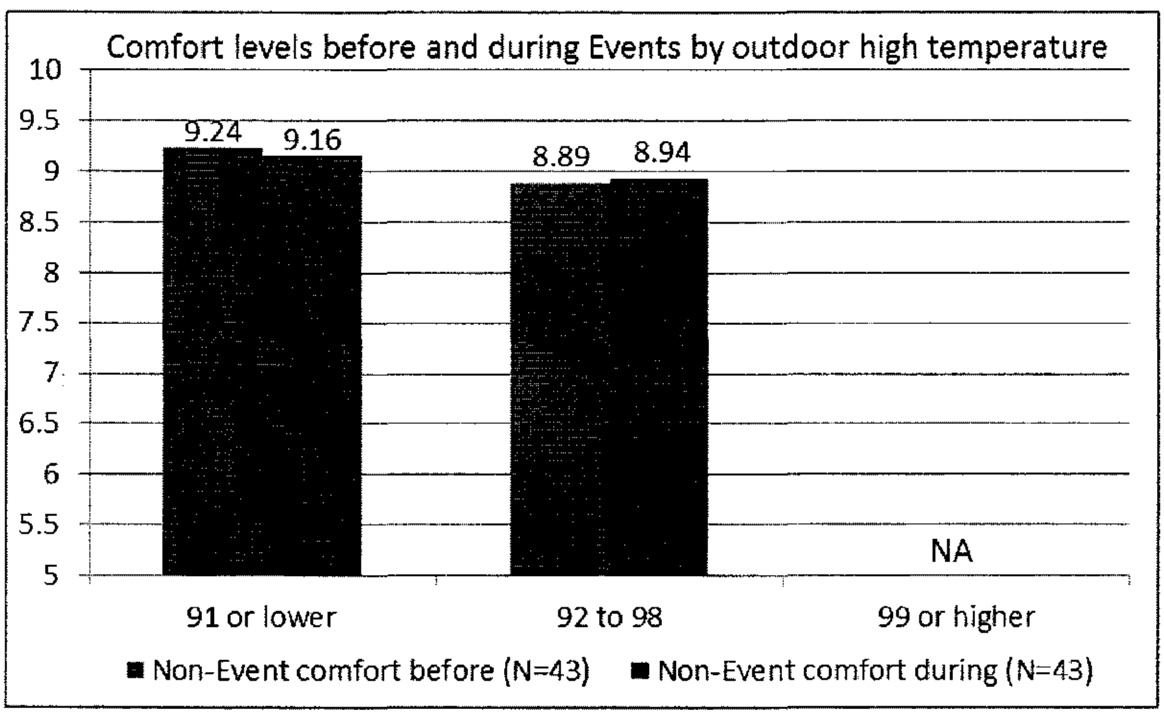

Figure 26. Comfort Ratings Before and During Non-Events by Outdoor High Temperature (N=43)

Note: There were no non-event high temperature days in Ohio where the outdoor temperature was 99 degrees or higher. Only respondents who were at home on the non-event high temperature day and who provided both comfort ratings are included in this chart.

Figure 27 shows the percentage of participants who reported a decline in comfort ratings during an event or non-event high temperature day. The percentage of participants who reported a decline in comfort during Power Manager events is consistently higher across outdoor temperature levels (27% to 36%), and at every temperature level it is significantly greater (p<.05 using student's t-test) than the percentage of Non-Event participants reporting a decline in comfort on non-event high temperature days.

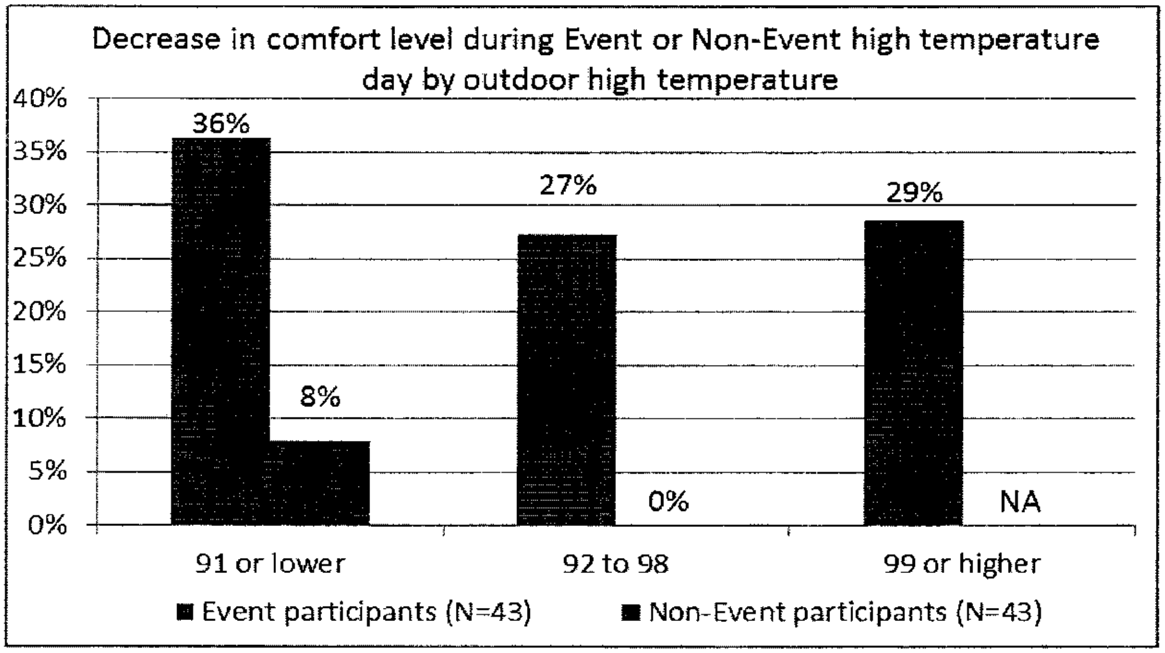

Figure 27. Decrease in Comfort by Outdoor High Temperature (total N=86)
Note: There were no non-event high temperature days in Ohio where the outdoor temperature was 99 degrees or higher. Only respondents who were at home on the event or non-event high temperature day and who provided both comfort ratings are included in this chart.

Comfort Ratings by Thermostat Settings

Event participants were more likely to notice a change in comfort during Power Manager events than Non-Event participants were to notice a change on a high temperature non-event day. However, the magnitude of the change for Event participants was greatest at higher and lower thermostat settings, as seen in Figure 28.

Thirteen event participants had their thermostats set at 72 degrees or lower and their mean comfort ratings declined from 8.23 before the Event to 7.00 during the event (significant at p<.10 using student's t-test), while five participants had their thermostats set at 79 degrees or higher and reported that their mean comfort ratings fell from 9.00 before the Event to 7.20 after the event (not statistically significant due to small sample size). For Event participants who had their thermostats set to between 73 and 78 degrees, there was no significant decline in comfort during Events.

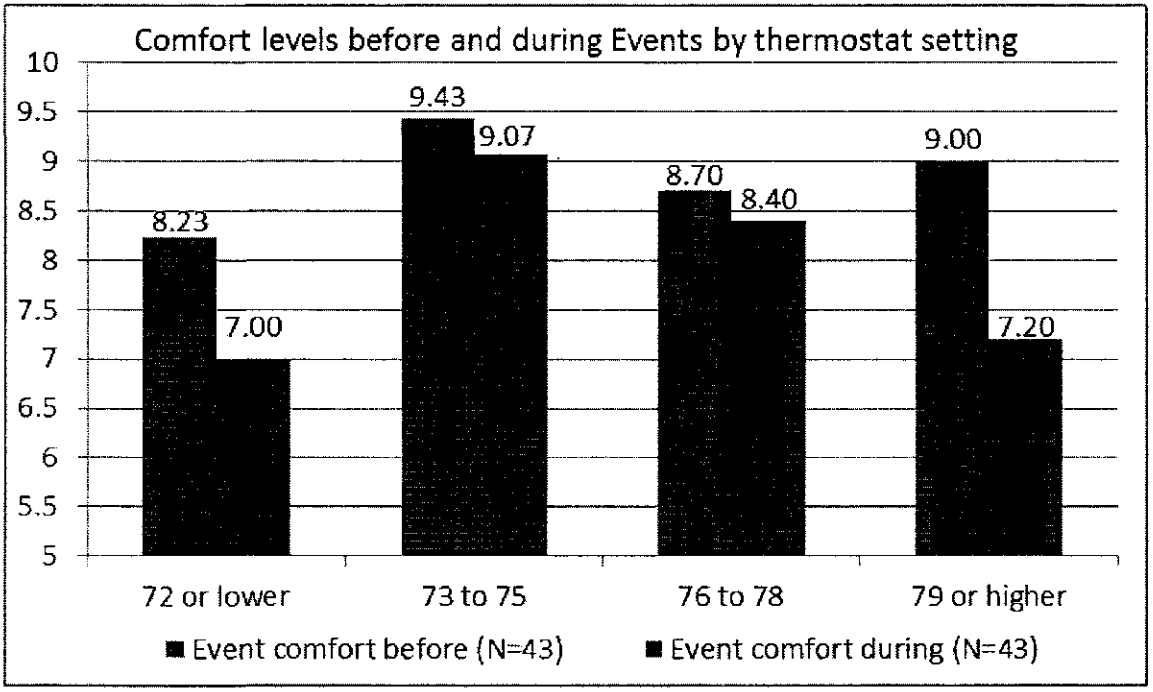

Figure 28. Changes in Comfort by Thermostat Settings – During Power Manager Events (N=43)

Changes in comfort ratings for Non-Event participants on high temperature days are shown in Figure 29. For these participants, there were no significant changes in comfort ratings at any thermostat level.

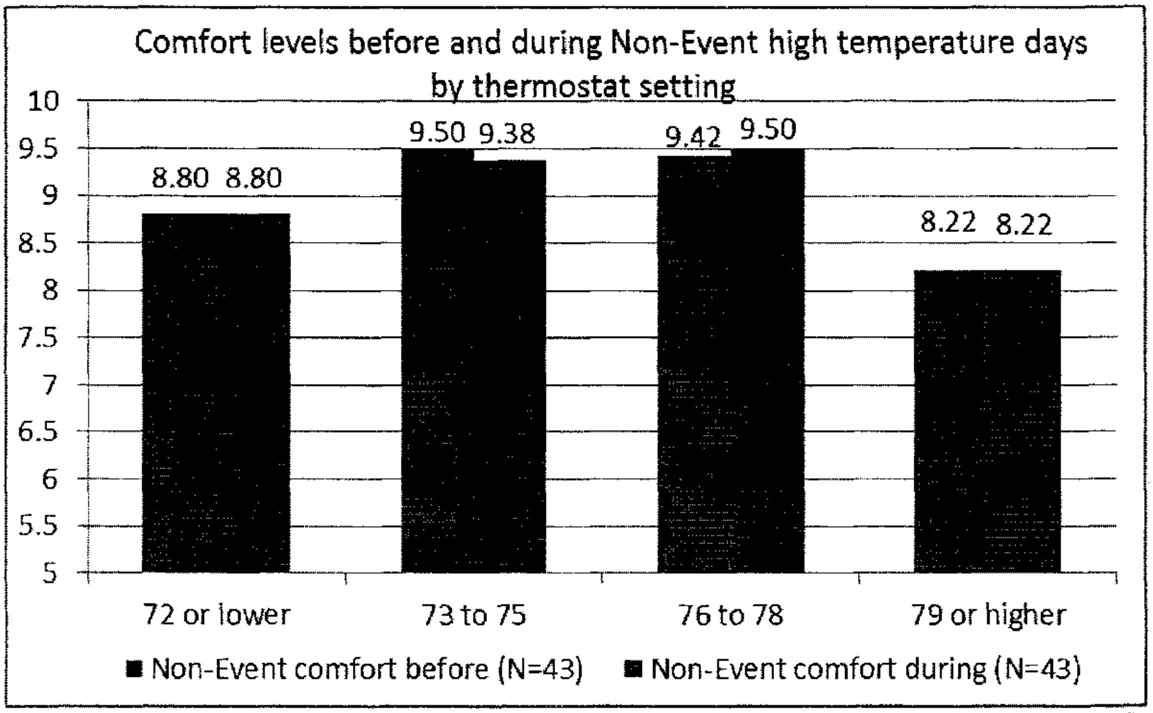

Figure 29. Changes in Comfort by Thermostat Settings – During High Temperature Non-Events (N=43)

Thermostat Settings by Age of Air Conditioner

Most participants set their thermostats between 73 and 78 degrees regardless of the age of their air conditioning unit, as seen in Figure 30. The only statistically significant relationship between the age of a participant's air conditioning unit and the temperature at which they had their thermostats set was that the seven participants with AC units more than 20 years old were more likely to set their thermostats to 79 degrees or higher (p<.10 using student's t-test).

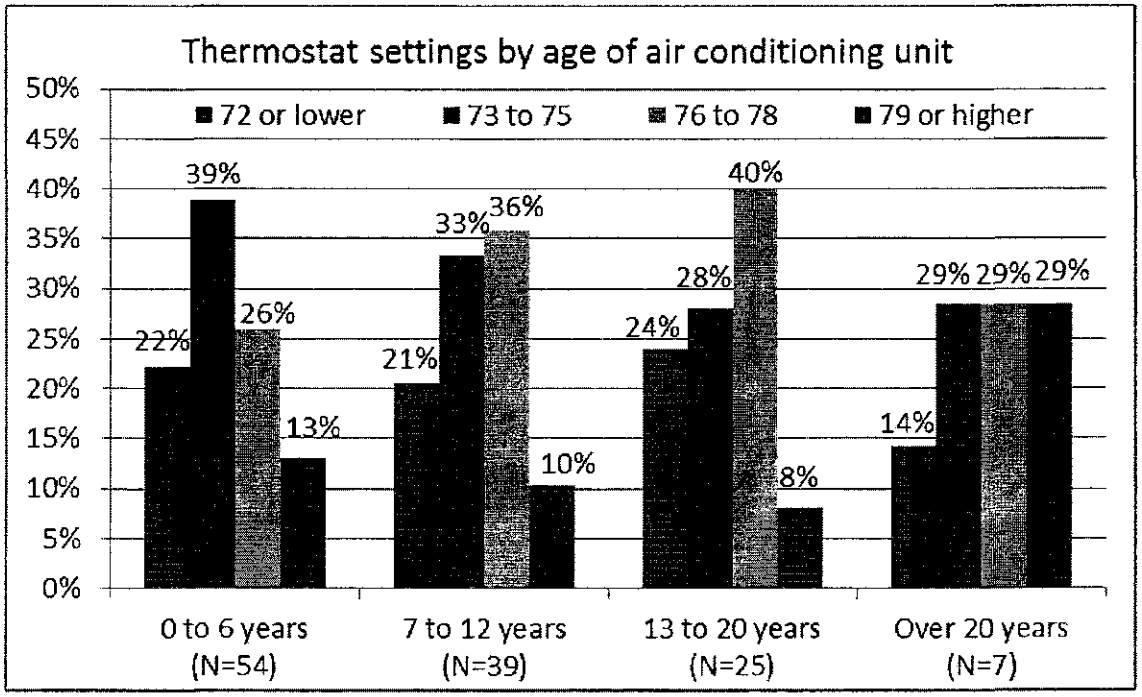

Figure 30. Thermostat Settings by Age of Air Conditioning Unit (Event and Non-Event Participants Combined)

Note: Only respondents who were able to specify thermostat settings and ages of air conditioning units are included in this chart (total N=125).

Appendix A: Event Survey Instrument

Use two attempts at different times of the day within 27 hours of event notification before dropping contact from the contact list. Call times are from 10:00 a.m. to 8:00 p.m. EST or 9-7 CST Monday through Saturday. No calls on Sunday. For example, if a control event occurs on a Monday, calling hours for that particular event would be:

Monday 5pm-8pm Eastern (4-7 Central)
Tuesday 10am-8pm Eastern (9-7 Central)

Note: Only read words in bold type, Italics are instructions.

State
( ) Indiana
( ) Ohio
( ) Kentucky
( ) North Carolina
( ) South Carolina

Info
Survey ID: ______________________
Event ID: ______________________
Surveyor Name: ______________________

Option
( ) 1.0 kW
( ) 1.5 kW

Introduction
On the first call attempt
Hello, my name is _____, and I'm calling on behalf of Duke Energy. According to our information, you presently participate in Duke Energy's Power Manager Program. This program allows Duke Energy to cycle your air conditioner when there is a critical need for electricity in the region. This is a short survey that will take about 5 minutes to complete, and the information you provide will be confidential and will help to improve the program.

On the second and final call attempt
Hello, this is _____ calling again on behalf of Duke Energy, with a survey about their Power Manager Program. This is my last attempt to reach you. Sorry for any inconvenience.

1. Are you aware of your participation in the Power Manager program?
( ) Yes
( ) No
( ) DK/NS

If no, **May I please speak to the person who would be most familiar with your household's participation in the Power Manager program?**
If not available, try to schedule a callback time within the 27 hour time-frame for the particular event. If transferred, begin survey from beginning (Introduction).

2. Has Duke Energy activated the Power Manager device since you joined the program?
[If they ask what this means, respond with: **"Duke Energy has the ability to send a signal to activate the device to cycle your central air conditioner on and off during an event."** *Then repeat the question.]*
( ) Yes
( ) No
( ) DK/NS

3. How do you know when the device has been activated?
[ ] A/C shuts down
[ ] Home temperature rises
[ ] The light on the meter is on
[ ] Light on AC unit flashes
[ ] Bill credits
[ ] Lower bill
[ ] Other: _______________
[ ] DK/NS

4. Has your device been activated within the last 7 days?
( ) Yes
( ) No
( ) DK/NS

(Ohio only)
5. If you were rating your overall satisfaction with the Power Manager Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?
( ) Very Satisfied
( ) Somewhat Satisfied
( ) Neither Satisfied nor Dissatisfied
( ) Somewhat Dissatisfied
( ) Very Dissatisfied
( ) Refused
( ) DK/NS

(Ohio only)
5a. Why do you give it that rating?

Your Power Manager device was recently activated on {*date*} starting at {*start time*} and ending at {*end time*}.

6. At what temperature was your thermostat set to during the time of the event?
( ) less than 65 degrees
( ) 65-68 degrees
( ) 69-72 degrees
( ) 73-75 degrees
( ) 76-78 degrees
( ) 79-81 degrees
( ) 82-84 degrees
( ) 85-87 degrees
( ) 88-90 degrees
( ) 91-94 degrees
( ) 95-97 degrees
( ) 98-100 degrees
( ) greater than 100 degrees
( ) It's programmed into the thermostat
( ) Thermostat was turned off
( ) Air conditioner was turned off
( ) DK/NS

7. Were you or any members of your household home when Duke Energy activated your Power Manager device at that time?
( ) Yes
( ) No
( ) DK/NS

If no or don't know, skip to question 14.

8. During this recent activation, using a scale of 1 to 10 where 1 means very uncomfortable and 10 means very comfortable, how would you describe your level of comfort <u>before</u> the control event?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10
( ) DK/NS

9. Using the same scale of 1 to 10 where 1 means very uncomfortable and 10 means very comfortable, how would you describe your level of comfort <u>during</u> the control event?
( ) 1
( ) 2

( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10
( ) DK/NS

Ask question 10 if score from question 9 is lower than score from question 8:
(Select all that apply.)
10. What do you feel caused your decrease in comfort?
[ ] Power Manager
[ ] Rising Temperature
[ ] Rising Humidity
[ ] Power Outage
[ ] Other: ________________
[ ] DK/NS

11. When Duke Energy activated your Power Manager device *{today or yesterday}*, **did you or any other members of your household adjust the settings on your thermostat?**
( ) Yes
( ) No
( ) DK/NS

If yes to question 11,
NOTE: enter a numeral for a temperature, or DK if not sure.
11a. What temperature was it originally at, and what temperature did you set it to during the control event?
Original temperature setting (degrees F): ________________________
Adjusted temperature setting (degrees F): ________________________

12. When Duke Energy activated your Power Manager device, did you or any other members of your household turn on any fans to keep cool?
( ) Yes
( ) No
( ) DK/NS

13. What else did you or other members of your household do to keep cool?
[ ] Continued normal activities/ Didn't do anything different
[ ] Turned on room/window air conditioners
[ ] Closed blinds/shades
[ ] Moved to a cooler part of the house
[ ] Left the house and went somewhere cool
[ ] Wore less clothing

[ ] Drank more water/cool drinks
[ ] Turned on fans
[ ] Opened windows
[ ] Other: _______________
[ ] DK/NS

Now I'm going to ask you some questions about your air conditioning use.

14. How often do you use your central air conditioner? Would you say you use it ...
(Read first 5 answers aloud, stop when they answer.)
[ ] **Not at all**
[ ] **Only on the hottest days**
[ ] **Frequently during the cooling season**
[ ] **Most days during the cooling season**
[ ] **Everyday during the cooling season**
[ ] DK/NS

15. When you think of a typical hot and humid summer day, at what outside temperature do you tend to feel uncomfortably warm?
( ) less than 65 degrees
( ) 65-68 degrees
( ) 69-72 degrees
( ) 73-75 degrees
( ) 76-78 degrees
( ) 79-81 degrees
( ) 82-84 degrees
( ) 85-87 degrees
( ) 88-90 degrees
( ) 91-94 degrees
( ) 95-97 degrees
( ) 98-100 degrees
( ) greater than 100 degrees
( ) DK/NS

16. At what outside temperature do you tend to turn on the air conditioner?
( ) less than 65 degrees
( ) 65-68 degrees
( ) 69-72 degrees
( ) 73-75 degrees
( ) 76-78 degrees
( ) 79-81 degrees
( ) 82-84 degrees
( ) 85-87 degrees
( ) 88-90 degrees
( ) 91-94 degrees
( ) 95-97 degrees

( ) 98-100 degrees
( ) greater than 100 degrees
( ) It's programmed into the thermostat
( ) DK/NS

17. How old is your air conditioner?
( ) 0 to 6 years old
( ) 7 to 12 years old
( ) 13 to 20 years old
( ) over 20 years old
( ) DK/NS

18. Using a scale of 1 to 10 where 1 indicates "Very Dissatisfied" and 10 indicates "Very Satisfied", what is your overall satisfaction with the Power Manager program?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10

If 7 or below ask,
18b. Why are you less than satisfied with Power Manager?
(Select all that apply)
[ ] They activated my Power Manager device more often than I would like
[ ] The bill credits/incentives were not large enough
[ ] I was uncomfortable when my Power Manager device was activated
[ ] Other: ________________
[ ] DK/NS

19. Using a scale of 1 to 10 where 1 indicates "Very Dissatisfied" and 10 indicates "Very Satisfied", what is your overall satisfaction with Duke Energy?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10

If 7 or below,
19b. Why are you less than satisfied with Duke Energy?

20. Using a scale of 1 to 10, where 1 means "Extremely Unlikely" and 10 means "Extremely Likely", how likely is it that you would recommend this program to a friend or colleague?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10

If 7 or below,
20a. Why would you not recommend the program?

21. Did you experience any power outage issues on the day of the event?
( ) Yes
( ) No
( ) DK/NS

22. Do you get your Duke Energy bill in the mail or by email?
( ) Mail
( ) Email
( ) DK/NS
( ) Other: ________________

23. How do you pay your bill? Do you...
(Read first 3 answers aloud, stop when they answer.)
( ) **Mail a check**
( ) log into your Duke Energy account and pay online
( ) or do you have an auto-pay set up for your account?
( ) Other: ________________

24. On average, how often do you review the details of your Duke Energy bill?
(Read first 4 answers aloud, stop when they answer.)
( ) **Every month**
( ) More than half the time
( ) Less than half the time
( ) Never
( ) Other: ________________
( ) DK/NS

25. How many people live in this home?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8 or more
( ) prefer not to answer

We have reached the end of the survey. Do you have any comments that you would like for me to pass on to Duke Energy?

Thank you for your time and feedback today!
Politely end call.

Appendix B: Non-Event Survey Instrument

Note: Text that is in red font indicates the changed wording from the Event survey to this Non-Event survey.

Use two attempts at different times of the day within 27 hours of weather exceeding 90°F and no Power Manager event being called. Call times are from 10:00 a.m. to 8:00 p.m. EST or 9-7 CST Monday through Saturday. No calls on Sunday. For example, if a high temperature/no event day occurs on a Monday, calling hours for that particular non-event would be:

Monday 5pm-8pm Eastern (4-7 Central)
Tuesday 10am-8pm Eastern (9-7 Central)

Note: Only read words in bold type. Italics are instructions.

State
( ) Indiana
( ) Ohio
( ) Kentucky
( ) North Carolina
( ) South Carolina

Info
Survey ID: ______________________
Event ID: ______________________
Surveyor Name: ______________________

Option
( ) 1.0 kW
( ) 1.5 kW

Introduction
on the first call attempt
Hello, my name is _____, and I'm calling on behalf of Duke Energy. According to our information, you presently participate in Duke Energy's Power Manager Program. This program allows Duke Energy to cycle your air conditioner when there is a critical need for electricity in the region. This is a short survey that will take about 5 minutes to complete, and the information you provide will be confidential and will help to improve the program.

on the second and final call attempt
Hello, this is _____ calling again on behalf of Duke Energy, with a survey about their Power Manager Program. This is my last attempt to reach you. Sorry for any inconvenience.

1. Are you aware of your participation in the Power Manager program?
( ) Yes

( ) No
( ) DK/NS

If no, **May I please speak to the person who would be most familiar with your household's participation in the Power Manager program?**
If not available, try to schedule a callback time within the 27 hour time-frame for the particular event. If transferred, begin survey from beginning (Introduction).

2. Has Duke Energy activated the Power Manager device since you joined the program?
[If they ask what this means, respond with: **"Duke Energy has the ability to send a signal to activate the device to cycle your central air conditioner on and off during an event.**" *Then repeat the question.]*
( ) Yes
( ) No
( ) DK/NS

3. How do you know when the device has been activated?
[ ] A/C shuts down
[ ] Home temperature rises
[ ] The light on the meter is on
[ ] Light on AC unit flashes
[ ] Bill credits
[ ] Lower bill
[ ] Other ______________________
[ ] DK/NS

4. Has your device been activated within the last 7 days?
( ) Yes
( ) No
( ) DK/NS

(Ohio only)
5. If you were rating your overall satisfaction with the Power Manager Program, would you say you were Very Satisfied, Somewhat Satisfied, Neither Satisfied nor Dissatisfied, Somewhat Dissatisfied, or Very Dissatisfied?
( ) Very Satisfied
( ) Somewhat Satisfied
( ) Neither Satisfied nor Dissatisfied
( ) Somewhat Dissatisfied
( ) Very Dissatisfied
( ) Refused
( ) DK/NS

(Ohio only)
5a. Why do you give it that rating?

6. At what temperature was your thermostat set to at 3pm on {*day of high temperature*}?
( ) less than 65 degrees
( ) 65-68 degrees
( ) 69-72 degrees
( ) 73-75 degrees
( ) 76-78 degrees
( ) 79-81 degrees
( ) 82-84 degrees
( ) 85-87 degrees
( ) 88-90 degrees
( ) 91-94 degrees
( ) 95-97 degrees
( ) 98-100 degrees
( ) greater than 100 degrees
( ) It's programmed into the thermostat
( ) Thermostat was turned off
( ) Air conditioner was turned off
( ) DK/NS

7. Were you or any members of your household home at that time?
( ) Yes
( ) No
( ) DK/NS

If no or don't know, skip to question 14.

8. During this recent activation, using a scale of 1 to 10 where 1 means very uncomfortable and 10 means very comfortable, how would you describe your level of comfort on {*day before high temperature*}?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10
( ) DK/NS

9. Using the same scale of 1 to 10 where 1 means very uncomfortable and 10 means very comfortable, how would you describe your level of comfort on {*day of high temperature*}?
( ) 1
( ) 2
( ) 3

( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10
( ) DK/NS

Ask question 10 if score from question 9 is lower than score from question 8:
(Select all that apply.)
10. What do you feel caused your decrease in comfort?
[ ] Power Manager
[ ] Rising Temperature
[ ] Rising Humidity
[ ] Power Outage
[ ] Other ____________________
[ ] DK/NS

11. On *{day of high temperature}*, did you or any other members of your household adjust the settings on your thermostat?
( ) Yes
( ) No
( ) DK/NS

If yes to question 11,
NOTE: enter a numeral for a temperature, or DK if not sure.
11a. What temperature was it originally at, and what temperature did you set it to on *{day of high temperature}*?
Original temperature setting (degrees F): ____________________
Adjusted temperature setting (degrees F): ____________________

12. When Duke Energy activated your Power Manager device, did you or any other members of your household turn on any fans to keep cool?
( ) Yes
( ) No
( ) DK/NS

13. What else did you or other members of your household do to keep cool?
[ ] Continued normal activities/ Didn't do anything different
[ ] Turned on room/window air conditioners
[ ] Closed blinds/shades
[ ] Moved to a cooler part of the house
[ ] Left the house and went somewhere cool
[ ] Wore less clothing
[ ] Drank more water/cool drinks

[ ] Turned on fans
[ ] Opened windows
[ ] Other _______________
[ ] DK/NS

Now I'm going to ask you some questions about your air conditioning use.

14. How often do you use your central air conditioner? Would you say you use it ...
(Read first 5 answers aloud.)
[ ] **Not at all**
[ ] **Only on the hottest days**
[ ] **Frequently during the cooling season**
[ ] **Most days during the cooling season**
[ ] **Everyday during the cooling season**
[ ] DK/NS

15. When you think of a typical hot and humid summer day, at what outside temperature do you tend to feel uncomfortably warm?
( ) less than 65 degrees
( ) 65-68 degrees
( ) 69-72 degrees
( ) 73-75 degrees
( ) 76-78 degrees
( ) 79-81 degrees
( ) 82-84 degrees
( ) 85-87 degrees
( ) 88-90 degrees
( ) 91-94 degrees
( ) 95-97 degrees
( ) 98-100 degrees
( ) greater than 100 degrees
( ) DK/NS

16. At what outside temperature do you tend to turn on the air conditioner?
( ) less than 65 degrees
( ) 65-68 degrees
( ) 69-72 degrees
( ) 73-75 degrees
( ) 76-78 degrees
( ) 79-81 degrees
( ) 82-84 degrees
( ) 85-87 degrees
( ) 88-90 degrees
( ) 91-94 degrees
( ) 95-97 degrees
( ) 98-100 degrees

( ) greater than 100 degrees
( ) It's programmed into the thermostat
( ) DK/NS

17. How old is your air conditioner?
( ) 0 to 6 years old
( ) 7 to 12 years old
( ) 13 to 20 years old
( ) over 20 years old
( ) DK/NS

18. Using a scale of 1 to 10 where 1 indicates "Very Dissatisfied" and 10 indicates "Very Satisfied", what is your overall satisfaction with the Power Manager program?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10

If 7 or below ask,
18b. Why are you less than satisfied with Power Manager?
(Select all that apply)
[ ] They activated my Power Manager device more often than I would like
[ ] The bill credits/incentives were not large enough
[ ] I was uncomfortable when my Power Manager device was activated
[ ] Other ______________________
[ ] DK/NS

19. Using a scale of 1 to 10 where 1 indicates "Very Dissatisfied" and 10 indicates "Very Satisfied", what is your overall satisfaction with Duke Energy?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10

If 7 or below,
19b. Why are you less than satisfied with Duke Energy?

20. Using a scale of 1 to 10, where 1 means "Extremely Unlikely" and 10 means "Extremely Likely", how likely is it that you would recommend this program to a friend or colleague?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8
( ) 9
( ) 10

If 7 or below,
20a. Why would you not recommend the program?

21. Did you experience any power outage issues on *{day of high temperature}?*
( ) Yes
( ) No
( ) DK/NS

22. Do you get your Duke Energy bill in the mail or by email?
( ) Mail
( ) Email
( ) DK/NS
( ) Other: ________________

23. How do you pay your bill? Do you...
(Read first 3 answers aloud, stop when they answer.)
( ) Mail a check
( ) log into your Duke Energy account and pay online
( ) or do you have an auto-pay set up for your account?
( ) Other: ________________

24. On average, how often do you review the details of your Duke Energy bill?
(Read first 4 answers aloud, stop when they answer.)
( ) Every month
( ) More than half the time
( ) Less than half the time
( ) Never
( ) Other: ________________
( ) DK/NS

25. How many people live in this home?
( ) 1
( ) 2
( ) 3
( ) 4
( ) 5
( ) 6
( ) 7
( ) 8 or more
( ) prefer not to answer

We have reached the end of the survey. Do you have any comments that you would like for me to pass on to Duke Energy?

Thank you for your time and feedback today!
Politely end call.

Appendix C: Survey Participant Customer Descriptive Data

Surveyed participants were asked how many people currently lived in their home. This distribution is shown below in Figure 31. Most Power Manager households surveyed have one or two people living in them: only 43.1% (28 out of 65) of Event households have three or more members, while 37.3% (28 out of 75) of Non-Event households have three or more members.

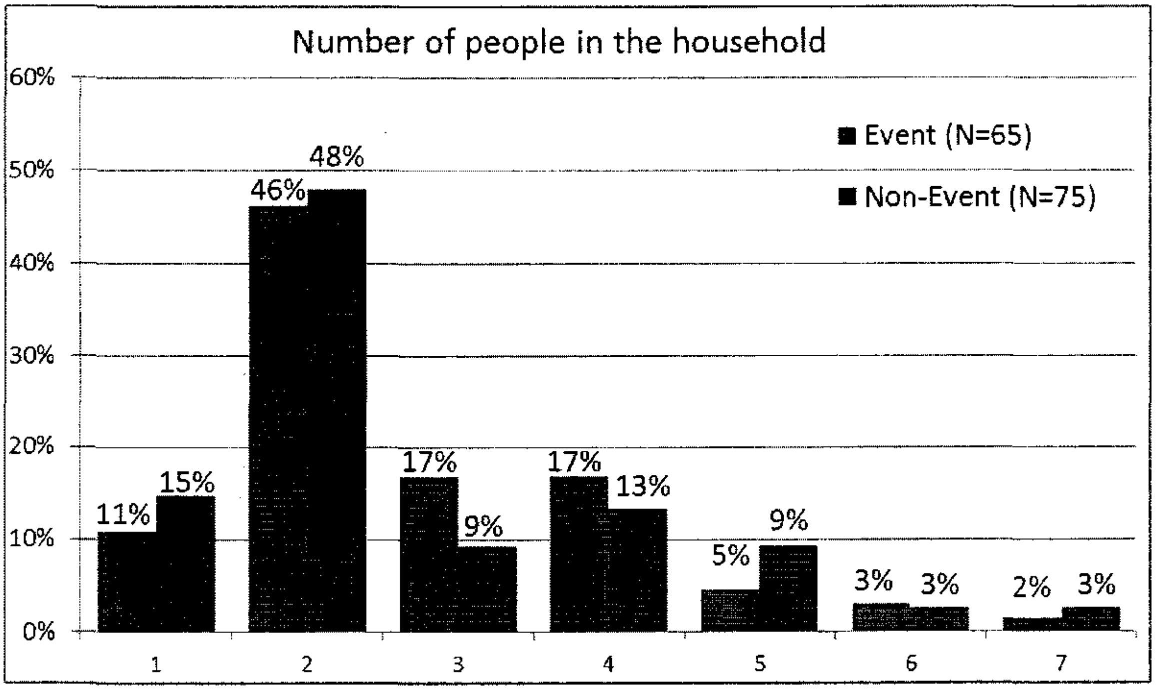

Figure 31. Population Distribution of Event and Non-Event Participants

Data provided by Duke Energy includes a variable for respondent age (this question was not asked as part of the survey). This distribution for Event and Non-Event participants is shown in Figure 32. Most participants surveyed were age 64 or younger (60.0% or 39 out of 65 Event participants, and 58.7% or 44 out of 75 Non-Event participants), with the most common age being between 55 and 64.

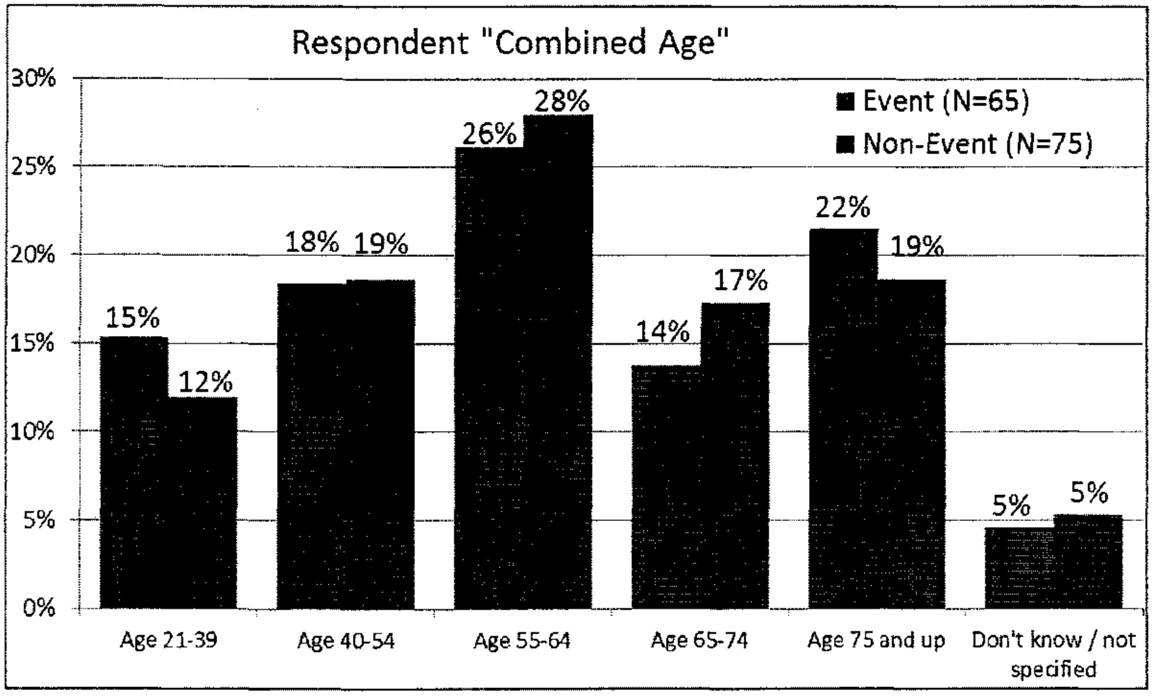

Figure 32. Age Distribution of Event and Non-Event Participants

Table 12 shows additional household descriptors from Duke Energy customer records: marital status, children in the household, income percentiles, education and ethnicity.

Table 12. Household Demographics

	Event (N=65)	Non-Event (N=75)
Marital Status: married	73.8%	60.0%
Marital Status: single	0.0%	2.7%
Marital Status: unknown	26.2%	37.3%
No children in household	67.7%	69.3%
One or two children in household	24.6%	24.0%
Three or more children in household	4.6%	5.3%
Children in household: unknown	3.1%	1.3%
Income percentile 1-25%	6.2%	14.7%
Income percentile 26-50%	13.8%	14.7%
Income percentile 51-75%	27.7%	17.3%
Income percentile 76-89%	32.3%	25.3%
Income percentile 90-99%	16.9%	26.7%
Income percentile unknown	3.1%	1.3%
Education: college graduate or better	50.8%	52.0%
Education: less than college graduate	46.2%	45.3%
Education: unknown	3.1%	2.7%
Ethnicity: Caucasian	80.0%	85.3%
Ethnicity: Non-Caucasian	10.8%	6.7%

Ethnicity: Unknown	9.2%	8.0%

Note: This data comes from Duke Energy customer records; these questions were not asked in this survey.

Table 13 presents data from Duke Energy customer records about survey participants' dwellings.

Table 13. Characteristics of Respondent Dwellings

	Event (N=65)	Non-Event (N=75)
Home owner	92.3%	86.7%
Home renter	3.1%	4.0%
Home ownership unknown	4.6%	9.3%
Single family structure	92.3%	92.0%
Multi-family structure	3.1%	4.0%
Home structure unknown	4.6%	4.0%
Home built 1949 or earlier	21.5%	13.3%
Home built during 1950's	15.4%	14.7%
Home built during 1960's	7.7%	10.7%
Home built during 1970's	18.5%	12.0%
Home built during 1980's	7.7%	12.0%
Home built during 1990's	13.8%	14.7%
Home built during 2000-2006	10.8%	10.7%
Home built during 2007-2012	0.0%	1.3%
Home age unknown	4.6%	10.7%
Lived in home 0-5 years	16.9%	21.3%
Lived in home 6-10 years	20.0%	24.0%
Lived in home 11-20 years	32.3%	28.0%
Lived in home 21-30 years	18.5%	17.3%
Lived in home more than 30 years	9.2%	8.0%
Lived in home unknown length of time	3.1%	1.3%
Estimated home value less than $100,000	6.2%	5.3%
Estimated home value $100,000-$149,999	15.4%	21.3%
Estimated home value $150,000-$199,999	29.2%	16.0%
Estimated home value $200,000-$274,999	20.0%	18.7%
Estimated home value $275,000-$349,999	10.8%	22.7%
Estimated home value $350,000 or more	13.8%	10.7%
Estimated home value unknown	4.6%	5.3%

Note: This data comes from Duke Energy customer records; these questions were not asked in this survey.