

**Energy Efficiency / Demand Response  
Plan: Plan Year 2 (6/1/2009-5/31/2010)**

**Evaluation Report: Central Air  
Conditioning Cycling**

**Presented to**

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## Section E. Executive Summary

Central Air Conditioning Cycling is Commonwealth Edison's residential direct load control program. The program allows ComEd to cycle off and on a participant's home central air conditioner condenser so it safely uses less electricity to ensure the reliability and stability of the electrical grid. It is an on-going program that Commonwealth Edison began in 1996. At the end of Program Year 2, there were approximately 65,000 participants in the program. Impact evaluation of this program is regularly performed by GoodCents Solutions, the installation contractor, based on a sample of approximately 250 customers that have whole house interval meters installed.

ComEd has a target of recruiting an additional 22,682 participants over three years for the Central Air Conditioning Cycling program as part of the Energy Efficiency and Demand Response Plan. Their plan calls for 8,092 new customers in Program Year 1 (PY1), 7,695 in Program Year 2 (PY2) and 6896 in Program Year 3 (PY3). Since this is a demand response program, there are no associated energy savings goals. The demand reduction achieved from these additional participants is expected to meet the statutory Demand Response goal, which is to reduce peak demand by 0.1% over the prior year for eligible customers.

### *E.1 Evaluation Objectives*

#### **Impact Evaluation**

Given that individual impacts are already estimated with a metered sample for the participants in this program before Program Year 1, the objective of this impact evaluation is to assess if the new participants in the program are significantly different in any way from the old participants. For this Program Year 2 evaluation, the information will be separated into three groups: participants prior to Program Year 1, Program Year 1 participants, and Program Year 2 participants. Last year's impact evaluation found no significant difference between the old participants and the new participants. Comparing Program Year 2 participants to both participants prior to Program Year 1 and Program Year 1 gives two points of reference for changes in the participant group makeup. To avoid confusion, the report will refer to Program Year 1 and Program Year 2 as new participants unless specified otherwise. The impact evaluation questions for this program are:

1. How do the new participants compare to the old program participants?
2. Are their average demand reductions expected to be different in any way from what would be found in the metered sample?

If differences are found between the participant groups, there may be a need to make adjustments to the impact per customer estimates to account for these differences among the new participants.

### **Process Evaluation**

The objective of the process evaluation is to assess the type of customer involved in the program, the ability of the program to motivate customers to join, and the experience of the customers once they are in the program.

### ***E.2 Evaluation Methods***

This study uses billing and program tracking data analysis to evaluate the similarities between participant groups in the Central Air Conditioning Cycling program.

### **Impact evaluation method**

Impact evaluation for this program is a bit different from what would normally be seen for other residential direct load control programs. The difference is due to the on-going nature of the program that already has an established M&V procedure to estimate demand reduction impacts. The main task for this impact evaluation is to determine if new participants are likely to have similar impacts to the old participants in the program, or if there are indications that impacts may be different.

The determination of similarity between new participants and old participants will be based on a thorough examination of the customer characteristics using information that is available in the ComEd billing system and the program tracking database. Key areas for investigation will be geography (where are the new customers located?) and size (what is the average annual kWh usage?).

Another important factor to consider when comparing the two groups is the number of air-conditioners per home. If a customer has more than one central air-conditioner in their home, it is assumed they must have control switches on both to have their load controlled during events. Previous studies in other jurisdictions have shown that the number of central air-conditioners in the home can have a significant effect on the average impacts per air-conditioner. If there are multiple units, the cooling load is shared and each unit tends to be smaller and/or used less than a unit that is the only provider of cooling in a home. This is true even though multiple units often occur in larger homes.

The number of customers selecting 50% cycling vs. 100% load shed could also contribute to a difference in average impact per participant; however, this difference can be used directly to estimate adjusted impacts for the new program participants.

### **Process evaluation method**

The process evaluation will use three data collection methods.

1. One CATI survey with program participants immediately following the August 19<sup>th</sup> cycling event.
2. In depth interviews with program staff/implementers
3. Collection of marketing materials for review

There is no net assessment planned for this program. Experience indicates that customers do not have the motivation or ability to cycle their HVAC unit in the absence of the program. Therefore, the NTGR for this program is 1.0.

Each data collection method will focus on the issues listed below.

- In depth Interviews: implementation aspects, marketing & outreach.
- Customer Survey: Demographics, how they learned of the program, satisfaction with program, how the customer handles their AC on a typical summer day and during heat waves, if they notice load control events and how they and their homes responds to these events.

Descriptive statistics of responses from the customer survey will be provided for the process evaluation. Additionally, we will perform a content analysis of the marketing material and synthesize the in-depth interviews to report on all aspects of the process findings.

### ***E.3 Key Findings***

#### **Impact Findings**

##### **Verification and Due Diligence**

Verification of participation in this program is overseen by the program implementer, GoodCents Solutions. They are responsible for reporting on load control switches that have been installed and removed as part of the program. All indications are that the GoodCents Solutions records of installations and removals are accurate and in good order.

##### **Tracking System Review**

We did not find any serious issues in the tracking system data for this program. In fact, we found the data to be consistent, clean and in good order. This is not surprising since the data is used for paying annual incentives, and there are financial consequences for poor program tracking.

## **Comparison of Old and New Customers**

This study uses billing and program tracking data analysis to evaluate the similarities between old and new participants in the Central Air Conditioning Cycling program. Participants who joined the program between June 1, 2008 and May 31, 2009 are considered PY1 participants and those joining the program between June 1, 2009 and May 31, 2010 are considered PY2 participants in this evaluation. The PY1 and PY2 participant groups will be referred to as new participants throughout this report unless otherwise specified.

Upon examining the data for old and new participants in the Central Air Conditioning Cycling program, only one (geographic location) of the four participant characteristics showed a need for adjustment of the gross savings estimates for new participants. Characteristics that were examined for similarities were geographic location, energy use, presence of multiple central AC units in the home, and selection of cycling level.

### **Geographic Location**

Last year's analysis showed a drop in program year 1 participants in the 600 and 601 zip code areas. Program year 2 participants in the 600 and 601 zip code areas increased from PY1 levels. The 600 and 601 zip code areas are where the majority of the participants are located. If there was a shift away from these zip code areas an adjustment to the per customer impact estimates could be necessary due to differing AC use based on location. This trend did not continue in PY2. The similarity of geographic location patterns between participant groups suggests that the program impacts of the participants would be similar and there is no need to be concerned about significant differences.

### **Annual Energy Use**

The distribution of annual energy use is very similar for the old and new participant groups. Given this similarity, the impact estimates for new participants are not expected to be different from the impacts of the old participants.

### **Multiple AC Units**

In both groups, over 90% of participants have only a single air-conditioning unit. Among the participants that have multiple AC units in each participant group, almost all of them have just two units. Given the similarity in the distribution of multiple units, the impact estimates for new participants are not expected to be different from the impacts of the old participants.

### **Cycling Levels**

The most significant factor affecting the impact from direct load control is the cycling level chosen by the participant. Participants who choose 100% cycling (load shed) will contribute

twice as much demand reduction as participants who choose 50% cycling. If new participants have different preferences than old participants regarding this choice, the average impact for the new group could be very different. The data shows a consistent selection of cycling options for each participant group.

### Verified Gross and Net Savings

ComEd’s original target for the Central Air Conditioning Cycling program was 11.1 MW of summer peak savings from 7,695 new participants in PY2. This impact is based on the assumption that 40.9% of new participants will choose the 50% cycling option while 59.1% will choose the 100% load shed option. This is equivalent to 1.446 kW per participant. The final PY2 report of claimed savings shows 13.55 MW of savings from 9,418 customers at 1.438 kW per participant.

Table 3-1 compares ComEd’s original program planning savings estimate for the program (11.1 MW) to the final program achievement evaluated savings estimate (13.55 MW). The biggest difference comes from the increase in the number of customers that joined the program compared to the PY2 program participation goal. A smaller difference comes from the fact that the 100% cycling option was chosen by 58.2% of new customers, compared to the original estimate of 59.1%. There is no free ridership or spillover expected in a direct load control program as a result, the Net-to-Gross ratio for this program is one and the net savings equal the gross savings.

**Table E-1. Program Planning and Program Achievement Gross Savings Calculations**

Participant Group	kW/ Cust	Program Planning			Ex Post Evaluation Adjusted Achievement		
		Customers	Share	MW	Customers	Share	MW
50% Cycling	0.909	3,147	40.9%	2.7	3,936	41.8%	2.97
100% Cycling	1.818	4,548	59.1%	8.3	5,482	58.2%	10.58
All Participants		7,695		11.0	9,418		13.55

### Process Findings

- ComEd’s marketing efforts for the program are very successful at generating program awareness and participation. Not only did the program exceed their PY2 participant goal by 22% (9,418 new participants), but the marketing materials (e.g., bill inserts, direct

mail brochure) were effective at generating program awareness. Furthermore, participants found the modalities of signing up for the program (e.g., mail, telephone, web site) easy to use.

- ComEd's implementation efforts are effective. The GoodCents technicians are doing a good job with installing and interacting with program participants, as nearly all surveyed participants (95%) expressed satisfaction with the GoodCents technician in PY2. The single residential control event examined by the evaluation was implemented effectively as nearly three quarters of participants who were home did not notice a change in the temperature in their home. Furthermore, very few participants (n=4 out of 141 surveyed) experienced any technical difficulty with their air conditioner after the event.
- Overall, program satisfaction is relatively high at 78%, while program retention is higher, as 87% of participants are unlikely to cancel their participation in the program. The program incentives and monthly savings are the primary drivers of program participation and satisfaction, especially among customers with the 100% option.

## Section 1. Introduction to the Program

### 1.1 Program Description

Central Air Conditioning Cycling is a residential direct load control program that allows ComEd to cycle off and on a participant's home central air conditioner compressor so it uses less electricity on the hottest days of the year. The air conditioner's fan remains powered to circulate air to help the participant's home stay comfortable.

Customers can select either a 50% cycling option or a 100% cycling option. They receive an annual incentive of \$20 for 50% cycling or \$40 for 100% cycling. Approximately 60% of past participants have chosen the 100% load shed option.

Central Air Conditioning Cycling is an on-going program that Commonwealth Edison began in 1996. Impact evaluation of this program is regularly performed by GoodCents Solutions, the implementation contractor. The evaluation is based on a sample of approximately 250 customers that have whole house interval meters installed. Estimated program impacts are reported annually to PJM as demand response resources.

ComEd has a target of recruiting an additional 22,682 participants over three years for the Central Air Conditioning Cycling program as part of the Energy Efficiency and Demand Response Plan. Their plan calls for 8092 new customers in Program Year 1 (PY1), 7695 in Program Year 2 (PY2) and 6896 in Program Year 3 (PY3). Since this is a demand response program, there are no associated energy savings goals. The demand reduction achieved from these additional participants is expected to meet the statutory Demand Response goal, which is to reduce peak demand by 0.1% over the prior year for eligible customers.

### 1.2 Changes to the Program

In PY2, the program was implemented and marketed in a manner similar to PY1. One technical design change occurred in PY2, as approximately 6,000 switches were transitioned from a third-party satellite system to ComEd's internal paging system.

### 1.3 Program Delivery Mechanisms and Marketing Strategy

Direct mail brochures (with self-mailer enrollment cards) are the primary marketing tools for the program. Other methods used to promote the program in PY2 included the Energy at Home newsletter, a bill insert, and a message on the customer bill. The messages included on these promotions primarily feature the cost savings, environmental benefits, and the system reliability as selling points. Customers can enroll in the program either by calling a ComEd telephone representative, by mailing in an enrollment form, or by signing up directly through ComEd's website.

### 1.3.1 Measures and Incentives

The program currently provides two levels of incentives: the 50% cycling option and the 100% cycling option. With the 50% cycling option, participants receive an annual incentive of \$20, which is delivered as a \$5 credit on participant's monthly electric bill from June through September. The 100% option offers an annual incentive of \$40 which is delivered as \$10 monthly credits for the same four month summer period.

## 1.4 Evaluation Questions

The three year evaluation plan for this program prescribes an impact evaluation each year and a process evaluation for Program Year 2 (PY2).

GoodCents Solutions, the program implementer, has been performing impact evaluations for this program since its beginning. For the impact analysis, they use data from whole house interval meters on a sample of approximately 250 program participants.

Given that individual impacts are already estimated with a metered sample, the objective of this impact evaluation is to assess if the new participants in the program are significantly different in any meaningful way from the old participants. The impact evaluation questions for this program are:

1. How do the new participants compare to the old program participants?
2. Are their average demand reductions expected to be different in any way from what would be found in the metered sample?

If significant differences are found between the two participant groups, there may be a need to make adjustments to the impact per customer estimates to account for these differences among the new participants.

The process evaluation will assess the type of customer involved in the program, the ability of the program to motivate customers to join, and the experience of the customers once in the program. Specifically, the process evaluation will answer the following research questions:

1. This program began prior to 2007. Has the program as implemented changed since the beginning of this program cycle? If so, how, why, and was this an advantageous change?
2. What challenges have occurred in implementation and how were they handled?
3. What are the characteristics of the customers in the program?
4. What is the turnover rate of customers?

5. Is the program outreach to customers through the program effective in increasing awareness of the program opportunities?
  - a. What is the format of the outreach?
  - b. How often does the outreach occur?
  - c. Are the messages within the outreach clear and actionable?
6. Are the program processes effective for motivating customers to participate?
  - a. Has the participation process and program requirements been clearly explained to customers?
  - b. How quickly does the program answer customer questions?
  - c. Are customers satisfied with the program processes in which they were involved?
  - d. Is the application process onerous? Does the process present any barriers to program participation?
7. What areas could the program improve to create a more effective program for customers and help increase the demand impacts? (e.g., How is the program addressing the difficult economic conditions and what could be provided to customers?)

## Section 2. Evaluation Methods

Impact evaluation for this program is a bit different from what would normally be seen for other residential direct load control programs. The difference is due to the on-going nature of the program that already has an established M&V procedure to estimate demand reduction impacts. The main task for this impact evaluation is to determine if new participants are likely to have similar impacts to the old participants in the program, or if there are indications that impacts may be different.

The determination of similarity between new participants and old participants will be based on a thorough examination of the customer characteristics using information that is available in the ComEd billing system and the program tracking database. Key areas for investigation will be geography (where are the new customers located?) and size (what is the average annual kWh usage?).

Another important factor to consider when comparing the two groups is the number of air-conditioners per home. If a customer has more than one central air-conditioner in their home, it is assumed they must have control switches on both to have their load controlled during events. Previous studies in other jurisdictions have shown that the number of central air-conditioners in the home can have a significant effect on the average impacts per air-conditioner. If there are multiple units, the cooling load is shared and each unit tends to be smaller and/or use less than a unit that is the only provider of cooling in a home. This is true even though multiple units often occur in larger homes.

The number of customers selecting 50% cycling vs. 100% cycling could also contribute to a difference in average impact per participant; however, this difference can be used directly to estimate adjusted impacts for the new program participants.

### *2.1 Analytical Methods*

The primary focus of the annual impact evaluation is the comparison of characteristics between the groups of customers: old participants and new participants. The goal is to determine if there are significant differences between the customer make-up of the groups and whether that could substantially affect their estimated average impacts during load control events.

Since the data that is used for this analysis is available for all participants, there is no need to establish statistical significance in the differences that are found. The analysis is done on a census of all participants rather than on a sample, so we can have 100% confidence in all of the differences that are found.

While the differences between the two groups in the characteristics that are examined will be known with certainty, it is still uncertain if those differences would make a real and substantial

difference in the load impacts seen during direct load control events. Any observed difference in characteristics is an indicator of possible difference in load impacts, but judgment must be applied before carrying that difference forward as an adjustment to the realization rate for the program. Each case will be examined carefully for proper application to gross impact adjustment.

## **2.2 Data Sources**

The main data source used for the impact evaluation is ComEd's residential CIMS database. Since the Central Air Conditioning Cycling program is tied to a tariff, most information on participants is in the billing system. The program implementer also keeps a program tracking database with some additional details related to installation, but most of the important information is transferred to the CIMS system as new participants join the program. Since the data for the program is kept in the CIMS database, we have complete information on all old and new program participants.

The process evaluation used the program tracking data delivered by ComEd. This information served as the sample frame for the telephone survey with program participants following one control event. We received program marketing materials to provide information on the quality of the marketing efforts.

### **2.2.1 PY2 Process Data Collection Activities**

The process evaluation consisted of in-depth telephone interviews with program staff and implementers, and a content review of the marketing materials as shown in the table below. The primary data collected for the evaluation of the PY2 Central Air Conditioning Cycling Program was gathered from Computer Assisted Telephone Interviews (CATI) with program participants. Table 2-1 below provides a summary of these data collection activities including the targeted population, the sample frame, and timing in which the data collection occurred.

**Table 2-1. Data Collection Activities**

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Computer Assisted Telephone Survey	Program participants	Program participant database	Random sample of program participants who had signed up for the program since June 1, 2008.	141	August 2010 Immediately following a control event
In-Depth Telephone Interviews	Program staff/implementers	Contacts from ComEd	Program managers from ComEd and GoodCents	2	July 2010
Content Review of Marketing Materials	-	Promotional materials and website	All materials used for PY2	-	July 2010

### 2.2.2 Program and Implementer Staff Interviews

The evaluation team conducted two in-depth interviews with program staff as part of this evaluation. One of these interviews was conducted with the ComEd Central Air Conditioning Program Manager and one with the GoodCents Implementation Manager. These interviews were completed over the phone in July 2010. Both interviews focused on changes to the program from PY1 to PY2 and perceived effectiveness of the program.

### 2.2.3 Program Participant Telephone Survey

The evaluation team designed, programmed, and administered a 15-minute CATI survey with participants who had signed up for the program since June 1, 2008. The survey focused on how participants learned of the program, customer experience and satisfaction with the program, typical customer AC usage, and response to the residential curtailment event called on Thursday, August 19, 2010.

## 2.3 Sampling Plan

Sampling is not an issue for the impact evaluation. Data from the billing system was collected and analyzed for the entire population of old and new participants since there is no extra cost for data collection. Using all participants in the analysis eliminates the potential problem of sampling bias in the results.

The sample of Central Air Conditioning Cycling program participants used for the telephone survey was randomly selected from a list of participants with “effective dates” (sign up dates)

from June 1, 2008 to August 5, 2010. This list of PY1, PY2, and some PY3 participants was drawn from the total program participant database provided by ComEd in mid-August, 2010. The total program participant list included approximately 66,000 records, of which 18,620 participants had an effective date on or after June 1, 2008.

Basic data cleaning steps were undertaken before the sample was pulled from this database so that records with missing, invalid, or duplicate phone numbers were removed. A total of 170 participants were dropped from the 18,620 records because of duplicate phone numbers (the 2<sup>nd</sup> phone number was removed), and 137 were dropped due to invalid or blank phone numbers. A random sample was then selected from this data set.

The sample was stratified by “Rider Type” or cycling option from the program tracking database. Participants in the 50% cycling option were oversampled in order to achieve a 90% confidence level and 10% precision level for this group. The table below shows the population sizes and number of completed surveys for each cycling option.

**Table 2-2. Participant Survey Population and Sample Sizes by Strata**

Strata (Rider)	Population Size* (N)	Completed Surveys (n)	Sampling Error (90% CI)
50% Cycling Option	7,478	70	9.8%
100% Cycling Option	10,972	71	9.7%
Total	18,450	141	6.9%

*\*Source: Central Air Conditioning Participant Survey Sample Frame from Program Tracking Database. Population includes participants with effective dates between June 1, 2008 and August, 2010 with duplicates phone numbers removed.*

For participants in each cycling option we can be 90% confident that the sampling error is +/- 10% or better among the population of participants with an effective date since June 1, 2008.

### Survey Dispositions

All of the 141 program participants we surveyed completed the interview on the day of the event. In order to reach this number of completes in one night we needed to call 1,374 program participants. Of these attempted interviews, we were unable to reach 53% of participants because no one answered, we reached the answering machine, or we received a busy signal. An additional 14% had issues with the phone number, in large part due to disconnected phone numbers.

**Table 2-3. Participant Survey Sample Dispositions**

Sample Disposition	Customers	%
Participants Attempted to Contact	1374	100%
Completes	141	10%
Refusal	11	1%
Unable to Reach	723	53%
Language Barrier	1	<1%
Phone Number Issue	196	14%
Non-Specific Callback/Appointment Scheduled	271	20%
Mid Interview Terminate	31	2%

### Weighting

In order to produce results representative of the overall population of participants who had enrolled since June 1, 2008, the data were weighted to match the population distribution. Because the total number of completes overrepresented participants in the 50% option and underrepresented participants in the 100% option, we weighted these participant groups to the population distribution shown below in the table.

**Table 2-4. Participant Survey Distribution and Weights by Strata**

Strata (Rider)	Population Distribution* (N=18,450)	Completed Surveys (n=141)	Weights
50% Cycling Option	40.5%	49.6%	0.82
100% Cycling Option	59.5%	50.4%	1.18

*\*Population includes participants with effective dates between June 1, 2008 and August, 2010 with duplicate phone numbers removed.*

## Section 3. Program Level Results

### 3.1 Impact Results

The impact results reported here will cover several important facets of the impact evaluation of the Central Air Conditioning Cycling program. First, there will be a discussion of verification and due diligence issues which speak to the reliability of the data collected for this program. Second, a tracking system review will report on the usability and completeness of the program tracking data collection system for this program. Third, impact parameter estimates and overall impact results will be reported at both the Gross and Net levels.

#### 3.1.1 Verification and Due Diligence

Verification of participation in this program is overseen by the program implementer, GoodCents Solutions. They are responsible for reporting on load control switches that have been installed and removed as part of the program. All indications are that these records of installations and removals are accurate and in good order.

Customers also contribute to verification of participation for this program since they expect to receive a bill incentive after the switches are installed. If they have a switch installed on their home but they do not get entered into the billing system as a participant in the program, it is likely that they will report this situation to ComEd so it can be remedied and they can receive their incentive.

The opposite is less true. If they no longer participate in the program or have their switch removed, they may not report receiving an incentive in error. Given the annual cost of incentives for maintaining customers in the program, ComEd, and consequently GoodCents Solutions, have a strong financial incentive for keeping their records accurate.

All direct load control programs like this that have one-way communication systems (i.e., control signals get broadcast out to switches, but switches do not send any acknowledgement signals back) have difficulty identifying failed switches and switches that do not respond to particular events. The cost of a two-way communication system is very high and generally not justified by the benefits it would bring to the direct load control program. For that reason, the most cost-effective course of action for verification of working switches in a one-way communication system is a rotational plan for checking switches at some regular interval. ComEd has a five year maintenance program which means every switch is checked at least once every five years.

It is estimated that roughly 10% of switches are found to have problems during the maintenance checks. Combining the five-year maintenance schedule with 10% failed switches after five years, the overall failure rate at any given time is probably close to 5%. This is a low number, but even

so, GoodCents Solutions does make an adjustment to their impact estimates to account for homes in the metered sample that do not show response to events. This non-response may be due to a non-working switch, or to the fact that air-conditioning is not in use in the home on the control event days. Either way, impact estimates are being properly adjusted for the unavoidable existence of non-working switches in the participant population. Consequently, we can say that based on the five year maintenance schedule and the non-response correction that GoodCents Solutions makes to the estimate of savings from the sample data, it is likely that the existence of non-working switches is properly accounted for in the estimation of program impacts.

### **3.1.2 Tracking System Review**

We did not find any serious issues in the tracking system data for this program. In fact, we found the data to be consistent, clean and in good order. This is not surprising since the data is used for paying annual incentives and there are financial consequences for poor program tracking.

The summary data reported for this program is consistent with the individual tracking system data.

### **3.1.3 Gross Program Impact Parameter Estimates**

Upon examining the data for old and new participants in the Central Air Conditioning Cycling program, only one of the four participant characteristics showed a need for adjustment of the gross savings estimates for new participants. Characteristics that were examined for similarities were geographic location, energy use, presence of multiple central AC units in the home, and selection of cycling level.

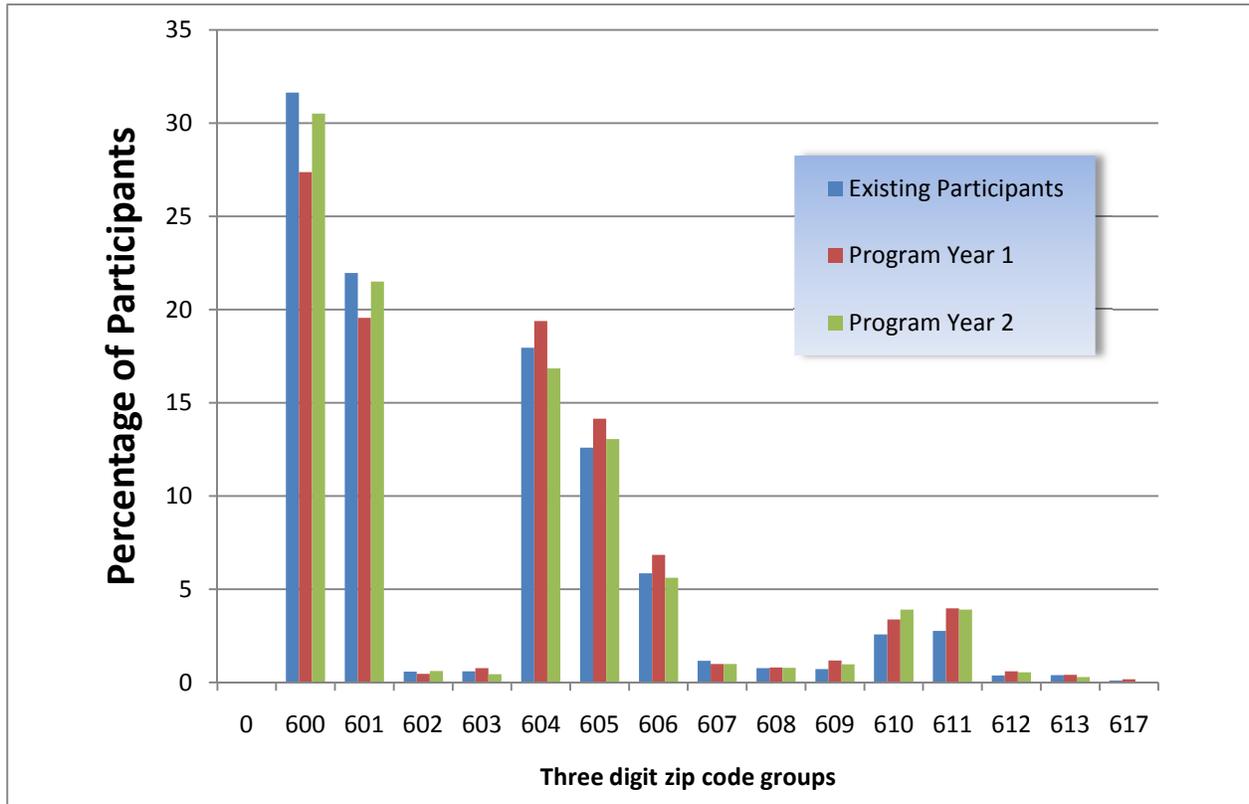
#### **Geographic Location**

Geographic location was examined to see if the groups had different geographic distributions. If the groups had a different geographic makeup then it would be more likely that the two groups have a different socio-economic mix. A different socio-economic mix would be an indicator that savings might be different for the respective groups. For example, higher income areas are more likely to have larger homes requiring more air conditioning.

Figure 3-1 compares old participants to new participants by their three digit zip code group. The participant groups have similar distributions across zip codes. Last year's analysis showed a drop in PY1 participants in the 600 and 601 zip code areas. PY2 participants in the 600 and 601 zip code areas increased from PY1 levels. The 600 and 601 zip code areas are where the majority of the participants are located. If there was a shift away from these zip code areas an adjustment to the per customer impact estimates could be necessary due to differing AC use based on location. This trend did not continue in PY2. The similarity of geographic location patterns

between participant groups suggests that the program impacts of the participants would be similar and there is no need to be concerned about significant differences.

**Figure 3-1. Percentage of Old and New Participants grouped by Three digit zip code**

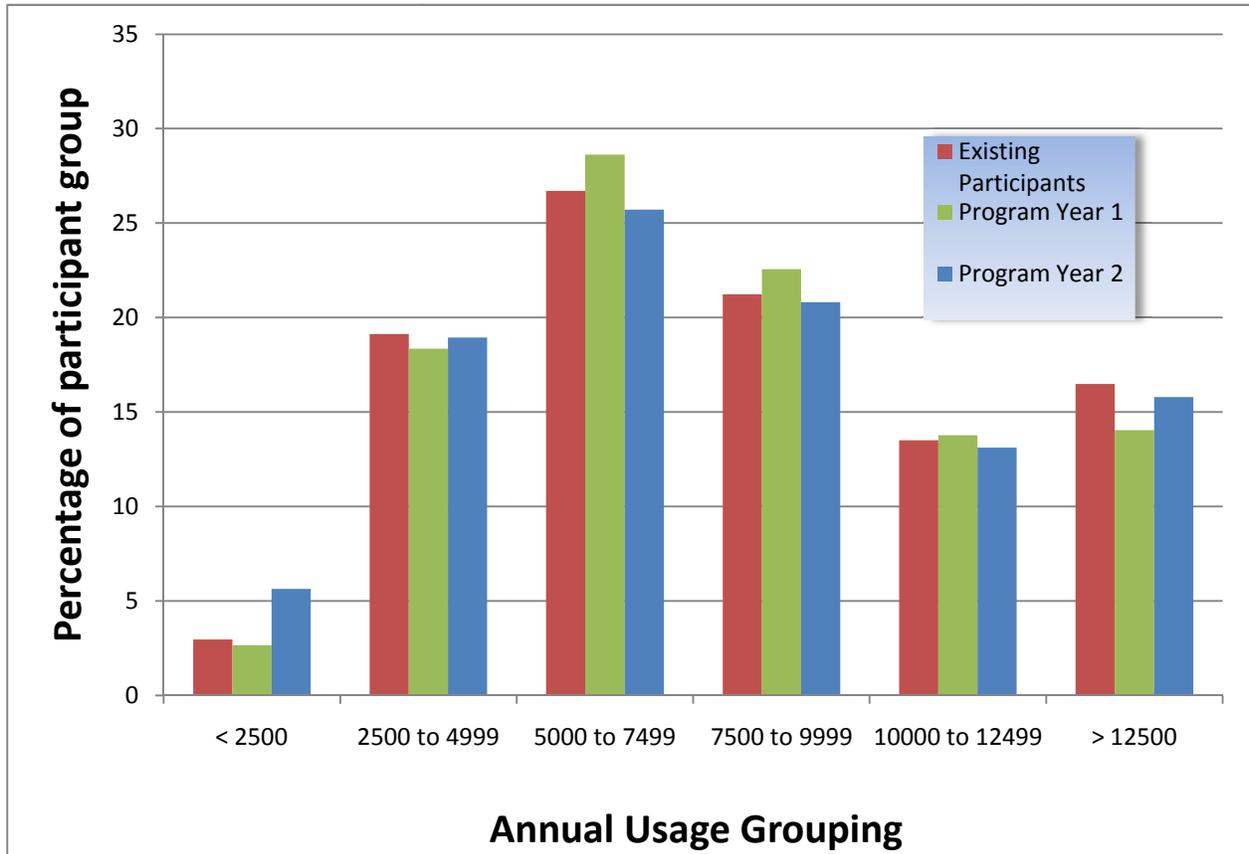


## Annual Energy Use

The distribution of annual energy use for old and new participants was also compared. A significant difference between the groups would imply that there may be different air conditioning usage characteristics which would affect impact estimates.

Figure 3-2 shows that the distribution of energy use is very similar for the old and new participant groups.

**Figure 3-2. Percentage of Old and New Participants grouped by Annual Usage**



Last year’s analysis showed a slight decrease in annual energy use between old and new customers. One possibility that was suggested for the difference was that new participants in the AC cycling program may be new ComEd customers. These new customers may not have billing data from the high energy use months. It was suggested that the PY1 participants be reexamined in the PY2 analysis to see if the data continued to show a decreased annual usage for the PY1 participants when it was certain that they all had 12 months of billing data.

The new results show that the slight decrease in annual energy use for PY1 participants reported last year was real. It shows up again in this year’s analysis of full-year data. However, it is not a trend. The share of PY2 participants in the highest energy use group (>12,500 kWh/year) is higher than the PY1 group, although it is not quite at the same level as the share of high energy users in the old participant group.

Given the small absolute size of the difference (less than 2% of participants shifted from the highest energy use group to mid-range energy use groups) and the fact that it is not a growing trend, there is no indication that current estimates of program impacts per customer need to be changed.

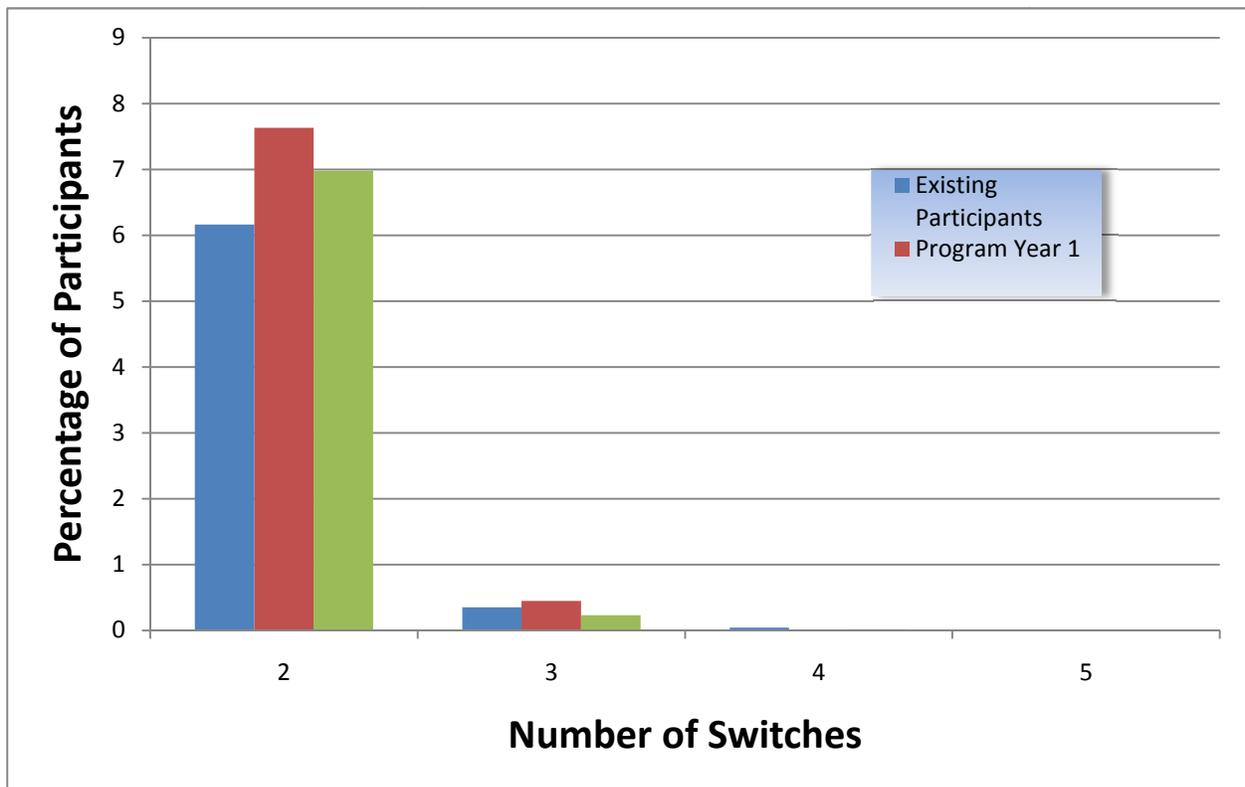
The more important point from this comparison is that the annual energy use distributions of the old, PY1, and PY2 participant groups are remarkably similar. The similarity of annual energy usage patterns between participant groups suggests that the program impacts of the participants would be similar and there is no need to be concerned about significant differences. Note that this is census data, not sample data, so the small differences are known with 100% confidence and there is no need to do statistical testing.

## Multiple AC Units

The number of switches per participant was examined to identify any potential differences between the participant groups. Multiple switches indicate that the customer has multiple AC units. Multiple AC units can affect the average usage of the individual AC units. Identifying if the occurrence of multiple AC units is significantly different for one participant group will identify whether changes need to be made to account for these differences.

In all groups, over 90% have only a single air-conditioning unit. Figure 3-3 shows that among the 9 to 10% of customers that have multiple AC units in each participant group, almost all of them have two units.

**Figure 3-3. Percentage of Old and New Participants with Multiple Switches**



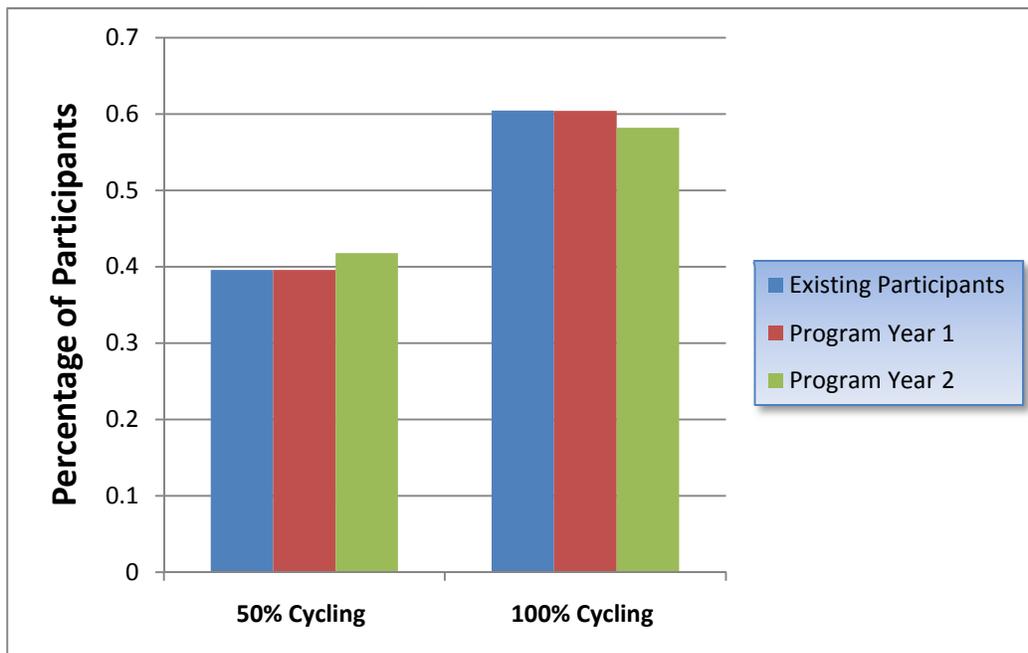
Given the similarity in the distribution of multiple units, the impact estimates for new participants are not expected to be different from the impacts estimates of the old participants.

## Cycling Levels

The most significant factor affecting the impact from direct load control is the cycling level chosen by the participant. Participants who choose 100% cycling (load shed) will contribute twice as much demand reduction as participants who choose 50% cycling. If new participants have different preferences than old participants regarding this choice, the average impact for the new group could be considerably different.

Figure 3-4 shows a consistent selection of cycling options for each group.

**Figure 3-4. Percentage of Old and New Participants who Elected 50% or 100% Cycling Option**



### 3.1.4 Gross Program Impact Results

Gross program impacts are calculated based on program participant counts and savings impacts per participant.

#### Participant Counts

The original goal was to add 7,695 new participants to the Central Air Conditioning Cycling program in PY2. The actual number of new participants was 9,418. This was verified with an assessment of program start dates for all new program participants.

It should be noted that this reflects 9,418 new participants added to the Central Air Conditioning Cycling program in PY2 without any adjustment for participants who left the program during the year. In other words, while 9,418 new customers joined the program in PY2 the total number of participants in the program did not increase by 9,418. Growth was offset by program attrition.

### **Savings Impacts per Participant**

Previous analysis done by GoodCents Solutions using the metered interval data produced an estimate of 0.909 kW savings per participant at the 50% cycling level.<sup>1</sup>

This impact estimate is based on regression analysis of metered whole house load data from the summers of 2005 and 2006. These summers contained several control events and many high temperature days which allowed for the estimation of impacts across a wide range of summer temperatures. The regression models estimated impacts based on the hour of the day, the maximum daily temperature, and the connected A/C load. All of the control events were at the 50% cycling level, so the results of the evaluation are impacts for 50% cycling.

The data also supplied an estimate of the correction factor that should be used to account for non-working switches and non-use of air-conditioning. By manual observation, they found that 29 out of 145 participant meters did not show any response to control signals. This created a correction factor of 29 / 145, or 20%. This means that it is expected that 80% of participants will respond to each control event. The estimated impacts from the regression models, which reflect only responsive customers, are multiplied by the 80% de-rating factor to reflect the average impact per program participant.

On pages 23 through 32 of their report, GoodCents Solutions uses the results of their regression models adjusted by the de-rating factor and a losses factor to create estimates of potential load reduction for each daytime hour on summer weekdays at different maximum daily temperatures. These estimated impacts follow the specific reporting guidelines required by PJM. One part of these requirements is to report expected impacts for a PJM system peak day.

GoodCents Solutions analyzed temperature data to find the expected maximum daily temperature in ComEd's service territory on PJM's RTO Peak Days. Temperature data collected from the O'Hare weather station for 1998 through 2006 showed that ComEd's average temperature during PJM's summer system peaks was 90.38° F.<sup>2</sup> This is cooler than what is normally expected for maximum daily temperatures on ComEd's system peak days, and it reflects the fact that the PJM peak is normally set by high temperatures in the north eastern

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<sup>1</sup> "ComEd's Nature First A/C Load Control Measurement and Verification, 2006 Revision and Revised PJM Control Matrices", GoodCents Solutions, March 2007

<sup>2</sup> GoodCents Solutions, "ComEd's Executive Summary of the Nature First Air Conditioning Load Study," Updated May 15, 2007.

region of the U.S. while Chicago peak weather runs a bit cooler during these times of peak eastern summer temperatures.

The key impact estimate can be found on page 24 of the 2006 Revised Report. At Hour Ending 16:00 on a day when the maximum daily temperature reaches 90.38 degrees, the expected impact per participant from 50% cycling is reported to be 0.9926 kW. This value is the expected load reduction at the generator busbar. To estimate load reduction at the customer level, the reported impact needs to be divided by the line loss factor of 1.092. This calculation,  $0.9926 \text{ kW} / 1.092$ , reveals the underlying load impact per participant of 0.909 at the customer level. Impacts need to be reported at the customer level for this program to be consistent with impacts reported for other programs in the portfolio.

This information was the basis of the program planning estimate of impacts per customer used in the development of the ComEd demand response plan. Assuming that 100% cycling customers would contribute twice as much load reduction as a 50% cycling customer, the contribution to load reduction was estimated to be  $0.909 \times 2 = 1.818 \text{ kW}$  for each participant that chose the 100% cycling option. As shown in Table 3-1, it was assumed in the program planning estimation of impacts that there would be 7,695 new participants and 40.9% of them would choose the 50% cycling option, and 59.1% would choose the 100% cycling option.

**Table 3-1. Program Planning and Program Achievement Gross Savings Calculations**

Participant Group	kW/ Cust	Program Planning			Ex Post Evaluation Adjusted Achievement		
		Customers	Share	MW	Customers	Share	MW
50% Cycling	0.909	3,147	40.9%	2.7	3,936	41.8%	2.97
100% Cycling	1.818	4,548	59.1%	8.3	5,482	58.2%	10.58
All Participants		7,695		11.0	9,418		13.55

The program achievement number of new participants was 9,418, which exceeded the customer sign-up goal. The program achievement shares turned out to be very close to the original estimate. The 100% cycling option was chosen by 58.2% of new customers, compared to the estimate of 59.1%. This difference in shares contributed to a small decrease in the average impact per customer. The program achievement weighted average impact per customer turned out to be 1.438 kW instead of 1.446, as shown in the equations below. This contributed to an overall achievement of 13.55 MW of load reduction from PY2 participants.

$$(0.909 \times 40.9\%) + (1.818 \times 59.1\%) = 1.446 \text{ kW per participant}$$

$$(0.909 \times 41.8\%) + (1.818 \times 58.2\%) = 1.438 \text{ kW per participant}$$

ComEd’s original target for the Central Air Conditioning Cycling program was 11.1 MW of summer peak savings from 7,695 new participants during PY2. The final PY2 report of claimed savings shows 13.55 MW of savings from 9,418 customers. The original target was exceeded mainly due to exceeding the target number of new participants.

We have verified the math used to calculate the year-end numbers for new participants and impact per customer and believe these values are an accurate estimate of gross savings from the Central Air Conditioning Cycling program in PY2 if they are adjusted to reflect the actual mix of 50% cycling and 100% load shed customers. A remaining question, however, is whether or not the PJM-based estimates of 0.909 kW for 50% cycling and 1.818 kW for 100% load shed are an appropriate estimate of load reduction at the time of ComEd system peak.

First, we will consider the use of 0.909 kW per participant for 50% cycling. This estimated impact is very consistent with what is found for other residential air conditioning direct load control programs across the country. Impact estimates for this type of program are generally near 1 kW per participant.<sup>3</sup> Differences will occur based on the hours of the day that an event is called and the outdoor temperatures during the event.

Looking at the hours of the day, it should be noted that the estimate of 0.909 kW is specifically for an event ending at 16:00. If a control event is called for ComEd, it is likely it will last for a period of at most three hours since that is the daily limit for 100% load shed. Looking at the GoodCents Solutions report for the three-hour period of hour-ending 15:00 to hour-ending 17:00 (2:00 to 5:00 p.m.), the average load reduction over those three hours is 90% of the maximum hour (0.819 instead of 0.909). This would indicate that the load impact estimate should be 10% lower over the three hour control period.

However, outdoor temperatures have a greater relative effect on impacts than hours of the day. The impact estimate of 0.909 is based on a maximum daily temperature of 90.38° F to be consistent with PJM system peak days. On a ComEd system peak day it is likely that the temperatures will be much higher. If the maximum daily temperature is 95° F instead of 90.38° F, the GoodCents Solutions study indicates that impacts will be 1.056 kW per customer instead of 0.909, which is an increase of 16%. If the temperature reaches 99° F, the predicted impact is 1.195 (an increase of 31%).

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<sup>3</sup>Mary Klos, Summit Blue Consulting, “A Regional Look at Residential DLC Impacts,” Association of Energy Services Providers (AESP) teleconference presentation, February 2008.

Looking at both hours of the day and maximum daily temperatures, it can be seen that these two effects offset each other with the temperature effect being greater. Rather than trying to adjust the estimated impact for each of these effects, ComEd has chosen to maintain consistency with the PJM estimates and stick with 0.909 kW per customer for estimating program goals and achievements. This is a conservative estimate since it is likely that temperatures on a ComEd system peak day will increase impacts beyond this level for 50% cycling. Given the importance of being able to achieve estimated demand reductions for demand response programs, we concur that the impact estimate should be kept conservative and we do not recommend any changes to it.

Next, we will consider the use of 1.818 kW per participant for 100% load shed. ComEd assumes that the load impact from 100% load shed will be twice as great as the estimated load impact for 50% cycling. We find this to be a reasonable assumption. A residential air-conditioner running for a full sixty minutes during a single hour on a very hot summer weekday afternoon can use anywhere from 2 to 6 kW, depending on the size and efficiency level of the unit and the cooling requirements of the home. As outdoor temperatures increase, average usage over a group of air-conditioners gets closer and closer to sixty minutes out of the hour. Given the 20% de-rating factor found in the GoodCents Solutions study, 1.818 kW fits reasonably into the low end of this range.

While many studies have been done on the impacts of 50% cycling, 100% load shed estimates are rare. While ComEd's current estimate of 1.818 kW per customer for 100% load shed appears reasonable based on known information, a verification of that number based on metered data from a 100% load control event would be valuable. Given that most program participants are choosing the 100% load shed option, we recommend conducting a test at this level on a very hot weekday during the next summer with high temperatures.

### **3.1.5 Net Program Impact Parameter Estimates**

There is no free ridership or spillover expected in a direct load control program. Customers cannot install a control switch on their own and have no reason to do so without a program and an incentive from the utility.

### **3.1.6 Net Program Impact Results**

Since there is no free ridership or spillover, the Net-to-Gross ratio for this program is one. The net savings equal the gross savings as shown in [Table 3-2](#).

**Table 3-2. Summary of Verified Gross and Net Savings**

Central Air Conditioning Cycling Program PY2	MWh Savings	MW Savings	Participation
	Verified	Verified	Verified
Gross Savings	-	13.55	9,418
Net-to-Gross Ratio	-	1	-
Net Savings	-	13.55	9,418

### **3.2 Process Evaluation Results**

The process evaluation component of the PY2 Central Air Conditioning Cycling Program Evaluation primarily focused on the quantitative telephone survey findings among program participants. In-depth interviews with Program Managers from ComEd and GoodCents confirmed process themes around the program design and activities in PY2 and identified changes from PY1 to PY2.

As stated previously in the methodology section, the participant surveys were fielded immediately after the August 19, 2010 control event to maximize customer recall of the experience. All 50% cycling customers had been cycled from 13:00 to 16:00 Central Time on that day, and all 100% cycling participants were interrupted from 13:00 to 15:00 Central Time. The temperature was 87 degrees from 14:00 to 16:00 on August 19, 2010. There were 26 days during the summer of 2010 when the average temperature during these hours was 87 degrees or higher. This was the only control event called during the summer and it was called to meet PJM requirements.

#### **3.2.1 Process Themes**

##### **Program Marketing and Outreach**

Despite spending only \$439,000 of its \$822,000 total budget in PY2<sup>4</sup>, the program was able to recruit 9,418 new participants in PY2, which is of 22% more than its target goal of 7,695 new participants. To accomplish this goal, the program relied on promotional materials such as a brochure with self-mailer enrollment card, a bill insert, and a message on the customer bill. The

<sup>4</sup> Interview with ComEd Program Manager in July, 2010

messages included on these promotions primarily feature the cost savings, environmental benefits, and the system reliability.

A content review of the marketing materials and website found no major problems. The ComEd website has an easy to find AC Cycling page that clearly describes the program and its benefits, and provides electronic program enrollment for customers. Additionally, the self-mailer and bill insert function as both brochures and enrollment forms for participants, making them an effective source at generating awareness and enrollment in the program. The marketing materials present the information in an attractive and consistent manner. The evaluation team did notice that none of the materials mention that the installation of the compressor switch is free of charge to the customer. Including this information could potentially lead to increased enrollment in the program.

The direct mail promotions have proven to be effective as they are the most prevalent way customers learn about the program. As shown in the table below, a combined 72% of program participants first learned of the program through bill inserts (42%) and direct mail/brochures (30%). Customers who signed up for the 50% option did so from learning about the program from direct mail/brochures more so than customers in the 100% option. Slightly less than 1 in 5 program participants (18%) heard about the program from other sources, mainly through word of mouth from friends, relatives, or neighbors.

**Table 3-3. How Participants First Learned About Central Air Conditioning Program**

Sources	Total N=141	Customer Option	
		100% N=71 A	50% N=70 B
Bill Insert	42%	44%	39%
Direct mail/brochure	30%	23%	41% <sup>A</sup>
Newspaper	3%	3%	4%
Friend/relative/neighbor	3%	6%	0%
Through my company	3%	3%	3%
Internet	2%	0%	6%
ComEd Energy at Home Newsletter	2%	3%	0%
From previous owner	2%	3%	0%
Phone call	1%	0%	3%
ComEd Website	1%	1%	0%
Television/media	1%	1%	0%
Other	1%	1%	0%
Don't know	9%	13% <sup>A</sup>	4%
Total	100%	101%	100%

*Source: ComEd ACLC Participant Survey (PY2)*

In terms of possible marketing improvements for PY3, only 5% of all surveyed participants believe the program should increase marketing efforts, while 3% felt that program requirements need to be communicated more clearly. Given that these perceptions are felt by a minority of participants, the program should continue to implement the same marketing strategy in PY3 as PY2.

### **Participant Sign-Up for Program**

Participants had a few different ways they could sign up for the program. They can call a ComEd telephone representative to enroll, enroll on the ComEd website, or mail in the brochure sign up card. The most popular method is mailing the brochure sign up card (49%), followed by

calling a ComEd telephone representative (23%) and then through the ComEd website (14%). The rest did not recall how they signed up (13%).

Participants with an annual income \$50,000 or greater are significantly more likely sign up using the website. Program participants found it easy to sign up for the program through all three channels; only one person had difficulty with the brochure sign-up card.

**Table 3-4. How Participants Signed Up**

Channels	Total N=121	Customer Option		Income	
		100% N=60 A	50% N=62 B	<\$50K N=41 C	\$50K+ N=55 D
Mailing in the sign up card	49%	50%	48%	57%	45%
ComEd telephone representative	23%	27%	18%	20%	23%
ComEd Website	14%	12%	16%	7%	20% <sup>c</sup>
Don't know/remember	13%	10%	18%	13%	11%
Refused	1%	2%	0%	3%	0%
Total	100%	101%	100%	100%	99%

*Source: ComEd ACLC Participant Survey (PY2) \* Percentages may not add up to 100% due to rounding*

### Program Implementation

GoodCents continues to be the implementation contractor for the Central Air Conditioning Cycling Program. GoodCents is primarily responsible for installing the compressor switches on each central air conditioning unit, and resolving any technical problems with the switches. According to GoodCents' Program Manager, the Central Air Conditioning Cycling program's operation and maintenance expense budget increased from \$830,000 in PY1 to \$924,000 in PY2. GoodCents was able to provide the installation and technical support needed in PY2 within its budget.

The installation process is generally done without the participants present at their homes, although customers with air conditioning units in gated or hard to reach areas need to be home to allow the technician access to the unit.

The relationship between ComEd and GoodCents continues to run smoothly, which appears to be reinforced by the level of participant satisfaction with the GoodCents technicians in PY2. Overall, GoodCents technicians are doing a good job, as 95% of customers who did have the opportunity to interact with a GoodCents technician indicated in the survey that they were satisfied with the technician; 83% were very satisfied.<sup>5</sup>

**Table 3-5. Level of Satisfaction with GoodCents Technician**

Satisfaction	Total N=56	Customer Option	
		100% N=22 A	50% N=34 B
Satisfied (7-10)	95%	100% <sup>B</sup>	91%
Neutral (4-6)	5%	0%	9%
Dissatisfied (0-3)	0%	0%	0%
Total*	100%	100%	100%
Mean	9.4	9.7	9.2

*Source: ComEd ACLC Participant Survey (PY2) \*Percentages may not add up to 100% due to rounding*

Because the direct mail marketing materials are sent in July the contractor experiences heavy enrollment volume after the July mailing. Thus, they generally need to work with ComEd to readjust the 60 day installation requirement to allow for the increased number of required installations. It appears that ComEd and GoodCents have been able to effectively manage any issues regarding installation and/or any technical issues of the compressor switches, as this has not come up with participants as an area of concern or dissatisfaction with the program.

In order to better retain new occupants of a house that was previously enrolled (by previous occupant), the ComEd customer service representatives will notify them that their home was previously enrolled in the program when they call in to activate their electric service. The customer then has the option of withdrawing from the program or making adjustments to the load option.

### **Characteristics of Program Participants**

Almost half of participants (45%) live in a three person household year-round. Another 27% of program participants live in a home with three or more people. Four out of 10 participants live

<sup>5</sup> In the data analysis of responses using the 0 to 10 satisfaction scale, responses of 9-10 are classified as very satisfied.

in a home less than 2,000 square feet, while another 4 out of 10 live in a home with 2,000+ square feet. More than half (52%) of participants have a college degree. Nearly 6 out of 10 participants (58%) have made other energy-efficient improvements in their home – mainly installing new windows (41%), and installing CFLs (23%). However, nearly 6 out of 10 participants (58%) indicated that their participation in the central air conditioning program had little to no influence on their decision to take additional energy-efficiency actions.

### Overall Program Satisfaction

Participants are highly satisfied with the Central Air Conditioning program. Overall, 78% of respondents are satisfied with their participation in the program, and more than half (56%) are very satisfied<sup>6</sup>. A small share of respondents (3%) indicated some level of dissatisfaction with the program. Customers are also generally satisfied with ComEd overall, with 77% being satisfied and 45% very satisfied. The program induced a more favorable perception of ComEd among half of participants (50%), while the other half remained impartial (47%).

**Table 3-6. Participant Satisfaction with Program**

Satisfaction	Total N=141	Customer Option	
		100% N=71 A	50% N=70 B
Satisfied (7-10)	78%	79%	77%
Neutral (4-6)	14%	14%	13%
Dissatisfied (0-3)	3%	3%	4%
Don't know	5%	4%	6%
Total	100%	100%	100%
Mean	8.3	8.4	8.1

*Source: ComEd ACLC Participant Survey (PY2)*

When asked what they specifically like about the program, nearly two-thirds (64%) indicated the monthly bill credit, while another quarter (23%) like the environmental benefits of the program. These same factors are also leading drivers of participation; almost 70% of participants said that they participated to either receive the monthly bill credit or to reduce their monthly electric bill itself, while another quarter of participants (24%) joined the program for the environmental benefits of conserving energy.

<sup>6</sup> In the data analysis of responses using the 0 to 10 satisfaction scale, responses of 6-10 are classified as satisfied, and responses of 9-10 are classified as very satisfied.

Customers with the 100% option were significantly more likely to be driven by the monthly bill credit than customers with the 50% option (44% vs. 26%). The monthly bill credit is an increasingly effective motivator, as significantly more participants in PY2 cited this as the main reason compared to participants who signed up in PY1 (42% vs. 25%). Conversely, customers who joined in PY1 were significantly more likely than those in PY2 to do it in order to conserve energy (32% vs. 19%).

**Table 3-7. Main Reason for Participating in Program**

Reasons	Total N=141	Customer Option	
		100% N=71 A	50% N=70 B
Receive monthly credit on my summer electric bill	36%	44% <sup>B</sup>	26%
Reduce my monthly electric bill	33%	28%	40%
Conserve energy	24%	23%	26%
Mutually beneficial	1%	1%	1%
Other	1%	0%	3%
Don't know	3%	3%	4%
Refused	1%	1%	-
Total	99%	100%	100%

*Source: ComEd ACLC Participant Survey (PY2)\*Percentages may not add up to 100% due to rounding*

The program appears to have a strong retention rate among participants. When asked if they would cancel the program, 87% are unlikely to cancel their participation in the program with 79% being very unlikely. This sentiment carried over recommending the program to friends and family, as nearly half (46%) of participants have already recommended the program to family and friends. Of the 54% who have not yet recommended the program, 41% are likely to recommend the program to family and friends. On a 10-pt scale, the mean likelihood to recommend the program to family and friends is significantly higher among customers in the 50% option than customers in the 100% option (6.4 vs. 4.8)

**Table 3-8. Likelihood to Recommend Program to Family and Friends**

Likelihood	Total N=76	Customer Option	
		100% N=37 A	50% N=39 B
Likely (7-10)	41%	35%	49%
Neutral (4-6)	27%	24%	31%
Unlikely (0-3)	25%	32%	15%
Don't know	7%	8%	5%
Total	100%	99%	100%
Mean	5.5	4.8	6.4 <sup>A</sup>

*Source: ComEd ACLC Participant Survey (PY2)*

*\* Percentages may not add up to 100% due to rounding*

Overall, 7 out of 10 participants (67%) did not mention anything they disliked about the program, while 63% of participants do not believe the program needs to improve in any area. Not surprisingly, the most frequent recommendation among those who actually offered suggestions for improvement is to increase the incentive amount. Twenty-nine percent of these participants would like to see an increase in the bill credit, representing about 10% of the total population.

### **Program Incentives**

More than half (51%) of all program participants since June 1, 2008 were able to confirm they received a monthly credit on their summer electric bill. Another 29% could not recall receiving the credit, while 20% indicated they did not receive the monthly credit. Customers with the 100% option are significantly more likely to have indicated receiving a monthly credit compared to 50% option customers (61% vs. 37%). The 20% of program participants indicating they did not receive the monthly credit might simply not recall receiving it or seeing it applied to their bill. ComEd should investigate this further in order to confirm that all eligible participants did receive monthly bill credits. Furthermore, this finding might provide ComEd with an opportunity to reassess the way it communicates to program participants that the monthly credit has been applied to their summer electric bill.

**Table 3-9. Received Monthly Credit on Summer Electric Bill**

	Total N=141	Customer Option	
		100% N=71 A	50% N=70 B
Yes	51%	61% <sup>B</sup>	37%
No	20%	14%	29% <sup>A</sup>
Don't know	29%	25%	34%
Total	100%	100%	100%

Source: ComEd ACLC Participant Survey (PY2)

As mentioned in the program satisfaction section, the monthly bill credit is the main reason why customers participated in the program (36%), and is what participants like most about the program (64%). When asked whether they would have still participated in the program without receiving the monthly bill credit, less than half (47%) indicated that they would likely have participated without the incentive. Of note, 100% option customers are less likely to participate in the program without the incentive than are 50% option customers. This is not surprising, given that this group receives a larger incentive amount and is drawn to the incentive more than 50% option customers.

**Table 3-10. Likelihood to Participate Without Incentive**

Likelihood	Total N=141	Customer Option	
		100% N=71 A	50% N=70 B
Very likely	25%	23%	29%
Somewhat likely	22%	21%	23%
Somewhat unlikely	16%	14%	20%
Very unlikely	35%	42% <sup>B</sup>	24%
Don't know	2%	0%	4%
Total	100%	100%	100%

Source: ComEd ACLC Participant Survey (PY2)

### **3.2.2 Residential Curtailment Event**

The telephone survey with program participants (effective as of June 1, 2008) was fielded on August 19, 2010 in the evening immediately following the residential curtailment event. The residential curtailment event was called from 1 pm to 4 pm for 50% option customers and from 1 pm to 3 pm for 100% option customers. In addition to capturing customer experience and satisfaction with the program (as discussed in previous sections), the survey inquired about typical customer air conditioning usage, and response to the residential curtailment event.

In order to provide the results in its proper context, it is important to note the temperature and humidity during the called residential curtailment event. The high temperature in Chicago on August 19, 2010 was 88 degrees at about 2pm, which is up 8 degrees from the normal temperature.<sup>7</sup> The relative humidity was 46 percent at 2pm, with a daily average of 65 percent that day.

#### **Participant's Air Conditioning Usage**

On average, participants keep their home temperature setting slightly under 77 degrees during weekdays between 1pm - 4pm, which is lower than the high temperature of 88 degrees in Chicago during the residential curtailment event. More than half (51%) of participants control the temperature of their air conditioners manually, while another 46% of participants program the temperature of their unit.

Forty-two percent of participants keep their air conditioner at one constant temperature, 34% adjust the temperature for daytime and nighttime, and 23% adjust it throughout the day based on comfort level. During a typical summer day, participants report keeping their air conditioning system on for an average of 13 hours. Customers in the 50% options operate their air conditioning for significantly longer hours than 100% option customers (15 hours vs. 12 hours).

#### **Awareness and Response to Curtailment Event**

Out of the 141 respondents, 97 were home during the residential curtailment event (68%). Nearly three-quarters (74%) of the 97 participants who were home during the curtailment event did not notice a change in the temperature in their home during the event. There is evidence that awareness of the change in temperature is tied to the size of the home, as respondents in smaller homes (<2,000 sq. ft) were significantly less likely to notice the change in temperature than respondents in larger homes (2,000+ sq. ft). Among the 23 participants who noticed a change in the temperature in their home, 15 were comfortable with the change, while 8 were uncomfortable with the change in temperature in their home.

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<sup>7</sup> Weather.gov

**Table 3-11. Awareness of Change in Temperature in Home**

	Total N=97	Customer Option		Home Size	
		100% N=47 A	50% N=50 B	<2000 sq. ft N=44 C	2000+ sq. ft N=42 D
Aware of change					
Yes	24%	30%	16%	15%	34% <sup>C</sup>
No	74%	70%	80%	83% <sup>D</sup>	66%
Don't know	2%	0%	4%	2%	0%
Total	100%	100%	100%	100%	100%

Source: ComEd ACLC Participant Survey (PY2)

Only half (50%) of all participants surveyed knew that ComEd was adjusting their air conditioner compressor during the curtailment event. Among these 71 participants 62 of them (88%) knew that ComEd was adjusting their air conditioning compressor because they recall receiving an automated phone call notifying them. The curtailment event in August was the first time ComEd gave participants prior notice of the event. ComEd should continue to send automated notifications to its participants prior to any curtailment events being called, as 85% of participants who recall receiving the automated message found it helpful.

**Table 3-12. How Participants Knew About Adjustments**

	Total N=71*	Customer Option	
		100% N=36 A	50% N=35 B
I received an automated telephone message notifying me	88%	83%	94%
I saw the change of temperature on the thermostat	6%	6%	6%
I was hot	4%	6%	3%
Could hear the device	3%	6%	0%
I called ComEd	2%	3%	0%
AC was not working	2%	3%	0%
Don't know	1%	0%	3%

Source: ComEd ACLC Participant Survey (PY2) \*Multiple responses allowed

Three-quarters of participants (76%) indicated that their central air conditioner continued to operate normally after the event, while another 21% were unsure. Four out of five (81%) of those who were home at the time of the curtailment event (n=97) responded that their central air conditioning system operated normally after the curtailment event, while 17% did not know. Not surprisingly, those who weren't home are significantly more likely to say they didn't know. What is important to note is that the program did not experience a large percentage of participants with technical problems on their air conditioning system.

**Table 3-13. Central Air Conditioner Operating After Event**

	Total N=141	Customer Option		At Home	
		100% N=71 A	50% N=70 B	Yes N=97 C	No N=44 D
		Yes	76%	72%	81%
No	3%	4%	1%	2%	5%
Don't know	21%	24%	17%	17%	30% <sup>C</sup>
Total	100%	100%	99%	100%	99%

Source: ComEd ACLC Participant Survey (PY2)  
Percentages may not add up to 100% due to rounding

### 3.3 Cost Effectiveness Review

This section addresses the cost effectiveness of the Central Air Conditioning Cycling program. Cost effectiveness is assessed through the use of the Total Resource Cost (TRC) test. The TRC test is defined in the Illinois Power Agency Act SB1592 as follows:

*“ ‘Total resource cost test’ or ‘TRC test’ means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial*

*costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases.”<sup>8</sup>*

ComEd uses DSMore™ software for the calculation of the TRC test.<sup>9</sup> The DSMore model accepts information on program parameters, such as number of participants, gross savings, free ridership and program costs, and calculates a TRC which fits the requirements of the Illinois legislation. Environmental benefits have been quantified for CO<sub>2</sub> reductions, using a value of \$0.013875 per kWh.

One important feature of the DSMore model is that it performs a probabilistic estimation of future avoided energy costs. It looks at the historical relationship between weather, electric use and prices in the PJM Northern Illinois region and forecasts a range of potential future electric energy prices. The range of future prices is correlated to the range of weather conditions that could occur, and the range of weather is based on weather patterns seen over the historical record. This method captures the impact on electric prices that comes from extreme weather conditions. Extreme weather creates extreme peaks which create extreme prices. These extreme prices generally occur as price spikes and they create a skewed price distribution. High prices are going to be much higher than the average price while low prices are going to be only moderately lower than the average. DSMore is able to quantify the weighted benefits of avoiding energy use across years which have this skewed price distribution.

Table 3-3 summarizes the unique inputs used in the DSMore model to assess the TRC ratio for the Central Air Conditioning Cycling program in PY2. Most of the unique inputs come directly from the evaluation results presented previously in this report. Measure life estimates and program costs come directly from ComEd. All other inputs to the model, such as avoided costs, come from ComEd and are the same for this program and all programs in the ComEd portfolio.

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<sup>8</sup> Illinois Power Agency Act SB1592, pages 7-8.

<sup>9</sup> Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.

**Table 3-3. Inputs to DSMore Model for Central Air Conditioning Cycling Program**

<b>Item</b>	<b>Value Used</b>
Measure Life	15 years
Participants	9,418
Annual Gross Energy Savings	13.55 MWh
Gross Coincident Peak Savings	13.5 MW
Net-to-Gross Ratio	100%
Utility Administration and Implementation Costs	\$47,300
Utility Incentive Costs	\$74,995
Participant Contribution to Incremental Measure Costs	\$0

Based on these inputs, the Illinois societal TRC for this program is 3.73 and the program passes the TRC test. The standard TRC calculation produced by DSMore is also 3.73.

## Section 4. Conclusions and Recommendations

### 4.1 Conclusions

This report is the Program Year 2 assessment of the Central Air Conditioning Cycling program. Program evaluation work will continue for Program Year 3, providing the opportunity to refine and update the assessment and watch for any trends that occur that would change the impact estimates.

The following conclusions highlight the major findings and recommendations presented in this Program Year 2 report.

#### 4.1.1 Program Impacts

##### **Number of Participants in the Air-Conditioning Load Control Program**

The original goal was to add 7,695 new participants to the Central Air Conditioning Cycling program in PY2. The actual number of new participants was 9,418. This was verified with an assessment of program start dates for all new program participants.

##### **Geographic Location of Participants**

Last year's analysis showed a drop in program year 1 participants in the 600 and 601 zip code areas. Program year 2 participants in the 600 and 601 zip code areas increased from PY1 levels. The 600 and 601 zip code areas are where the majority of the participants are located. This trend did not continue in PY2. The similarity of geographic location patterns between participant groups suggests that the program impacts of the participants would be similar and there is no need to be concerned about significant differences.

##### **Participant Energy Use Patterns**

Average annual energy use statistics for old participants and new participants were not significantly different. There was some indication in the PY1 analysis of lower average annual use among new participants, but it was believed that this was a reflection of the fact that they were more likely to be new customers without a full year of kWh usage data. The PY1 participant annual energy use rose to the same level as the old participants in the PY2 analysis.

##### **Participants with Multiple Central AC units**

The number of participants with multiple central AC units was very similar between the participant groups.

## 4.1.2 Program Processes

Here are the key findings from ComEd's Central Air Conditioning Cycling program process evaluation:

- The direct mail promotions have proven to be effective as they are the most prevalent way customers learn about the program. The three program sign-up methods (telephone, mail, and website) are all easy for participants to understand. ComEd should continue using the same promotional materials and sign-up methods in PY3.
- Overall, satisfaction with the program is high among participants at 78%, while retention is at 87%. The monthly bill credit is an increasingly effective motivator, as significantly more participants in PY2 cited it as their main reason for participating compared to participants who signed up in PY1 (42% vs. 25%). However, recall of receiving the monthly bill credit is only at a modest 51% of participants, which the program should strive to increase through reminders.
- The GoodCents technicians are doing a good job with installing and interacting with program participants, as nearly all surveyed participants (95%) expressed satisfaction with the GoodCents technician in PY2.
- The residential curtailment event was implemented in an effective manner with few customer complaints. The majority of participants (85%) who recall receiving the notification message from ComEd found the message helpful. The majority of participants (74%) did not notice a change in the temperature in their home, while only 3% of participants indicated that their air conditioning system did not operate normally after the event.

## 4.2 Recommendations

### 4.2.1 Impact Recommendations

#### Recommendations Concerning Future Metered Data Tests

While many studies have been done on the impacts of 50% cycling, 100% load shed estimates are rare. While ComEd's current estimate of 1.818 kW per customer for 100% load shed appears reasonable based on known information, a verification of that number based on metered data from a 100% load control event would be valuable. Given that the majority of program participants are choosing the 100% load shed option, the evaluation team recommends conducting a test at this level on a very hot weekday during the next summer with high temperatures.

#### **4.2.2 Process Recommendations**

ComEd's Air Conditioning Cycling program exceeds its metric goals and continues to run smoothly with few problems. The following are a few recommendations for process improvements:

##### **Marketing**

- Consider adding message in materials that installation of compressor is free of charge. Including this information could lead to increased enrollment in the program.
- To smooth out the installation process for new compressor switches and reduce potential backlog of scheduled appointments beyond the 60 day installation requirement, consider spreading out marketing efforts over the spring, instead of all in July.

##### **Implementation**

- Investigate reasons for why participants claim they did not receive their monthly bill credit. Also, ComEd should consider new cost-effective ways of communicating to program participants that the monthly credit has been applied to their summer electric bill (e.g. email, automated message, etc).
- Continue to send automated telephone message to participants prior to any curtailment event, as 85% of participants who recall receiving the automated message found it helpful.

## Section 5. Appendices

### 5.1 Data Collection Instruments

#### ComEd Smart Ideas Central Air Conditioning Cycling Program

##### Participant Survey

Summer 2010

Hello, my name is \_\_\_\_\_ from Opinion Dynamics. I'm calling on behalf of Commonwealth Edison (ComEd) to ask you some questions about your participation in their Central Air Conditioning Cycling Program. Please be assured this is not a sales call. My questions are for research purposes only. Your opinions are important in helping us improve our programs, and understand how to assist customers in saving money on their utility bills. Your responses will be used by ComEd to evaluate energy-efficiency programs.

[If respondent asks how long, say "Approximately 15 minutes."]

According to our records, someone in your household contacted ComEd to participate in the Central Air Conditioning Cycling Program, previously known as "Nature's First". Are you that person? (IF NO: Is that person available to speak with us?)

**[Sample frame will consist of June 1, 2008, 2009 and, 2010 participants who ComEd identifies as having been issued a cycling event (either control or actual) in the summer of 2010]. For analysis, we'll need to have option type (100% or 50%) to the sample database.**

(CONTINUE WITH CORRECT CONTACT)

##### VERIFICATION

Q2A. Have you lived in this home since [insert installation date from database]?

1. (Yes)
2. (No)
98. (Don't know) [Thank and Terminate]
99. (Refused) [Thank and Terminate]

##### PROGRAM AWARENESS

Q3. How did you first learn about ComEd's Central Air Conditioning Cycling program? [Do not read, prompt if necessary...]

1. (Internet)
2. (Bill Insert)
3. (Direct mail/brochure)
4. (ComEd Energy at Home Newsletter)

- 5. (Friend/relative/neighbor)
- 6. (ComEd website)
- 7. (City/country fair)
- 8. (Environmental fair)
- 9. (Museum event)
- 10. (Through my company)
- 11. (Newspaper)
- 12. (Press release)
- 13. (From previous owner)
- 00. (Other\_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

- Q4. Have you heard about the program from any other sources?
- 1. (Yes)
  - 2. (No)
  - 98. (Don't know)
  - 99. (Refused)

[ASK IF Q4 = 1 ELSE Q6]

- Q5. Which other sources have you heard about the program?? (Categories eliminated based on Q3) (Multiple Response, Up to 3)
- 1. (Internet)
  - 2. (Bill Insert)
  - 3. (Direct mail/brochure)
  - 4. (ComEd Energy at Home Newsletter)
  - 5. (Friend/relative/neighbor)
  - 6. (ComEd website)
  - 7. (City/country fair)
  - 8. (Environmental fair)
  - 9. (Museum event)
  - 10. (Through my company)
  - 11. (Newspaper)
  - 12. (Press release)
  - 00. (Other\_\_\_\_\_)
  - 98. (Don't know)
  - 99. (Refused)
- Q6. What is the MAIN reason you chose to participate in ComEd's Central Air Conditioning Cycling Program?

[If multiple are mentioned, ask]: “Of those, which is the main reason?” [Do not read, accept one answer only.]

1. (Receive monthly credit on my summer electric bill)
2. (Better manage my AC usage)
3. (Conserve energy)
4. (Reduce my monthly electric bill)
5. (Recommendation of a friend/relative)
6. (Recommendation of contractor)
00. (Other [Specify])
98. (Don't know)
99. (Refused)

Q6b. Have you received a monthly credit on your summer electric bill for participating in ComEd's Central Air Conditioning Cycling Program?

1. (Yes)
2. (No)
98. (Don't know)
99. (Refused)

Q7. What is the likelihood that you would have still participated in the ComEd Central AC Cycling program if a monthly credit on your summer electric bill was not included in the program?

1. Very Unlikely
2. Somewhat unlikely
3. Somewhat likely
4. Very Likely
98. (Don't know)
99. (Refused)

Q7b. On a scale of 0 to 10 where 0 is extremely dissatisfied and 10 is extremely satisfied how satisfied, how satisfied are you with your participation in the ComEd Central Air Conditioning Cycling Program?

[REPEAT SCALE IF NECESSARY]  
 \_\_\_\_\_ [RECORD RATING 0-10]

98. (Don't know)
99. (Refused)

[ASK IF Q7b >4 AND Q7b < 98, ELSE Q7d]

Q7c. What do you particularly like about the program? [Multiple Response accept 3]

1. (Technician who installed device/didn't have to be home/wait long)
2. (Was easy to sign up/participate)

- 3. (The monthly credit on my summer electric bill)
- 4. (Helps the environment)
- 00. (Other [Specify])
- 96. (None of it/didn't like any of it)
- 98. (Don't know/Not sure)
- 99. (Refused)

[ASK ALL]

- Q7d. What, if anything, do you particularly dislike about the program? [Multiple Response accept 3]
- 1. (Negative comment about technician who installed device)
  - 2. (The service was difficult to sign up for)
  - 3. (Did not receive the monthly credit on my summer electric bill)
  - 4. (That I had to wait long for installation of device after signing up)
  - 00. (Other [Specify])
  - 96. (None of it/was satisfied with all)
  - 98. (Don't know/Not sure)
  - 99. (Refused)

### Awareness of Events

- Q8. Were you home [today] between [INSERT START AND END TIME OF EVENT]?
- 1. Yes
  - 2. No
  - 98. (Don't know)
  - 99. (Refused)
- Q9. What temperature do you usually keep your home at weekdays between [INSERT START TIME AND END TIME OF EVENT]? (IF NECESSARY: If you usually change the temperature during that time, please indicate the set point temperature while you are home.)
- [NUMERIC OPEN END [e.g., 50-85] degrees]
- 98. (Don't know)
  - 99. (Refused)

[ASK IF Q8 =1, ELSE Q12]

- Q10. Did you notice a change in temperature in your home [today] between [INSERT START AND END TIME OF EVENT]?
- 1. Yes
  - 2. No
  - 98. (Don't know)
  - 99. (Refused)

[ASK IF Q10=1 ELSE Q12]

Q11. How would you characterize your comfort, temperature wise, [today] between [INSERT START AND END TIME OF EVENT]? Would you say you were...

4. Very comfortable
3. Somewhat comfortable
2. Somewhat uncomfortable
1. Very uncomfortable
98. (Don't know)
99. (Refused)

Q12. Were you aware that ComEd was adjusting your air conditioner compressor on and off in your home between [INSERT TIME OF EVENT] [today]?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK IF Q12=1, ELSE Q14]

Q13. How did you know that ComEd was adjusting your air conditioner compressor on and off in your home [today]? (multiple response)

1. (I saw the change of temperature on the thermostat)
2. (I called ComEd)
3. (I was hot)
4. (AC was not working)
5. (I received an automated telephone message notifying me)
00. (Other, specify)
98. (Don't know)
99. (Refused)

[ASK IF Q13<5]

Q13a. Do you recall receiving an automated telephone message notifying you that ComEd was adjusting your air conditioner compressor on and off in your home?

1. Yes
2. No
3. (Don't know)
4. (Refused)

[ASK IF Q13=5 or Q13a=1]

Q13b. Was receiving an automated telephone message notifying you of today's air conditioner compressor adjustment helpful?

- 1. Yes
- 2. No
- 3. (Don't know)
- 4. (Refused)

Q14. To the best of your knowledge, did your central air conditioner operate normally after [INSERT END TIME OF EVENT] [today]?

- 1. Yes
- 2. No
- 98. (Don't know)
- 99. (Refused)

[ASK IF Q14=2, ELSE Q16]

Q15. What was the issue?

- 1. (My AC never came back on)
- 00. Other (specify)
- 98. (Don't know)
- 99. (Refused)

## CENTRAL AIR CONDITIONING USAGE

I would now like to ask you some questions about how you typically operate your central air conditioning system during the summer.

Q16. Do you control your Central Air Conditioning unit manually or is the unit programmed?

- 1. (Operate the unit manually)
- 2. (Unit is programmed)
- 00. (Other [Record Response] \_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

Q17. Thinking about a typical summer day (e.g., day and nighttime), how many hours per day on average is your Central Air Conditioning running?

Hours per day \_\_\_\_ [0-24]

- 98 (Don't know)
- 99 (Refused)

Q18. Thinking about a heat wave (for example 2 days of 90 degree weather), how many hours per day on average is your Central Air Conditioning running?

Hours per day \_\_\_\_ [0-24]

- 98 (Don't know)

99. (Refused)

Q19. Thinking about a typical summer day, which of the following BEST describes how you operate your Central Air Conditioning? [Read responses]

1. I keep one constant temperature level for daytime and nighttime
2. I set different temperature levels for daytime and nighttime
3. I adjust the temperature throughout the day as needed for comfort
00. (Other [Record Response] \_\_\_\_\_)
98. (Don't know)
99. (Refused)

## SIGN UP PROCESS

Now I would like to ask you questions about your experience in **signing up** for the ComEd Central Air Conditioning Cycling program

Q20. Once you decided to participate, the first step was signing up for the program. Are you the one that took care of this, or did someone else in your household sign up?

1. (I signed up)
2. (Someone else signed up)
98. (Don't know/remember)
99. (Refused)

[ASK if Q20=1, ELSE Q25c]

Q21. How did you sign up for the Central Air Conditioning Cycling program?

1. (ComEd website)
2. (ComEd telephone representative)
3. (Mailing in the sign up card)
98. (Don't know/remember)
99. (Refused)

[ASK IF Q21=01 ELSE Q24]

Q22. How easy was it to sign up for the program through the ComEd website? Was it....

1. Very difficult
2. Somewhat difficult
3. Somewhat easy
4. Very easy
98. (Don't know/remember)
99. (Refused)

[ASK IF Q22 = 1, 2]

Q23. What aspect of the website sign up process wasn't easy?

00. OPEN END
98. (Don't know/remember)

99. (Refused)

[ASK IF Q21=02 ELSE Q25a]

Q24. How easy was it to sign up for the program through the ComEd **telephone representative**? Was it....

1. Very difficult
  2. Somewhat difficult
  3. Somewhat easy
  4. Very easy
98. (Don't know/remember)  
99. (Refused)

[ASK IF Q24 = 1, 2]

Q25. What aspect of signing up through a ComEd **telephone representative** wasn't easy?

00. OPEN END  
98. (Don't know/remember)  
99. (Refused)

[ASK IF Q21=03 ELSE Q25c]

Q25a. How easy was it to sign up for the program through the ComEd **brochure sign up card**? Was it....

1. Very difficult
  2. Somewhat difficult
  3. Somewhat easy
  4. Very easy
98. (Don't know/remember)  
99. (Refused)

[ASK IF Q25a = 1, 2]

Q25b. What aspect of the **brochure sign up card** process wasn't easy?

00. OPEN END  
98. (Don't know/remember)  
99. (Refused)

## PROGRAM EXPERIENCE AND SATISFACTION

Now I am going to ask you questions about your experience and satisfaction with the different aspects of the program.

Q25c. On a scale of 0 to 10 where 0 is extremely dissatisfied and 10 is extremely satisfied, how satisfied are you with ComEd overall? [REPEAT SCALE IF NECESSARY]

\_\_\_\_\_ [RECORD RATING 0-10]

98. (Don't know)  
99. (Refused)

[ASK IF Q25c<5 ELSE Q26]

Q25d. Why did you rate it that way?

00 (OPEN END)

98 (Don't know)

99 (Refused)

[ASK IF 2a = 1, otherwise skip to Q31]

Q26. Were you at home when the technician arrived to install the control switch on your central air conditioner?

1. Yes (SKIP TO Q28)

2. No

3. (Don't know)

4. (Refused)

Q27. How did you learn that a technician installed the device on your Central AC?

1. (The technician spoke to someone else at home)

2. (The technician left a door hanger)

3. (I was not aware that a technician installed the device)

00. (Other [Record Response] \_\_\_\_\_)

98. (Don't know)

99. (Refused)

[ASK IF Q26=01 ELSE Q31]

Q28. On a scale of 0 to 10 where 0 is extremely dissatisfied and 10 is extremely satisfied how satisfied were you with the technician who installed the device on your Central Air Conditioning?

\_\_\_\_\_ [RECORD RATING 0-10]

98. (Don't know)

99. (Refused)

[ASK Q28<5 ELSE Q31]

Q29. Why do you give it that rating? [Do not read; mark all that apply]

\_\_\_\_\_ [Record Response—Use below for code]

1. (The technician dressed/acted unprofessionally)

2. (My AC wasn't working properly after the device was installed)

00. (Other [Record Response] \_\_\_\_\_)

98. (Don't know)

99. (Refused)

[ASK IF Q29 = 2]

Q30. Did you have to call ComEd to have them send a technician to repair/replace the device on your Central Air Conditioning system?

1. Yes
2. No
98. (Don't know)
99. (Refused)

Q31. Have you called ComEd this summer regarding any questions or issues with the program?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK IF Q31=01 ELSE Q35]

Q32. Why did you call?

00. (OPEN END, MULTIPLE RESPONSES)
98. (Don't know)
99. (Refused)

Q33. Were your questions or issues addressed in a timely manner and to your satisfaction?

1. Yes
2. No
98. (Don't know)
99. (Refused)

[ASK IF Q33=02]

Q34. Why not?

00. (OPEN END, MULTIPLE RESPONSES)
98. Don't know
99. Refused

Q35. Would you say participating in this program has made you feel more favorable, less favorable, or no different about ComEd?

3. (More favorable about ComEd)
2. (No different about ComEd)
1. (Less favorable about ComEd)
98. (Don't know)
99. (Refused)

- Q36. Have you recommended the ComEd Central Air Conditioning Cycling Program to friends and family members?
1. (Yes) [Go to Q37b]
  2. (No)
  98. (Don't know)
  99. (Refused)
- Q37. On a scale of 0-10, where 0 is extremely unlikely and 10 is extremely likely, how likely are you to recommend the ComEd Central Air Conditioning Cycling Program to friends and family members?
- \_\_\_\_\_ [RECORD RATING 0-10]
98. (Don't know)
  99. (Refused)
- Q37b. On a scale of 0-10, where 0 is extremely unlikely and 10 is extremely likely, how likely are you to cancel your participation in the ComEd Central Air Conditioning Cycling Program?
- \_\_\_\_\_ [RECORD RATING 0-10]
98. (Don't know)
  99. (Refused)
- Q38. Is there anything you would suggest to improve the ComEd Central Air Conditioning Cycling Program? [Record response] [MULTIPLE RESPONSE]
1. (Increase the bill credit amount)
  2. (Have scheduled appointments)
  3. (Have the technician call before arriving at home)
  4. (Make the enrollment process easier)
  5. (Communicate when curtailment event occurs)
  6. (Increase marketing and communications efforts)
  7. (Communicate program requirements more clearly)
  8. (Better/more careful technicians)
  00. (Other [Record Response] \_\_\_\_\_)
  96. (None/nothing)
  98. (Don't know)
  99. (Refused)

#### MARKET EFFECTS/SPILLOVER

- Q39. Since participating in the ComEd Central Air Conditioning Cycling Program, have you participated in any other energy efficiency programs offered by ComEd?
1. (Yes)

- 2. (No) [Go to Q42]
- 98. (Don't know) [Go to Q42]
- 99. (Refused) [Go to Q42]

Q40. Which programs did you participate in?

- 1. (Residential Lighting)
- 2. (Appliance Recycling)
- 3. (HVAC Diagnostics/Tune Up)
- 4. (New HVAC/Quality Install)
- 5. (Home Performance)
- 6. (Residential Advance Lighting)
- 7. (Energy Efficiency Single Family Remodeling)
- 00. (Other [Record Response] \_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

Q41. On a scale from 0-10, where 0 is not at all influential and 10 is extremely influential, how influential was your participation in the ComEd Central Air Conditioning Cycling Program in your decision to participate in another ComEd energy-efficiency program?

\_\_\_\_\_ [RECORD RATING 0-10]

- 98. (Don't know)
- 99. (Refused)

Q42. Have you made other energy-efficiency improvements or purchases on your own without any assistance from a utility or other energy organizations?

- 1. (Yes)
- 2. (No)
- 98. (Don't know)
- 99. (Refused)

[ASK IF Q42 =1 ELSE Q45]

Q43. What action(s) did you take? [Do not prompt] [ALLOW MULTIPLE RESPONSE]

- 1. (Installed a high-efficiency dishwasher)
- 2. (Installed a high-efficiency washer)
- 3. (Installed a high-efficiency dryer)
- 4. (Installed a high-efficiency refrigerator)
- 5. (Installed a high-efficiency water heater)
- 6. (Installed CFLs [Compact Fluorescent Light bulbs or "Spiral" bulbs])
- 7. (Installed new windows)
- 8. (Installed new thermostats)
- 9. (Installed new furnace)

- 10. (Added insulation (includes windows, attic and door insulation))
- 11. (Bought a new stove)
- 12. (Replaced a TV)
- 13. (New Central HVAC system)
- 14. (Installed new doors)
- 97. (Other, [Record Response]\_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

Q44. On a scale from 0-10, where 0 is not at all influential and 10 is extremely influential, how influential was your participation in the ComEd AC Cycling program in your decision to take additional energy-efficiency action on your own?

\_\_\_\_\_ [RECORD RATING 0-10]

- 98. (Don't know)
- 99. (Refused)

## DEMOGRAPHICS

I have a few final questions about your household and then we are done.

Q45. How many people live in this home year-round?

[NUMERIC OPEN END]

- 98. (Don't Know)
- 99. (Refused)

Q45A. What type of residence do you live in [READ LIST]?

- 1. Single family
- 2. Duplex or two family
- 3. Town house or row house (adjacent walls to another house)
- 4. Apartment/condo **2-4 unit building**
- 5. Apartment/condo **more than 5 units**
- 6. Mobile home
- 00. Other
- 98. (Don't know)
- 99. (Refused)

Q46. What is the approximate square footage of this home?

[NUMERIC OPEN END]

- 99998. (Don't Know)
- 99999. (Refused)

[ASK IF 46 = DK, ELSE 47]

Q46a. Is it...

1. Less than 500 square feet
2. 500 to less than 1000 square feet
3. 1000 to less than 1500 square feet
4. 1500 to less than 2000 square feet
5. 2000 to less than 2500 square feet
6. 2500 to less than 3000 square feet
7. 3000 to less than 4000 square feet
8. 4000 to less than 5000 square feet
9. 5000 square feet or more
98. (Don't Know)
99. (Refused)

Q47. How long have you lived at your current residence?

[RECORD YEARS]

00. (Less than 1 year)
98. (Don't know)
99. (Refused)

Q47a. Was your total family income in 2009 before taxes UNDER OR OVER \$50,000?

1. (Under \$50,000)
2. (Over \$50,000)
3. (Exactly \$50,000)
98. (Don't know)
99. (Refused)

[ASK IF Q47a=1, ELSE Q48]

Q47b. Was it under \$15,000, between \$15,000 and \$30,000 or between \$30,000 and \$50,000?

[INTERVIEWER NOTE: IF EXACTLY \$30,000 ENTER AS '3. \$30,000-\$50,000']

1. Under \$15,000
2. \$15,000-\$30,000
3. \$30,000-\$50,000
98. (Don't know)
99. (Refused)

[ASK IF Q47a=2, ELSE Q48]

Q47c. Was it between \$50,000 and \$75,000 or between \$75,000 and \$100,000 or was it over \$100,000?

[INTERVIEWER NOTE: IF EXACTLY \$75,000 ENTER AS '2. \$75,000-\$100,000'. IF EXACTLY \$100,000 ENTER AS '3. OVER \$100,000']

1. \$50,000-\$75,000
2. \$75,000-\$100,000

- 3. Over \$100,000
- 98. (Don't know)
- 99. (Refused)

Q48. What is the highest level of education you have completed?

- 1. Less than high school
- 2. High school graduate or equivalent (e.g., GED)
- 3. Attended some college (includes junior/community college)
- 4. Bachelors degree
- 5. Advanced degree
- 0. (Other [Record Response] \_\_\_\_\_)
- 98. (Don't know)
- 99. (Refused)

Q49. In what year were you born?

[NUMERIC OPEN END, 1900-1992, 9998=DK 9999=Refused]

This completes the survey. ComEd appreciates your participation. Thank you for your time.