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Energy Efficiency / Demand Response Plan: Plan Year 3 (6/1/2010-5/31/2011)

Evaluation Report: Central Air Conditioning Cycling

Presented to

Commonwealth Edison Company

May 16, 2012

Presented by

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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 3, there were approximately 73,000 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 6,896 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 PY3 evaluation, the information will be separated into four groups: participants prior to PY1, PY 1 participants, PY2 participants, and PY3 participants. Last year's impact evaluation found no significant difference between the old participants and the new participants. Comparing PY3 participants to participants prior to PY1, PY1 and PY2 participants gives three points of reference for changes in the participant group makeup. To avoid confusion, the report will refer to the past three program years 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

A process evaluation was not conducted this year as this program will no longer be part of Commonwealth Edison's second plan cycle.

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 an 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?).

The number of customers selecting 50% cycling vs. 100% load shed could 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.

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.

E.3 Key Impact Findings and Recommendations

Program Goals

The Central Air Condition Cycling program is using appropriate demand savings estimates.

The demand reduction achieved from the additional participants in PY3 meets the statutory Demand Response goal, which is to reduce peak demand by 0.1% over the prior year for eligible customers.

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 those joining the program between June 1, 2009 and May 31, 2010 are considered PY2 participants, and those joining the program between June 1, 2010 and May 31, 2011 are considered PY3 participants. The past three years 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, the characteristics of the participants are uniform for all groups. The annual energy use characteristic changed this year with more participants joining at the extreme ends of the annual energy use spectrum this will be discussed further in the annual energy use section. Characteristics that were examined for similarities were geographic location, energy use, and selection of cycling level.

Geographic Location

All four points of participant data show the geographic location of the program to be consistent each year. 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. The similarity of geographic location patterns between participant groups suggests that the program impacts of the participants would be similar.

Annual Energy Use

Overall 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. The normalized PY3 participant data shows consistency with the other groups.

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 10.0 MW of summer peak savings from 6,896 new participants in PY3. 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 PY3 report of claimed savings shows 14.72 MW of savings from 10,180 customers at 1.480 kW per participant.

Table 3-1 compares ComEd's original program planning savings estimate for the program (10.0 MW) to the final program achievement evaluated savings estimate (14.72 MW). The biggest difference comes from the increase in the number of customers that joined the program compared to the PY3 program participation goal. A smaller difference comes from the fact that the 100% cycling option was chosen by 62.8% 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

		Program Planning			Ex Post Evaluation Adjusted Achievement		
Participant Group	kW/ Cust	Customers	Share	MW	Customers	Share	MW
50% Cycling	0.909	2,820	40.9%	2.6	3,787	37.2%	3.10
100% Cycling	1.818	4,075	59.1%	7.4	6,393	62.8%	11.62
All Participants		6,896		10.0	10,180		14.72

E.4 Cost Effectiveness Summary

ComEd uses DSMore™ software for the calculation of the Illinois TRC test[1].Table3-3 summarizes the unique inputs used in the DSMore model to assess the TRC ratio for the Central Air Conditioning Cycling program in PY3. 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.

Table E-2. Inputs to DSMore Model for Central Air Conditioning Cycling Program

Item	Value Used
Measure Life	15
Utility Administration and Implementation Costs	$1,043,560
Utility Incentive Costs	$1,073,874
Net Participant Costs	$0

Based on these inputs, the Illinois societal TRC for this program is 2.46 and the program passes the TRC test.

[1] Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.

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 6,896 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 Evaluation Questions

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.

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?).

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.

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.

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.

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.

Most 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. Navigant 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

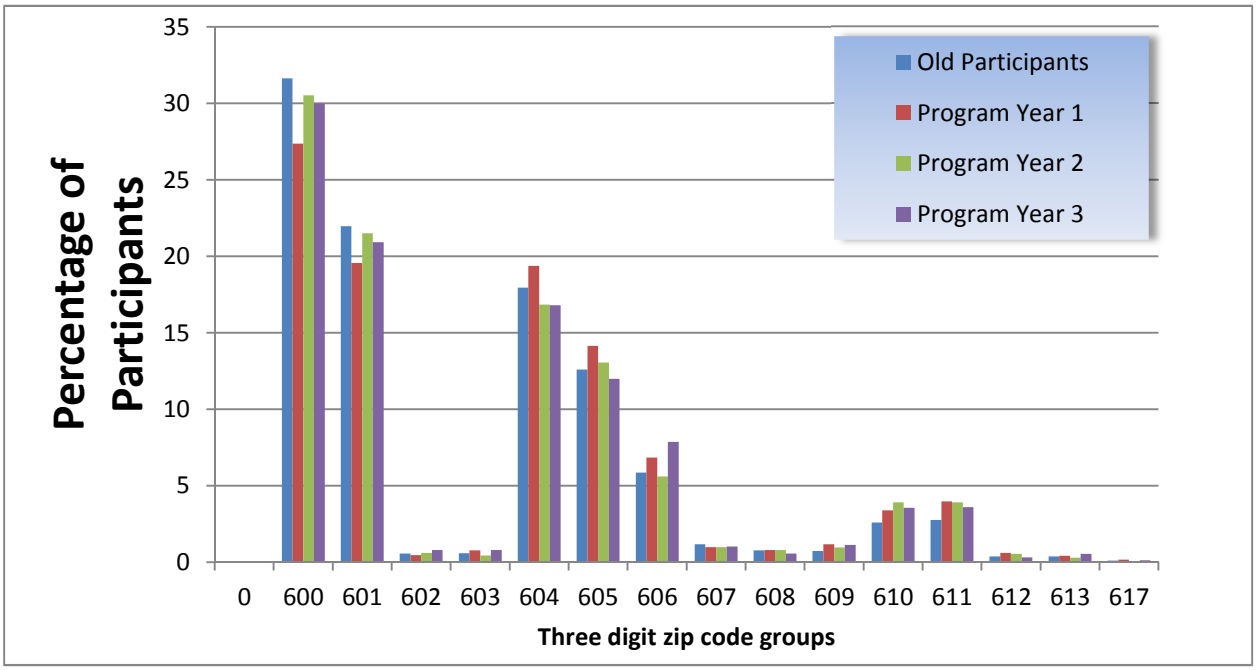
Characteristics that were examined for similarities were geographic location, energy use, and selection of cycling level.

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. The analysis from PY1 showed a drop in participants in the 600 and 601 zip code areas. PY2 participants in the 600 and 601 zip code areas increased from PY1 levels. PY3 participants in the 600 and 601 were consistent with old participants and PY2 participants. It appears that the drop in PY1 participants in the 600 and 601 area was an anomaly. 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 or PY3. The similarity of geographic location patterns between participant groups suggests that the program impacts of the participants would be similar as there is no significant difference between participant groups.

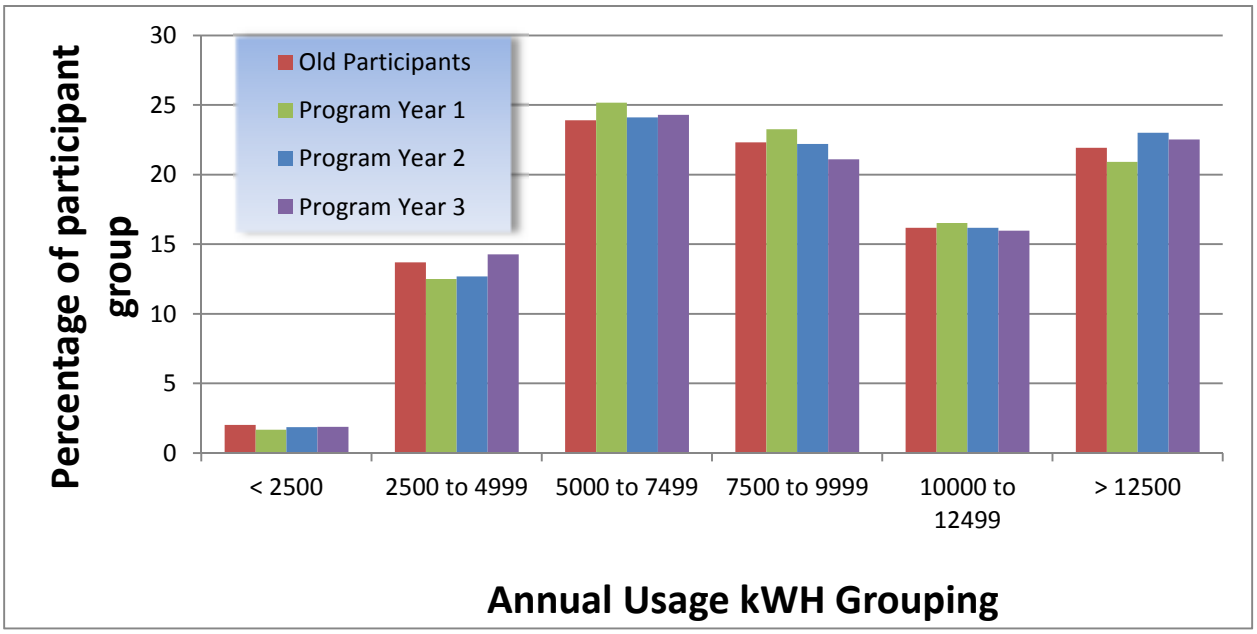
Figure 3-1. Percentage of Old and New Participants grouped by Three digit zip code



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. The annual energy use distributions of the old and new participant groups are similar. The normalized PY3 participant data shows consistency with the other groups.

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



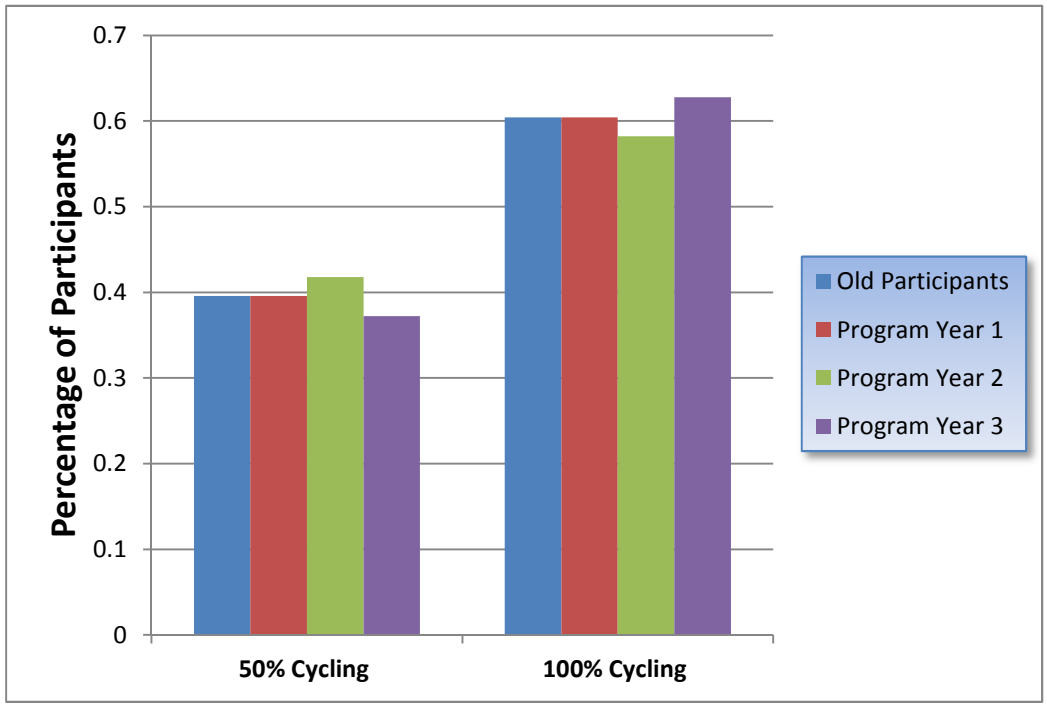
Note: 22% of PY3 participants did not have a full year's worth of energy use data these customers were removed for the annual usage analysis. When the PY3 participants who did not have a full year's worth of energy use data were included they skewed the data by showing the PY3 group to have much lower usage pattern which is to be expected when several months of energy use are omitted .

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

Figure 3-3. 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 6,896 new participants to the Central Air Conditioning Cycling program in PY3. The actual number of new participants was 10,180. This was verified with an assessment of program start dates for all new program participants.

It should be noted that this reflects 10,180 new participants added to the Central Air Conditioning Cycling program in PY3 without any adjustment for participants who left the program during the year. In other words, while 10,180 new customers joined the program in PY3 the total number of participants in the program did not increase by 10,180. 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.[2]

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.

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 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 x 2 = 1.818 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 6,896 new participants and 40.9% of them would choose the 50% cycling option, and 59.1% would choose the 100% cycling option.

[2] "ComEd's Nature First A/C Load Control Measurement and Verification, 2006 Revision and Revised PJM Control Matrices", GoodCents Solutions, March 2407

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

		Program Planning			Ex Post Evaluation Adjusted Achievement		
Participant Group	kW/ Cust	Customers	Share	MW	Customers	Share	MW
50% Cycling	0.909	2,820	40.9%	2.6	3,787	37.2%	3.10
100% Cycling	1.818	4,075	59.1%	7.4	6,393	62.8%	11.62
All Participants		6,896		10.0	10,180		14.72

The program achievement number of new participants was 10,810, which exceeded the customer sign-up goal. The program achievement shares turned out to be close to the original estimate. The 100% cycling option was chosen by 62.8% of new customers, compared to the estimate of 59.1%. This difference in shares contributed to an increase in the average impact per customer. The program achievement weighted average impact per customer turned out to be 1.480 kW instead of 1.446, as shown in the equations below. This contributed to an overall achievement of 14.72 MW of load reduction from PY3 participants.

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

$$(0.909 \times 37.2\%) + (1.818 \times 62.8\%) = 1.480 \text{ kW per participant}$$

ComEd's original target for the Central Air Conditioning Cycling program was 10.0 MW of summer peak savings from 6,896 new participants during PY3. The final PY3 report of claimed savings shows 14.72 MW of savings from 10,180 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 PY3 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.[3] 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%).

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

[3]Mary Klos, Summit Blue Consulting, "A Regional Look at Residential DLC Impacts," Association of Energy Services Providers (AESP) teleconference presentation, February 2008.

factor found in the GoodCents Solutions study, 1.818 kW fits reasonably into the low end of this range.

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	-	14.72	10,180
Net-to-Gross Ratio	-	1	-
Net Savings	-	14.72	10,180

3.2 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 Illinois Total Resource Cost (TRC) test. The Illinois 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.*[4]

ComEd uses DSMore™ software for the calculation of the Illinois TRC test.[5] The DSMore model accepts information on program parameters such as number of participants, gross savings, free ridership, program costs and CO_2 reductions. It then calculates a TRC that fits the requirements of the Illinois Legislation.

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 that extreme weather has on electricity prices. Extreme weather generally results in electricity price spikes and creates 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.

Results

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 PY3. 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.

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

[4] Illinois Power Agency Act SB1592, pages 7-8.
[5] Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.

Item	Value Used
Measure Life	15
Utility Administration and Implementation Costs	$1,043,560
Utility Incentive Costs	$1,073,874
Net Participant Costs	$0

Based on these inputs, the Illinois societal TRC for this program is 2.46 and the program passes the TRC test.

Section 4. Conclusions

4.1 Conclusions

This report is the Program Year 3 assessment of the Central Air Conditioning Cycling program.

The following conclusions highlight the major findings and recommendations presented in this Program Year 3 report.

The Central Air Condition Cycling program is using appropriate demand savings estimates.

The demand reduction achieved from the additional participants in PY3 meets the statutory Demand Response goal, which is to reduce peak demand by 0.1% over the prior year for eligible customers.

4.1.1 Program Impacts

Number of Participants in the Air-Conditioning Load Control Program

The original goal was to add 6,896 new participants to the Central Air Conditioning Cycling program in PY3. The actual number of new participants was 10,180. This was verified with an assessment of program start dates for all new program participants.

Geographic Location of Participants

The similarity of geographic location patterns between participant groups suggests that the program impacts of the participants are similar and there are no significant differences between participant groups.

Participant Energy Use Patterns

The annual energy use distributions of the old and new participant groups are similar.