

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

### Evaluation Report: Public Sector Electric Efficiency Standard Incentives Program

Presented to

The Illinois Department of Commerce and  
Economic Opportunity

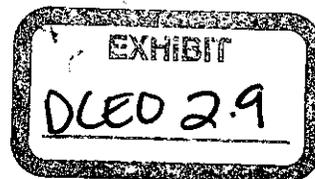
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## Executive Summary

### *E.1. Evaluation Objectives*

The goal of this report is to present a summary of the findings and results from the evaluation of the Program Year 3 (PY3) Standard Incentives program.<sup>1</sup> The primary objectives of this evaluation are to quantify gross and net savings impacts and to determine key process-related program strengths and weaknesses and identify ways in which the program can be improved.

Under the Illinois Energy Efficiency Portfolio Standard (EEPS), the Illinois Department of Commerce and Economic Opportunity (DCEO) administers the Illinois Energy Now (IEN) Public Sector Energy Efficiency program (PSEE)<sup>2</sup> program that provides incentives for public sector customers of ComEd and Ameren Illinois Utilities who upgrade their facilities with energy efficient equipment. There were two specific program elements that were available to customers during the program year: a Custom Incentives program and a Standard Incentives program.

- The Standard program provides an expedited application approach for public sector customers interested in purchasing efficient technologies. The program targets discrete retrofit and replacement opportunities in lighting, LED traffic signals, HVAC, motor, and refrigeration equipment. A streamlined incentive application and quality control process is intended to facilitate ease of participation.
- Custom program incentives are available to customers for less common or more complex energy-saving measures installed in qualified retrofit and equipment replacement projects.

Some tasks within the Standard and Custom program evaluations involved close coordination between the two efforts, but the evaluations were otherwise conducted through separate approaches. The Standard and Custom programs have evaluation results reported separately.

### *E.2. Evaluation Methods*

The key evaluation activities to assess gross and net impacts of the Standard program were:

Reviewed tracking data and default savings assumptions used by the program.

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<sup>1</sup> The Program Year 3 (PY3) program year began June 1, 2010 and ended May 31, 2011.

<sup>2</sup> The portfolio of programs has been branded as Illinois Energy Now and the former Public Service "Electric" Efficiency program was renamed to "Energy" because natural gas measures are added to the program for PY4.

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Implemented a stratified random sampling design on the population of 449 Standard project applications with three project-size strata of roughly equal ex ante energy savings allocations. Conducted a random selection of 52 projects that included all eight of the projects in the large-project stratum, 14 of 40 projects in the medium-sized project strata, and 30 of 401 of the smallest-sized projects. The sample covered 50% of PY3 Standard energy savings claimed.

Conducted on-site visits and measurement and verification (M&V) activities on a sample of 25 Standard projects selected from the 52 projects to support gross impact evaluation. An engineering review of project files and reported energy savings was conducted on the remaining 27 projects from the sample of 52 projects. The on-site M&V was targeted to larger and more complex projects. The on-site M&V sample covered 88% of sampled energy savings, and 44% of total PY3 Standard energy savings claimed.

Completed computer assisted telephone interviews (CATI) with 78 contacts that implemented Standard projects to support net-to-gross analysis. The Standard interviews were supplemented by an additional 14 Custom program interviews with project contacts that had combined Custom and Standard projects and reported a single decision making process was used for both measure types.

Questions in the CATI survey were asked regarding lighting hours of use, but responses were only considered for gross impact adjustments for projects in the engineering review sample.

Four research activities were conducted in support of the process evaluation: (1) interviews with program staff, (2) a quantitative telephone survey with 77 participating customers, (3) qualitative telephone interviews with 10 participating customers focused on the procurement process, and (4) qualitative telephone interviews with five program drop-outs. These activities are further described in the main report.

The data collection and analyses for impact and process evaluation was conducted at the state-level. Energy impacts for the program are reported statewide in the main body of this report, and separately for the ComEd and Ameren Illinois Utilities in Appendix 5.2. The process results report statewide data.

Evaluation review of energy savings reported through the Smart Energy Design Assistance Program (SEDAP) are described in Appendix 5.5.

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

### **E.3.1. Standard Program Impact Results**

As shown in Table ES-1, the PY3 Standard evaluation found that verified gross energy savings were 9 percent higher than savings in DCEO's tracking system, as indicated by the realization rate (realization rate = verified gross / tracking system gross). The PY3 realization rate of 1.09

compares with an estimated value of 1.27 in PY2. The verified net-to-gross ratio (NTGR) of 0.66 estimated for PY3 compares with a value of 0.75 estimated in PY2.

**Table ES-1. Program-Level Evaluation-Adjusted Net kWh Impacts for PY3**

Segment	Ex Ante Gross kWh	Ex Post Gross kWh	kWh RR	Ex Post Net kWh	NTGR (ex post gross)
Standard	53,634,742	58,328,889	1.09	38,236,880	0.66

*Source: Analysis of tracking savings from DCEO tracking system, September 7, 2011. The values displayed for RR and NTGR are rounded.*

The relative precision at a 90% confidence level for the Standard projects in the sample is  $\pm 7\%$  for the kWh realization rate. The relative precision at a 90% confidence level for the program NTG ratio is  $\pm 7\%$ .

The primary factor that raised the Standard energy realization to 1.09 was a common finding, through on-site verification and telephone interviews, of longer hours of use than assumed in the default savings. Factors that lowered realization rates on individual projects were adjustments to quantities installed, and adjustments to savings based on installed and baseline equipment performance relative to default assumptions. Findings of lower hours of use than default values lowered the realization rates on some projects. A large proportion of PY3 program savings was for traffic signal projects, including 36% of overall program reported savings with the City of Chicago, and these projects were not subject to hours of use adjustments.

The primary difference in overall net-to-gross ratios between PY2 and PY3 was that larger PY3 projects had lower NTG ratios than in PY2. In PY3, some large projects had quite low NTG ratios, and a substantial fraction had results in the 0.60 to 0.65 range.

Table ES-2 below provides an overview of planned, reported ex ante, and evaluation-adjusted net savings impacts for the combined PY3 Standard and Custom programs.

**Table ES-2. Comparison of Sector Electric Efficiency Program Net Savings**

Net Savings Estimates	Standard MWH	Custom MWH	Combined MWH
DCEO PY3 Plan Target	128,821	20,000	148,821
DCEO Reported for PY3 (ex ante net)	42,908	21,471	64,379
Total PY3 Third-Year Evaluation-Adjusted Net Savings (ex post net)	38,237	15,477	53,714

*Source: Plan target from Direct Testimony of Jonathan Feipel, DCEO, Docket No. 07-0541, Exhibit 1.2, November 15, 2007. DCEO's planned and reported net savings include a net-to-gross ratio of 0.8.*

The PY3 evaluation-adjusted net savings of 38,237 MWH for Standard and 53,714 MWH for the Custom and Standard programs compares with the PY2 evaluation-adjusted net savings of 29,220 MWH for Standard and 43,191 MWH for the combined Custom and Standard programs. The PY3 ex post net savings for the Custom and Standard programs of 53,714 MWH is 0.58% of estimated 9,271,325 MWH non-low income public sector base usage.<sup>3</sup>

### E.3.2. SEDAP Impact Results

In PY3, a pilot effort within the Standard program evaluation was made to quantify energy savings implemented as a result of technical services provided by the Smart Energy Design Assistance Center (SEDAC) through the Smart Energy Design Assistance Program (SEDAP). The evaluation assessment was conducted to identify savings resulting from SEDAC services that have not been claimed through incentive programs operated by DCEO, ComEd, or Ameren Illinois. Details of the data provided by SEDAC to support the claimed savings and evaluation analysis are provided in Appendix 5.5.

Based on desk-review of SEDAC tracking data, our evaluation assessment concluded SEDAP is generating energy savings that are not being claimed by other programs. The measures recommended through SEDAP include equipment retrofits and operational improvements. The measures we believe are not being claimed by other programs include equipment retrofits that are not eligible for prescriptive or custom rebates, and operational improvements. The implementation of savings is estimated by SEDAC staff from a structured protocol of regular follow-up with service recipients who identify progress on implementing audit report recommendations. The tracking records suggest that SEDAC staff is effective at steering

<sup>3</sup> Communication from David Baker, DCEO, December 6, 2010 indicating public sector usage of 9,271,325 MWh for non-low income public sector energy consumption.

technical service recipients to ComEd, Ameren Illinois, and DCEO programs for incentives on eligible measures.

Our evaluation review consisted of reviewing SEDAC measure-level tracking data for each of the 40 projects with PY3 service recipients who reported completing or starting measure implementation. Where recipients had reported completing the measure implementation process, we could identify measures assignable as unclaimed SEDAP savings from measures that had been submitted for EEPs incentives. Only a small portion of savings potentially assignable to SEDAP fell into this category. The bulk of potential SEDAP claimable savings implemented by service recipients could not be separated and verified at the measure level from savings potentially claimed by an EEPs incentive program because action on recommendations were partially implemented and still ongoing. Verification would require project documentation review and site-specific data collection by the evaluation team once the SEDAP participant had concluded work on the audit recommendations. Table ES-3 provides a summary of our assessment of SEDAC tracking data.

The 146,813 kWh of desk review verified savings from SEDAP in PY3 shown in Table ES-3 consists only of savings resulting from technical services provided during PY3. A second block of PY3 implemented energy savings totaling 1,375,147 kWh was identified by SEDAC as measures that had participated in an EEP's incentive program. The third and largest category PY3 implemented energy savings totaling 2,692,674 kWh involved projects where the contact had indicated implementation was in-progress. Although some measures had been implemented, we could not verify from the data how much of the savings to assign to SEDAP versus measures that could be counted toward EEPs. On some projects, additional detail from SEDAC to provide implemented savings on a measure level would allow us to categorize measures as either SEDAP claimable or EEPs even if work was still ongoing at the facility. In other cases, we would need to wait until EEPs eligible work at the facility had been completed in order to make a determination due to the complexity of the project and potential for measure interactions.

Our review of SEDAP tracking data indicated that approximately 21,502 MWh of energy savings measures from SEDAP services provided during PY1 and PY2 were reported implemented by the end of PY3. It was not possible to quantify SEDAP claimable savings for PY3 from services provided in PY1 and PY2 from the data. It may be possible to quantify implemented savings from prior year's technical services through site-specific data collection.

**Table ES-3. Verified and Potential Energy Savings Claimable through SEDAP Services**

Evaluation Assessment Category	Project Count	Implemented Savings, kWh			Measure not yet implemented, assignment to EEPs or SEDAP to be determined, kWh
		EEPs, "desk verified"	SEDAP, "desk verified"	EEPs or SEDAP, to be verified	
PY3 Implementation completed, EEPs savings claimed	7	1,375,147		-	-
PY3 Implementation completed on measures claimable by SEDAP, with some measures not yet implemented	10	-	146,813	-	905,554
PY3 Implementation completed on measures claimable by EEPs, with some measures not yet implemented	3	113,852	-	-	1,001,609
PY3 Implementation in-progress	20	444,448	-	2,692,674	4,936,020
SEDAP PY3 services provided, implementation not begun	139				30,161,029
<b>Subtotal, All SEDAP PY3 services</b>	<b>179</b>	<b>1,933,447</b>	<b>146,813</b>	<b>2,692,674</b>	<b>37,004,212</b>
<b>Subtotal, All SEDAP PY1 and PY2 services</b>	<b>342</b>			<b>21,502,357</b>	<b>82,698,391</b>
<b>Total, All SEDAP services, PY1 through PY3</b>	<b>521</b>	<b>1,933,447</b>	<b>146,813</b>	<b>24,195,031</b>	<b>119,702,603</b>

Source: Evaluation analysis of tracking data provided by SEDAC Based on our desk review of SEDAC tracking data, measure savings claimable for SEDAP are similar to those implemented through the retrocommissioning program offered by DCEO. To estimate the size of potential net savings from SEDAC services, we recommend the gross energy realization rate (0.795) and net-to-gross ratio (0.98) from the PY3 Retrocommissioning evaluation be applied to evaluation verified savings. Applying these ratios to the 146,813 kWh of evaluation verified gross ex ante

savings for SEDAP yields 114,382 kWh of verified net savings that could be claimed for SEDAP in PY3. With additional measure-level savings data from SEDAC and site verification by evaluators on a sample of the 2,692,674 kWh recommended and implemented in PY3 plus PY3 implementation from prior years' services, the evaluation verified savings for SEDAP in PY3 could be much higher.

### **E.3.3. Key Impact Findings and Recommendations**

Specific recommendations to consider include:

During PY4, DCEO should consider working with the evaluation team to ensure that statewide technical reference manual development provides additional building types or modifications to existing building types that would be beneficial for reporting energy savings. Although the current set of building types work reasonably well, they were developed by ComEd for commercial businesses and not specifically designed for public building types. After three years of Standard program operation and evaluation cycles, plus work conducted by SEDAC, a substantial set of site collected data is available. The evaluation team has compiled observations from field verification and telephone survey work and can provide additional analysis.

During PY4, prior to closing out year-end ex ante savings estimates, DCEO should consider working with the evaluation team to review default values and ex ante savings calculation outputs to ensure that tracking system output matches values expected by the evaluators. The evaluation team can review default lookup values coded into the tracking system and check the values against the default values documentation, and advise DCEO on any differences. The evaluation team could also review the output of ex ante calculations as ongoing changes are made in the tracking system.

DCEO should consider working with the evaluation team to facilitate evaluation analysis and reporting of measure-level impact results. The tracking system stores project data at the measure level, however, the evaluation team was not able to produce measure level impacts from tracking data extracts provided by DCEO for the PY3 evaluation. If the evaluation team could extract measure-level savings information it would facilitate savings verification analysis and allow the evaluation team to provide greater detail to reporting.

DCEO should consider additional quality assurance and quality control steps to verify the unit basis and quantities entered into the tracking system. As a general qualitative finding, DCEO was quite accurate on measure quantities claimed, with a common finding being exact or within one or two percent on sampled projects. This is commendable given that some Standard projects have quantity counts that number in the hundreds and thousands. There were instances where projects had recorded the wrong units when recording savings, either recording lamps when the correct unit was an entire fixture, or recording a fixture count when

the unit required was lamps. The new tracking system may allow for enhanced checking or alerts regarding individual measure entries.

DCEO should consider additional quality assurance and quality control steps to verify the eligibility requirements on measure types with complex requirements. As a general qualitative finding, equipment was eligible for the measure assigned. Within our sample, there was an instance of a high performance T8 lamp and ballast installation not meeting the baseline and ballast requirements, and a project with HVAC measures that did not qualify. The new tracking system may allow for enhanced checking, flags, or alerts regarding individual measure entries.

**DCEO should consider strategies to increase participation of smaller projects.** Projects in the small-size stratum, with savings under 200,000 kWh, had higher gross realization rates and net-to-gross ratios than larger projects, on average.

DCEO should continue strategies to increase participation of fluorescent lighting projects tied to pending Federal fluorescent lighting standards. Open-ended interview responses indicated a concern for the future availability of T12 and standard T8 lamps and this was a motivating factor in some projects. This is an important topic to address in ongoing marketing and outreach efforts.

#### **E.3.4. Key Process Finding and Recommendations**

Participants are very satisfied with the Standard Program: More than 90% of participants are satisfied with DCEO overall, the program overall, staff communications, and the incentive level. Satisfaction with the incentive amount is higher in PY3 compared to PY1, reflecting the increasing incentive levels since program inception. Specific recommendations to consider include:

##### **Program Participation**

**DCEO should consider special offerings for sectors with limited participation but high savings potential.** Hard-to-engage sectors with high savings potential might benefit from specific offerings to encourage more participation. This could include limited-time offerings or a bonus incentive for projects exceeding a certain size. The increase in incentive levels for non-carve out entities<sup>4</sup> (universities and State and Federal governments) in PY4 should help in increasing participation among these sectors.

DCEO should continue the development of database functionalities to make it a more useful program management and evaluation tool. While the database has allowed staff to be more

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<sup>4</sup> A "carve out" group was developed by DCEO in PY3. This group (local governments, K-12 schools, and community colleges) received higher incentive levels than federal and state governments, and universities.

efficient in a number of ways, it is not yet developed and used to its fullest potential as a management tool. The program should continue to make database improvements and provide ongoing user training to program staff and any partners who might use it in the future. DCEO has noted that they have recently provided training to SEDAC, the Energy Resources Center and several other partners on use of the DCEO database. Partners that administer programs on their behalf or conduct site visits are using the DCEO database in PY4.

## Program Partnerships

DCEO should be aware that participation by projects that also receive significant funding from other public sources has the potential to result in higher free-ridership in the DCEO program. Although the savings weighted-average free-ridership on co-funded projects in PY3 was not higher than the mean value for the overall program, co-funding has the potential to increase DCEO free-ridership scores if participants assign relatively more influence to the other co-funding sources.

## Trade Allies

Development of a program-specific trade ally network is well-warranted, and DCEO should consider recruiting trade allies capable of helping at the project design stage, so that the trade allies have an opportunity to promote energy efficiency and participation in the PSEE program to public sector entities. Based on our procurement process interviews, trade allies are often involved at the project specifications stage and then again at the implementation stage. While trade allies have influence over the energy efficiency of equipment at the former stage, they rarely do at the latter stage since project details have already been determined. In future promotions the program should continue to leverage trade ally involvement as a key channel to inform participants. DCEO reports that activity on this recommendation is underway, with the Energy Resources Center and SEDAC developing a trade ally program for DCEO.

**Consider providing additional resources to help potential applicants connect with technical expertise.** While SEDAC already provides technical assistance, a program-specific trade ally network could help connect applicants with qualified technical support. Outreach materials should emphasize these resources.

## Marketing and Outreach

The program should consider developing short sector-specific case studies or fact sheets that provide examples of potential savings. This might be a useful tool for facility managers when seeking approval for energy efficiency upgrades. While the increased PY4 incentive level will help reduce financial barriers for non-carve out sectors, the upfront cost of energy efficient equipment is likely to remain a barrier to participation for many public sector entities. However, this barrier might be reduced if prospective participants had more collateral that

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demonstrates the savings that can be expected from the installation of energy efficient equipment.

## **Program Drop-outs**

**DCEO should continue making regular requests of periodic status updates from applicants.** Requesting status updates throughout the year will allow program staff to remain connected with applicants and potentially help them by suggesting resources or clarifying points of confusion. DCEO reports that using the email addresses in the database, they did two mass mailings in 2011, in February and April, to all grantees that had not completed their projects to determine their status and remind them of deadlines.

**DCEO should consider enacting a follow up process with program drop-outs in the future if the number drop outs increases.** At this time, there are very few drop-outs that do not re-apply the following year. If drop-outs increase, following up with these applicants and informing them about PSEE opportunities might result in additional project applications.

## ***E.A. Cost Effectiveness***

Cost effectiveness is assessed through the use of the Illinois Total Resource Cost (TRC) test. Table ES-4 summarizes the unique inputs used to calculate the TRC ratio for the Public Sector Electric Efficiency Standard Incentives Program in PY3. Most of the unique inputs come directly from the evaluation results presented in this report. Measure life estimates were based on similar ComEd programs, third party sources including the California Public Utilities Commission (CPUC) developed Database of Energy Efficiency Resources (DEER) and previous Navigant evaluation experience with similar programs. Program costs data came directly from DCEO. Incremental costs were estimated from program, survey data and similar ComEd programs. Avoided cost data came from both ComEd and Ameren and are the same for all programs.

**Table ES-4. Inputs to TRC Model for Public Sector Electric Efficiency Standard Incentives Program**

Item	Value Used
Measure Life	12 years
Participants	449 <sup>5</sup>
Annual Gross Energy Savings	58,329 MWh
Gross Coincident Peak Savings	8.58 MW
Net-to-Gross Ratio	66%
DCEO Administration and Implementation Costs	\$533,848
DCEO Incentive Costs	\$13,176,441
Net Participant Costs	\$14,695,870

Based on these inputs, the Illinois societal TRC for this program is 1.19 and the program passes the Illinois TRC test.

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<sup>5</sup> 449 projects conducted by 305 organizations

## Section 1. Introduction to the Program

This evaluation report covers the Standard Incentives program element of the PY3 Public Sector Electric Efficiency incentive program.<sup>6</sup>

### 1.1 Program Description

In PY3, the Illinois Department of Commerce and Economic Opportunity (DCEO) Public Sector Electric Efficiency program provided incentives for public sector customers of ComEd and Ameren Illinois Utilities who upgrade their facilities with energy efficient electric equipment. There were two specific program elements that were available to customers during the program year: a Custom Incentives program and a Standard Incentives program.

- The Standard Incentives program provides an expedited application approach for public sector entities interested in purchasing efficient technologies. The program targets discrete retrofit and replacement opportunities in lighting, HVAC, motor, and refrigeration equipment. A streamlined incentive application and quality control process is intended to facilitate ease of participation. The measure list matched ComEd, except that DCEO offered incentives for LED traffic signals.
- Custom program incentives are available to customers for less common or more complex energy-saving measures installed in qualified retrofit and equipment replacement projects.

DCEO uses internal staff to manage, implement, and administer the program. Technical assistance is provided as needed with the assistance of the Smart Energy Design Assistance Center (SEDAC). A detailed discussion of the program design and operation is provided in the process evaluation findings of Section 3.2.

The net MWh savings goals and budgets for the Standard Incentives program, as included in the Three-Year Plan approved by the Illinois Commerce Commission, are presented in Table 1-1 for PY3.

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<sup>6</sup> The portfolio of programs has been branded as Illinois Energy Now and the former Public Service "Electric" Efficiency program was renamed to "Energy" for PY4 because natural gas measures are added to the program.

**Table 1-1. Public Sector Electric Efficiency Standard PY3 Planned Savings Goals and Budgets**

Utility	Plan Target Net MWh	Plan Target Net MW	Plan Target Total Cost
ComEd	94,954	27.1	\$14,679 million
Ameren	33,867	9.7	\$5,194 million
Total	128,821	36.7	\$19,873 million

Source: Direct Testimony of Jonathan Feipel, DCEO, Docket No. 07-0541, Exhibit 1.2, November 15, 2007.

DCEO operates the PSEE program with a joint goal for energy savings that combines Standard and Custom program results, not as separate goals for each program. The combined Standard and Custom goal for PSEE net energy savings is 148,821 MWh, which includes 20,000 MWh for Custom.

## 1.2 Evaluation Questions

The evaluation sought to answer the following key researchable questions.

The impact evaluation questions focused on the following key areas:

1. What are the gross impacts from this program?
2. What are the net impacts from this program?
3. Did the program meet its energy goals? If not, why not?
4. What is the program's benefit-cost ratio using the Illinois TRC test?

The process evaluation questions focused on the following topics:

1. Program participation
2. Program design and implementation
3. Program partnerships
4. Trade allies
5. Marketing and outreach
6. Barriers to participation
7. Program drop-outs
8. Public sector procurement process
9. Participant satisfaction

The full list of researchable questions can be found in the Evaluation Plan.

## Section 2. Evaluation Methods

The key evaluation activities to assess gross and net impacts of the Standard program were:

Reviewed tracking data and default savings assumptions used by the program.

Implemented a stratified random sampling design on the population of 449 Standard project applications with three project size strata of roughly equal ex ante energy savings allocation. Conducted a random selection of 52 projects that included all eight of the projects in the large-project stratum, 14 of 40 projects in the medium-sized project strata, and 30 of 401 of the smallest-sized projects. The sample covered 50% of PY3 Standard energy savings claimed.

Conducted on-site visits and measurement and verification (M&V) activities on a sample of 25 Standard projects selected from the 52 projects to support gross impact evaluation. An engineering review of project files and reported energy savings was conducted on the remaining 27 projects from the sample of 52 projects. The on-site M&V was targeted to larger and more complex projects. The on-site M&V sample covered 88% of sampled energy savings, and 44% of total PY3 Standard energy savings claimed.

Completed computer assisted telephone interviews (CATI) with 78 contacts that implemented Standard projects to support net-to-gross analysis. The Standard interviews were supplemented by an additional 14 Custom program interviews with project contacts that had combined Custom and Standard projects and reported a single decision making process was used for both measure types.

Questions in the CATI survey were asked regarding lighting hours of use, but responses were only considered for gross impact adjustments for projects in the engineering review sample.

Four research activities were conducted in support of the process evaluation: (1) interviews with program staff, (2) a quantitative telephone survey with 77 participating customers, (3) qualitative telephone interviews with 10 participating customers focused on the procurement process, and (4) qualitative telephone interviews with five program drop-outs. These activities are further described in Section 3.2.

The data collection and analyses for impact and process evaluation was conducted at the state-level. Energy impacts for the program are reported statewide in the main body of this report, and separately for the ComEd and Ameren Illinois Utilities in Appendix 5.2. The process results report statewide data.

The sections that follow provide a summary of the analytical methods deployed, while full details may be found in Appendix 5.3.

## 2.1 Analytical Methods

### 2.1.1 Impact Evaluation Methods

#### Gross Program Savings

The objective of this element of the impact evaluation is to verify the accuracy of the PY3 ex ante gross savings estimates in the Standard program tracking system. The savings reported in DCEO's tracking system were evaluated using the following steps:

1. Engineering review at the measure-level for a sample of 52 project files, with the following subcomponents:
  - a. Engineering review and analysis of measure savings based on project documentation, default assumptions, and tracking data.
  - b. Review and application (if appropriate) of participant telephone survey impact data (reported hours of use) to projects in the engineering review sample.
  - c. On-site verification audits at 25 project sites selected from the sample of 52 projects. Performance measurements included spot measurements and run-time hour data logging for selected measures. On-site data collection was conducted in the July through September period.
  - d. Calculation of a verified gross savings value (kWh) for each project within the sample, based on measure-level engineering analysis.
2. Carry out a quality control review of the ex post impact estimates and the associated draft site reports and implement any necessary revisions.

A verified gross realization rate (which is the ratio of the ex post gross savings-to-reported tracking savings) was then estimated for the sample, by sampling stratum, and applied to the population of reported tracking savings, using sampling-based approaches that are described in greater detail in Sections 2 and 3 below. The result is an ex post estimate of gross savings for the Standard program.

#### Net Program Savings

After gross program impacts have been assessed, net program impacts are derived by estimating a Net-to-Gross (NTG) ratio that quantifies the percentage of the gross program impacts that can be reliably attributed to the program.

For PY3, the net program impacts were quantified from the estimated level of free-ridership. Quantifying free-ridership requires estimating what would have happened in the absence of the program. A customer self-report method, based on data gathered during participant telephone interviews, was used to estimate the free-ridership for this evaluation. The existence of participant spillover was qualitatively examined by identifying spillover candidates through

questions asked in the participant interviews. If response data provides sufficient detail to quantify participant spillover, those impacts are estimated.

Once free-ridership and participant spillover has been estimated the Net-to-Gross (NTG) ratio is calculated as follows:

$$\text{NTG Ratio} = 1 - \text{Free-ridership Rate} + \text{Participant Spillover}$$

Free ridership was assessed following a framework that was developed for evaluating net savings of California's 2006-2008 nonresidential energy efficiency programs. This method calculates free-ridership using data collected during participant telephone interviews concerning the following three items:

A **Timing and Selection** score that reflected the influence of the most important of various program and program-related elements in the customer's decision to select the specific program measure at this time.

A **Program Influence** score that captured the perceived importance of the program (whether rebate, recommendation, or other program intervention) relative to non-program factors in the decision to implement the specific measure that was eventually adopted or installed. This score is cut in half if they learned about the program after they decided to implement the measures *and* funds were committed before learning about the program (if funds were not committed, the program received full credit).

A **No-Program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by incorporating the likelihood that the customer would have installed program-qualifying measures at a later date if the program had not been available.

Interviews with Standard project contacts were supplemented by interviews with project contacts that had combined Custom and Standard projects and reported a single decision making process. For projects that receive greater program funding levels, an effort is made during the customer telephone interview to more completely examine project influence sources in order to allow for any adjustments to the customer self-reported score.

The net-to-gross scoring approach is summarized in Table 2-1.

**Table 2-1. Net-to-Gross Scoring Algorithm for the PY3 Standard Program**

Scoring Element	Calculation
<p><b>Timing and Selection score.</b> The maximum score (on a scale of 0 to 10 where 0 equals not at all influential and 10 equals very influential) among the self-reported influence level the program had for:</p> <ul style="list-style-type: none"> <li>A. Availability of the program incentive</li> <li>B. Recommendation from a DCEO staff person</li> <li>C. Information from program marketing materials</li> <li>D. Endorsement or recommendation by a utility account manager</li> <li>E. Other factors (recorded verbatim)</li> <li>F. Information provided through technical assistance received from DCEO or SEDAC staff</li> <li>G. Vendor Score (if triggered)</li> </ul> <p>Potential adjustments for non-program influences</p>	<p>Basic Rigor: Maximum of A, B, C, D, and E</p> <p>Standard Rigor: Maximum of A, B, C, D, E, F, and G, with potential adjustments for non-program influences</p>
<p><b>Program Influence score.</b> "If you were given a TOTAL of 100 points that reflect the importance in your decision to implement the &lt;ENDUSE&gt;, and you had to divide those 100 points between: 1) the program and 2) other factors, how many points would you give to the importance of the PROGRAM?"</p>	<p>Points awarded to the program (divided by 10)</p> <p>Divide by 2 if the customer learned about the program AFTER deciding to implement the measure that was installed <i>and</i> funds were committed before learning about the program</p>
<p><b>No-Program score.</b> "Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely," if the sponsor program had not been available, what is the likelihood that you would have installed exactly the same equipment?" The NTG algorithm computes the Likelihood Score as 10 minus the respondent's answer (e.g., the likelihood score will be 0 if extremely likely to install exactly the same equipment if the program had not been available).</p> <p>Adjustments to the "Likelihood score" are made for timing: "Without the program, when do you think you would have installed this equipment?" Free-ridership diminishes as the timing of the installation without the program moves further into the future.</p>	<p>Interpolate between Likelihood Score and 10 to obtain the No-Program score, where</p> <p>If "At the same time" or within 6 months then the No Program score equals the Likelihood Score, and if 48 months later then the No Program Score equals 10 (no free-ridership)</p>
<p>Project-level Free-ridership (ranges from 0.00 to 1.00)</p>	<p>1 – Sum of scores (Timing &amp; Selection, Program Influence, No-Program)/30</p>
<p>Apply score to other end-uses within the same project?</p>	<p>If yes, assign free-ridership score to other end-uses of same project</p>
<p>Apply score to other projects of the same end-use?</p>	<p>If yes, assign score to same end-use of additional projects</p>
<p>PY3 Project level Net-to-Gross Ratio (ranges from 0.00 to 1.00)</p>	<p>1 – Project level Free-ridership</p>

## 2.1.2 Process Evaluation Methods

Four research activities were conducted in support of the process evaluation: (1) interviews with program staff, (2) a quantitative telephone survey with 77 participating customers, (3) qualitative telephone interviews with 10 participating customers focused on the procurement process, and (4) qualitative telephone interviews with five program drop-outs. These activities are further described in the section below.

## 2.2 Data Sources

Table 2-2 provides a summary of the principal data sources contributing to the evaluation of the PY3 Standard program. For each data element listed, the table provides the targeted population, the sample frame and design, the sample size, and the timing of data collection.

The interview guides and data collection instruments for telephone surveys are included in Appendix 5.1.

**Table 2-2. Principal Data Sources Contributing to the PY3 Evaluation**

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
In-depth Telephone Interviews	DCEO Management and Standard Program Staff	Contact from DCEO	Standard Incentives Program Manager Manager of Marketing and Outreach, and DCEO Management	3	August 2011
CATI Telephone Survey	Standard Program Participants	Tracking Database	Stratified Random Sample of DCEO Standard Program Participants	77 (Process) 78 (Net-to-Gross)	September 2011
Procurement Process Interviews	Standard Program Participants	Tracking Database	Contacts provided through Participant Survey	10	September/October 2011
Program Drop-out Interviews	Standard Program Participant Drop-outs	Tracking Database	Census Attempt	5	September/October 2011
Engineering File Review	Projects in the Standard Program	Tracking Database, July 13, 2011 Extract	Stratified Random Sample of 52 by Standard Project-Level kWh (3 Strata) Assigned to On-Site or File Review	27	July 2011-September 2011
On-Site Visit M&V				25	

## 2.2.1 Tracking Data

The tracking data for this evaluation was extracted from a copy of the DCEO database provided to the evaluation team on a periodic basis. The final ex ante tracking data used to provide program reported energy savings for this evaluation was dated September 7, 2011.

Sampling was conducted from DCEO extracts produced in July 2011. For gross impact evaluation, the sample was drawn from the population of projects identified as the PY3 participants in a July 13, 2011 extract. The Standard telephone survey sample was drawn from a database extract dated July 28, 2011.

Midway through PY3, DCEO implemented a transition from the spreadsheet-based tracking approach used throughout PY1 and PY2 and most of PY3 to a new centralized database tracking system. The transition for program staff occurred later in PY3, and the new system was undergoing programming refinements throughout the summer of 2011 at the time when evaluation sample design was taking place. The September 7, 2011 extract data changed the ex-ante energy savings for approximately one-third of the Standard program population compared with July 13<sup>th</sup> and July 28<sup>th</sup> 2011 extracts, with some projects changing significantly. DCEO reports that the tracking system was correctly calculating savings during this period, but that they were not correctly converted into the evaluation extract drawn from the tracking system. Although DCEO's September 7, 2011 reported savings were used in the final impact analysis, sample design was based on the July extracts. As a result, sample points selected for impact verification do match the intended allocations by strata; however, the sample selected was large enough so that precision targets were met.

## 2.2.2 Program Staff Interviews

The evaluation team conducted one interview with the Standard Program manager. The interview focused on the changes to program design and implementation compared to PY2 and the effects of those changes on program administration and participation. In addition, two telephone interviews were conducted with DCEO Management staff. One interview explored the Standard Program's marketing and outreach activities in PY3; the second focused on several high level PY3 program design, process, and implementation changes.

## 2.2.3 CATI Telephone Survey

A Computer-Assisted Telephone Interviewing (CATI) survey was conducted with a stratified random sample of 77 participants.<sup>7</sup> This survey focused on three key areas:

**Net program impacts.** The survey collected data for a quantitative assessment of free-ridership and a qualitative assessment of spillover.

**Gross program impacts.** The survey collected data on hours-of-use for lighting measures.

**Process evaluation.** The survey collected data on participant perceptions of program processes and implementation, satisfaction, barriers to participation, and business demographics.

The survey was directed toward unique customer contact names drawn from the PY3 tracking database. All surveys were completed by Opinion Dynamics Corporation's call center in September 2011.

## 2.2.4 Procurement Process Interviews

Telephone interviews were conducted with 10 participants in the Standard and Custom programs regarding their equipment procurement approval processes. These processes can be a key barrier to participation for many public sector entities. The evaluation targeted individuals identified during the participant survey process as those in charge of procurement at their organization.

## 2.2.5 Program Drop-out Interviews

The evaluation team conducted five interviews with contacts that had filed a pre-approval application for either a Standard or Custom project in PY3 but ultimately did not file a final application. The purpose of these interviews was to understand barriers to program participation and the reasons for not moving forward with the planned projects. The sample frame for this effort included 50 contacts for 53 projects for which pre-approval applications had been filed. These projects were flagged as "Canceled." Excluded from the sample frame were projects where the tracking database indicated that the project was likely to be completed in PY4.

We interviewed 21 of the 50 contacts, but 16 respondents indicated that the project had already been submitted for PY4 or would be submitted in the near future.

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<sup>7</sup> One respondent terminated the interview after completing the net-to-gross module; as such, 78 completed interviews were available for the net-to-gross analysis.

## **2.2.6 Project Application File Review**

To support final application file review, project documentation in hard copy format was scanned into electronic files for each sampled project. Documentation included some or all of hardcopy application forms and supporting documentation from the applicant (ex-ante impact calculations, invoices, measure specification sheets, vendor proposals), pre-inspection reports (when conducted), post inspection reports (when conducted), and important email and memoranda.

## **2.2.7 On-Site Visits and Measurement**

On-site surveys were completed for 25 of the applications sampled for M&V. During each on-site visit, data identified in the analysis plan is collected, including monitoring records (such as instantaneous spot watt measurements for relevant equipment, measured temperatures, data from equipment logs and EMS/SCADA system downloads), equipment nameplate data, system operation sequences and operating schedules, and a careful description of site conditions that might contribute to baseline selection.

## **2.3 Sampling**

Sampling was conducted from extracts produced in July 2011. For gross impact evaluation, the sample was drawn from the population of projects identified as the PY3 participants in a July 13, 2011 extract. The Standard telephone survey sample was drawn from a database extract dated July 28, 2011.

Details of the sampling approach are provided in Appendix 5.3.

### **2.3.1 Gross Impact M&V Sample**

For the PY3 program year, a statistically significant sample based on a 90/10 confidence/precision level for program-level savings was drawn for the gross savings verification.

Table 2-3 provides a profile of the gross impact verification sample for the Standard program in comparison with the Standard program population. Shown is the resulting sample that was drawn, consisting of 52 projects, responsible for 26.6 million kWh of ex ante impact claim and representing 50% of the ex-ante impact claim for the program population. Also shown are the ex-ante based kWh sample weights for each of three strata.

**Table 2-3. Profile of the Gross Impact Sample by Strata**

Standard Population Summary				Impact Sample		
Sampling Strata	Number of Project Applications (N)	Ex Ante kWh Impact Claimed	kWh Weights	n	Ex Ante kWh	Sampled % of Population
1	8	20,890,748	0.390	8	20,890,748	100%
2	40	13,741,669	0.256	14	4,175,611	30%
3	401	19,002,325	0.354	30	1,528,882	8%
<b>TOTAL</b>	<b>449</b>	<b>53,634,742</b>	<b>1.000</b>	<b>52</b>	<b>26,595,241</b>	<b>50%</b>

*Source: Evaluation analysis of tracking savings from DCEO tracking system, September 7, 2011.*

Table 2-4 provides a comparison of the population profile to the sample analyzed by utility, and shows that the sample reflects the same proportions by utility as the population.

**Table 2-4. Profile of the Gross Impact Sample by Utility**

Standard Population Summary				Impact Sample		
Utility	Number of Project Applications (N)	Ex Ante kWh Impact Claimed	kWh Weights	n	Ex Ante kWh	kWh Weights
Ameren	158	12,932,568	0.24	18	6,487,723	0.24
ComEd	291	40,702,174	0.76	34	20,107,518	0.76
<b>TOTAL</b>	<b>449</b>	<b>53,634,742</b>	<b>1.00</b>	<b>52</b>	<b>26,595,241</b>	<b>1.00</b>

*Source: Evaluation analysis of tracking savings from DCEO tracking system, September 7, 2011.*

Table 2-5 provides a comparison of the population profile to the sample analyzed by public sector customer type. The sample reflects the dominance of local government projects, which includes a large representation by LED traffic signal projects. In PY3, the City of Chicago had 25 traffic lighting project applications that totaled 19,307,723 kWh of ex ante energy savings, and many other municipalities statewide took advantage of the DCEO Standard program to improve the efficiency of their traffic lighting. Although K-12 Schools are somewhat underrepresented in the sample compared with the percentage of energy savings in the population, the sample was able to cover 22 percent of K-12 school savings statewide.

**Table 2-5. PY3 Standard Sample Public Sector Type Comparison**

Public Sector Type	Ex-Ante Claimed Savings			
	Gross kWh, Population		Gross kWh, Sample	
College	776,496	1%	308,880	1%
Federal Government	3,231,251	6%	2,174,610	8%
K-12 Schools	10,025,921	19%	2,192,672	8%
Local Government	33,306,792	62%	16,682,655	63%
State Government	631,347	1%	-	0%
University	5,662,935	11%	5,236,424	20%
<b>Total</b>	<b>53,634,742</b>	<b>100%</b>	<b>26,595,241</b>	<b>100%</b>

Source: Evaluation analysis of tracking savings from DCEO tracking system, September 7, 2011.

Table 2-6 provides a breakdown of sample by verification approach. A very large portion of the sample, 88 percent, was verified through on-site M&V audits, covering 44 percent of all PY3 Standard program energy savings. This was possible because of the concentration of program savings in larger projects. It should be noted that for the large traffic lighting projects, the site verification strategy involved sampling of installed measures within individual projects, not a census count of installed traffic signals.

**Table 2-6. PY3 Standard Sample by Verification Approach**

Verification Approach	Ex-Ante Claimed Savings	
	Gross kWh, Sample	
Engineering File Review	3,082,331	12%
On-Site M&V	23,512,910	88%
<b>Total</b>	<b>26,595,241</b>	<b>100%</b>

Source: Evaluation analysis of tracking savings from DCEO tracking system, September 7, 2011.

### 2.3.2 CATI Telephone Survey for Participating Customers

To best support estimation of the net-to-gross ratio for the program, a stratified random sampling approach was employed for this survey. Projects were stratified by savings, using the ex-ante kWh impacts reported in the tracking database. Records were sorted from largest to smallest kWh claimed and placed into one of three strata, such that approximately one-third of ex ante savings fell into each stratum.<sup>8</sup> The CATI sample used the same stratum boundaries as the gross impact M&V sample described in the previous section.

<sup>8</sup> Stratum 1: large savers (>843,000 kWh); Stratum 2: medium savers (between 843,000 and 199,000 kWh); Stratum 3: small savers (<=199,000 kWh). Strata were developed using a database abstract from July 28, 2011. After surveys were fielded based on these strata assignments, the evaluation team received an updated extract of program savings.

The sampling unit for the CATI telephone survey was the unique project contact. The sample frame included 280 unique contacts that had completed 354 projects. Projects associated with duplicate contact names were removed from the sample (in cases where a single person was involved in more than one project application). Projects with larger savings were retained in the sample. Projects with non-lighting end uses were also given preference. With the exception of three contacts who had completed very large Standard projects, participants who completed both Standard and Custom projects were also removed from the sample for the Standard survey (given the smaller population of Custom projects, the Custom Program was given priority for calling overlapping project contacts).

Of the 280 unique contacts in the Standard sample frame, 77 completed the survey. In addition, one respondent did not complete the entire survey but responded to all net-to-gross questions. The Standard net-to-gross interview results were supplemented by the results of 14 Custom program interviews with project contacts that had combined Custom and Standard projects and reported a single decision making process was used for both measure types. Interviewees were reminded of additional applications they had submitted for projects of the same end-use, and then asked whether the additional applications had the same decision making process. When the respondent indicated a single decision covered all projects, the net-to-gross score was applied to the other project applications of the same end use. Through this question, an additional 36 projects were included within the Standard net-to-gross scoring. This resulted in a sample of 128 project applications with a precision level of +/-7% for net-to-gross questions, and a precision level of +/-8% for process questions (at a 90% confidence level) for the 77 completed process interviews.<sup>9</sup>

Table 2-7 provides a summary of the sampling approach used for the net impact analysis, by stratum, and the resulting kWh weights. The table shows that the 78 completed Standard net-to-gross interviews plus the additional 14 interviews completed for the Custom and Standard projects, plus the additional 36 multiple-application scores represent 61% of reported ex ante program savings.

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While strata boundaries remained the same, 14 Stratum 2 projects moved to stratum 3. Two completed interviews fell into this group.

<sup>9</sup> The difference in precision between net-to-gross questions and process questions is the result of net-to-gross findings being based on savings for all project applications and process findings being based on unique respondents.

**Table 2-7. Summary of Sampling Approach for the Participant Survey**

Sampling Strata	Final Population			Completed Interviews		
	Number of Applications (N)	Ex Ante kWh Impact Claimed	kWh Weights by Segment	Number of Respondent Applications (n) <sup>a</sup>	Ex Ante kWh Claimed	% of Population Impacts Surveyed
1	8	20,890,748	0.390	5	18,163,870	87%
2	40	13,741,669	0.256	26	9,297,068	68%
3	401	19,002,325	0.354	97	4,998,750	26%
<b>TOTAL</b>	<b>449</b>	<b>53,634,742</b>	<b>1.000</b>	<b>128</b>	<b>32,459,688</b>	<b>61%</b>

*\*Includes one mid-interview terminate who only completed the net-to-gross questions.  
Source: Program tracking database; results of CATI telephone survey.*

### Survey Disposition

Table 2-8 below shows the final disposition of the 280 unique contacts included in the sample frame for the participant survey. Contact with over three quarters of the sample (79%) was attempted at least once, resulting in 77 completed interviews. The survey center was unable to make contact with 13% of contacts for a variety of reasons including: no one answered the telephone, an answering machine picked up, or the telephone line was busy. On average, we attempted to reach each of these customers five times. The telephone numbers provided for 5% of the sample had problems such as being disconnected or an incorrect number.

Overall the response rate for this survey was 38% computed as the number of completed interviews divided by the number of eligible respondents.<sup>10</sup>

<sup>10</sup> Eligible respondents include the following dispositions: a) Completed Surveys, b) Unable to Reach, c) Callback, and d) Refusal/Mid-Interview Termination.

**Table 2-8. Sample Disposition**

Sample Disposition	Customers	%
Sample Frame of Unique Contacts	280	
Completed Survey	77	28%
Not Dialed	60	21%
Unable to reach	35	13%
Callback	48	17%
Refusal/Mid Interview Termination	45	16%
Phone Number Issue	13	5%
Could not confirm participation	2	1%
<i>Response Rate</i>	38%	

Source: ODC CATI Center

### **Profile of Survey Respondents**

The evaluation team compared attributes of those who completed the CATI survey to the full population of unique contacts who completed projects in PY3. This comparison provides an indication of how representative the 77 completed interviews are of the final population.

Table 2-9 shows the distribution of project size among the population and among contacts that completed the survey. Even though the stratified sampling approach over-emphasized larger projects, the distribution of survey respondents by project size is almost identical to that of the population. We therefore determined that the analysis of process results does not require sample weights.

**Table 2-9. Comparison of Completed Interviews and Population by Project Size**

Project Size	Population*		Completed Survey	
	#	%	#	%
Large Projects	6	2%	2	3%
Medium Projects	21	6%	6	8%
Small Projects	308	92%	69	90%
<b>TOTAL</b>	<b>335</b>		<b>77</b>	

\*Note: The population represents the number of unique contacts who completed projects that could be used for survey fielding purposes (including those that were removed due to overlap with the Custom Program).

Source: Program tracking database; results of CATI telephone survey.

Table 2-10 compares the sector category of those who completed the survey to the population of unique contacts who completed projects in PY3. This comparison shows that the distribution by