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

Evaluation Report:

Public Sector Electric Efficiency Custom Incentives Program

Draft

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Executive Summary

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 Public Sector Electric Efficiency (PSEE) Custom Incentives program.[1] The primary objectives of this evaluation are to quantify gross and net 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)[2] 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.

Evaluation Methods

Project-specific M&V was completed for a sample of 17 selected projects in order to assess the gross impacts achieved by the program, and ratio estimation was then applied to estimate program-level gross savings using the project M&V results. Net impact results were developed based on survey data collected for 39 projects. Four research activities were conducted in

[1] The Program Year 3 (PY3) program year began June 1, 2010 and ended May 31, 2011.

[2] 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.

support of the process evaluation: (1) interviews with program staff, (2) a quantitative telephone survey with 39 participating customers, (3) qualitative telephone interviews with 10 participating customers focused on the procurement process, and (4) qualitative interviews with five program drop-outs. Additional information about the evaluation data sources can be found in Appendix 5.2.

Key Findings and Recommendations

Table ES-1 below provides a summary of reported ex ante savings from the DCEO tracking system, and evaluation-adjusted gross and net annual savings for the Statewide PY3 Custom Incentives program. As shown in the table, the PY3 Custom program evaluation found that verified gross impacts were equal to 78% of the savings in DCEO's tracking system, as indicated by the realization rate (realization rate = ex post gross / tracking system gross). A realization rate for peak demand impact could not be estimated due to the fact that the program does not track kW savings.

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

Ex Ante Gross kWh	Ex Post Gross kWh	kWh RR	Ex Post Net kWh	NTGR (ex post gross)
26,839,055	20,885,239	0.78	15,476,819	0.74

Source: Ex ante savings from DCEO tracking system, September 7, 2011.The values for RR and NTGR are rounded.

The chained realization rate (gross RR * NTG Ratio) is 0.58 for kWh (0.78 x. 0.74). This indicates that the Custom program evaluation-based (ex post) estimate of net savings is equal to 58 percent of the value claimed in the DCEO tracking system for gross savings. The relative precision at a 90% confidence level for the 17 Custom projects in the gross impact sample is ± 9% for the kWh Realization Rate. The relative precision at a 90% confidence level for the program NTG ratio is ± 4% for the kWh Realization Rate. Utility specific impacts are provided in Appendix 5.1.

Table ES-2 below provides an overview of planned, reported ex ante, and evaluation-adjusted net savings impacts for the combined PY3 Custom and Standard 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 15,477 MWH for Custom and 53,714 MWH for the Custom and Standard programs compares with the PY2 evaluation-adjusted net savings of 13,972 MWH for Custom 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.[3]

The energy realization rate of 0.78 is a significant increase from the PY2 level of 0.56. This shows DCEO has done a good job of improving the estimation of gross impacts for Custom energy efficiency projects in the program. PY3 energy savings realization rate results indicate that the largest projects (stratum 1 with a RR or 0.94) and the smallest projects (stratum 3 with a RR of 0.85) realized a greater proportion of the ex ante claims than the medium projects (stratum 2 with a RR of 0.57). . This is due to the complexity of the projects involved in stratum 2 that include technologies such as HVAC, VSDs and high efficiency blowers that require more in-depth technical reviews and pose a greater challenge for estimating savings accurately -- for example, due to varying operating conditions. Therefore, overall results suggest, and especially among complex projects in stratum 2 (n=7), that ex ante estimates could be further improved. Key evaluation conclusions and recommendations include the following:

Improvements to Ex Ante Impact Estimates

Conclusion. Program reported installed measures for two projects were not fully operational. For project (#486) the installed lighting control measure was not operational and for project (#3302) three from a total of 11 VFDs installed were not operational which significantly reduced the realized savings for these projects.

[3] 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.

- **Recommendation.** Program should conduct thorough site visits to confirm that all the installed measures are fully operational.

Conclusion. Program estimated annual energy savings were not representative of the typical annual operating conditions for several projects (e.g. #3093 (VSD), 3302 (VSD), #3386 (Lights, Sensors), #3609 (Ext LED) and #3344 (Aeration Blower)). The program calculations were also not normalized to account for changes in operating conditions from the pre retrofit period to the post retrofit period (e.g. #3447 (AHU Coil Cleaning)).

- **Recommendation.** To improve program calculations and realization rates, the program could do a better job of verifying that the estimated operating hours and energy usage represents typical annual operating conditions for the installed equipment. The program should also determine whether the energy savings will require normalization to properly adjust for changes in operating conditions from pre retrofit period to the post retrofit period. Additionally, the program should perform in-depth engineering review of the calculations and models submitted to verify the accuracy of savings for the largest projects.

Conclusion. For lighting projects, program estimated fixture wattages were different from the ex post verified fixture wattages for two projects (e.g. #3745 and #3335).

- **Recommendation.** Estimate fixture and lamp wattages from manufacturer data sheets or from standard wattage tables.

Conclusion. For high efficiency blower projects #3093 and #3344, the ex ante energy usage was estimated using incorrect input values such as full load amps, blower power at full load conditions (for baseline energy usage) or speed settings (for post retrofit energy usage) which resulted in overestimation of energy savings. Also, the operating hours were incorrectly estimated for project #3344 since the ex ante calculations did not account for seasonal variation of the load profile that resulted in reduced ex post operating hours.

- **Recommendatio**n. Use blower performance curves, to calibrate or to verify the baseline energy usage based on the actual (load profile) operating conditions of the facility. In addition for post retrofit conditions, verify the range of speed settings (VSD) or airflow profile for the blowers. Typically, customers have a good idea how they would program the blowers to operate (such as speed setting or speed range) for the post retrofit conditions. Adjust the estimated energy usage based on the information obtained through these additional verification steps.

Project Documentation

Conclusion. Project documentation was not detailed for many projects. In some cases, supporting calculations for projects were not clearly documented or were difficult to identify in

the project documentation. For some projects, final applications did not include information about the adjustments made to initial savings estimates and therefore, the evaluators were not able understand the reasons for observed ex ante savings adjustments (e.g. #3447 (AHU Coil Cleaning), #3223 (chill water controls) and #3224 (chiller loop)).

- **Recommendation**. DCEO should consider making project documentation available electronically. Final applications should include all calculations (spreadsheets, building models, etc) and documentation to support the estimated savings. If any changes are made to the submitted savings calculations – the documentation should include the reasons for these changes. This will allow the evaluators to better understand the reasons for project application updates and changes to savings estimates.

Peak Demand Estimation

Conclusion. Ex ante calculations did not estimate peak demand savings for any of the projects. The program should incorporate estimates of peak demand savings. Peak demand impact estimation is given a lower priority than energy savings due to the fact that incentive levels are tied to energy savings and not peak demand reduction. Peak demand savings are important because they reflect load reduction on the grid and are critical for utility power supply planning.

- **Recommendation.** Calculate peak demand savings for all projects by establishing an industry accepted set of program rules and definitions. The program should also track summer peak demand savings. For consistent reporting and tracking of peak demand savings for projects, the program should include dedicated fields in the custom project application form (for the applicant to report peak demand savings).

Net Impacts

Conclusion. Free-ridership levels for PY3 custom program (26%) are significantly lower than PY2 levels (35%). This free-ridership level is somewhat low for a Custom program. Program influence was high in many cases specifically for the large stratum 1 and stratum 2 projects. Participants report the program being a strong motivating factor in their decision to upgrade to efficient equipment at the time they elected to do so. However, mean free-ridership was relatively high across smaller projects (37% for sampling stratum 3).

- **Recommendation.** One approach to further reduce free ridership is for program administrators to simply exclude projects from the program that they believe have a high probability of being free riders. For example, incentives should not be provided to projects that are already installed. Similarly, if there is evidence that the program did not contribute significantly to the decision to install a particular project or equipment type then an incentive may not be warranted. Incentives might only be provided if the program process leads to a higher efficiency level than initially planned. Also, ensure

that program incentives are not offered for measures and technologies that are industry standard practice or projects that were being implemented by end users as part of their regular facility upgrade requirements or due to facility energy efficiency practices.

Tracking System

Project Status Updates. One aspect of the tracking system that affected the evaluation was the delay in reporting status updates for Custom projects. The Custom program tracking system originally had 130 projects, one of which was cancelled and two were moved into PY4. Of the remaining 127 projects, only 100 were marked as "Complete", and the transition between "Final" and "Complete" status often occurred with significant changes in the reported kWh savings. This affected the sampling phase of the evaluation and significantly delayed field visits to sampled sites. The evaluator asked for updates periodically, but it turned out, for example, that some projects that were completed had not yet been entered into the tracking system.

- **Recommendation.** Enhanced electronic tracking of projects within the program is needed, including accurate real-time updates to the tracking system for completed projects.

Program Partnerships

Conclusion. In PY3, DCEO has continued to leverage partnerships with organizations such as the Illinois Association of Regional Councils and the Illinois State Board of Education. These partnerships have been successful in increasing participation by local governments and K-12 schools. Cooperation included shared marketing and outreach efforts and channeling participants into each others' programs.

- **Recommendation.** DCEO should exercise caution when seeking participation by projects that also receive funding from other public sources. While cooperation in marketing and outreach can be beneficial for both organizations, care should be taken that co-funding of projects does not create freeridership in the program. Results from the PY3 net impact analysis suggest that some of the projects that received funding from other government sources have relatively high rates of freeridership.

Trade Allies

Conclusion. In PY3, DCEO continued to make use of the utilities' and SEDAC's existing trade ally networks, but made a first attempt at developing its own network of contractors through a pilot effort under the Building Industry and Training Education Program (BITE). Program staff did not find this pilot effort to be a worthwhile use of program resources. In PY4, DCEO plans to build a trade ally network similar to that of the utilities, where trade allies are enticed to participate by being eligible for incentives themselves. Participant survey results confirm the

importance of trade allies in channeling participants into the program, assisting them with the design of their projects, and supporting them through the application process.

- **Recommendation.** Development of a program-specific trade ally network is well-warranted. Based on 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. It is therefore important that DCEO's network include trade allies capable of helping at the project design stage, so that they have an opportunity to promote energy efficiency and participation in the PSEE program to public sector entities.

Marketing and Outreach

Conclusion. In PY3, the PSEE Program was re-branded as *Illinois Energy Now* (IEN). DCEO conducted marketing and outreach efforts through various means, including electronic media as well as in-person events and presentations.

Conclusion. Budget constraints are a key barrier to the installation of energy efficient equipment and participation in the program. The program developed limited marketing materials in PY2, but no new collateral was developed in PY3. Currently few materials highlight how energy efficient equipment can help budgets in the long run, and there are no materials specific to the various public sectors.

- **Recommendation.** While the increased PY4 incentive level will help reduce financial barriers for non-carve-out entities (federal and state government and universities), 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 demonstrates the savings that can be expected from the installation of energy efficient equipment. 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.

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Section 1. Introduction to the Program

This evaluation report covers the Custom Incentive (Custom) program element of the Public Sector Electric Efficiency incentive program. [4]

1.1 Program Description

The Illinois Department of Commerce and Economic Opportunity (DCEO) Public Sector Electric Efficiency program 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 program and a Standard program.

- **Custom Incentives** were available to customers for less common or more complex energy-saving measures installed in qualified retrofit and equipment replacement projects. Custom measure incentives were paid based on the first year energy (kWh) savings. Equipment installed includes lighting retrofits, aeration blower retrofits , HVAC measures such as VFDs, equipment controls, coil replacement, retro-commissioning of buildings, and other miscellaneous measure installations. Some of these measure installations are "True Custom" measures in the sense that simple deemed savings and/or simple-to-apply algorithms do not already exist for this homogenous measure segment of the program population.
- **Standard Program Incentives** provide an expedited application approach for public sector customers interested in purchasing efficient technologies. The program targets discrete retrofit and replacement opportunities in lighting, HVAC, motor, and refrigeration systems. A streamlined incentive application and quality control process is intended to facilitate ease of participation.

DCEO uses internal staff to manage, implement, and administer the program. Technical assistance is provided as needed through the Smart Energy Design Assistance Center (SEDAC). The PY3 program application form lists measures, eligibility criteria and incentive levels. The measure list and incentives matched those offered by the utilities (ComEd & Ameren), except that DCEO offered incentives for LED traffic signals.

In PY3, a few changes were made to the Custom incentive program. Program incentive caps were increased to $300,000 (from $200,000 in PY2). In PY2, all custom projects received a flat incentive rate of $0.08/kWh. In PY3, the maximum incentive rate for custom projects was

[4] 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.

increased from $0.08/kWh to $0.09/kWh for local governments, K-12 schools, and community colleges and to $0.12/kWh for other types of entities.

The net MWh savings goals for the 2011 (PY3) Custom incentive program, as included in the Three-Year Plan approved by the Illinois Commerce Commission, are presented in Table 1-1.

Table 1-1. Public Sector Electric Efficiency Custom Program PY3 Planned Savings Goals

Utility	Plan Target Net MWh	Plan Target Net MW
ComEd Service Territory	14,742	1.9
Ameren Service Territory	5,258	0.7
Total	20,000	2.6

Source: Direct Testimony of Jonathan Feipel, DCEO, Docket No. 07-0541, Exhibit 1.3, 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 128,821 MWh for Standard.

1.2 Evaluation Questions

The evaluation sought to answer the following key researchable questions:

Impact Questions

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 and demand goals? If not, why not?

Process Questions:

The process evaluation questions focused on the following key areas:

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

Section 2. Evaluation Methods

This section describes the analytic methods and data collection activities implemented as part of the PY3 process and impact evaluation of the Custom program, including the data sources and sample designs used as a base for the data collection activities.

Although participants consist of both ComEd and Ameren utility customers', the evaluation was planned and completed in such a way that it supports a single program-wide result and not individual utility results. However, examination of the tracking data identifies the following participation patterns and ex ante impact claim from each utility:

- There were 87 applications processed for ComEd customers involving an ex ante impact claim of 11.6 million kWh.
- There were 40 applications processed for Ameren customers involving an ex ante impact claim of 15.2 million kWh.

To support the gross impact evaluation objectives the PY3 evaluation activities performed on-site visits and detailed M&V for 17 Custom projects Furthermore, telephone surveys were completed for 39 Custom projects to address evaluation net-to-gross and for 40 Custom projects to address evaluation process objectives. The key evaluation activities were:

- Conduct on-site visits and M&V activities. These activities seek to develop independent ex post estimates of savings, and to update, refine or replace the calculation procedures that were submitted as part of the final application submittal.
- Conduct CATI telephone surveys for 39 Custom projects to support the net impact approach (as described in greater detail in the Net Program Savings section, 2.1.2 below). Survey data collection purposefully includes all 17 gross impact points in an effort to coordinate NTG and gross impact-based conclusions and to obtain the best possible story line supporting both efforts. As was the case for PY1 and PY2, the Basic rigor NTG approach was predominantly used in PY3. For PY3 evaluation, only three Custom projects were sufficiently large to trigger a Standard rigor approach. These same CATI surveys support the process evaluation.

The sections that follow provide greater detail on the methods deployed.

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 veracity and accuracy of the PY3 ex ante gross savings estimates in the Custom program tracking system. The savings reported in DCEO's tracking system was evaluated using the following steps:

1. Develop a site-specific M&V plan for a representative sample of program projects. Each M&V plan details the data collection and analysis approach to be undertaken, following a careful review of relevant documents stored in DCEO's tracking system, including the Final Application submittal and the application-based calculations.
2. Implement a site-specific data collection approach for each sampled project. The focus of the data collection is to verify and/or update the assumptions that feed into engineering algorithms used to estimate measure savings. Data collection also includes verification of measure installation and that the systems are functioning and operating as planned, and if not then in what way(s) there is variance.
3. Perform on-site measurement or obtain customer-stored data to support downstream M&V calculations. Measurement data obtained from the sites are used to calibrate engineering models or algorithms, as measured parameters typically have the least uncertainty of any of the data elements collected. Measurement includes spot measurements, run-time hour data logging, and post-installation interval metering. Customer-supplied data from energy management systems (EMS) or supervisory control and data acquisition (SCADA) systems are often used when available.
4. Complete ex post engineering-based estimates of gross annual energy (kWh) and summer peak demand (kW) impact for each sampled project. A site specific analysis is performed for each point in the impact sample. The engineering analysis methods and degree of monitoring will vary from project to project, depending on the complexity of the measures installed, the size of the associated savings and the availability and reliability of existing data. Gross impact calculation methodologies are generally based on IPMVP protocols, options A through D. At a minimum the ex post impact evaluation incorporates the following additional information that may not have been feasible to incorporate in Final Application submittal:
    a. Verification that measures are installed and operational, and whether or not the as-built condition will generate the predicted level of savings.
    b. Observed post-installation operating schedule and system loading conditions.
    c. A thorough validation of baseline selection, including appropriateness of a retrofit vs. replace on burnout claim.
    d. Development of stipulated and measured engineering parameters that contribute to the impact calculations.

5. Prepare a detailed, site-specific impact evaluation report for each sampled site.
6. 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 strata, 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 Custom program.

Additional information regarding the gross impact methods can be found in Appendix 5.3.1 including baseline assessment, production adjustments, data collection and quality control methods.

Net Program Savings

The primary objective of the net savings analysis for the Custom program was to determine the program's net effect on customers' electricity usage. 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 reliably be attributed to the program. A customer self-report method, based on data gathered during participant phone surveys, was used to estimate the NTG ratio for this evaluation.

For PY3, the net program impacts were quantified solely on the estimated level of free-ridership. This requires estimating what would have happened in the absence of the program. The existence of participant spillover was examined in PY3, but not quantified as a component of the NTG ratio for each point in the sample.

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

NTG Ratio = 1 – Free-ridership Rate

Additional information regarding the net impact evaluation methodology can be found in Appendix 5.3.2 including the table with summarized scoring approach and spillover assessment methodology.

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 39 participating customers, (3) qualitative telephone interviews with 10 participating customers focused on the procurement process, and (4) qualitative interviews with five program drop-outs. These activities are further described in Appendix 5.3.3.

2.2 *Sampling*

The tracking data delivered for this evaluation was provided as a collection of SQL tables by DCEO on June 10, 2011 (for sampling purposes) and September 7, 2011 (providing the full population of PY3 projects and the final ex ante estimates). Seventeen Custom M&V sample points were selected based on the June 10 extract. The tracking data provided as a collection of SQL tables by DCEO on June 10, 2011 was used for selecting 17 M&V sample points.

2.2.1 Profile of Population

The final tracking data delivered for this evaluation was provided by DCEO on September 7, 2011. A total of 127 completed Custom projects, installed by 101 unique customers were identified in the tracking data. The total energy savings for the population of 127 completed projects is 26.8 million kWh.

Project applications were first sorted and placed in three strata using ex ante savings kWh to create three strata with roughly equal contributions to total program savings.

Table 2-1 presents each of the three strata developed for sampling within the Custom Program, which consist a total of 127 Custom project applications. The number of project applications is presented by strata, along with ex ante gross kWh claimed, and the amount of incentive paid. The twelve largest applications that make up all the strata 1 and 2 projects account for 67% of the kWh-based ex ante impact claim in the population.

Sampling by strata was completed for ex post gross M&V-based evaluation, and for a telephone survey supporting ex post net impact evaluation and the process evaluation. Due to overlapping customers in both the Prescriptive and Custom programs, those two samples were carefully coordinated to avoid contacting customers more than once.

Table 2-1. PY3 Custom Program Participation by Sampling Strata

Sampling Strata	Ex Ante kWh Impact Claimed	Percent of Total kWh Claimed	Project Applications	Incentive Paid to Applicant
1	8,493,421	32%	3	$922,403
2	9,277,658	35%	9	$1,062,311
3	9,067,976	34%	115	$1,420,314
TOTAL	26,839,055	100%	127	$3,405,028

2.2.2 Gross Impact M&V Sample

The sample for the PY3 Custom program was selected from project data in the DCEO tracking system provided by DCEO on June 10, 2011. Data review was undertaken before the sample was selected to check for outliers and missing values. 57 projects contain both Custom and Standard measures (combined projects). The Custom and Standard Incentive programs were evaluated through different approaches by necessity, so the evaluation team included all custom measures within the Custom evaluation, and all standard measures within the Standard evaluation. The phone survey was coordinated by assigning combined projects to one evaluation or the other to avoid multiple contacts. Most of the combined projects were handled by the Custom evaluation, and 2 (only UIUC) projects required coordination between the two evaluations.

Program-level Custom savings data were analyzed by project size to inform the sample design for this population of heterogeneous measures. Projects were stratified by tracking record size using the ex ante kWh impact claim. Projects were sorted from largest to smallest Custom kWh claim, and placed into one of three strata in an effort to place roughly one-third of the program total kWh claim in each. Thus, the three largest projects comprising one-third of the program savings was assigned to strata 1, the next 9 largest projects comprising one-third of program savings were assigned to strata 2, and the smallest 115 projects were assigned to strata 3.

The Custom evaluation plan called for a target sample of 17 projects in the ex post gross impact M&V sample. This sample was drawn as follows: the three records in stratum 1 were selected, 7 of the 9 projects in strata 2 were randomly selected, and 7 projects out of 115 were randomly selected in strata 3.

Profile of the Gross Impact M&V Sample

Table 2-2 provides a profile of the gross impact M&V sample for the Custom program in comparison with the Custom program population. Shown is the resulting sample that was drawn, consisting of 17 projects, responsible for 16.8 million kWh of ex ante impact claim and representing 63% of the ex ante impact claim for the program population. Also shown are the ex ante based kWh sample weights for each stratum. Ex ante based kW weights were not developed because peak demand impact estimates are not tracked by the program. The sample points targeted were all completed.

Table 2-2. PY3 Custom Program Gross Impact Sample by Strata

Custom Population Summary				Sample		
Sampling Strata	Number of Projects (N)	Ex Ante kWh Impact Claimed	kWh Weights	n	Ex Ante kWh	Sampled % of Population kWh
1	3	8,493,421	0.32	3	8,493,421	100%
2	9	9,277,658	0.35	7	8,185,903	88%
3	115	9,067,976	0.34	7	203,181	2%
TOTAL	**127**	**26,839,055**	**-**	**17**	**16,882,505**	**63%**

2.2.3 CATI Telephone Survey

Sampling

Per the evaluation plan, the target for the participant survey was to complete 34 interviews in support of the net impact evaluation and 51 interviews in support of the process evaluation.

For telephone surveys, the unit of sampling is the project contact. To develop the sample of unique project contacts, duplicate contact names were removed from the sample where a single person was involved in more than one project application. In addition, contacts who also completed Standard Program projects could only be contacted once regarding one of the projects (or project components if the project yielded both Standard and Custom savings). Because so few Custom projects had been completed in comparison with the Standard Program, Custom projects were given preference over Standard ones. However, three contacts that had completed very large Standard projects were removed from the Custom sample to be used for the Standard survey. Ultimately, the Custom sample frame included 97 contacts.

Of the 97 contacts in the sample frame, two had completed large projects in stratum 1. These individuals were not included in the CATI survey but were interviewed by a professional interviewer.[5] The resulting sample frame for the CATI survey therefore included 95 contacts, 9 in stratum 2 and 86 in stratum 3. In order to complete the target number of interviews, we called a census of unique customers.

Given that this is a census attempt, there is no need for estimating precision levels for the sampling effort. In other words, there is no sampling error and the error bounds are zero.

[5] These interviews included net impact questions as well as a subset of process questions.

Sample Weights

Error! Not a valid bookmark self-reference. summarizes the 39 participant interviews completed in support of the NTG analysis. The completed interviews represent 13.8 million kWh of ex ante impact claim, which is 51% of the ex ante impact claim of the program population.

Table 2-3. Profile of the Participant Survey Sample by Strata

Program Population Summary				Sample		
Sampling Strata	Number of Projects (N)	Ex Ante kWh Impact Claimed	kWh Weights by Strata	n	Ex Ante kWh	Sampled % of Population kWh
1	3	8,493,421	0.32	3	8,493,421	100%
2	9	9,277,658	0.35	4	2,554,339	28%
3	115	9,067,976	0.34	32	2,745,900	30%
TOTAL	127	26,839,055	-	39	13,793,660	51%

For process questions, the evaluation team determined that an un-weighted analysis provided the best representation of results, because survey respondents are reasonably representative of the population (see discussion below).

Survey Disposition

Table 2-4 below shows the final disposition of the 97 unique contacts targeted for completing the participant survey either through the CATI system or by professional interviewers. The survey was completed with 41% of the available contacts, resulting in a response rate of 44%.[6] Contact was unable to be made with 11% of contacts for a variety of reasons including: no one answered the phone, an answering machine picked up, or the phone line was busy. On average, we attempted to reach each of these customers eight times through the CATI system. Eight contacts were ineligible due to incorrect phone numbers.[7]

[6] Computed as the number of completed interviews divided by the number of eligible respondents. Eligible respondents include the following dispositions: (1) Completed Survey, (2) Unable to Reach, (3) Callback, and (4) Refusal.

[7] Attempts to obtain replacement phone numbers for wrong or disconnected numbers were unsuccessful.

Table 2-4. Disposition for the Participant Survey

Sample Disposition	Customers	%
Sample Frame of Unique Contacts	95	
Completed Survey	39	40%
Unable to reach	11	11%
Callback	29	30%
Refusal	10	10%
Phone Number Issue	8	8%
Response Rate	*44%*	

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 completed interviews are of the final population.

Table 2-5 shows the comparison by project size. While two contacts had large projects, these were not included in the CATI sample frame and therefore did not complete the survey (see discussion above). The comparison shows that survey respondents are reasonably representative of the final population, with a slight over-representation of medium-sized projects, a slight under-representation of smaller projects, and no representation of the largest projects.

Table 2-5. Comparison of CATI Completed Interviews and Population by Project Size

Project Size	Population*		Completed Survey	
	#	%		%
Large Projects (Stratum 1)	2	2%	0	0%
Medium Projects (Stratum 2)	9	9%	5	14%
Small Projects (Stratum 3)	89	89%	32	86%
TOTAL	**100**		**37**	

**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 Standard Program and those removed for professional interviewing).).*
Source: Program tracking database; results of CATI telephone survey

Table 2-6 shows the comparison by sector. This comparison shows that the completed interviews are quite representative of the population.

Table 2-6. Comparison of CATI Completed Interviews and Population by Sector

Sector	Population*		Completed Survey	
	#	%	#	%
Local Government	68	67%	24	65%
K-12 Schools	19	19%	8	22%
Federal Government	2	2%	1	3%
College	6	6%	3	8%
University	4	4%	1	3%
State	1	1%	0	0%
TOTAL	**100**		**37**	

**Note: The population represents the number of unique contacts who completed projects that could have been used for survey fielding purposes (including those that were removed due to overlap with the Standard Program and those removed for professional interviewing).*
Source: Program tracking database; results of CATI telephone survey.

Based on these comparisons, we conclude that survey responses to process questions are reasonably representative of the PY3 population.

Section 3. Program Level Results

This section presents the Custom program impact and process evaluation results.

3.1 Impact

3.1.1 Tracking System Review

A review of the Custom Incentives program data in the DCEO tracking system was completed to identify issues that could affect program reporting and improve future evaluation efforts. Project data were reviewed for outliers and missing information, obvious errors and general usefulness for reporting accomplishments and conducting evaluation activities. Basic functionality of the tracking system was also assessed with respect to recording, tracking, and reporting impact data.

The tracking data for this evaluation consisted of a collection of SQL tables that DCEO updated and delivered on a periodic basis, and that Navigant read-into an Access Database. The review is based on versions sent by DCEO dated June 10, 2011 and September 7, 2011. The extracts contain project level details including measures, incentives, milestone dates and savings for each participating project, plus data surrounding the applicants (including project identifiers, customer identifiers and more).

DCEO implemented a major upgrade to its project tracking systems, converting them to a relational database structure. The evaluation team strongly endorsed the need for that effort but hopes that the following issues will be addressed in the new system in the future. DCEO uses this database as the tracking system for the Custom Incentives program. The database is used to record savings and incentives for each project, and track basic implementation milestones. Participant data and project details from the application package are retained in hard copy files at DCEO offices. While superior to the previous Excel-based system, this tracking approach has limited functionality for evaluation tasks such as analyzing data and drawing samples.

Database Development. The development of a program tracking database was a key activity in PY3. The new database system was intended to reduce administrative burden and allow multiple staff to enter data into the database at the same time. While the new database has helped with tracking projects, program staff reported that entering data into the system is more time consuming than the previous system (because more information is captured) and that many report automation capabilities that would be useful in conducting their work were not yet available in PY3.

- **Recommendation:** Continue the development of database functionalities to make it a more useful program management tool. While the database has allowed staff to be more 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 (e.g., SEDAC).

Project Status Updates. One aspect of the tracking system that affected the evaluation was the delay in reporting status updates for Custom projects. The Custom program tracking system originally had 130 projects, one of which was cancelled and two were moved into PY4. Of the remaining 127 projects, only100 were marked as "Complete", and the transition between "Final" and "Complete" status often occurred with significant changes in the reported kWh savings. This affected the sampling phase of the evaluation and significantly delayed field visits to sampled sites. The evaluator asked for updates periodically, only to be told that some projects that were completed had not yet been entered into the tracking system.

- **Recommendation.** Enhanced electronic tracking of projects within the program is needed, including accurate real-time updates to the tracking system for completed projects.

Measure Descriptions. Measure description information was populated in the tracking system but there is room for improvement in consistently labeling individual measures. Currently applications involving more than one measure appear as a single record and therefore the measure descriptions tend towards a mixture of rough information concerning the measures installed. There were a couple data accuracy issues identified where the data in the "Custom Incentive" table (contains individual project records) did not match "Projects" table records (contains tracking data). The evaluator tried to work with DCEO, but eventually had to resort to copying paperwork to reconcile these differences.

- **Recommendation.** Consideration should be given to enhancing the DCEO tracking system for Custom measures to ensure measure-level tracking, with use of common measure descriptions and "reporting" across projects. This might include tracking the relevant size, quantity and efficiency of each item-level measure installation, including the appropriate units. (For example, measure = chiller replacement, number of units = 2, total capacity = 600, units of capacity = rated cooling tons, efficiency = 0.60, efficiency units = kW/ton, and detailed measure type = rotary screw water-source chiller replacement.) Currently the tracking system still lists multiple measures under a single line item, and disaggregation for reporting is either very difficult or not feasible. Working towards a tracking system model that reports individual measure records would enhance reporting of measure installations, both within the program and within the annual evaluation. The current system also has inconsistencies between measure descriptions from the "Projects" table and those from the "CustomIncentive" table.

Peak Demand. DCEO does not track summer peak demand impact (kW). This prevents evaluators from confidently and accurately representing the program population using a

sample of selected projects. To do so would require that DCEO consistently estimate summer peak demand, and then store those data in the tracking system.

- **Recommendation.** The program should estimate and track summer peak demand savings. For consistent reporting and tracking of peak demand savings for projects, the program should include dedicated fields in the custom project application form for the applicant to report peak demand savings.

One aspect of the tracking system that has improved compared to the previous year was the tracking of participating customer contact information in electronic format. This includes applicant contact name, applicant phone number, applicant e-mail and applicant address. Third-party vendor was similarly tracked as appropriate. However, DCEO should consider expanding the Contacts table, as many projects had only one contact person specified, and that person tended to be the "Signature Authority" for the project. Including a project manager or facilities director contact into the database would ensure that the evaluator does not make multiple phone calls to find the person who is most knowledgeable about each project.

3.1.2 Gross Program Impact Parameter Estimates

Ex post gross program impacts were developed for this evaluation based on detailed M&V for a selected sample of seventeen applications.

Realization Rates for the Custom Program

There are two basic statistical methods for combining individual realization rates from the sample projects into an estimate of verified gross kWh savings for the population when stratified random sampling is used. These two methods are called "separate" and "combined" ratio estimation.[8] In the case of a separate ratio estimator, a separate gross kWh savings realization rate is calculated for each stratum and then combined. In the case of a combined ratio estimator, a single gross kWh savings realization rate is calculated directly without first calculating separate realization rates by stratum.

The separate ratio estimation technique was used to estimate verified gross kWh savings for the Custom program. The separate ratio estimation technique follows the steps outlined in the California Evaluation Framework. These steps are matched to the stratified random sampling method that was used to create the sample for the program. The standard error was used to estimate the error bound around the estimate of verified gross kWh. The results are summarized in Table 3-1 and Table 3-2 below. The realization rate for energy savings is 0.78.

[8] A full discussion and comparison of separate vs. combined ratio estimation can be found in Sampling Techniques, Cochran, 1977, pp. 164-169.

The relative precision and confidence intervals are estimated based on the program population. The relative precision at a 90% confidence level for the 17 Custom projects in the gross impact sample is ± 9% for the kWh Realization Rate. A realization rate for peak demand impact could not be estimated due to the fact that the program does not estimate kW savings.

The energy savings realization rate of 0.78 for PY3 is a significant increase from the PY2 levels of 0.56. PY3 energy savings realization rate results indicate that the stratum 1 (RR = 0.94) and the stratum 3 (RR = 0.85) projects realized a greater proportion of the ex ante claims than the stratum 2 (RR = 0.57) projects. This is due to the complexity of the projects involved in stratum 2 that include technologies such as HVAC, VSDs and high efficiency blowers that require more in-depth technical reviews and pose a greater for estimating savings accurately -- for example, due to varying operating conditions.

Table 3-1. Gross Impact Realization Rate Results for the Selected Custom Sample

Sampled Application ID	Sample-Based Ex Ante kWh Impact Claimed	Sample-Based Ex Ante kW Impact Claimed	Sampling Strata	Ex Ante-Based kWh Gross Impact Weights by Strata	Sample-Based Ex Post Gross kWh Impact	Sample-Based Ex Post Gross kW Impact	Application-Specific Ex Post Gross kWh Realization Rate	Sample-Based Ex Post Gross kWh Realization Rate
3392	5,185,740	-	1	0.61	5,254,407	759	1.01	
3745	2,763,640	-	1	0.33	2,674,819	-	0.97	0.94
3447	544,041	-	1	0.06	14,673	2	0.03	
3223	2,212,170	-	2	0.27	1,094,995	106	0.49	
314	1,750,540	-	2	0.21	2,146,465	182	1.23	
3279	1,609,380	-	2	0.20	261,244	4	0.16	
3224	815,125	-	2	0.10	505,405	163	0.62	0.57
3302	662,724	-	2	0.08	129,244	5	0.20	
3093	619,910	-	2	0.08	233,360	22	0.38	
3344	516,054	-	2	0.06	256,696	39	0.50	
3335	90,950	-	3	0.45	66,602	-	0.73	
3438	48,299	-	3	0.24	50,132	6	1.04	
3630	21,635	-	3	0.11	22,109	-	1.02	
3386	12,533	-	3	0.06	9,347	-	0.75	0.85
3531	11,462	-	3	0.06	12,330	-	1.08	
3609	10,221	-	3	0.05	11,937	-	1.17	
486	8,081	-	3	0.04	0	-	0.00	
TOTAL	16,882,505	-	-	-	12,743,765	1,287	-	0.78

Table 3-2. Gross kWh Realization Rates and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
Stratum 1	0%	0.94	0.94	0.94
Stratum 2	25%	0.43	0.57	0.70
Stratum 3	17%	0.71	0.85	0.99
Total kWh RR	9%	0.71	0.78	0.85

3.1.3 Gross Program Impact Results

Based on the gross impact parameter estimates described in the previous section, the evaluation team derived gross program impacts for the PY3 Custom program.

The evaluation team has provided to DCEO site-specific M&V reports for each Custom gross impact sample point. These site-specific draft impact evaluation reports summarize the ex ante savings in the Final Application submitted, the ex post M&V plan, the data collected at the site, and all of the calculations and parameters used to estimate savings. While it probably is not reasonable to draw generalized conclusions from details in those reports, there may be valuable lessons to be learned in those reports as they relate to submitted impact calculations, the approach applied and parameters used.

Site specific observations from the gross impact sample include the following:

- For project #486, the ex post verification found that the installed lighting controls were not operational. Therefore, there were no savings for this project.
- For project #3302, three VFDs from the total of 11 VFDs installed were not operational. This reduced the total realized savings for this project.
- For project #3630, the ex ante estimated operating hours were different from the ex post verified operating hours. For projects #3745 and #3335, ex ante estimated wattages were different from the ex post verified wattages. The ex post savings for these projects were reduced due to these factors.
- For outdoor lighting projects ex ante operating hours were adjusted to be consistent with the actual dusk to dawn based operating hours. This increased the savings realized for these projects (e.g. #3531, #3609 and #3630)
- For projects #3223 and #3224, the ex ante reported delta T (difference between supply and return temperatures) estimates were smaller than the ex post findings. This resulted in reduced savings.

- For project #3302, the VSD pumps were operating at almost the same rated speed as required under baseline conditions resulting in relatively low ex post savings. Another reason for the decrease in savings is that the ex ante calculation assumed the pumps operate 8,760 hours per year when in fact they cycle to fill a water tower.

- For project #3093 and #3344, the ex ante calculations overestimated the load factor (100% load) of the blower motor to calculate baseline energy usage, which was adjusted during the ex post analysis based on the actual load profile, blower curves and motor efficiencies. This resulted in lower ex post savings.

- For project #3279, ex ante baseline equipment selection was adjusted for this project. The baseline equipment selected was the existing system, which was found to be very old and in need of replacement. In this case, a standard efficiency unit was selected for the ex post baseline system.

- Savings for #3447 were significantly affected as the ex ante calculations made several incorrect assumptions to estimate savings for the RCx measures (cleaning AHU coils) that significantly reduced the ex post savings. For example, ex ante calculations assumed that the RCx measures would reduce cooling loads, but the RCx measures do not contribute to any reduction in the cooling load.

- Ex ante calculations did not estimate peak demand savings for any of the projects.

- We found that project #3438 exceeded the minimum payback period of 7 years that is required to be eligible for incentives.

In summary, estimates should be based upon appropriate verification of installed equipment, actual operating conditions, normalization of hours of operation, and careful application of assumptions made when estimating energy usage and savings.

3.1.4 Net Program Impact Parameter Estimates

The separate ratio estimation technique was used to estimate Net-to-Gross (NTG) Ratios for the Custom program. The separate ratio estimation technique follows the steps outlined in the California Evaluation Framework. These steps are matched to the stratified random sampling method that was used to create the sample for the program. The standard error was used to estimate the error bound around the estimate of verified NTG Ratio.

As mentioned before, the evaluation team estimated the NTG ratio for the PY3 Custom program using a customer self-report approach. This approach relied on responses provided by program participants during telephone surveys to determine the fraction of measure installations that would have occurred by participants in the absence of the program (free-ridership). The stratum and program level NTG Ratios, along with precision estimates, are shown in Table 3-3.

A quantification of spillover was not included in the calculation of NTG ratio for PY3. However spillover effects were examined in this evaluation and their magnitude was found to be quite small as discussed below.

Once gross and NTG program impacts have been estimated, net program impacts are calculated by multiplying the gross impact estimate by the program NTG ratio.

Table 3-3. NTG Ratio and Relative Precision at 90% Confidence Level

Sampling Strata	Relative Precision ± %	Low	Mean	High
1	0%	0.73	0.73	0.73
2	4%	0.83	0.86	0.89
3	13%	0.55	0.63	0.71
Total	4%	0.71	0.74	0.77

The measured Year 3 NTG ratio of 0.74 was higher than in PY2 (0.65), meaning free-ridership was lower. Significant free-ridership (above 40%) was found in 10 out of 33 evaluated projects, of which only five had a resulting NTG ratio below 0.40. Four of these projects with substantial free-ridership had very low Program Influence[9] and No-Program[10] scores. The other one project with substantial free-ridership had a zero as the No-Program score (on a scale of 0 to 10).

Projects with the lowest Program Components[11] scores tend to have lower NTG ratios, while those with higher Program Component scores have NTG ratios that are among the highest. For example, all projects with Program Components scores of 7 or lower have NTG ratios that are somewhat low; the average NTG ratio across all of these projects is 0.5. In contrast, the mean NTG ratio in the group with a Program Components score of 9 or greater is 0.80.

Relatively high and relatively low NTG scores in the sample are not directly affected to the same extent by the Program Influence score. That is, the correlation between the Program Influence score and resulting NTG is not as significant as is the correlation with the No-Program and Program Components scores.

[9] A Program Influence score reflects the degree of influence the program had on the customer's decision to install the specified measures.

[10] A No-Program score 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.

[11] A Program Components score reflects the importance of various program and program-related elements in the customer's decision and timing of the decision in selecting specific program measures.

Program influence was high in many cases, especially for the large stratum 1 and stratum 2 projects. The results indicate that the availability of incentives was a major factor for larger projects that customers initiated for energy savings reasons. Participants reported the program being a strong motivating factor in their decision to upgrade to efficient equipment at the time they elected to do so. The results also confirm that the program has improved in the area of project screening.

However, there were many cases for smaller Stratum 3 projects where the program influence was low for a number of different reasons. In some cases, the evidence indicates that the customer learned about the program late in the decision making process and offered incentives for projects that had already been decided upon. There were also several cases where the customer reported that they would have installed the same equipment at the same time in the absence of the program incentives (thus significantly increasing the odds of free ridership in any given project).

Spillover

Spillover effects were addressed in the PY3 evaluation, based on responses to a battery of spillover questions in the phone survey. The evidence of spillover for the Custom Incentive program is summarized in Table 3-4 below.

Table 3-4. Evidence of Spillover in PY3

Spillover Question	Evidence of Spillover
Since your participation in the DCEO program, did you implement any additional energy efficiency measures at this facility that did NOT receive incentives through any utility or government program?	Of the 37 surveyed customers that responded to this question, 14 said "Yes" (38%). These 14 respondents implemented a total of 26 energy efficiency measures.
What type of energy efficiency measure was installed without an incentive?	(6) Lighting Measures (2 T-8, 1 LED lamps, 1 CFL, 2 Non-specific lighting measures) (6) HVAC measures (3 Boilers, 1 In-ground radiant heat, 1 VFD on HVAC Motors, 1 VAV System) (5) Building Envelope (2 Windows, 2 Roof, 1 Insulation) (2) Lighting Controls (1 occupancy sensors, 1 timers) (3) Energy Management System/Building Automation System/Intelligent power distribution system (2) Conservation Measures (1 Turn off lights when not in use, 1 Reducing energy use)

Spillover Question	Evidence of Spillover
	(2) Water Heat (1 Solar, 1 Unspecified) (1) Refrigerator (1) Fans (1) Stoves
On a scale of 0 to 10, where 0 means "not at all significant" and 10 means "extremely significant," how significant was your experience in the DCEO program in your decision to implement this energy efficiency measure?	For the 26 implemented measures: (16) Rating of 0 (2) Rating between 4 and 6 (7) Rating between 7 and 10 (1) Refused/Don't know
If you had not participated in the DCEO program, how likely is it that your organization would still have implemented this measure? Use a 0 to 10, scale where 0 means you definitely would NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?	For the 26 implemented measures: (5) Rating between 0 and 3 (2) Rating between 4 and 6 (14) Rating between 7 and 10 (5) Refused/Don't know
Why did you purchase this energy efficiency measure without the financial assistance available through the DCEO program?	For the 26 implemented measures: (13) Lack of knowledge about the program or about the measures eligible for program incentives (10 respondents, 13 measures) (3) No funding (2 respondents, 3 measures) (2) Part of normal maintenance (1 respondent, 2 measures) (2) Needed to replace measures ASAP (2 respondents, 2 measures) (1) Project was too small (1 respondent, 1 measure) (1) Incentive not worth the time involved (1 respondent, 1 measure) (1) Measures don't qualify (1 respondent, 1 measure) (1) Was planning to apply (1 respondent, 1 measure) (2) Currently looking to apply (1 respondent, 2 measures)

These findings suggest that spillover effects for PY3 are relatively small. While participating customers are installing other energy efficiency improvements outside of the program, they attribute little influence to the program in their decision to install these additional measures and

further state that these actions generally would have been implemented regardless of their program participation experiences. In addition, the respondents indicated that they did not pursue rebates through the DCEO program due to the lack of knowledge about the program or about the measures eligible for program incentives.

3.1.5 Net Program Impact Results

Net program impacts were derived by multiplying gross program savings by the estimated NTG ratio. Table 3-5 provides the program-level evaluation-adjusted net impact results for the PY3 Custom program. The gross program savings realization rate is 0.78, calculated based on the results from the projects in the impact sample. The overall NTG ratio for energy savings is 0.74, calculated using the responses from each contributing participant (and other sources) and kWh-based weights. The NTG ratio for demand savings could not be estimated due to the fact that the program does not estimate kW savings. The chained realization rate (gross RR * NTG Ratio) is 0.58 for kWh. Utility specific impacts are provided in Appendix 5.1.

Table 3-5. PY3 Gross and Net Parameter Estimates for Selected Custom Sample

Sampling Strata	Ex Ante Gross kWh	Ex Post Gross kWh	kWh RR	Ex Post Net kWh	NTGR (ex post gross)
1	8,493,421	7,943,899	0.94	5,794,757	0.73
2	9,277,658	5,244,567	0.57	4,513,840	0.86
3	9,067,976	7,696,774	0.85	4,845,068	0.63
Total	26,839,055	20,885,239	0.78	15,476,819	0.74

3.2 Process Evaluation Results

The process evaluation of the Custom Program covered a range of topics, including program participation, program design and implementation, program partnerships, trade allies, marketing and outreach, barriers to participation, program drop-outs, public sector procurement process, and participant satisfaction. Data sources for the process evaluation include a review of program materials, three in-depth interviews with DCEO staff, ten in-depth interviews with program participants regarding the equipment procurement process, five in-depth interviews with program drop-outs, and a CATI survey with 37 program participants. Of the telephone survey respondents, about two thirds (24) are in ComEd's service territory and one third (13) are in Ameren's service territory.

To facilitate participant survey data presentation and comparisons with previous years, we present many of the results as percentages of respondents. However, it should be noted that when sample sizes are small, such as in this survey (37 in PY3, 15 in PY2, and 10 in PY1), a

single response can have a large impact on overall results. The reader should keep this in mind when drawing conclusions from survey results.

3.2.1 Participant Profile

In PY3, 99 organizations completed a total of 127 custom projects that accounted for 26.8 GWh of ex ante gross savings.[12] PY3 participants represent a range of sectors. Key observations, by sector, are:

- Local governments represent the largest share of projects (65%), participants (67%), and energy savings (53%). K-12 schools account for the second largest share of projects (20%) and participants (19%), while universities account for the second largest share of energy savings (33%).
- The average size of projects in the university sector is significantly larger than any other sector (1.76 GWh). While universities only completed five projects (4%) in PY3, they accounted for 33% of savings. Two of the three largest custom projects were completed by universities.
- Community colleges and federal and state government entities represent the smallest shares of projects, participants, and energy savings.

Table 3-6 summarizes the distribution of PY3 projects, participants, and energy savings by sector.

Table 3-6. PY2 Distribution of Participants, Projects and Savings by Sector

	Projects		Participants			Ex Ante Savings		kWh/ Project
	#	%	#	%	Projects/ Participant	kWh	%	
Local Government	83	65%	66	67%	1.3	14,329,664	53%	172,647
K-12 Schools	26	20%	19	19%	1.4	1,566,784	6%	60,261
Federal Government	5	4%	2	2%	2.5	1,201,724	4%	240,345
Community Colleges	6	5%	6	6%	1.0	877,597	3%	146,266
University	5	4%	4	4%	1.3	8,805,375	33%	1,761,075
State Government	2	2%	2	2%	1.0	57,912	0%	28,956
TOTAL	**127**		**99**		**1.3**	**26,839,055**		**211,331**

Source: Program tracking database.

[12] Ex ante gross savings reported in this section are based on the program tracking database.

Overall, program participation increased compared to PY2, from 82 projects completed by 69 entities to 127 projects completed by 99 entities. On the other hand, ex ante gross energy savings decreased by 29% from 37.8 GWh in PY2 to 26.8 GWh in PY3.

Key participation trends over the three program years include:

- The total number of projects in PY3 increased by 55% over PY2 (127 vs. 82). Projects implemented by local governments continue to represent approximately two thirds (65%) of the projects. The distribution of projects by sector is similar to previous years.
- The total number of participants (entities) has increased by 43% over PY2 (99 vs. 69). The distribution of participants across sectors in PY3 is fairly similar to previous years. In PY3, state government entities participated in the Custom Program for the first time.
- PY3 ex ante energy savings decreased by 29% compared to PY2. The biggest reductions came from the Federal government sector (almost 8 GWh, or 87%) and Universities (4 GWh, or 32%). Nonetheless, universities continue to represent the second largest share (33%) of energy savings.
- The average project size decreased from 462 MWh per project in PY2 to 211 MWh per project in PY3. Projects implemented by universities and the federal government sector both saw substantial declines in project size.

The figures below compare the number of projects, participants, ex ante gross energy savings, and average project size by sector and program year.

Figure 3-1. Projects by Sector and Program Year

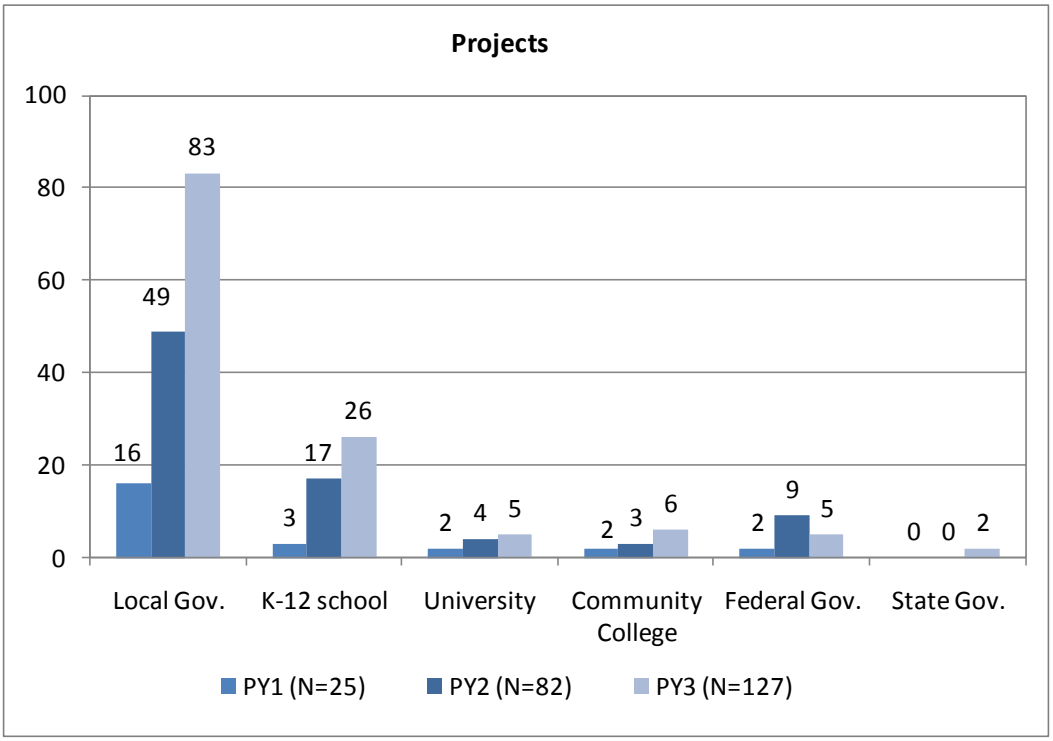


Figure 3-2. Participants by Sector and Program Year

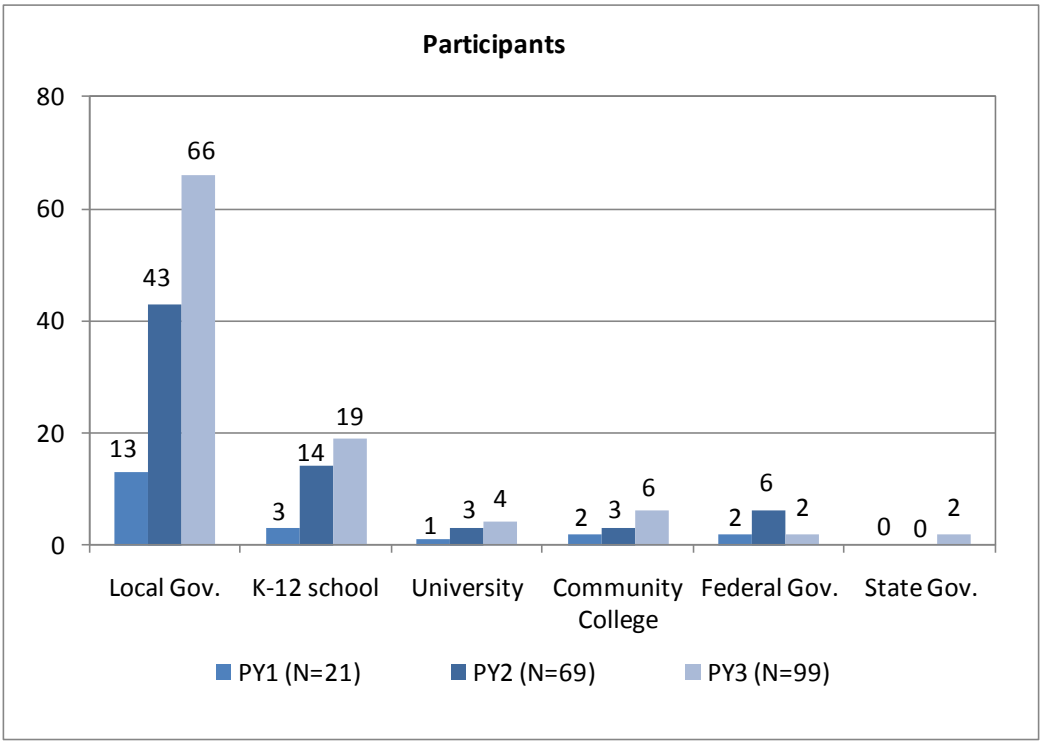


Figure 3-3. Energy Savings by Sector and Program Year

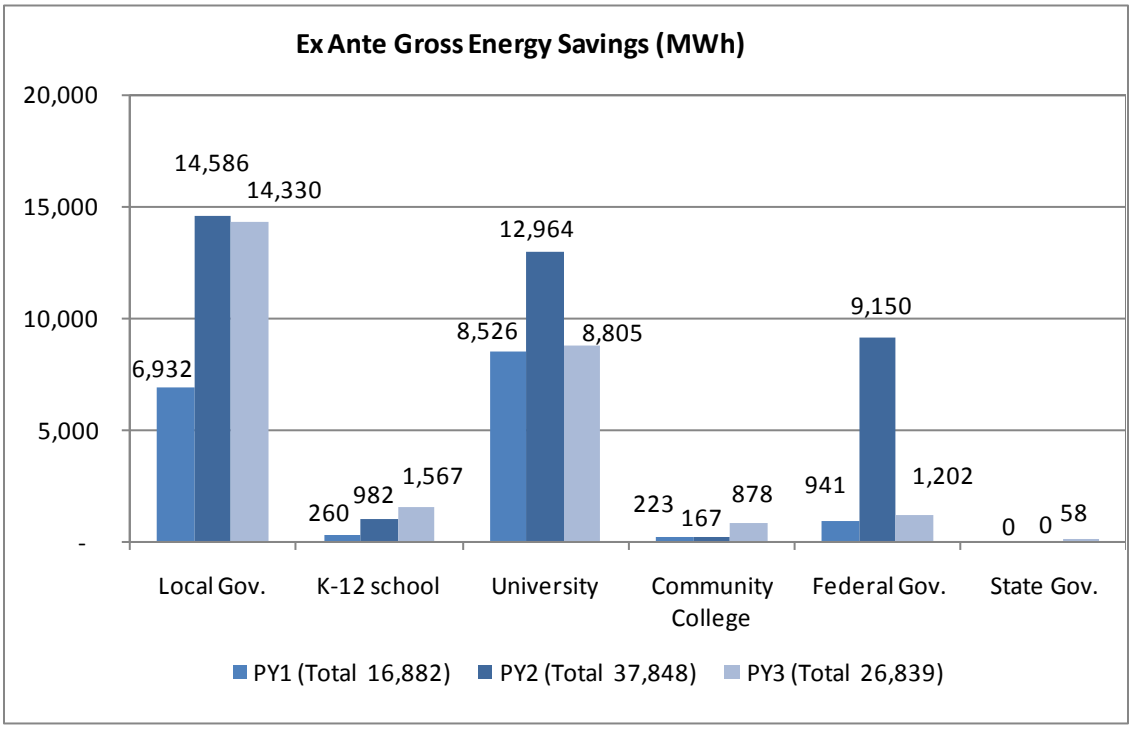
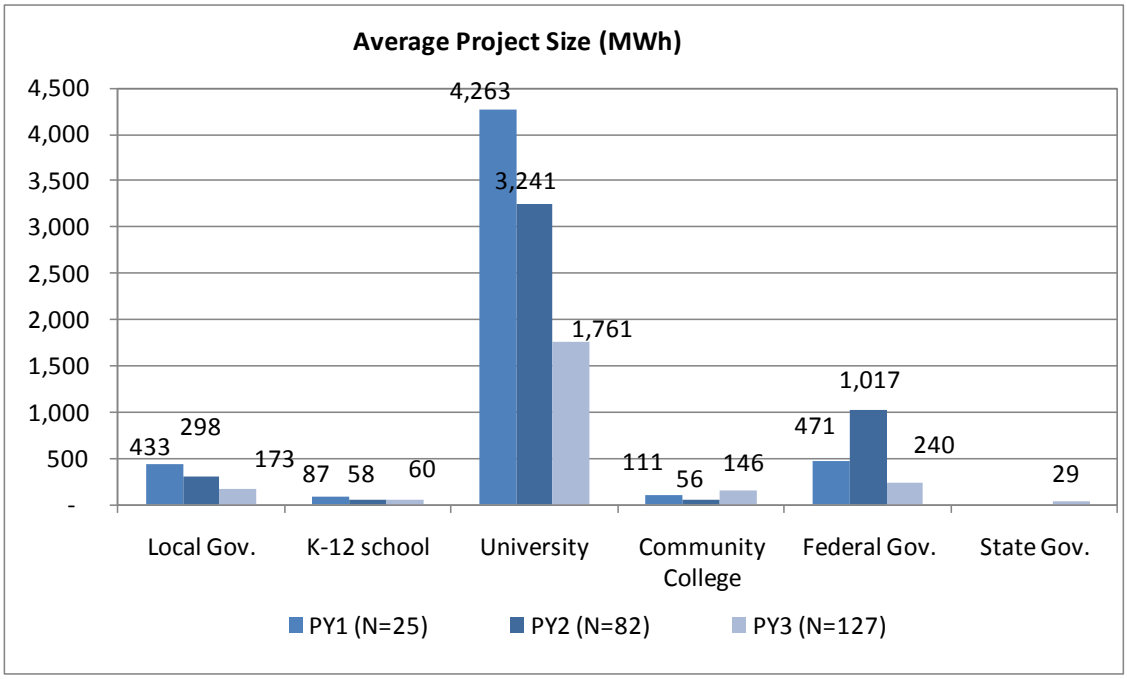


Figure 3-4. Average Project Size by Sector and Program Year



Source: Program tracking database

3.2.2 Program Design and Implementation

In PY3 several key changes were made to the design and implementation of the Custom Program:

- **Incentives:** Program incentive caps were increased to $300,000 (from $200,000 in PY2). In addition, the maximum incentive rate for custom projects was increased from $0.08/kWh to $0.09/kWh for local governments, K-12 schools, and community colleges and to $0.12/kWh for other types of entities.
- **Resources:** The program developed a relational database to enhance its ability to track participation data and manage the program. In addition, the program hired three new staff members.
- **Partnerships:** The program began partnering with the Illinois State Board of Education (ISBE) to channel K-12 school participants into the program. The program also leveraged its relationship with the Illinois Association of Regional Councils (ILARC) to 1) channel projects with EECBG funding into the PSEE program and 2) offer a 20% bonus for local government entities that applied for but did not receive EECBG funding.
- **Application Assistance Providers:** The program implemented an application assistance pilot program in PY3. This pilot will not be continued in future years.

The following sections provide more information about these and other changes implemented in PY3.

Incentives

In order to induce participation, a few changes have been made to the program incentive structure in PY3. First, the incentive cap was increased from $200,000 in PY2 to $300,000 in PY3. Despite this increase, nearly a fifth of participants say that the scope of their project was either limited (16%) or somewhat limited (3%) by the incentive cap.

Additionally, the maximum incentive rate for custom projects increased in PY3. In PY2, all projects received a flat incentive rate of $0.08/kWh. In PY3, this rate was increased to $0.12/kWh for the carve-out group (local governments, K-12 schools, and community colleges) and to $0.09/kWh for non-carve out entities (federal and state governments and universities).

Since PY2, the program has been implementing an Emerging Technologies Pilot as part of the Custom Program. This pilot offers increased incentive rates for exterior LED and induction lighting. According to the Custom Program Manager, in PY3 the pilot continued to be successful in stimulating program participation and installation of energy efficiency lighting equipment.

In collaboration with the Illinois Association of Regional Councils (ILARC), the Standard and Custom Programs offered a 20% bonus for local governments in PY3 (the Non-EECBG 20% Bonus). This bonus was available for local governments that submitted Federal Energy Efficiency & Conservation Block Grant (EECBG) applications to their Regional Planning Agencies but were not selected for funding. The promotion was implemented to increase participation among local government entities. However, according to the program tracking database, no custom projects were implemented as part of this promotion.

Program Resources

Several changes took place in PY3 with regard to program resources:

- **Database development:** According to program staff, the development of a program tracking database was a key activity in PY3. Deployment of a new database system was intended to reduce administrative burden and allow multiple staff to enter data into the database at the same time. Staff members agree that the database has allowed them to be more productive and efficient in terms of processing paperwork and generating reports. However, the development of the database along with database user training required substantial effort and time on the part of program staff. Moreover, program staff point out that entering data into the system is more time consuming than the previous system (because more information is captured) and that many report automation capabilities that would be useful in conducting their work were not yet available in PY3.

- **Increased Staffing:** In PY3, DCEO hired more staff, bringing the total to nine staff members within the PSEE programs. Starting in PY2 and continuing in PY3, the PSEE programs have leveraged employees hired to support the implementation of the American Recovery and Reinvestment Act of 2009 (ARRA). These employees will transition full time to the PSEE programs as ARRA work phases out by January 2012. According to program staff, the additional resources have allowed the program to keep up with the increased volume of applications in PY3. However, other demands on staff's time (including the preparation for the integration of natural gas programs in PY4 and the processing of stimulus fund-related incentives), have continued to limit certain program activities (e.g., the number of inspections).
- **Staffing Segmentation:** In PY3, DCEO transitioned toward more staff specialization where individual staff members are assigned projects based on the sectors and utility service territories of the participant. This allows participants to work with the same staff member throughout their project and across years.

Participation and Application Process

The participation process has remained largely unchanged from previous years. Every custom project still has to undergo several steps, including project application, final paperwork, payment processing, and incentive disbursement. In addition, certain projects are subject to pre- and post-inspections to qualify for an incentive.

Similar to previous years, the application process includes a pre-approval application (not required) and a final application. Only minor changes were made to the PY3 application process:

- **Carve-out Applications:** Two separate application forms were developed for different sectors. As part of an effort to direct three quarters of its funding to specific sectors, a "carve-out" group (local government, K-12 schools, and community colleges) was developed. The carve-out group was provided with a distinct application form that reflects the higher incentive levels compared to non-carve-out entities (federal and state government and universities).
- **Project Timelines:** In PY3 program participants were required to submit the final application within 45 days of project completion, as opposed to 60 days in previous years.
- **Application Assistance Providers:** In PY3 the program implemented a pilot effort that used Application Assistance Providers (AAPs) to help customers with the application process. As part of this effort, the program selected a small number of trade allies and listed them on the program website. However, this pilot was not as successful as expected and will not continue in future years (see Trade Allies section for further details).

More than half of participants (59%) fill out the program paperwork themselves. About three quarters of these individuals (73%) feel that the application forms clearly explain the program requirements and participation process. More than half of those who filled out the paperwork themselves (59%) rate the application process as easy, but some (14%) rate the process as difficult.[13] Participants appear to find the application process more difficult than in previous years: in PY3, the average rating was 6.3 (in the "neutral" range) compared to 7.9 (in the "easy" range) in PY2. In addition, the most common drawback to participating in the program, identified by participants, is that the paperwork is too burdensome (11%).

3.2.3 Program Partnerships

DCEO has developed a number of partnerships that help channel participants into the program and support participants through the participation process. Program staff emphasized the importance of the partnerships the program has maintained over the years and those that were newly developed in PY3.

Smart Energy Design Assistance Center

The Smart Energy Design Assistance Center (SEDAC) continues to be one of the program's closest partners. SEDAC currently supports several key functions for the PSEE programs. These functions are generally conducted in collaboration with DCEO and supported by DCEO funding. They include producing and distributing marketing materials; educating public entities about the PSEE programs; and providing technical design and project implementation assistance. One DCEO staff member notes that expanding SEDAC's role in the program in the future would be beneficial, and plans have been made to enlist SEDAC in the development of a trade ally network in PY4.

Results from the participant survey confirm that SEDAC provides a supportive role in the Custom Program. About a quarter of program participants (24%) recall attending a SEDAC event that discussed the PSEE programs in PY3, and one-third (32%) recall receiving information about the PSEE programs through the SEDAC newsletter. Over a quarter of participants (28%) report that their contractor is affiliated with SEDAC (slightly more, 31%, do not know).

Illinois Association of Regional Councils

The program targets 75% of its funding towards local governments, K-12 schools, and community colleges. To achieve this level of participation, DCEO has partnered with other

[13] "Easy" is defined as a score of 7 to 10 on a scale from 0 to 10, where 0 is "very difficult" and 10 is "very easy." "Difficult" is defined as a score of 0 to 3.

relevant public organizations, including the Illinois Association of Regional Councils (ILARC). As part of this effort, DCEO provided training to ILARC's Regional Planning Agencies on PSEE Program opportunities. ILARC guidelines required communities that received EECBG funds to also apply under the PSEE program, where eligible.

Based on the program tracking database, the number of local government projects in PY3 increased by almost 70% compared to PY2. Program staff estimates that as many as 100 PSEE applications were generated through this partnership; however, some of these applicants dropped out of the program. The final PY3 program tracking database shows that a total of 81 standard and custom projects received EECBG or Non-EECBG 20% Bonus funding; 10 of these were custom projects (8% of all custom projects).

Illinois State Board of Education

In PY3, the Illinois State Board of Education (ISBE) began awarding Energy Efficiency Grants, dollar for dollar state matching grants providing up to $250,000 for energy efficiency projects in schools. All school districts, charter schools, vocational centers, or public university laboratory schools are eligible. DCEO collaborated with ISBE by sharing marketing and outreach efforts and by channeling participants into each others' programs. Participants were then incentivized by each entity for 50% of eligible measures. In PY3, the number of K-12 school participants in the Custom Program increased by 36% compared to PY2.

Ameren Illinois Utilities and ComEd

In PY3, DCEO continued to leverage Ameren Illinois Utilities and ComEd's activities in promoting the PSEE programs. The three entities coordinate through monthly conference calls in which marketing and outreach and other issues are discussed. The utilities include DCEO at events and in outreach efforts. Like in previous years, DCEO helped fund, co-sponsor, and attend some larger PY3 outreach events with the utilities.

DCEO continues to conduct training sessions for utility account managers. Program staff remarked that account managers are more knowledgeable about and engaged in the PSEE programs each year. Some account managers provide marketing support while others simply refer public sector customers to DCEO.

Participant survey responses also indicate that account managers play a role, albeit a small one, in supporting the Custom Program:

- Nearly a third of interviewed program participants (11 of 37, or 30%) report having a utility account manager. This share has decreased since PY1 when over half of participants (6 of 10, or 60%) reported having an account manager.
- Of those with an account manager, 82% received assistance from their account manager in implementing their project, 45% discussed the program with their

account manager, and 20% first found out about the program from the account manager.

3.2.4 Trade Allies

In the first two program years, DCEO leveraged the trade ally networks of SEDAC, ComEd, and Ameren Illinois Utilities by referring potential participants to their lists of qualified contractors. In addition, DCEO directs marketing and outreach efforts towards these networks to inform trade allies of the PSEE program.

In PY3, DCEO continued to leverage these existing networks, but made a first attempt at developing its own network of contractors through a pilot effort under the Building Industry and Training Education Program (BITE). As part of this effort, DCEO selected a small number of Application Assistance Providers (AAPs) through a competitive bidding process. These trade allies were listed on the program website and were paid a fee per kWh for helping customers through the application process (AAPs received one payment when a pre-approval application was submitted and a second payment when a final application was submitted). Overall, program staff did not find this pilot effort to be a worthwhile use of program resources. While AAPs assisted with 10% of custom projects (based on program records), the quality of applications was not as good as program staff expected. As such, the AAP pilot was discontinued. DCEO plans to develop a formal trade ally network in PY4.

The telephone survey with program participants included questions about their use of contractors, their contractors' affiliation with SEDAC or the utility trade ally networks, and satisfaction with their contractors. Responses to the survey show that trade allies play an important role in the implementation of projects and channeling of participants:

- Nearly all participants (92%) work with a vendor or contractor in selecting equipment for their project.
- Trade allies are the most common channel through which participants first learn about the program: 18% first learned of it through an equipment contractor, installer, designer, or consultant, and 15% first learned about it through a supplier, distributor, or vendor.
- 85% mention a trade ally as the resource who provided them with the most assistance in the design and specification of the installed equipment: nearly half (47%) named a contractor, equipment installer, designer, or consultant, and over a third (38%) named an equipment distributor, supplier, or vendor.
- Over a quarter of participants (28%) report that their contractor is affiliated with SEDAC (slightly more, 31%, do not know).

- A contractor's affiliation with SEDAC or the utility programs is important to about half of program participants (48%).[14] On average, those in ComEd service territory find this to be more important than those in Ameren Illinois Utilities territory (mean rating of 7.1 vs. 4.4).
- Participant satisfaction with the contractors who helped implement the projects is high. Nearly all interviewed participants (97%) say that their contractor was able to meet their project needs and that they would recommend their contractor to others.

These findings support DCEO's plans to develop its own trade ally network in PY4. This network is planned to be similar to that of the utilities, where trade allies are enticed to participate by being eligible for incentives themselves.

3.2.5 Program Marketing & Outreach

In PY3, the PSEE Program was re-branded as *Illinois Energy Now* (IEN). The branding effort included usage of the IEN logo on all program marketing materials and revisions to the program website. Due to budget limitations, DCEO produced limited marketing materials in PY3. However, the majority of participants who recalled seeing program marketing materials (76%) found them to be useful.[15]

Key marketing and outreach activities included:

- **Events:** DCEO gave presentations at 52 workshops, conferences, and meetings in PY3 with an estimated total attendance of over 2,500. Target audiences included a range of public sector groups and organizations, as well as trade allies. Almost one in five participants (18%) first learned about the program through a presentation at an event.
- **Webinars:** DCEO continued conducting the webinars in PY3. According to program staff, webinar attendance has steadily grown during PY3. Some webinars were attended by up to 300 people. For example, the program held one well-attended webinar promoting the IEN Lighting Special directed at Ameren Illinois Utilities and ComEd trade ally contacts. Over a quarter of participants (29%) heard about the program during a webinar.
- **Elected Officials:** DCEO made efforts to leverage the work of elected officials and representatives – such as state senators – by encouraging these officials to speak about the PSEE Program in their communities. Notably, the contact for one of the three largest projects first learned about the program through an event at the Mayor's Office.

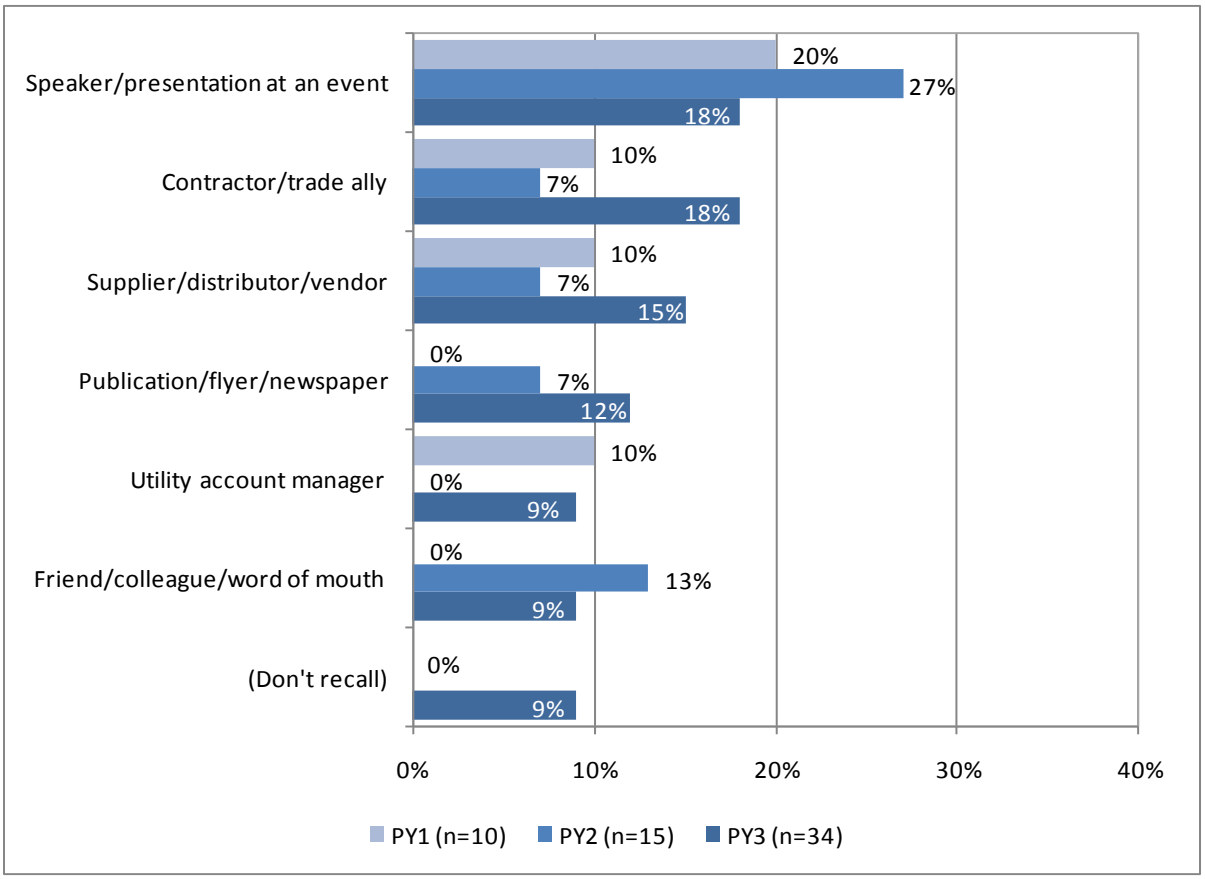
[14] "Important" is defined as a score of 7 or higher on a scale from 0 to 10, where 0 is "not at all important" and 10 is "very important."
[15] A response of "very useful" or "somewhat useful."

- **SEDAC Electronic Correspondence:** DCEO continued leveraging SEDAC's electronic newsletter and contact list to disseminate news and information about the program. Nearly a third of participants (32%) recall seeing information about the program in the SEDAC/DCEO newsletter and over two-thirds (68%) recall seeing information about the program in an email.

In PY3, participants first found out about the program from a range of sources. The contribution of contractors and other market actors in promoting the program (33%) supports DCEO's planned efforts to develop its own trade ally network. As in previous program years, DCEO events and presentations are continuing to be an important way of recruiting participants (18%).

Figure 3-5 summarizes the ways participant first heard about the program.

Figure 3-5. How Participants First Learned about the Program (Unprompted)



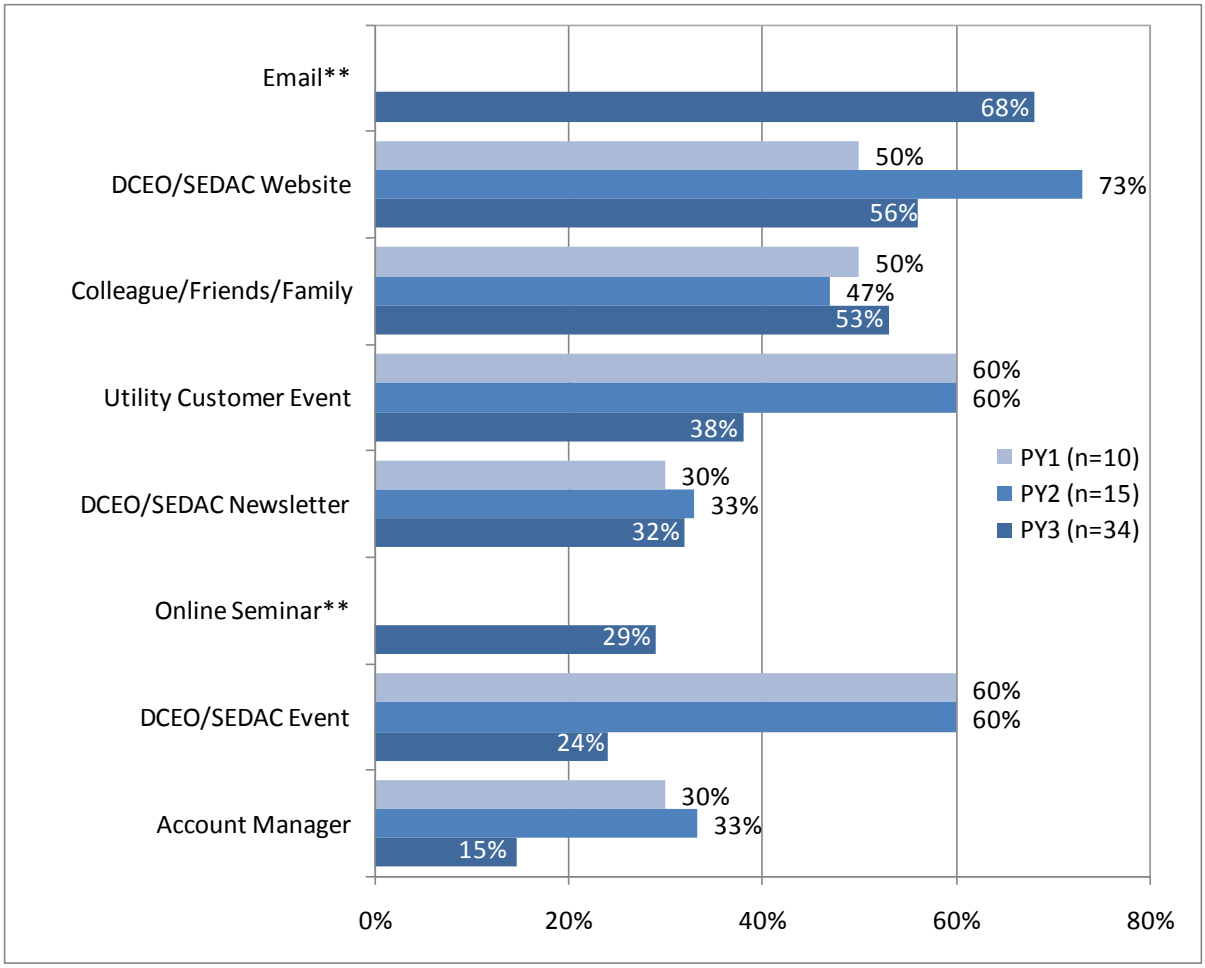
Source: PY1, PY2, and PY3 CATI Participant Surveys
Note: Response categories under 5% in PY3 have been omitted.

The survey also asked participants about various sources through which they might have obtained information about the program in the past. Key findings include:

- Electronic media are an important way of disseminating information about the PSEE Program. More than two-thirds of participants (68%) recall receiving an e-mail with information about the program, and 32% recall hearing about the program in the DCEO/SEDAC newsletter, which is also sent out electronically. In addition, 56% of participants have seen program information on the DCEO website, and 29% have attended an on-line seminar/webinar.
- Word-of-mouth continues to be an important way of sharing information about the program. More than half of PY3 participants (53%) have heard about the program from colleagues, friends, or family.
- Participants are less likely to have heard about the program at a DCEO/SEDAC event (24%) or a utility event (38%) than in previous years. They are also less likely to have discussed the program with an account manager (15%).

Figure 3-6 summarizes these responses.

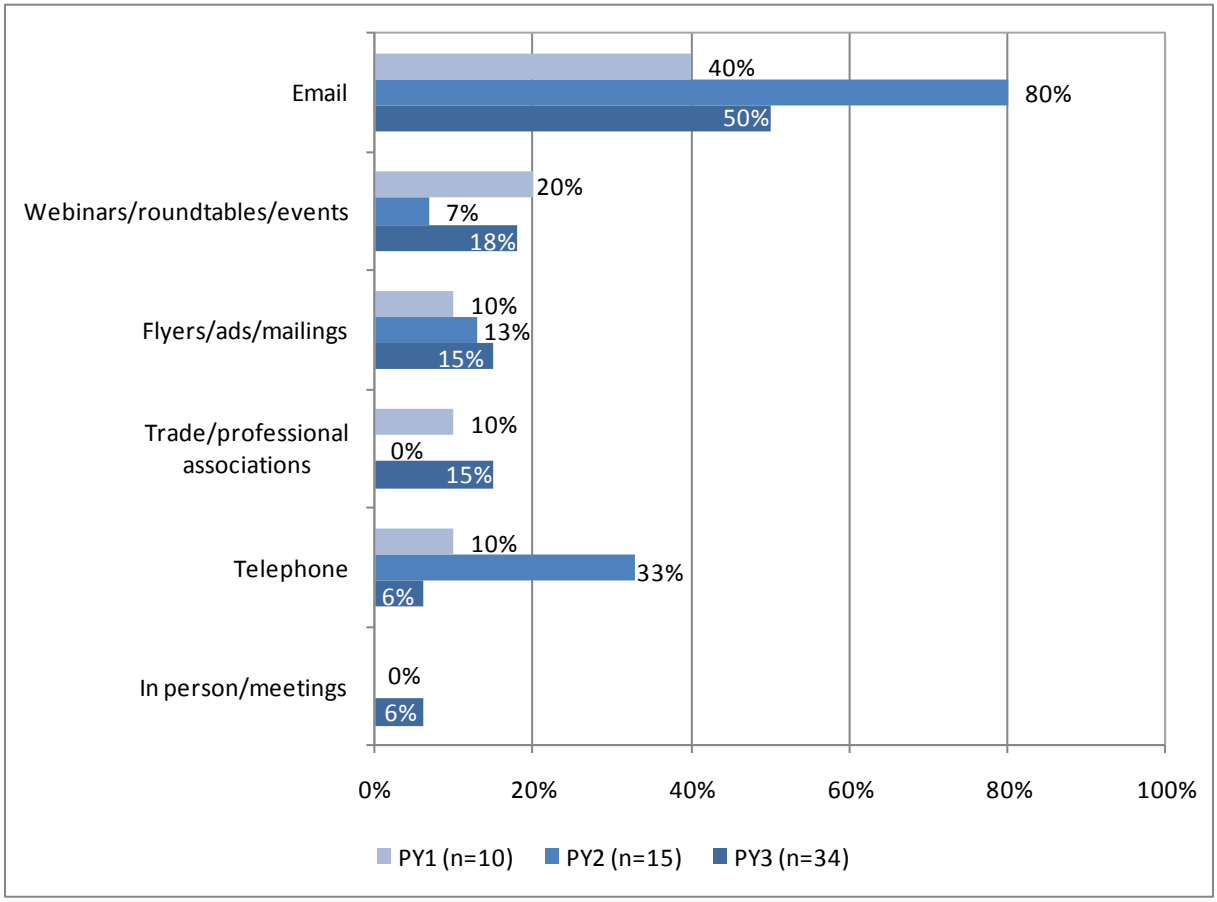
Figure 3-6. Sources of Information about the Public Sector Electric Efficiency Program (Prompted)



Source: PY1, PY2, and PY3 CATI Participant Surveys
***Channel not asked about in previous years.*

E-mail continues to be the best way of reaching public sector entities with information about energy efficiency programs (50%) but the share of participants who prefer this outreach channel has declined compared to PY2 (80%). Other preferred ways of outreach include webinars and other events (18%), mailings and ads (15%), and through trade associations (15%). Figure 3-7 summarizes these findings.

Figure 3-7. Preferred Methods of Contact (Multiple Response, Unprompted)

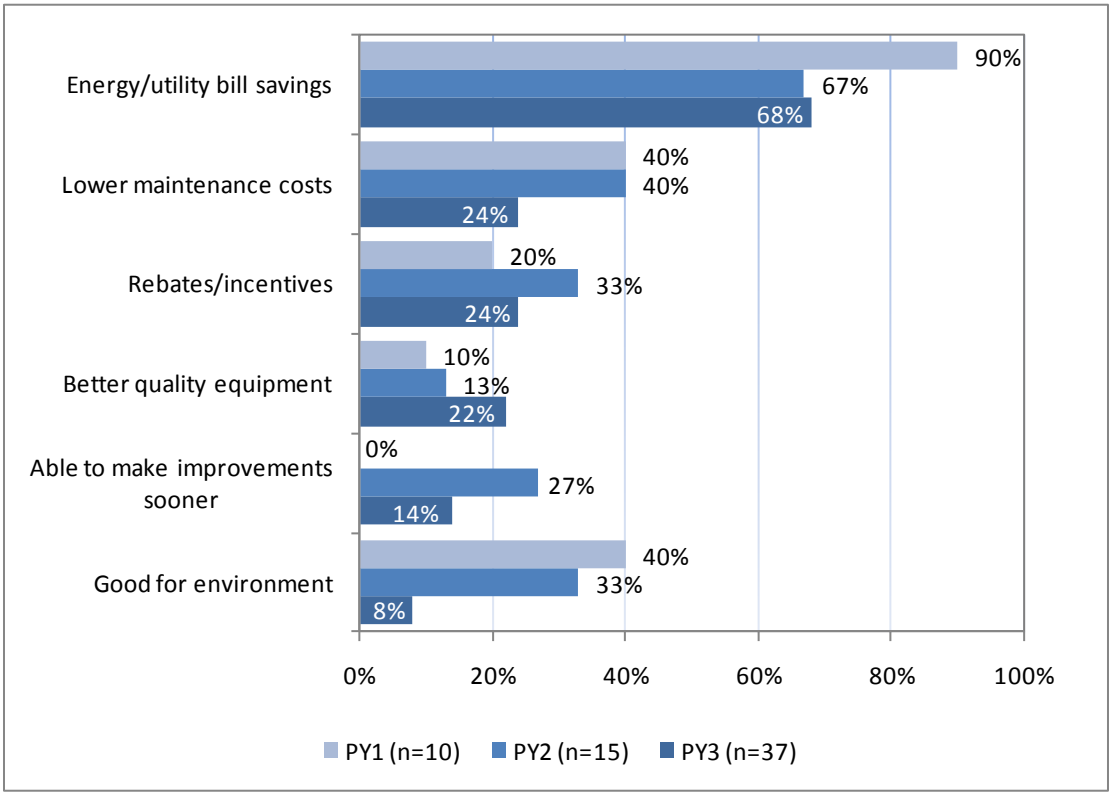


Note: Response categories under 5% in PY3 have been omitted.
Source: PY1, PY2, and PY3 CATI Participant Surveys.

Similar to previous years, participants consider energy and cost savings the major benefit of participating in the Custom Program (68%). Participants also commonly reference the importance of lowering their maintenance costs (24%), receiving the rebates and incentives (24%), and acquiring better quality equipment (22%). These benefits should be emphasized in program marketing materials. Perhaps not surprisingly, considering the current economic climate, participants are far less motivated by a concern for the environment than they were previously (8% in PY3 vs. 33% in PY2 and 40% in PY1).

Figure 3-8 summarizes participant responses about the benefits of program participation.

Figure 3-8. Benefits of Program Participation (Unprompted, Multiple Response)



Source: PY1, PY2, and PY3 CATI Participant Surveys

3.2.6 Barriers to Participation

With increasing program goals, attracting new and repeat participants will become increasingly important in future years. As such, understanding why customers do not participate and what can be done to reduce their participation barriers is important. While this evaluation did not include research with non-participants, the evaluation did include several activities that explored barriers to participation (program staff interviews, interviews with customers who initiated the participation process but did not submit a final application, procurement process interviews, and the participant survey). Based on this research, key barriers to participation include:

- **Lack of program awareness:** In the participant surveys for all three program years, lack of program awareness was most often identified as a barrier to participation. In PY3, 46% of participants thought that this prevented other public sector entities from participating.
- **Budget constraints:** Lack of funding was identified as a barrier to the installation of energy efficient equipment, and thus participation in the PSEE program, by participants (24%) as well as program drop-outs and entities interviewed about the procurement process. As the contact for one entity that dropped out of the program in PY3 put it:

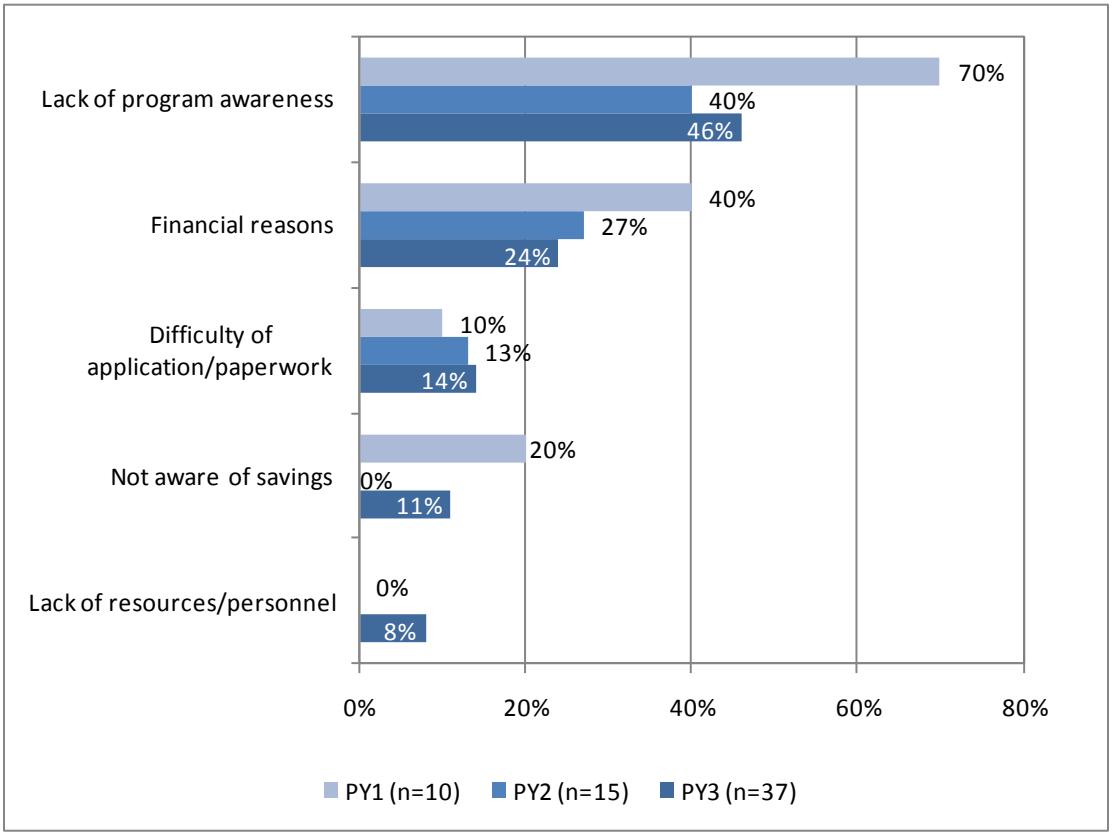
> *"As soon as funding is available I want to go ahead with [the project] because we saw such drastic decreases in our bills [after the first project we implemented] that it was well worth our effort to do it now. And I think as we go forward we're going to save even more money."*

- **Lack of human resources/technical expertise:** Lack of technical expertise, or in some cases just personnel to oversee the application process, further affects adoption of energy efficient technologies and participation in the PSEE program. Program staff found that some of the smaller entities that came to the program through their EECBG funding simply did not have the resources to complete the application process (either personnel or physical office supplies).
- **Procurement process:** In the first program year, program staff identified the length and timing of the budget planning process as one of the major barriers to participation. Since public sector budgets are generally set far in advance, many customers did not have a chance to take advantage of the program in PY1 because the budgeting process for the year had already taken place. Research conducted for the PY3 evaluation confirm that the budgeting and procurement process is usually lengthy, often requiring multiple approvals and extensive project documentation, which can lead to delays in implementing projects and participation in programs like PSEE. Detailed findings from the procurement process research are presented in a later subsection.
- **Competing funds:** According to program staff, some projects dropped out of the program because the entity received direct stimulus grants from the federal government. These entities had started to work with DCEO but then dropped out when they learned that federal funding would cover 100% of the project cost.

Additional findings from our interviews with program drop-outs and entities interviewed about the procurement process are presented in the next two subsections.

Figure 3-9 summarizes participant survey responses to the question – "What do you think are the reasons organizations like yours do not participate in this program?" – from the PY3 participant survey, compared to PY1 and PY2.

Figure 3-9. Reasons for Non-Participation (Unprompted, Multiple Response)



Note: Response categories 5% and under in PY3 are not included.
Source: PY1, PY2, and PY3 CATI Participant Surveys.

3.2.7 Program Drop-outs

Understanding why applicants drop out of the program was a topic of interest to program staff in PY3. The evaluation team conducted interviews with 21 organizations that had filed a pre-approval application but did not submit a final application in PY3. Notably, 16 of these 21 organizations reported that they had already resubmitted their application for PY4 or were planning to do so. These individuals explained that their projects had been delayed due to difficulty obtaining funding and/or the timing of non-DCEO grants. According to program staff, EECBG funding could be used in either PY3 or PY4. Some applicants started the DCEO application process in PY3 but did not implement the project within the program year, causing them to "drop out."[16]

[16] It should be noted that in PY3, the program tracking database did not have the ability to reassign an applicant from PY3 into PY4. As such, the database identifies any project that started the application process in PY3 but was not completed as "cancelled."

Interestingly, some applicants dropped out of the PSEE program *as a result* of receiving federal stimulus money. As explained above, these entities had started to work with DCEO but then dropped out when they learned that federal funding would cover 100% of the project cost. While some projects were lost this way, other recipients of direct stimulus grants expanded the scope of their original project, or implemented additional projects, to take advantage of the DCEO funding.

Of the five interviewed drop-outs who have not resubmitted their application in PY4 and do not intend to do so, two implemented their project without the DCEO incentive and three are not planning to complete the project:

- Of the two entities that implemented the project without the DCEO incentive, one did not submit the final application because of staffing changes and the resulting lack of a person responsible for finalizing the grant application. The other did not know how and where to submit the final application. However, both indicated that the availability of DCEO funding was very influential on the initial decision to implement the projects and that the projects would not have been of the same efficiency levels without the program's incentive opportunities and information. These two projects present a missed opportunity for the program.
- The other three drop-out applicants never completed the project and do not plan to do so in the near future. Reasons for not completing the projects include project costs, an inability to secure supplemental funding, and structural limitations that prevented equipment installation. None of these respondents had any suggestions for ways DCEO could have helped them to complete those projects as payback and upfront costs are their organizations' primary considerations when investing in energy efficiency.

Overall, applicants like these five drop-outs present an opportunity for DCEO in the future. Most cite budget shortages and overall lack of funding as the core barriers to adoption of energy efficient equipment. However, all rate their facilities as either somewhat energy efficient or not very energy efficient, and nearly all plan to make additional improvements and are likely to consider energy efficient options. In addition, two drop-outs pointed to lack of technical expertise as a barrier to energy efficiency, and all five respondents rated themselves as being only somewhat knowledgeable about energy efficiency. Following up with these applicants, informing them about PSEE opportunities, and offering additional technical assistance and support might result in additional projects in the future.

3.2.8 Public Sector Equipment Procurement Process

The equipment procurement process of public organizations is fundamentally different from that of private ones, and it can present a challenge with respect to participation in energy efficiency programs. To further examine this process, and how the PSEE program might help potential participants overcome the challenges associated with it, the evaluation team

conducted in-depth interviews with public sector personnel involved in the equipment procurement process. We interviewed ten entities who participated in PY3. These entities represent a range of public sectors including local governments (6), K-12 schools (3), and federal government entities (1).

Project Funding

Public sector entities use a variety of funding sources to pay for equipment replacement projects. For the majority of interviewed entities, capital improvements are budgeted for as part of the facility maintenance funds or general building operating expenses, which are then rolled into overall school, county, or other budgets. In addition, some entities utilize life safety funds, bonding issue, or additional taxes for capital improvements. These funding sources are frequently supplemented with available grant opportunities, such as the PSEE program.

Based on the interviews we conducted, there do not appear to be any caps or limitations for the costs of equipment upgrade projects.

Documentation required to reserve funding varies from general cost assumptions to detailed project specifications with ROI and payback calculations and a rationale for undertaking the project.

Budget Planning

Since capital improvements are often part of a school or county budgets, planning such improvements often goes hand-in-hand with the fiscal year planning process deadlines. All counties in Illinois have a fiscal year of December 1st through November 30th; planning for the year's budget starts in August. Fiscal years for other public sector entities vary. Notably, three of the ten interviewed entities mentioned having long-ranging capital improvement plans (three- and five-year plans) for larger equipment replacement projects. These plans outline priorities for the upcoming years; they are then further revised, specified, and incorporated into annual budgets.

A respondent from a local government entity explained that incorporating unforeseen projects into long-ranging plans is possible, yet onerous:

> *"You can submit a request [to amend long-ranging plans], which I had to do for next year's budget, but […] you have to go through the process and put everything together and justify why you want to do what you want to do."*

Timing of Project Implementation

No single time of year appears to be ideal for project implementation. For example, all K-12 school representatives name summer as the best time for all equipment upgrade projects; one local government facility prefers to implement the projects in the fall, while another one says that spring is the best time. The remaining five respondents do not have a preference or say that the timing is equipment-specific.

Project Approval Process

Project approval steps vary among interviewed entities but generally include the following three common steps:

- **Cost estimates and project specifications:** This step can be performed by an in-house staff or outside engineering professional, sometimes with contribution from internal maintenance staff, the department of public works, or other individuals or entities.
- **Bidding process and winning bid selection:** This step generally includes issuing request for bids or proposals, an internal review of bids once they are submitted, and development of recommendations on the winning bidder.
- **Project approval:** depending on the entity, this step usually includes voting by the board of trustees, board of education, county board, or city council.

Interestingly, the order of the above mentioned steps varies. Within some interviewed public sector entities, the board approves project specifications and budgets before requests for bids are issued, while within others, the board approves the project after the bids are fielded. In cases where project specs do not undergo the board or council approval prior to issuing request for bids, individuals such as city managers, department heads, internal maintenance staff, or engineers review the accuracy of the project scope and pricing. In cases where bids are not reviewed or approved by the board or council, this step is performed by engineers or central purchasing department.

Within one local government entity, board approval is required both before the bid is issued and for the final selection of the winning bidder. One federal government entity requires several levels of project approval:

> *"Well [there are] many steps. It's got to go to the director of property management. Then it goes to asset management, and then above that it goes to executive director of office properties, and then after that it's got to […] be approved by ownership."*

The duration of the project approval process among interviewed entities ranges from four to six months.

Bidding Process

All of the interviewed entities have project cost thresholds that require a formal bidding process, with $20,000 being the most frequently cited cut-off amount below which the projects can be approved internally and procured directly without a need for an official bid request or board or council approval/voting. However, most of the interviewed public sector entities issue an informal request for bids regardless of the project costs, with the goal of ensuring competitive project pricing. Furthermore, a few respondents mentioned that they inform their board of the project or project-related decisions, even when board approval is not required. This is done in order to keep all the parties informed and maintain a good working relationship.

When it comes to awarding the bids, most of the public sector entities have either a requirement or a recommendation to award the project to the lowest qualified bidder. According to one respondent, proving that quality should come before cost presents its own hurdle:

> *"We have to take the lowest responsible bidder but at times […] we can demonstrate why the low bid is not the one to go with. If we have some valid reasons for rejecting their bid – […] if we get a bad reference or we hear that they didn't complete the project on time – but you do have to validate that in writing. You can't just decide arbitrarily to not take the lowest bid; you have to have some pretty good rationale for not accepting it."*

Within one local government entity, there are ordinances in place that recommend selection of a local contractor. Most other interviewed public sector entities, however, do not have a requirement to give preference to a specific contractor type (e.g., local, women-run, etc.). A few respondents however, noted that in case of competitive bids, they give preference to local contractors. The tendency to select the lowest bidder does not present a barrier to energy efficiency, as project specifications are tightly formulated and outlined to bidding contractors at this stage in the process.

Role of Energy Efficiency

The importance of energy efficiency varies across the interviewed public sector entities. While not a formal requirement for any of the interviewed entities, three out of ten respondents said that energy efficiency is a top priority, two more said it is one of the main factors (along with cost), and one respondent said that energy efficiency is of greater importance for certain equipment options (such as motors).

Procurement Process Challenges

Procurement process challenges mentioned by respondents include difficulty obtaining funding and developing project scope. Few of the interviewed entities have difficulty securing contractors to perform the work. One respondent, however, noted that while it is fairly easy to secure contractors for more common types of projects (such as lighting or HVAC projects), finding qualified contractors for specialized projects (such as water treatment or sewer plant retrofits) can present a challenge. Another respondent found that lack of internal technical expertise, when defining project scope and specifying equipment characteristics, is a challenge. This might present an area where DCEO can provide additional assistance to its customers. A DCEO specific trade ally network, planned for PY4, might help connect public sector entities to specialized contractors. Through SEDAC, additional technical assistance and support is available to customers who lack such resources.

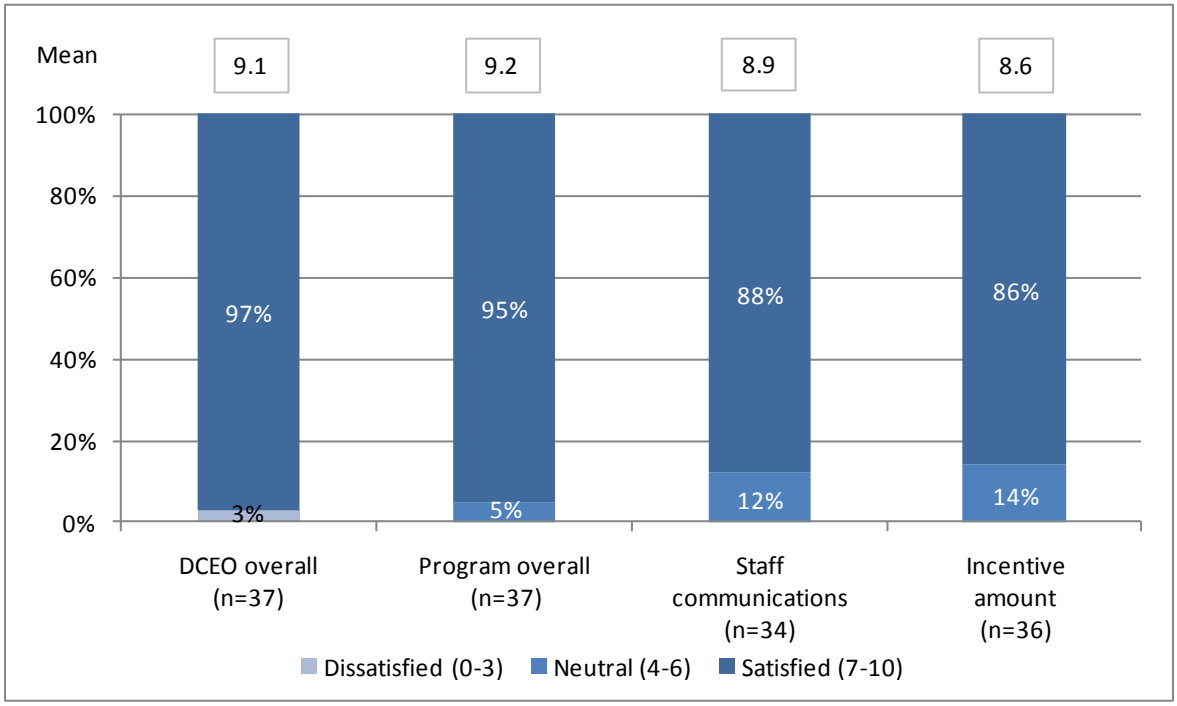
3.2.9 Participant Satisfaction

Participants are very satisfied with the Custom Program. Participants were asked to rate – on a scale of 0 to 10, where 0 means "very dissatisfied" and 10 means "very satisfied" – several aspects of the program. No participants are dissatisfied with the program overall, the incentive levels, or their communications with program staff. Satisfaction is highest with the program overall and DCEO overall, where participants give an average rating of 9.2 and 9.1, respectively.[17] Figure 3-10 summarizes these results.

In addition, all participants interviewed about their procurement processes are very satisfied with their participation process and their interactions with DCEO.

[17] Satisfied is defined as a rating of 7 to 10; dissatisfied as a rating of 0 to 3.

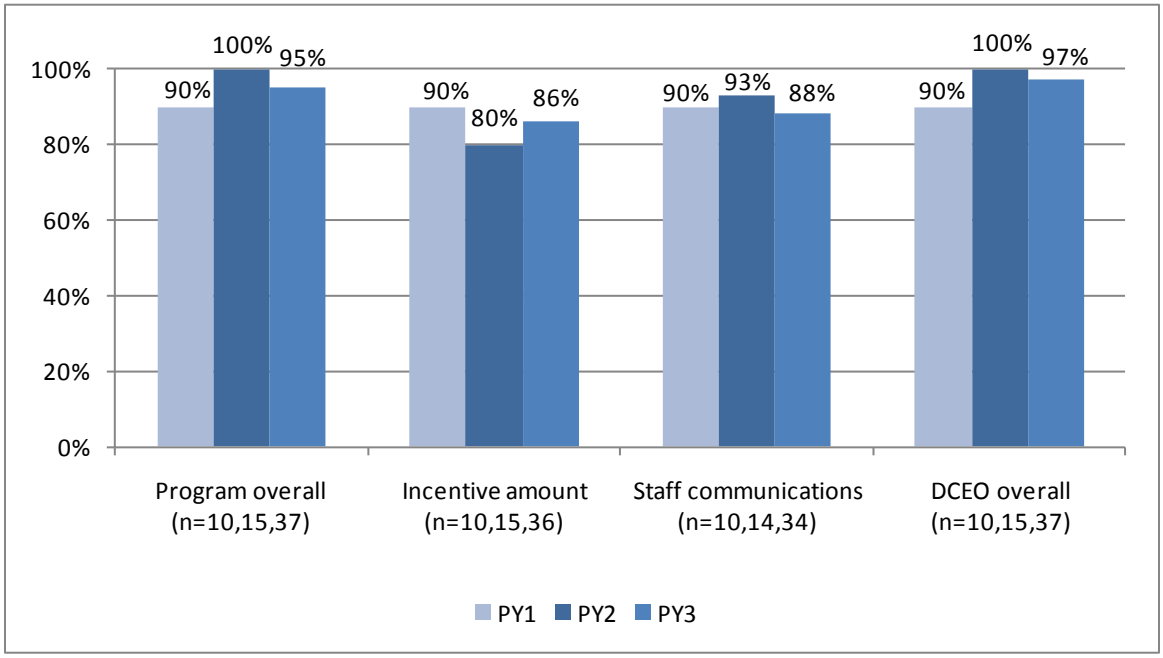
Figure 3-10. Program Satisfaction



Source: PY3 CATI Participant Survey

Satisfaction with the program and its elements in PY3 is largely unchanged from previous years. Figure 3-11 summarizes satisfaction levels in the three program years.

Figure 3-11. Percent Satisfied by Program Year



Source: PY1, PY2, and PY3 CATI Participant Surveys.

Given the high levels of satisfaction, it is not surprising that most participants plan to participate again in the future (84% say yes, 14% say maybe).

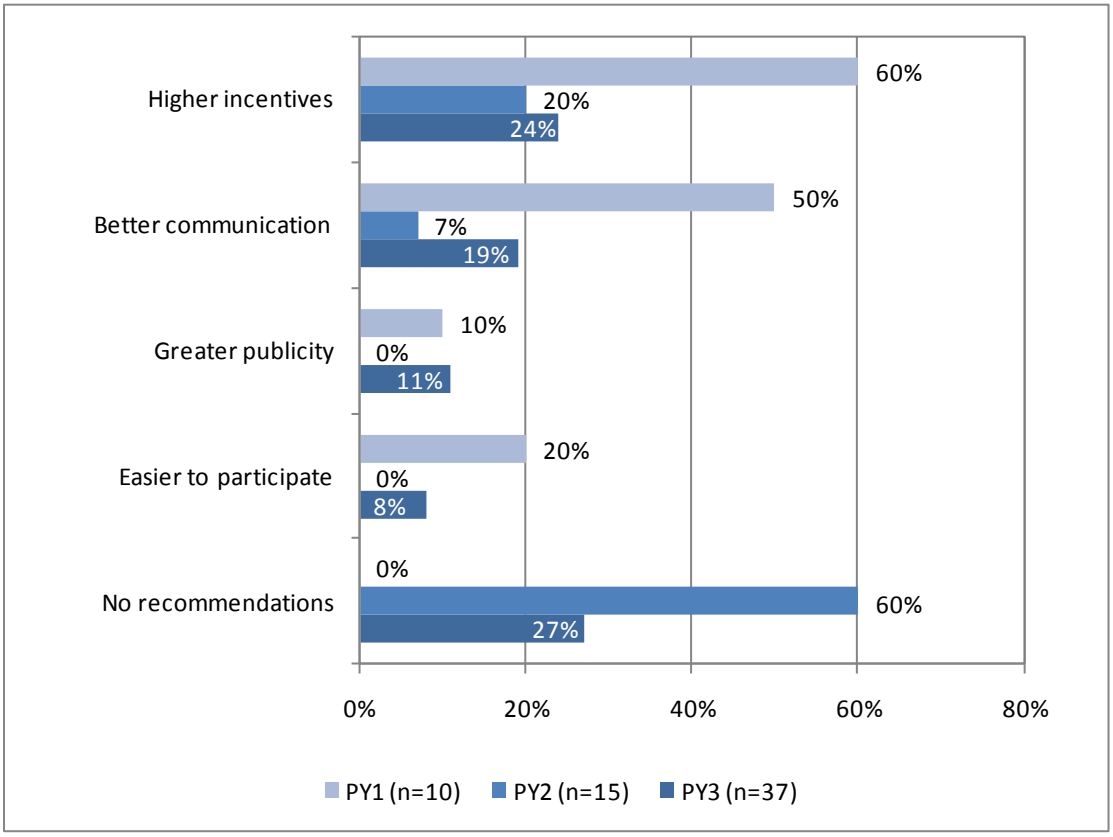
When asked what could be done to improve the program, 27% of participants have no recommendations. The most common recommendations include increasing incentive levels (24%) and improving communication (19%). However, both of these concerns seem to be less of an issue in the last two years, compared to PY1 where 6 out of 10 respondents suggested increasing incentives and 5 out of 10 thought that better communication was needed.

One participant noted slight dissatisfaction with limitations in the equipment eligible for an incentive. The participant explained that it would have been more cost-effective, in terms of time and money spent on maintenance costs, if incentives could also cover the wiring components of the measures being retrofitted or replaced.

Participants interviewed about their procurement processes suggested that the program increase marketing and outreach efforts and simplify the applications process.

Figure 3-12 summarizes recommendations provided by PY3 participants, compared to PY1 and PY2.

Figure 3-12. Recommended Program Improvements by Program Year
(Unprompted, Multiple Response)



Note: Response categories 5% and under in PY3 are not included.
Source: PY1, PY2, and PY3 CATI Participant Surveys.

3.3 Cost Effectiveness

[To be added after impact results are finalized.]

Section 4. Conclusions and Recommendations

This section highlights the findings and recommendations from the PY3 evaluation of DCEO's Public Sector Electric Efficiency Custom Incentive program. The primary evaluation objectives include quantifying the gross and net energy impacts resulting from the rebated measures and assessing program theory, design, and delivery. Below are the key conclusions and recommendations.

4.1 Key Impact Conclusions and Recommendations

Gross Impacts

The gross impact results yielded an energy realization rate of 0.78 which is a significant increase from the PY2 levels of 0.56. This shows DCEO has done a good job of improving the estimation of gross impacts for Custom energy efficiency projects in the program. However, the implementation team should make efforts to further close this gap. PY3 energy savings realization rate results indicate that the stratum 1 (RR = 0.94) and the stratum 3 (RR = 0.85) projects realized a greater proportion of the ex ante claims than the stratum 2 (RR = 0.57) projects. This is due to the complexity of the projects involved in stratum 2 that include technologies such as HVAC, VSDs and high efficiency blowers that require more in-depth technical reviews and pose a greater challenge for estimating savings accurately -- for example, due to varying operating conditions. Therefore, overall results suggest, and especially among complex projects in stratum 2 (n=7), that ex ante estimates could be further improved. Key evaluation conclusions and recommendations include the following:

Improvements to Ex Ante Impact Estimates

Conclusion. Program reported installed measures for two projects were not fully operational. For project (#486) the installed lighting control measure was not operational and for project (#3302) three from a total of 11 VFDs installed were not operational which significantly reduced the realized savings for these projects.

- **Recommendation.** Program should conduct thorough site visits to confirm that all the installed measures are fully operational.

Conclusion. Program estimated annual energy savings were not representative of the typical annual operating conditions for several projects (e.g. #3093 (VSD), 3302 (VSD), #3386 (Lights, Sensors), #3609 (Ext LED) and #3344 (Aeration Blower)). The program calculations were also not normalized to account for changes in operating conditions from the pre retrofit period to the post retrofit period (e.g. #3447(AHU Coil Cleaning)).

- **Recommendation.** To improve program calculations and realization rates, the program could do a better job of verifying that the estimated operating hours and energy usage

represents typical annual operating conditions for the installed equipment. The program should also determine whether the energy savings will require normalization to properly adjust for changes in operating conditions from pre retrofit period to the post retrofit period. Additionally, the program should perform in-depth engineering review of the calculations and models submitted to verify the accuracy of savings for the largest projects.

Conclusion. Additionally for lighting projects, the program estimated fixture wattages were different from the ex post verified fixture wattages for two projects (e.g. #3745 and #3335).

- **Recommendation.** Estimate fixtures and lamp wattages from manufacturer data sheets or from standard wattage tables.

Conclusion. For outdoor lighting projects controlled by a photocell, which entailed dusk-to-dawn operation, the hours of operation were not accurately estimated. (e.g. #3531 #3609 #3630 and #3745).

- **Recommendation.** Calculate hours of operation using the actual dusk to dawn schedule. Use the geographical location specific sunrise and sunset times for each day to estimate the annual hours of operation.

Conclusion. For high efficiency blower projects #3093 and #3344, the ex ante energy usage was estimated using incorrect input values such as full load amps, blower power at full load conditions (for baseline energy usage) or speed settings (for post retrofit energy usage) which resulted in overestimation of energy savings. Also, the operating hours were incorrectly estimated for project #3344 since the ex ante calculations did not account for seasonal variation of the load profile that resulted in reduced ex post operating hours.

- **Recommendatio**n. Use blower performance curves, to calibrate or to verify the baseline energy usage based on the actual (load profile) operating conditions of the facility. In addition for post retrofit conditions, verify the range of speed settings or airflow profile for the blowers. Typically, customers have a good idea how they would program the blowers to operate (such as speed setting or speed range) for the post conditions. Adjust the estimated energy usage based on the information obtained through these additional verification steps.

Conclusion. For HVAC projects, program calculations were not detailed and assumptions included in the calculations were not verified. These assumptions resulted in overestimation of ex ante savings. Ex ante analyses were sometimes based on vendor calculations that did not represent actual site specific conditions. For example, ex ante calculations for project #3224 estimated post retrofit delta T (difference between supply and return temperatures) to be 16F. However, ex post verified delta T was 6F. For project #3223, ex ante calculations assumed that

the delta T would range from 10F to 20F; however, ex post efforts verified that the delta T was about 8F.

- **Recommendation.** While estimating critical parameters (such as delta T, flows, cooling load and chiller efficiency), efforts should be made to collect site specific data. Avoid estimating savings using assumptions from vendors without verifying true or expected operations.

Conclusion. For VSD projects, equipment control strategies were not accurately modeled in the ex ante calculations (e.g. Project #3302).

- **Recommendation.** For estimating savings accurately for VSD projects, use the equipment control strategy (throttling, bypass or cycling) that is consistent with the site conditions for estimating the baseline energy usage. For post retrofit conditions determine if the VFD is manually set to operate at constant speeds or is programmed to operate within a set speed range. Additionally, use equipment performance curves to support calculations or to verify the calculated savings.

Baseline Selection

Conclusion. Baseline condition was adjusted for only one project in the impact sample (#3279). The program selected the pre-existing (often referred to as "in situ") equipment as the baseline for estimating program savings and incentives. This assumption would only be justifiable in situations where the program induced an early replacement of equipment and for cases where the equipment has a very high probability of continuing in operation for the predominant period over the EUL of the new equipment. Instead, in this case we found that the existing equipment had a relatively short remaining useful life or generally required replacement. The program should have treated the project as replace-on-burnout not early retirement.

- **Recommendation.** One step that would improve the realization rate would be adjusting the baseline condition consistent with the evaluation approach when the existing equipment being removed has a relatively short remaining useful life or generally requires replacement. The age, remaining useful life, operating condition of the existing equipment and the estimated time at which the existing equipment would have been replaced in the future should be verified before selecting the existing equipment as the baseline condition. The true test should be whether or not there is enough evidence pointing to program induced accelerated adoption (of a higher efficiency unit than standard practice).

- **Recommendation.** Identify projects explicitly in program files as replace-on-burnout or natural turnover. For the replace-on-burnout and natural turnover cases, baselines should be based on the efficiency of alternative new equipment or code requirements and not the existing in situ equipment.

Project Eligibility

Conclusion. It was found that project #3438 exceeded the minimum payback period of 7 years (that is a requirement to be eligible for incentives). However, this project was approved and provided incentives. The reasons for approving this project were not provided in the project documentation.

- **Recommendation:** The project screening process should make sure that the projects meet all the program requirements before providing incentives.

Project Documentation

Conclusion. Project documentation was not detailed for many projects. In some cases, supporting calculations for projects were not clearly documented or were difficult to identify in the project documentation. For some projects, final applications did not include information about the adjustments made to initial savings estimates and therefore, the evaluators were not able understand the reasons for observed ex ante savings adjustments (e.g. #3447 (AHU Coil Cleaning), #3223 (chill water controls) and #3224 (chiller loop)).

- **Recommendation.** DCEO should consider making project documentation available electronically. Final applications should include all calculations (spreadsheets, building models, etc) and documentation to support the estimated savings. If any changes are made to the submitted savings calculations – the documentation should include the reasons for these changes. This will allow the evaluators to better understand the reasons for project application updates and changes to savings estimates.

Peak Demand Estimation

Conclusion. Ex ante calculations did not estimate peak demand savings for any of the projects. The program should incorporate estimates of peak demand savings. Peak demand impact estimation is given a lower priority than energy savings due to the fact that incentive levels are tied to energy savings and not peak demand reduction. Peak demand savings are important because they reflect load reduction on the grid and are critical for utility power supply planning.

- **Recommendation.** Calculate peak demand savings for all projects by establishing an industry accepted set of program rules and definitions.

Net Impacts

Conclusion. Free-ridership levels for PY3 custom program (26%) are significantly lower than PY2 levels (35%). This free-ridership level is somewhat low for a Custom program. However, mean free-ridership was relatively high across smaller projects (37% for sampling stratum 3).

Program influence was high in many cases specifically for the large stratum 1 and stratum 2 projects. Participants reported the program being a strong motivating factor in their decision to upgrade to efficient equipment at the time they elected to do so. The results also confirm that the program has improved in the area of project screening.

Conclusion. There were many cases for smaller Stratum 3 projects where the program influence was low for a number of different reasons. In some cases, the evidence indicates that the customer learned about the program late in the decision making process and offered incentives for projects that had already been decided upon. There were also several cases where the customer reported that they would have installed the same equipment at the same time in the absence of the program incentives (thus significantly increasing the odds of free ridership in any given project). The evidence also indicates that program claims were made for some projects that customers initiated and were influenced by other factors instead of the program.

- **Recommendation.** One approach to further reduce free ridership is for program administrators to simply exclude projects from the program that they believe have a high probability of being free riders. For example, incentives should not be provided to projects that are already installed. Similarly, if there is evidence that the program did not contribute significantly to the decision to install a particular project or equipment type then an incentive may not be warranted. Incentives might only be provided if the program process leads to a higher efficiency level than initially planned. Also, ensure that program incentives are not offered for measures and technologies that are industry standard practice or projects that were being implemented by end users as part of their regular facility upgrade requirements or due to facility energy efficiency practices.

Tracking System

DCEO implemented a major upgrade to its project tracking systems, converting them to a relational database structure. The evaluation team strongly endorsed the need for that effort but hopes that the following issues will be addressed in the new system in the future.

Database Development. The development of a program tracking database was a key activity in PY3. The new database system was intended to reduce administrative burden and allow multiple staff to enter data into the database at the same time. While the new database has helped with tracking projects, program staff reported that entering data into the system is more time consuming than the previous system (because more information is captured) and that many report automation capabilities that would be useful in conducting their work were not yet available in PY3.

- **Recommendation:** Continue the development of database functionalities to make it a more useful program management tool. While the database has allowed staff to be more 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 (e.g., SEDAC).

Project Status Updates. One aspect of the tracking system that affected the evaluation was the delay in reporting status updates for Custom projects. The Custom program tracking system originally had 130 projects, one of which was cancelled and two were moved into PY4. Of the remaining 127 projects, only100 were marked as "Complete", and the transition between "Final" and "Complete" status often occurred with significant changes in the reported kWh savings. This affected the sampling phase of the evaluation and significantly delayed field visits to sampled sites. The evaluator asked for updates periodically, but it turned out, for example, that some projects that were completed had not yet been entered into the tracking system.

- **Recommendation.** Enhanced electronic tracking of projects within the program is needed, including accurate real-time updates to the tracking system for completed projects.

Peak Demand. DCEO does not track summer peak demand impact (kW). **Recommendation.** The program should track summer peak demand savings. For consistent reporting and tracking of peak demand savings for projects, the program should include dedicated fields in the custom project application form (for the applicant to report peak demand savings).

4.2 Key Process Conclusions and Recommendations

Program Participation

Conclusion. Although the number of projects increased by 55% in PY3, savings decreased by 29%. PY3 projects were, on average, much smaller than PY2 projects (211 MWh per project in PY3 compared to 462 MWh per project in PY2). Some sectors with the highest per project savings (universities, Federal government) had stagnant or no growth in the number of projects in PY3. These are sectors that have not been targeted with increased incentives in PY3.

- **Recommendation:** 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 the incentive for non-carve out entities (universities and State and Federal governments) from $0.09 per kWh in PY3 to $0.12 per kWh in PY4 should help in increasing participation among these sectors.

Program Partnerships

Conclusion. In PY3, DCEO has continued to leverage partnerships with organizations such as the Illinois Association of Regional Councils and the Illinois State Board of Education. These partnerships have been successful in increasing participation by local governments and K-12 schools. Cooperation included shared marketing and outreach efforts and channeling participants into each others' programs.

- **Recommendation.** DCEO should exercise caution when seeking participation by projects that also receive funding from other public sources. While cooperation in marketing and outreach can be beneficial for both organizations, care should be taken that co-funding of projects does not create freeridership in the program. Results from the PY3 net impact analysis suggest that some of the projects that received funding from other government sources have relatively high rates of freeridership.

Trade Allies

Conclusion. In PY3, DCEO continued to make use of the utilities' and SEDAC's existing trade ally networks, but made a first attempt at developing its own network of contractors through a pilot effort under the Building Industry and Training Education Program (BITE). Program staff did not find this pilot effort to be a worthwhile use of program resources. In PY4, DCEO plans to build a trade ally network similar to that of the utilities, where trade allies are enticed to participate by being eligible for incentives themselves. Participant survey results confirm the importance of trade allies in channeling participants into the program, assisting them with the design of their projects, and supporting them through the application process.

- **Recommendation.** Development of a program-specific trade ally network is well-warranted. Based on 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. It is therefore important that DCEO's network include trade allies capable of helping at the project design stage, so that they have an opportunity to promote energy efficiency and participation in the PSEE program to public sector entities.

Conclusion. Lack of technical expertise is a key challenge in the equipment procurement process. Drop-outs also point to lack of technical expertise as a barrier to energy efficiency and rated themselves as being only somewhat knowledgeable about energy efficiency.

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

Marketing and Outreach

Conclusion. In PY3, the PSEE Program was re-branded as *Illinois Energy Now* (IEN). DCEO conducted marketing and outreach efforts through various means, including electronic media as well as in-person events and presentations. Electronic media have been successful in disseminating information about the program: 68% of participants have received an e-mail with information about the program, 32% have heard about the program in the DCEO/SEDAC e-newsletter, 56% have seen program information on the DCEO website, and 29% have attended an on-line seminar/webinar. E-mail continues to be the best way of reaching public sector entities with information about energy efficiency programs (50%).

Conclusion. Budget constraints are a key barrier to the installation of energy efficient equipment and participation in the program. The program developed limited marketing materials in PY2, but no new collateral was developed in PY3. Currently few materials highlight how energy efficient equipment can help budgets in the long run, and there are no materials specific to the various public sectors.

- **Recommendation.** While the increased PY4 incentive level will help reduce financial barriers for non-carve out entities (federal and state government and universities), 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 demonstrates the savings that can be expected from the installation of energy efficient equipment. 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.

Program Drop-outs

Conclusion. Our interviews with contacts for projects that have been identified as cancelled in the program tracking database showed that 16 of 21 projects had not been cancelled but simply postponed. In PY3, the program tracking database did not have the ability to reassign an applicant from PY3 into PY4. As such, the database identifies any project that started the application process in PY3 but did not complete it as "cancelled."

- **Recommendation.** Incorporate a "Program Year" field into the database so that projects can seamlessly be moved from one program year to the next.

Conclusion. Two of the five interviewed program drop-outs completed their projects outside of the program. These entities did not submit a final application because they were unclear on how and where to do so.

- **Recommendation.** DCEO should consider requesting 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. Additional functionalities in the program tracking database could help automate this process.

Conclusion. Nearly all interviewed program drop-outs plan to make additional improvements to their facilities and say they are likely to consider energy efficient options.

- **Recommendation.** DCEO should consider a follow up procedure with program drop-outs. Following up with these applicants and informing them about PSEE opportunities might result in additional project applications.

Participant Satisfaction

Conclusion. Participants are very satisfied with the Custom Program. Satisfaction is highest with the program overall and DCEO overall. Moreover, satisfaction with the program and its elements in PY3 is largely unchanged from previous years. The most common recommendations participants make are to increase incentive levels and improve communication.

Section 5. Appendices

5.1 PY3 Utility Specific Savings

5.1.1 PY3 Utility Specific Savings for Ameren

Table 5-1. Utility Specific Evaluation-Adjusted Net kWh Impacts for PY3

Utility	Ex Ante Gross kWh	Ex Post Gross kWh	kWh RR	Ex Post Net kWh	NTGR (ex post gross)
Ameren	15,215,805	11,840,421	0.78	8,774,238	0.74

5.1.2 PY3 Utility Specific Savings for ComEd

Table 5-2. Utility Specific Evaluation-Adjusted Net kWh Impacts for PY3

Utility	Ex Ante Gross kWh	Ex Post Gross kWh	kWh RR	Ex Post Net kWh	NTGR (ex post gross)
ComEd	11,623,251	9,044,818	0.78	6,702,581	0.74

5.2 Evaluation Data Sources

Table 5-3 provides a summary of the principal data sources contributing to the evaluation of the PY3 Custom program. For each data element listed, the table provides the targeted population, the sample frame, sample size and timing of data collection.

Table 5-3. Principal Data Sources Contributing to the PY3 Evaluation

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data Analysis	Custom Program Customers, Projects and Measures	DCEO Tracking Database	-	All	Ongoing
In-depth Phone Interviews	DCEO Management and Custom Program Staff	Contact information from DCEO	DCEO PSEE Custom Program Manager, Manager of Marketing and Outreach, and DCEO Management	3	August 2011
CATI Phone Survey	Custom Program Participants	Tracking Database	Census Attempt	NTG: 36 Process: 37	July – September 2011
In-depth Interviews by Senior Consultant	Custom Program Participants	Tracking Database	Census Attempt (N=3)	NTG: 3	September 2011
Follow-up Calls	Custom Program Participants and Vendors	Selected Net-to-Gross Sample	Selected Projects Where Warranted	Selected Projects Where Warranted	September 2011
Procurement Process Interviews	Custom Program Participants	Tracking Database	Contacts provided through Participant Survey	10	September/ October 2011
Program Drop-out Interviews	Custom Program Drop-outs	Tracking Database	Census Attempt	5	September/ October 2011
Project Application File Review	Projects in the Custom Program	Tracking Database	Stratified Random Sample by Custom Project-Level kWh (3 Strata)	17	July – September 2011
On-Site Visits and Measurement					

5.3 Other Appendices

5.3.1 Gross Impact Evaluation Methods

Gross Program Savings

The objective of this element of the impact evaluation is to verify the veracity and accuracy of the PY3 ex ante gross savings estimates in the Custom program tracking system. Additional information regarding the gross impact methods is shown below

Selection of IPMVP Approach

Ex post gross annual energy and demand impacts were assessed using an array of methods that are compliant with and defined by the International Performance Measurement and Verification Protocols (IPMVP). Flexibility was also considered in applying these protocols, with an eye towards deployment of a cost-effective M&V approach (i.e., reduction in uncertainty per evaluation dollar spent). Choices include IPMVP Option A (retrofit isolation: key parameter measurement), Option B (retrofit isolation all parameter measurement), Option C (normalized annual consumption model or a fully specified regression model) and Option D (calibrated building energy simulation models).

Baseline Assessment

Development of baseline is a crucial step in accurately assessing custom measure ex post savings, and it is sometimes the case that the ex post evaluation-defined baseline does not agree with the program-defined baseline. In each case, an investigation is needed to determine whether the existing equipment was at the end of its life and whether there is an efficiency increment among new equipment available in the market. If the equipment is at the end of its life and there is variation among new equipment efficiencies, then the savings should be based on the delta between the efficiency of the standard baseline equipment and program induced installation. If the equipment is at the end of its life (i.e., no evidence of program-induced early replacement) and there is little or no difference in efficiencies among new equipment choices, then the savings will essentially be zero. The evaluation acknowledges that early replacement activities would normally yield an array of annual (and peak demand) savings throughout the effective useful life (EUL) of the new equipment, involving impacts in the first series of years that reflect differences in usage versus the pre-existing system, and in later years versus the likely equipment adoption in the absence of the program (i.e., two different baselines might be applied). However, this evaluation seeks to identify the predominant baseline condition, and derive a single (representative) year estimate of annual and peak demand savings. The point here is to simply illustrate that baseline determination and analysis are an integral and extremely important part of custom impact evaluation, and to acknowledge the complexities involved in the actual grid-level impacts.

Production Adjustments

Changes in production between the pre-retrofit and post-retrofit periods must be accounted for in this evaluation. Changes in production have a direct impact on total energy usage and energy savings.

Guidelines in place for this evaluation requires energy savings calculations to be based on the pre retrofit production levels if the measure caused the change in production, on the other hand, if market demand causes a change in production, then post retrofit production levels would be used. Following these guidelines ensures that all the projects with production changes are addressed in a consistent manner.

Review Applications and Prepare Analysis Plans

For each selected application, an in-depth application review is performed to assess the engineering methods, parameters and assumptions used to generate all ex ante impact estimates. Application review serves to familiarize the assigned engineer with the gross impact approach applied in the program calculations. This also forms the basis for determining the additional data and monitoring needs that are required to complete each analysis and the likely sources for obtaining those analytic inputs. For most projects on-site sources include interviews that are completed at the time of the on-site, visual inspection of the systems and equipment, EMS data downloads, spot measurements, and short-term monitoring (e.g., less than four weeks). For some projects, data sources also include interviews with program implementers, vendors and other Energy Efficiency Service Providers (EESPs)[18] that participated in a given project.

Each review results in a formal analysis plan. Each plan explains the general gross impact approach used (including monitoring plans), provides an analysis of the current inputs (based on the application and other available sources at that time), and identifies sources that will be used to verify data or obtain newly identified inputs for the ex post gross impact approach.

Schedule and Conduct On-Site Data Collection

On-site surveys are completed for each of the customer applications sampled. The engineer assigned to each project first calls to set up an appointment with the customer.

During the on-site audit, data identified in the analysis plan is collected, including monitoring records (such as instantaneous spot watt measurements for relevant equipment, measured

[18] Energy Efficiency Service Providers are supply-side market actors that might assist customers in completing one or more tasks for a given project. This might include consultants, designers, vendors, contractors and energy services companies (ESCO's).

temperatures, data from equipment logs and EMS/SCADA system downloads), equipment nameplate data, system operation sequences and operating schedules, and, of course, a careful description of site conditions that might contribute to baseline selection.

All engineers who conduct audits are trained and experienced in completing inspections for related types of projects. Each carries all equipment required to conduct the planned activities. They check in with the site contact upon arrival at the building, and check out with that same site contact, or a designated alternate, on departure. The on-site audit consists of a combination of interviewing and taking measurements. During the interview, the engineer meets with a building representative who is knowledgeable about the facility's equipment and operation, and asks a series of questions regarding operating schedules, location of equipment, and equipment operating practices. Following this interview, the engineer makes a series of detailed observations and measurements of the building and equipment. All information is recorded and checked for completeness before leaving the site.

Conduct Site-Specific Impact Calculations and Prepare Draft Site Reports

After all of the field data is collected, including any monitoring data, annual energy and demand impacts are developed based on the on-site data, monitoring data, application information, and, in some cases, billing or interval data. Each program engineering analysis is based on calibrated engineering models that make use of hard copy application review and on-site gathered information surrounding the equipment installed through the program (and the operation of those systems).

Energy and demand savings calculations are accomplished using methods that include short-term monitoring-based assessments, simulation modeling (e.g., DOE-2), bin models, application of ASHRAE methods and algorithms, analysis of pre- and post-installation billing and interval data, and other specialized algorithms and models.

For this study, peak hours are defined as non-holiday weekdays between 1:00 PM and 5:00 PM Central Prevailing Time (CPT) from June 1 to August 31. This is in accordance with the PJM manual 18, *Energy Efficiency and Verification,* of Mar 1 2010.

Peak demand savings for both baseline and post retrofit conditions are the average demand kW savings for the 1 pm to 5 pm weekday time period. If this energy savings measure is determined to have weather dependency then the peak kW savings are based on the zonal weighted temperature humidity index (WTHI) standard posted by PJM. The zonal WTHI is the mean of the zonal WTHI values on the days in which PJM peak load occurred in the past ten years. This mean WTHI value is 80.4. Demand savings is the difference in kW between the baseline and post retrofit conditions.

After completion of the engineering analysis, a site-specific draft impact evaluation report is prepared that summarizes the M&V plan, the data collected at the site, and all of the calculations and parameters used to estimate savings.

Quality Control Review and Final Site Reports

The focus of the engineering review is on the quality and clarity of the documentation and consistency and validity of the estimation methods.

Each draft site report underwent extensive senior engineer review and comment, providing feedback to each assigned engineer for revisions or other improvements. Each assigned engineer then revised the draft reports as necessary to produce the final site reports.

5.3.2 Net Impact Evaluation Methods

Additional information regarding the net impact evaluation methodology is shown below.

Basic Free-Ridership Assessment

Free ridership was assessed using a customer self-report approach 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 phone surveys concerning the following three items:

- A **Program Components** score that reflects the importance of various program and program related elements in the customer's decision and timing of the decision in selecting a specific program measures.
- A **Program Influence** score that reflects the degree of influence the program had on the customer's decision to install the specified measures. This score is cut in half if they learned about the program after they decided to implement the measures.
- 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.

Each of these scores represents the highest response or the average of several responses given to one or more questions about the decision to install a program measure. The rationale for using the maximum value is to capture the most important element in the participant's decision making. This approach and scoring algorithm is identical to that used by the Ameren Illinois evaluators with the exact same questions.

The calculation of free-ridership for the Custom program is a multi-step process. The survey covers a battery of questions used to assess net-to-gross ratio for a specific end-use and site.

Responses are used to calculate a Program Components score, a Program Influence score and a No-Program score for each project covered through the survey. These three scores can take values of 0 to 10 where a lower score indicates a higher level of free-ridership. The calculation then averages those three scores to come up with a project-level net-to-gross ratio. If the customer has additional projects at other sites covering the same end-use, the survey asks whether the responses also apply to the other projects. If that is the case, the additional projects are given the same score.

The scoring approach used to calculate free-ridership from data collected through participant phone surveys is summarized in Table 5-4.

Table 5-4. Basic Net-to-Gross Scoring Algorithm for the PY3 Custom Program

Scoring Element	Calculation
Program Components score. 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: A. Availability of the program incentive B. Technical assistance from utility or program staff C. Recommendation from utility or program staff D. Information from utility or program marketing materials E. Endorsement or recommendation by a utility account rep	Maximum of A, B, C, D, and E
Program Influence score. "If you were given a TOTAL of 100 points that reflect the importance in your decision to implement the <ENDUSE>, 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?"	Points awarded to the program (divided by 10) Divide by 2 if the customer learned about the program AFTER deciding to implement the measure that was installed
No-Program score. "Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the utility program had not been available, what is the likelihood that you would have installed exactly the same equipment?" Adjustments to the "likelihood score" are made for timing: "Without the program, when do you think you would have	Interpolate between No Program Likelihood Score and 10 where "At the same time" or within 6 months equals No Program score, and 48 months later equals 10 (no free-

Scoring Element	Calculation
installed this equipment?" Free-ridership diminishes as the timing of the installation without the program moves further into the future.	ridership)
Project-level Free-ridership (ranges from 0.00 to 1.00)	1 – Sum of scores (Program Components, Program Influence, No-Program)/30
PY3 Project level Net-to-Gross Ratio (ranges from 0.00 to 1.00)	1 – Project level Free-ridership
Apply score to other end-uses within the same project?	If yes, assign score to other end-uses of the same project
Apply score to other projects of the same end-use?	If yes, assign score to same end-use of the additional projects

Standard Free-Ridership Assessment

For projects in strata 1 and strata 2 of the sample, an effort is made during the customer telephone survey to more completely examine project influence sources in order to allow for any analyst-determined adjustments to customer self-reported score calculations using the Basic approach outlined above. Additional survey batteries examine other project decision-making influences including the vendor, age and condition of existing equipment, corporate policy for efficiency improvements and so on. Any adjustments made on this basis are carefully documented and the rationale for any adjustments is recorded, to ensure their transparency to an independent reviewer.

Additional Data Sources, Call-Backs and Free-Ridership Adjustments

All project free-ridership scores and responses (including open-ends) were carefully reviewed prior to finalization and, in certain instances, additional data sources were examined and follow-up calls were found to be warranted in order to finalize and adjust each free-ridership component score. Callbacks were placed with the respondents to 1) resolve apparent discrepancy in responses, 2) obtain a clearer understanding of the equipment installation decision making, 3) examine the influence of organization-level policy and 4) examine any other project influences. Calls were placed with the vendors associated with a given project where their customer-supplied importance scores (that is, project influence) warranted it. Adjustments were made where warranted. Any adjustments made on this basis were carefully documented and the rationale for any adjustments recorded, to ensure their transparency to an independent reviewer.

Spillover

For the PY3 Custom program evaluation, a battery of questions was asked to assess spillover. Below are paraphrased versions of the spillover questions that were asked:

1. Since your participation in the DCEO program, did you implement any ADDITIONAL energy efficiency measures at this facility that did NOT receive incentives through any utility or government program?
2. What specifically were the measures that you implemented?
3. Why are you not expecting an incentive for these measures?
4. Why did you not install this measure through the DCEO Program?
5. Please describe the SIZE, TYPE, and OTHER ATTRIBUTES of these measures.
6. Please describe the EFFICIENCY of these measures.
7. Please describe the QUANTITY installed of these measures.
8. Were these measures specifically recommended by a program related audit, report or program technical specialist?
9. How significant was your experience in the DCEO Program in your decision to implement this Measure, using a scale of 0 to 10, where 0 is not at all significant and 10 is extremely significant?
10. Why do you give the DCEO program this influence rating?
11. If you had not participated in the DCEO program, how likely is it that your organization would still have implemented this measure, using a 0 to 10, scale where 0 means you definitely WOULD NOT have implemented this measure and 10 means you definitely WOULD have implemented this measure?

Responses to these questions allow us to assess whether spillover may be occurring and the type of equipment involved, but do not offer enough detail to quantify the spillover. Spillover could be quantified with the further use of follow-up questioning and site visits on potential spillover occurrences reported by the participants.

5.3.3 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 39 participating customers, (3) qualitative telephone interviews with 10 participating customers focused on the procurement process, and (4) qualitative interviews with five program drop-outs. These activities are further described in the section below.

5.3.4 Program Staff Interviews

The evaluation team conducted one interview with the Custom 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 phone interviews were conducted with DCEO Management staff. One interview explored the Custom Program's marketing and outreach activities in PY3; the second focused on several high level PY3 program design, process, and implementation changes.

5.3.5 Participant Telephone Survey

A Computer-Assisted Telephone Interviewing (CATI) survey was conducted with 37 participants. This survey focused on two key areas:

- **Net program impacts**. The survey collected data for a quantitative assessment of free-ridership and a qualitative assessment of spillover.
- **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 37 CATI interviews were completed by Opinion Dynamics Corporation's call center in September 2011.

In addition, two interviews with three contacts were conducted with a professional interviewer using the same survey instrument. These interviews targeted the largest PY3 custom projects and focused on net impact questions (a subset of the process questions were also asked). While responses to the process questions could not be integrated into the CATI results, they were generally consistent with responses given by the 37 CATI interviewees.

The CATI survey instrument is included in Appendix 5.4.1.

5.3.6 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.

The interview guide is included in Appendix 5.4.2.

5.3.7 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 indicated that the project had already been submitted for PY4 or would be submitted in the near future.

The interview guide is included in Appendix 5.4.3.

5.4 Data Collection Instruments

5.4.1 CATI Survey Instrument

DCEO PY3 PSEE Participant Survey 20

5.4.2 Procurement Process Interview Guide

DCEO PY3 PSEE Equipment Procureme

5.4.3 Program Drop-out Interview Guide

DCEO PY3 PSEE Dropout Guide 20110