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Public Sector Electric Efficiency Program: Plan Year 3 (6/1/2010-5/31/2011)

Evaluation Report: Public Sector New Construction

Presented to

Illinois Department of Commerce and Economic Opportunity

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Presented by

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Section E. Executive Summary

This document provides the results of the evaluation of the Department of Commerce and Economic Opportunity (DCEO) Public Sector New Construction (PSNC) Program that began June 1, 2009.[1] The program provides incentives to improve the efficiency of newly constructed public buildings with a target market of local governments, K-12 schools, community colleges, public universities, and state buildings throughout Illinois.

DCEO uses internal staff to manage, implement, and administer the program. The Smart Energy Design Assistance Center (SEDAC) reviews project documentation, energy models based on a set building design,[2] and recommends appropriate incentives. Program records show that by the close of PY3 (May 2011), four projects received incentives through the program, two from PY3 and two from PY2. DCEO provided incentives on a design basis for three projects and one project earned incentives on a measure-level basis.

E.1 Evaluation Objectives

The objectives of the evaluation are to: (1) Quantify net energy (kWh) and peak demand impacts for the program cycle (June 2009 to May 2011); and (2) Determine key process-related program strengths and weaknesses and provide recommendations to improve the program.

In early 2010, our evaluation team reviewed the PY2 evaluation plan for this program to assure ourselves that plans made the previous year (before the program began) were still relevant. Through contact with the DCEO program manager, we found that as of 2/2/2010 there were two projects completed to date and none slated to be completed prior to May 31, 2010. These two projects had a combined funding of $75,000.

Based on this finding, and to be prudent with our evaluation resources, we did not evaluate the Public Sector New Construction Program in PY2. To complete the evaluation of the three-year cycle of programs, we now assess all participants of the program. That is, the two PY2 projects are included in this evaluation and reported on herein. We have assigned any required adjustments to PY3.

[1] The annual cycle for the portfolio of programs is from June 1 to May 31.

[2] Throughout this report, it is important to consider the distinction between 'design modeling' which occurs *before* the building design has been set, and 'building energy modeling' which is done *after* the design has been set. The program provides incentives based on the latter form of modeling.

E.2 Evaluation Methods

The evaluation team used in-depth interviews of program implementers and participants to reach conclusions in the process analysis. We used engineering desk review of all four sites to assess gross impacts as well as onsite inspections to assure that the measures were in place and operating. We calculated net impacts using self-reported data from participants.

E.3 Key Findings

This section presents the gross and net energy and demand savings results followed by the process analysis findings from the DCEO PY2 to PY3 Public Sector New Construction Program.

E.3.1. Impact Findings

There were four completed projects through the PY2 and PY3 program with ex-ante gross savings (i.e., the results expected by the program from the four projects before any adjustments) of 971 MWh. The ex-post gross savings were 702 MWh (165 MWh in Ameren territory and 537 MWh in ComEd territory).

When comparing the ex-ante results to the ex-post gross impacts, the evaluation analysis reduced the gross impacts by 28% for energy and 38% for demand (Table E-1). The changes in ex post gross were mainly due to two projects in which a combination of one or more of the following were present: 1) efficiency measures required by code were awarded incentives; 2) the operation of the facility was not accurately represented in the energy model calculations; and 3) the energy model submitted by contractors or vendors was not consistent with the modeling approaches given in ASHRAE 90.1 Appendix G.

Ex-post net savings were 351 MWh (82 MWh for Ameren and 269 MWh for ComEd). The net-to-gross ratio (NTGR) was 0.50 for the program (compared to the ex ante assumption of 1.0). This result is due to two customers, who represent 39% of the expected savings across the four projects, stating that the program had no influence on the energy efficiency choices made on their projects. Both of these customers stated that the designs of their respective projects were set before they knew about the program; and, in one case, construction was already complete. It is a common challenge for new construction programs to get to participants early in the design process. This is particularly challenging for new programs as they enter the market. Thus we are not surprised at the NTG result.[3] The program, as with all new construction programs, will have to work hard at getting in early in the design process and recognizing when they have arrived on the scene too late to affect the efficiency of the building.

[3] As a comparison, ComEd's C&I New Construction program had a NTGR of 0.59 for their first year and 0.65 for their second year while the 2006-2008 California Nonresidential New Construction program had a NTGR of 0.63.

Table E-1. Program Gross & Net Savings – Public Sector New Construction

	Ex-Ante Gross	Ex-Post Gross	Realization Rate	Ex-Post Net	Net-to-gross Ratio (applied to ex-post gross)
MWh	971	702	72%	351	0.50
MW	0.295	0.182	62%	0.09	0.50

DCEO's net plan target across PY2 and PY3 was 2,807 MWh (737 MWh in Ameren territory and 2,070 MWh in ComEd territory).[4] However, these goals may have been high for the program due to low construction in the sector. Program staff reported that state funding is used within the sector they serve (aside from universities and schools) and there has not been any available funding for ten years. While schools can go to districts if they get bond referendums to pass, this can be a lengthy process. Both issues reduce the likelihood of new construction in the public sector.

E.3.2. Impact Recommendations

To improve the gross impact realization rate between ex ante and ex post values from completed projects, the evaluation team makes the following three recommendations:

1) Ensure incentives are awarded for efficiency measures only if they exceed levels required by code.
2) Accurately represent the operation of the facility in the energy model calculations.
3) Ensure that the energy models submitted by contractors or vendors are consistent with the modeling approaches given in ASHRAE 90.1 Appendix G.

To increase the program's impact on the project's design and energy efficiency, the evaluation team makes the following recommendation:

1) Reach customers early in the design process and channel them into SEDAC's Design Assistance Program.

[4] Source: Commonwealth Edison Company's 2008 – 2010 Energy Efficiency / Demand Response Plan, Docket No. 07-0540, November 15, 2007 (Table 2). Ameren Illinois Utilities 2008 – 2010 Energy Efficiency / Demand Response Plan, November 15, 2007 (Table 12)

E.3.3. Process Findings

All participants we interviewed found DCEO and SEDAC program staff courteous and helpful, allowing participants to successfully progress through the program. Participants were grateful to receive the program incentives. Half the participants could point to how the program funding increased the energy efficiency of the final construction. Participants found the application process "straightforward" but some found the documentation process required to receive incentives difficult due to the expense and the level of detail required to complete it. Program staff identified several PY2 and PY3 implementation challenges mostly related to 1) receiving the energy model documentation; and 2) motivating customers with few incentive dollars. Program staff are aware that participant satisfaction with the program process was mixed.

PY2 and PY3 participant characteristics match program targets. Although program marketing and outreach efforts were modest, the program reached appropriate public sector targets. The program will likely benefit from continuing to market and outreach to potential customer and partner participants in the public sector. The program was not able to engage PY3 New Construction participants in the Design Assistance program, limiting the effectiveness of the program. However, some participants appear to be taking advantage of the Design Assistance program in PY4.

E.3.4. Process Recommendations

Program staff are already well aware of the main program challenges and are working toward appropriate solutions. The key recommendations we provide here are based on information we collected during interviews we conducted with program staff and participants.

Perform more marketing of the Design Assistance Program. Participants would likely benefit from earlier collaboration with SEDAC in their Design Assistance Program. While SEDAC staff are promoting the program in conversation with interested customers, the program's web page could help sell it a little more. The web page messaging highlights a few of the positive aspects of working with the SEDAC team in the design phase, but it might benefit the program to also highlight that more incentive dollars can result from the "higher performance".

Create a list of appropriate building energy modeling software reports. Program staff have found it difficult to communicate exactly what building energy modeling software reports participants need to submit. Over ten software programs qualify[5] and each identifies the necessary modeling reports differently. As of the program staff interviews, the program had not

[5] The program application directs participants to a Department of Energy website that lists qualified software for calculating commercial building tax deductions.

attempted to list the appropriate reports for each software that might facilitate participant documentation. Once several projects are coming into the program, program staff should spend the time to create a list that provides this level of information as it will increase clarity in the process.

Reframe the incentive to include building energy modeling expenses. Some participants were surprised by the building energy modeling and documentation requirements and found them expensive to complete, perhaps as much as 20% of the incentive received. Program staff suggested that the program possibly reframe the incentive not only as a way to help implement energy efficient design or measures, but also as a way to help cover the cost of the modeling. This is a good idea since it would also help alert potential participants to the existence of the building energy model requirement early on.

E-4 Cost Effectiveness Findings

Cost effectiveness is assessed through the use of the Illinois Total Resource Cost (TRC) test. Table E-2 summarizes the unique inputs used to calculate the TRC ratio for the Public Sector New Construction Program in PY3. Most of the unique inputs come directly from the evaluation results presented in this report. Measure life estimates were based on similar ComEd programs, third party sources including the California Public Utilities Commission (CPUC) developed Database of Energy Efficiency Resources (DEER) and previous Navigant evaluation experience with similar programs. Program costs data came directly from DCEO. Incremental costs were estimated from program, survey data and similar ComEd programs. Avoided cost data came from both ComEd and Ameren and are the same for all programs.

Table E-2. Inputs to TRC Model for Public Sector New Construction Program

Item	Value Used
Measure Life	12 years
Participants	4
Annual Gross Energy Savings	702 MWh
Gross Coincident Peak Savings	0.18 MW
Net-to-Gross Ratio	50%
DCEO Administration and Implementation Costs	$1,900
DCEO Incentive Costs	$45,743
Net Participant Costs	$67,014

Based on these inputs, the Illinois societal TRC for this program is 2.44 and the program passes the Illinois TRC test.

Section 1. Introduction to the Program

1.1 Program Description

The Illinois Department of Commerce and Economic Opportunity (DCEO) began their Public Sector New Construction (PSNC) Program June 1, 2009.[6] The program provides incentives to public sector customers of ComEd and Ameren Illinois Utilities to improve the efficiency of newly constructed public buildings with a target market of local governments, K-12 schools, community colleges, public universities, and state buildings throughout Illinois.

1.1.1 Implementation Strategy

DCEO uses internal staff to manage, implement, and administer the program. Program records show that by the close of PY3 (May 2011), four projects received incentives through the program. DCEO provided incentives for three of the projects on a design basis and one project earned incentives on a measure-level basis.

The PY3 program application form lists eligibility criteria and incentive levels. The program bases incentives on how much the project exceeds the Illinois Energy Conservation Code for Commercial Buildings (IL ECC), with a maximum grant award of $2 per square foot.

DCEO contracts with the Smart Energy Design Assistance Center (SEDAC) to provide technical assistance. SEDAC funds come from grant monies. The DCEO grant funding provides audit and design review services and was set up 5-6 years before the current Energy Efficiency Program opened. SEDAC funding comes from the two utilities as well as the Department of Energy (DOE) through State Energy Program (SEP) funds (but no ARRA funds). The DCEO modified the SEDAC contract to include specific technical assistance scopes for Public Sector New Construction. According to SEDAC program staff, about 1 to 5% of SEDAC's weekly activities relate to the New Construction program.

Within the Public Sector New Construction program, SEDAC reviews project documentation to determine the incentive. In this role, SEDAC staff communicate with participants to clarify and complete documentation as necessary; compare the building energy model and the construction documents to ASHRAE 90.1 Appendix G model[7]; and report findings and incentive recommendations to DCEO.

SEDAC is also poised to provide program participants with building design assistance, although none of the four projects made use of it. Design Assistance is a separate program and

[6] The annual cycle for the portfolio of programs is from June 1 to May 31.
[7] This comparison is a requirement of the program.

would be provided to participants during the building design process, earlier than when participants are currently stepping into the New Construction program. Following design assistance, SEDAC would then channel public sector participants into the non-design assistance variant of the New Construction program as appropriate.

Marketing and Outreach

Both DCEO and SEDAC have roles in marketing the program. DCEO primarily markets the program directly to public sector customers, attempting to gain entrance into and raise awareness within networks of schools, including universities, and local government associations. Up until December 2010, marketing efforts were led by a DCEO employee who has since retired. For the remainder of PY3, marketing was divided among other DCEO staff. Throughout PY2 and PY3, there were no written marketing materials that solely featured the New Construction program. Instead, marketing materials also included other DCEO programs.

SEDAC provides marketing and outreach in two main ways. First, it hosts a web page for the program which provides a program overview, incentive levels, links to the applications and information sources, and the information needed to apply. Second, SEDAC promotes the program while promoting other energy efficiency programs. SEDAC promotes DCEO public sector energy efficiency (PSEE) programs, as well as other energy efficiency programs for ComEd and Ameren Illinois Utilities. Thus, when SEDAC staff market programs at workshops, conferences, and to different trade ally groups, they do not solely market the New Construction program. ComEd, Ameren, and DCEO implementers provide cross-program promotion for each other's programs. The New Construction manager noted that a significant amount of outreach occurs at ComEd's trade ally event at which DCEO presents a 30 minute presentation covering all their programs. SEDAC also channels trade allies and customers who may be involved in other efficiency programs into the New Construction program when appropriate.

Goals

We present the net MWH savings goals for the PY2 and PY3 Public Sector New Construction in Table 1-1. DCEO has stated that their Public Sector goals are significantly higher than the legislative goal as a percent of total sector consumption.[8]

[8] Communication from David Baker, DCEO, December 6, 2010.

Table 1-1. Public Sector Electric Efficiency New Construction Program PY2 and PY3 Planned Savings Goals

	Net MWh		Net MW[a]	
Service Territory	Ameren Illinois	ComEd	Ameren Illinois	ComEd
DCEO Plan Net Target PY2 & PY33	737	2,070	0	0
DCEO Expected Net Savings PY2 and PY3 (ex ante)	165	537	.016	.166

Source: Commonwealth Edison Company's 2008 – 2010 Energy Efficiency / Demand Response Plan, Docket No. 07-0540, November 15, 2007 (Table 2). Ameren Illinois Utilities 2008 – 2010 Energy Efficiency / Demand Response Plan, November 15, 2007 (Table 12). Ex ante values from DCEO program files.
[a] *There are no planned demand goals for this program.*

1.1.2 Measures and Incentives

While the program works with all involved entities, the person who owns the buildings is the qualifying applicant for incentives. For public sector new construction, determining the most appropriate entity for the incentive is not always straightforward. For example, one project was a state owned botanical gardens and built by a not-for-profit 501c3, but the state forest preserve owns the building. DCEO worked with the botanical garden to determine details around the project, but the incentives went to the forestry entity as the qualifying applicant.

Incentives are set based on the year in which the qualifying application was submitted. Because projects can span a number of program years, the incentives do not change, regardless of when the project is completed.

Based on our review of the program's PY1 application (also used for PY2) and the PY3 application, the program made several changes in its incentive structure starting in PY3. In Table 1-2 below, we compare the incentives (Incentives section 2.5) appearing in each application. Notably, while the general principle guiding incentive awards was maintained, the maximum grant award moved from a set dollar amount to a maximum rate.

Table 1-2. PY3 Incentives Changes

Aspect	PY1 and PY2 Application	PY3 Application	Comment
General Principle	"The incentives will be set based on how far beyond the Illinois Energy Conservation Code for Commercial Buildings that the building or the building components will be constructed..."		No change from one application to the other

<table>
<tr><th>Aspect</th><th>PY1 and PY2 Application</th><th>PY3 Application</th><th>Comment</th></tr>
<tr><td>Maximum Base Incentive Rate</td><td>“The maximum incentive rate will be $0.05 per kWh saved.”</td><td>“The maximum incentive rate will be $0.08 per kWh saved.”</td><td>The rate increased by $0.03 per kWh</td></tr>
<tr><td>Design Bonus for total building performance and LEED-qualifying buildings</td><td>“Total building performance”
<table><tr><th>Performance beyond code (kWh)</th><th>Incentive per sq. ft.</th></tr><tr><td>10%</td><td>$0.20</td></tr><tr><td>15%</td><td>$0.40</td></tr><tr><td>20%</td><td>$0.60</td></tr><tr><td>25%</td><td>$0.80</td></tr><tr><td>30%</td><td>$1.00</td></tr></table></td><td>“Buildings seeking LEED Silver, Gold or Platinum”
<table><tr><th>Performance beyond code (kWh)</th><th>Incentive per sq. ft.</th></tr><tr><td>10%</td><td>$0.20</td></tr><tr><td>15%</td><td>$0.40</td></tr><tr><td>20%</td><td>$0.60</td></tr><tr><td>25%</td><td>$0.80</td></tr><tr><td>30%</td><td>$1.00</td></tr></table>“Maximum bonus cannot exceed $50,000.”</td><td>No change in incentive level from one application to the other; however, the design bonuses are referred to differently, and a maximum bonus incentive was added in PY3.</td></tr>
<tr><td>Total Incentive</td><td>“The total incentive cannot exceed 100 percent of the incremental measure cost and 50 percent of the project cost.”</td><td>“The total incentive cannot exceed 100 percent of the incremental measure cost and 75 percent of the project cost.”</td><td>The project cost maximum increased by 25 percentage points.</td></tr>
<tr><td>Maximum Grant Award</td><td>“The Department may provide up to, but not more than, a maximum grant award of $100,000 for projects 10%-20% beyond code and $200,000 for projects 25%-30% beyond code.”</td><td>“The Department may provide up to, but not more than, a maximum grant award of $2.00 per square foot for projects (Base plus Bonus Incentive).”</td><td>Moved from a set dollar amount to a maximum rate.</td></tr>
</table>

1.2 Evaluation Questions

In early 2010, our evaluation team reviewed the evaluation plan for this program to verify that plans made the previous year (before the program began) were still relevant. Through contact with the DCEO program manager, we found that as of 2/2/2010 there were two projects completed and none slated to be completed prior to May 31, 2010. These two projects had a combined funding of $75,000.

Based on this finding, and to be prudent with our evaluation resources, we did not evaluate the PY2 Public Sector New Construction Program. To complete the evaluation of the three-year cycle of programs, we have assessed all projects in the program. That is, the two PY2 projects are included and we assigned adjustments to PY3.

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:

1. Has the program as implemented changed from the plan filed with the ICC? If so, how, why, and was this an advantageous change?
2. What challenges have occurred in implementation and how were they handled?
3. What are the characteristics of the customers and program "partners" (which encompass local governments, K-12 schools, higher education entities, and the Capital Development Board) participating in the programs and is this the expected group for participation? Who should be more involved but is not, and how can the program increase their involvement?
4. Is the program outreach to customers and program partners effective in increasing awareness of the program opportunities?
    a. What is the format of the outreach?
    b. How often does the outreach occur?
    c. Are the messages within the outreach clear and actionable?
5. Are the program processes effective for smoothly providing incentives to customers and motivating customers and program partners to participate?

a. What is the timing from start to finish for projects that go through this program?

b. How quickly does the program answer customer and program partner questions?

c. What is the expectation of the program partners and are they fulfilling that role?

d. Are customers and program partners satisfied with the program processes in which they were involved?

e. Is the application process onerous?

Section 2. Evaluation Methods

As a part of the overall portfolio, the risk of non-performance by this program is low as the targeted ex ante[9] impacts are a small percent of the portfolio energy savings (0.8%). Additionally, with four projects, the evaluation costs were low. For these reasons, the evaluation activities for PY3 are limited (about 4% of the overall evaluation budget).

For the Public Sector Non-Residential New Construction program assessment, the Navigant Consulting team conducted in-depth interviews with the DCEO program manager, two SEDAC staff and all participants. The gross impact analysis was based on an engineering desk review using computer simulation modeling and engineering algorithms. We performed onsite audits of each site to verify installation. We based the net impact results on the self-report method.

The Public Sector New Construction program allows participants freedom to design or retrofit their new facilities without prescribed efficiency measures, which may include innovative HVAC systems, for example. Such measures are potentially too diverse and interdependent for a prescriptive program. For this reason, we based our ex-post impact assessment on a whole building simulation of the efficient design compared with a minimally code-compliant building.

SEDAC provided the evaluation team with their electronic computer simulation for us to review. We obtained hardcopy information on each site through an onsite visit to DCEO in March 2011.

Table 2-1. Data Collection Summary

What	Who	How Many	When	Purpose
In-Depth Interview	DCEO Program Manager and SEDAC Staff	3	March 2011 and September 2011	Process
In-Depth Interview	Program Participants	7 individuals from all 4 projects	September 2011	Process and Impact
Engineering Review	Data from Program Implementer	4 projects	August 2011 to September 2011	Impact

We provide a detailed write up of the evaluation methods in appendix Section 5.1.

[9] Ex ante refers to the program estimated impact found in the program tracking database.

Section 3. Program Level Results

3.1 Impact Results

3.1.1 Verification and Due Diligence

The evaluation team obtained the hard copy and electronic copy of all four projects. We verified the information found in the hard copy via onsite audits of each project.

3.1.2 Gross Program Impact Results

Across PY2 and PY3, there were four completed projects. Table 3-1 shows the gross ex ante and ex post savings by project, including individual project realization rates, for the population of projects.

Table 3-1. Program Gross Savings for by Project

Project	Ex Ante KWh	Ex Post kWh	Gross kWh Realization Rate	Ex Ante kW	Ex Post kW	Gross kW Realization Rate
Project 1	272,831	262,831	96%	168.9	165.9	98%
Project 2	248,841	248,841	100%	0	0	
Project 3	105,866	25,766	24%	0	0	
Project 4	343,908	164,879	49%	126	15.9	13%
Total	971,446	702,317	72%	295	182	62%

Source: Ex ante: Files submitted by DCEO to EM&V Team
Ex post: EM&V analysis.

As shown above, we adjusted the energy savings downward for three projects and made no change for one project. Next, we provide a short write up of each project.

Project #1 was a 76,738 sq. ft. municipal building in the ComEd service territory. The efficiency measures claimed for this facility included windows that exceeded code requirements for U-value and Solar Heat Gain Coefficient (SHGC), roof and wall constructions that exceeded code required R-values, efficient lighting design, occupancy controls, variable speed drives (VSD), condensing boilers, a heat recovery chiller, condensing hot water heater, and an underfloor air distribution system. We calculated the savings for these measures by the customer's contractor using DOE 2.1e.

We physically verified each of the measures and interviewed the customer to determine the operating characteristics. All of the measures were found to be installed and operating consistent with the model definitions, with the exception of the roof insulation level. The savings were determined based on an assumed U-value of 0.039. This value seemed excessively

low for the amount of polyisocyanurate installed. For the ex post analysis, we increased the U-value to 0.046. This reduced the expected savings by 3 kW and 10,000 kWh. We note that the SEDAC report also noted that the U-value used in the analysis appeared low, but it does not appear that any savings adjustments were made.

Project #2 was a 36,184 sq. ft. research building in the ComEd service territory. The efficiency measures claimed for this facility included roof, wall, and slab constructions that exceeded code required R-values, variable speed drives, condensing boilers, an efficient water-cooled chiller, heat recovery, and photovoltaic panels.

We physically verified each of the measures and interviewed the customer to determine the operating characteristics. All of the measures were found to be installed and operating consistent with the model definitions. We made no changes to the savings estimates.

Project #3 was a 110,000 sq. ft. school building in the ComEd service territory. The efficiency measures claimed for this facility included variable speed drives, condensing water heaters and occupancy sensors on the lighting. Claimed energy savings for this project came from the occupancy sensors and variable speed drives.

We physically verified each of the measures and interviewed the customer to determine the operating characteristics. The site visit revealed that an electronic lighting management system controls occupancy sensor set points for the building. These set points are set to a one-hour delay during class periods. After 4pm, the set points are reset to 15 minutes. Per the facility manager, the effect is that lights do not turn off during school hours. As programmed, occupancy sensors might claim an average of a half-hour savings each afternoon (about 90 hours total for the school year) after teachers leave and before the time-of-day control turns off lights. This is substantially lower than the ex ante calculation assumption that the controls turned off lights for about 431 hours. Further diminishing impact, the ex ante figure assumes savings for all 81.5 kW of occupancy controlled lighting—even for code required controls in classrooms and lunch and break rooms. Approximately 10 kW of occupancy controlled lighting is located in spaces (such as corridors and restrooms) not already required by code to be fitted with occupancy controls.

The ex ante savings calculation claimed 262 hp of motors controlled by VSDs. Code requires air-handler fans larger than 10 hp (170 hp out of the 262 hp in the ex ante calculation) to have some kind of part load control. Installation of VSDs on these motors should not be considered program impacts. However, the hot and chilled water circulating pumps exceed code requirements. The impact adjustment reflects the removal of the air-handler fan horsepower from the ex ante incentive calculation.

Project #4 was a 27,195 sq. ft. health care building in the Ameren service territory. The efficiency measures claimed for this facility included windows that exceeded code requirements for U-

value and Solar Heat Gain Coefficient (SHGC), roof and wall constructions that exceeded code required R-values, efficient lighting design, energy recovery, and Variable Refrigerant Flow (VRF) heat pumps.

We physically verified each of the measures and interviewed the customer to determine the operating characteristics. All of the measures were found to be installed and operating consistent with the model definitions report.

We also reviewed the building model parameters. Several issues were found with the model. First, the baseline model used to determine the savings had 40% glazing. Although 40% glazing is allowable under the code, per ASHRAE 90.1 Appendix G, for determining energy savings the baseline model should have the same percent glazing as the proposed building model, up to a maximum of 40% glazing. In addition, the baseline system used in the analysis was a constant volume dual-duct system. These systems control the heating and cooling delivered to a space by mixing air from a hot deck with cooled air from a cold deck. This use of concurrent heating and cooling is prohibited by code[10]. In addition, this type of system is inconsistent with the baseline model definitions used in ASHRAE 90.1 Appendix G, which suggests a packaged rooftop variable air volume (VAV) with electric heat. The heating and cooling efficiencies used in the analysis were also found to be incorrect. The cooling EER used was 9.3, which is the value for air-source heat pumps. However, the model used electric resistance heating. It is not consistent to use an air source heat pump for cooling, but not use the heat pumps for heating. The fan power was examined for the model as well. Based on the reviewed parameters, the fan power use exceeded the fan motor horsepower allowed by code.

Finally, the model suggested that no heating energy is required. It is likely that this was done to include the effects of the VRF heat pumps system, which recover heat from cooling zones and use the heat for zones that are in heating. However, our model showed that the cooling load in the peak winter months was insufficient to fully eliminate the heating load for the building. Along with the difference in windows between the original baseline model and the proposed case, the baseline model's heating and cooling systems were defined incorrectly. This skewed seasonal energy use resulting in much lower demand savings than expected, as well as reduced overall annual energy savings.

For the ex post analysis, an alternate building model was created using eQUEST. The baseline model was created using a packaged VAV with Parallel Fan Powered (PFP) boxes and electric resistance heat. The window areas for the baseline and proposed models were set equal to the observed window areas. The heating and cooling efficiencies were taken from the code minimum efficiencies for the baseline system type. All other parameters, when appropriate,

[10] We applied the code applicable at the time of the building's construction. For this project, that was the IECC 2006 code.

were taken from the original model definitions provided. The VRF system was modeled using an external calculation, which reviewed the loads for each zone, and reduced the cooling energy to account for the total net heating and cooling loads for each VRF system.

Although two of the four projects reviewed had significant changes made to the savings during the evaluation process, we note that there are many positive aspects of the program as well. First, three of the four projects reviewed were analyzed on a "whole-building" approach and had efficiency improvements being made to HVAC systems, HVAC equipment, shell, and lighting aspects. Many new construction programs rely heavily on lighting, with minimal savings coming from other areas. The inclusion of multiple systems and shell components indicates thoughtful analyses. Second, the review of the projects completed by SEDAC appears to be thorough and well documented. In some cases, SEDAC reviewers made the same recommendations for the changes that that the evaluation team ultimately made.

3.1.3 Net Program Impact Results

Our net-to-gross interviews reached participants representing all projects and thus 100% of the ex ante gross impacts. For this type of program, we use all information from our in-depth conversations with the customers to determine attribution. We include both closed ended questions to calculate a NTGR value and open-ended questions to adjust that value as deemed appropriate. As we discuss in the methods section in Section 5.1.1, we carefully reviewed the NTG responses from each of our interviewees and concluded that no adjustments to the customers' responses were necessary.

Weighting the project-level NTG values by project savings produced a total program-level NTG ratio of 0.50. This result is due to two customers, who represent 37% of the expected savings across the four projects, stating that the program had no influence on the energy efficiency choices made on their projects. . Both of these customers stated that the designs of their projects were set before they knew about the program; and, in one case, construction was already complete. Notably, we reached two representatives for each of these projects, including both customer and designer project participants. In all interviews, all participants of these projects consistently stated that the program, had no influence on the projects' design or construction. It is a common challenge for new construction programs to get to participants early in the design process. This is particularly challenging for new programs as they enter the market. Thus we are not surprised at the NTG result. The program, as with all new construction programs, will have to work hard at getting in early in the design process and recognizing when they have arrived on the scene too late.

When applied to the total ex post gross impacts, this NTG ratio yields the final net impacts shown in Table 3-2 below.

Table 3-2. Program Net Impacts

Metric	Ex Post Gross Impacts	NTG Ratio	Ex Post Net Impacts
kWh	702,317	0.50	351,010
kW	182	0.50	91

3.2 *Process Evaluation Results*

There are many themes to explore during a process evaluation. Our evaluation questions focused on five specific themes:

1) changes made to the program during PY2 and PY3;
2) challenges in implementation during PY2 and PY3 and how were they handled
3) marketing and outreach;
4) characterizing the partners and customers participating in the program; and
5) effectiveness of the program processes in motivating customers and program partners to participate and providing incentives to participants.

We first provide a synopsis of all areas to bring out the value of the program and then go through the results found for each theme. This analysis is based on the responses of seven participants (including customers and program partners) from the four projects, as well as two program staff and one program manager. Although we interviewed representatives from all projects, since there is a small number of respondents, we do not provide statistics such as percentages. We bring out relevant quotes to show context in each area. Aside from the next section (which is a summary across the process evaluation), the first paragraphs of Sections 3.2.2 to 3.2.6 give the conclusion of our analysis of that section. Additional information is provided after that paragraph to show how those conclusions were reached.

3.2.1 Value of the program

Participants tended to view the program incentives as extremely small percentages of the overall project budgets (i.e., 0.05% to 0.6%). On three of the four projects, when asked about the influence of the incentive on the energy efficient design and implementation, participants compared the incentive amount to the overall project cost. Yet, all participants were also grateful to receive the incentive. For example, one participant stated:

> *It's difficult to find support for energy efficiency, even though (energy efficiency) is popular. And so the (program's financial) support was certainly welcome. That we certainly are grateful for." –Customer*

However, program records for the three projects receiving design-based incentives show that incentives tended to represent large portions of the incremental costs associated with energy efficient design, 14%, 29%, and 38%. The payback periods were eleven, three and three years respectively. Further, half the participants could point to how the program funding increased the energy efficiency of the final construction. For example, one participant explained that the program incentives helped keep in efficient design features that would have otherwise been removed:

> *"Some of the (efficient lighting design features) we would have had to cut out, were it not for these grant monies. We were able to put (them) back in….We (had) the funding available to improve on what the (architect) value engineered out" –Customer*

The program manager believes that the program incentives are valuable because they give architects a sales tool. Combined with other incentives in the marketplace, such as those from the Clean Energy Foundation, some LEED costs may be offset and architects may have an easier time in getting customers to accept LEED design. Notably, two of the four the program's projects sought LEED-Gold certification.

Finally, all participants we interviewed found DCEO and SEDAC staff courteous and helpful, allowing participants to successfully progress through the program. For example, one participant stated,

> *"I thought (program staff) were very responsive; they were very helpful. They gave us ideas. (For example, when) we couldn't generate the (modeling) data on our own,(they let us know) how we might go about it, such as what types of people we might want to contact within our own resources and so on." -Customer*

3.2.2 Program Changes

This evaluation found only one major program change in PY3. The program's incentive structure underwent a few, mostly minor, changes. Notable, the maximum grant award changed from a set dollar amount to a maximum rate (See Table 1-2).

3.2.3 Program Challenges

Section Summary: Program staff identified several PY2 and PY3 implementation challenges mostly related to 1) receiving the energy model documentation; and 2) motivating customers with few incentive dollars. Program staff have sought solutions to most of these challenges, yet some remain.

In this section, we describe the challenges by primarily drawing on interviews with program staff, and secondarily by drawing on interviews with participants. Since the main challenges are

participant-facing issues, we revisit them in more depth in the Effectiveness of Program Processes section.

Inter- and Intra- Program Communication

One challenge stemmed from the program having multiple customer-facing contacts, i.e. DCEO and SEDAC staff. Participants sometimes sent application materials intended for one contact to the other. In other cases, participants were not fully aware of all the materials that they needed to submit to SEDAC. However, program staff noted that communication between DCEO and SEDAC, along with facilitation of document delivery, improved in PY3:

> *I think most of the issues that we had early on have been worked out. Early on there were some problems with communication, getting the documents that were being delivered to DCEO, getting them through Springfield, and getting them here. But that has all been worked out. We have worked hard on this program to make it flow much better and from the administrative side it is working quite well. –Program Staff*

Further, staff described a current level of good communication between the two groups citing: 1) a weekly meetings that takes place between the two groups; 2) the accessibility and receptivity of their partners in the other group; and 3) important changes in the application accomplished by the two groups working together:

> *[DCEO staff] has been extremely receptive to how we need information brought to us, so that we can best look over these projects and give DCEO the best input back of how we feel that project fits into the goals of the program…(For example), we need to have construction documents…(and) … information on the model. On all these sorts of specifics [DCEO staff] has worked with us very well at incorporating into the application and the information available on the program. –Program Staff*

Documentation and Modeling

The next set of major challenges for program staff stems primarily from the documentation in support of the building energy model participants are required to submit to SEDAC (Appendix D in the PY3 application). As noted earlier, the building energy model is not a design model used to evaluate possible designs. Rather, this model occurs after the design has been set and is used to evaluate the energy savings above code of the planned or final construction. There are several points of friction around the building energy model that the program has been working to overcome. In the next few paragraphs, we provide mainly program staff perspective on these issues, exploring participant perspective later in the report.

First, since the person completing the model is usually organizationally distant from the main project contact, program staff have to wait on, or communicate across, multiple layers of contact, through which model requirement details may get lost due to miscommunication:

> *The person that we are asking for this information from is often the owner's representative who is first one step removed from the design team … who are fairly often one or two steps removed from the company doing the modeling…because most consulting firms or architectural engineers aren't in the business of doing full building energy models so they fairly often subcontract that…So, it has been a matter of communicating through those three steps of communication to that entity whoever they are that has been doing the modeling and making sure they understand precisely what is needed. –Program Staff*

Second, program staff reported that some program participants did not fully expect or understand the building energy model requirements, a finding also reflected in participant interviews. Thus, as program staff reported, some participants were surprised by the documentation requirements:

> *We are actually asking for more documentation than LEED does so (participants) are a little bit taken aback when we suddenly appear out of the woodwork and say we require these documents. –Program Staff*

Thus, to manage participant expectations around required documentation, program staff created a list of all required program documentation in PY3 and added it to both the website and the PY3 application.

Third, program staff have also found it difficult to communicate exactly what modeling software reports participants need to submit. Over ten software programs qualify[11] and each identifies the necessary modeling reports differently. As of the time we interviewed program staff, the program has not attempted to list the appropriate reports from each software package that might facilitate participant documentation. Instead, in PY4, program staff are presently focused on a more basic conceptual step—increasing participant understanding of ASHRAE Appendix G, which we describe next.

Fourth, program staff noted that some participants do not understand what an ASHRAE Appendix G model requires or how to model it correctly. In some cases, participants do not understand that an engineering model of the building is different from the Appendix G model. In instances in which the building was modeled for LEED certification and therefore did use the Appendix G model, program staff found that some participants still did not model the building correctly. Program staff explained,

[11] The program application directs participants to a Department of Energy website that lists qualified software for calculating commercial building tax deductions.

> *If you go for LEED you have to do an appendix G model anyway, but LEED doesn't do a whole lot of verification... So (the participants) are not getting caught (but) when we look at (the model) we see that pretty quickly because we are looking at their inputs and outputs. LEED doesn't look at their inputs and outputs. So on several occasions we've had to go back and say 'You didn't model this correctly; we found all these discrepancies. We don't feel that your savings are going to equal what you are claiming. You have a choice of either remodeling it with these correct figures or you don't get an incentive'. – Program Staff*

Thus, in PY4, program staff are working on a fact sheet that addresses some basic underlying concepts to clarify the building energy model for participants:

> *We have in the works a modeling … fact sheet that might at least help some of the less experienced modelers understand where to look for the information that we generally send them to once they have applied…It would probably (include) an outline that would go through some of the steps that appendix G requires, so that people know right off the bat that their base building is prescribed by appendix G; it is not something that they get to decide or that (changes based on atypical aspects of the building). (For example,) they may have a precast building, but the base case is still going to be metal frame building. .... Some people really don't even get the sort of basic concept. –Program Staff*

A final model-related challenge for the program stems from contractors who believed that their energy model is proprietary. Thus, in some cases, program staff initially received only the model inputs and outputs, but could not immediately see how the two sets of information were linked. To assure themselves that the models were accurate required additional communication with the modeling contractors.

As described in the previous paragraphs, there are many challenges the program faces throughout the modeling documentation process which require increased communication and extended timing to support. To the staff's credit and as participant interview findings generally suggest, their communication efforts have succeeded. As one program staff explained,

> *We have always succeeded in getting what we needed from (participants). It has just taken a little bit more time sometimes than we would like. –Program Staff*

Finally, program staff note that the building energy modeling and documentation process is expensive for some, especially inexperienced, participants. Staff, as well as some participants, believe that the incentive levels make it difficult to convince some participants to put the effort into creating and documenting and energy model and thus participating in the program. As one staff explained,

> *I have actually had one consultant I was working with… say 'If I had known how little this incentive was I would have given the client the money myself and saved myself a*

headache of doing this energy model.' His feeling was that (given) the effort expended to do modeling, he would like to see a higher level of incentive… but that was from somebody relatively inexperienced. –Program Staff

Program staff believe incentive levels would have to double, to effectively motivate participant valuation of energy model creation and documentation. They believe that greater incentives would motivate participants to find out more about the program and focus on understanding its requirements in depth. Thus, they would learn more about the Design Assistance program opportunity. They also believe that a messaging change could be an effective way to raise awareness of the Public Sector New Construction program. We discuss this in the Participants

Section Summary**:** PY2 and PY3 participant characteristics match program targets. The program will benefit from continuing to market and outreach to potential customer and partner participants in the public sector.

Participant Targets

All PY2 and PY3 participants came from expected participant target groups. There was a good mix of customer types including state, municipal, and education participants. Two of the four projects, also included program "partners", i.e., architect, designer, and engineer market actors who during the interviews, praised the program. One partner knew about the program and recruited the project into it. The other learned about the program through the project, but became convinced of the value of the program and praised the performance based financial incentive design:

(The customers) got more money back (from the program) than the cost of us putting (the program application) together (and) I think that's great. It makes it worth their time and I think the energy efficiency measures they put in were all good, solid things… (The program criteria is the) bottom line performance and I think that's a good way to go about things as opposed to writing programs that specifically favor one type of technology… –Program Partner

While both the program partners described above are likely to recruit projects into the program in the future, one customer participant mentioned having to reiterate the importance of energy efficiency to the architect throughout the project. This suggests that not all design-side market actors have been convinced of the value of energy efficiency, indicating that the program will likely benefit from continued outreach to the design community.

In about half the interviews, participants suggested that a way to improve the program would be to increase marketing and awareness around it. For example, one participant stated,

(The program would benefit from)… a little better marketing…I can see that by going through so many hands before it gets to the person who would actually (submit) an

> *application, some (of the intended audiences) would get lost along the way. … So I think some more direct correspondence to …the departments within the (municipality) as opposed to the (municipality) itself, might actually allow DCEO to directly touch and impact the people and agencies that they're trying to. –Customer*

The mix of PY2 and PY3 customer types, the presence of program partner champions, and feedback provided in the interviews, suggests that the program will benefit from continuing to raise awareness of the program among potential customer and partner participants in the public sector. Based on our discussion with the DCEO program manager, it appears that knowledge of the program is diffusing through the target market as there are over ten projects in the pipeline for the next program cycle.

Marketing and Outreach section below.

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3.2.5 Marketing and Outreach

Section Summary: Through the modest marketing and outreach efforts (as described in the implementation section of this report), the program reached appropriate public sector targets. The program was not able to engage PY3 New Construction participants in the Design Assistance program, however there is some indication that this is changing. Framing the program incentive as a way to help pay for the energy model may help increase participation in the program.

Outreach to Public Sector Targets

Through the modest marketing and outreach efforts, the program reached appropriate public sector targets. Findings from participant interviews indicate that both customers and market actors learned about the program from various sources including the internet, at a municipal conference, and through an association of county board officials. Further, there is some evidence that awareness of the program is being raised by networks in the public sector, such that, at least one participant reported hearing about the program in two ways:

> *We actually heard about it in two ways almost simultaneously. I am the grant administrator for the department so I try to keep my ear out for things like that and while I was doing a little bit of research on these things there was something that came through the Northwest municipal conference …(Then), all of a sudden a (program) flyer came through from the mayor to the manager to me… –Customer Participant*

From our discussion with the DCEO program manager, we understand that knowledge of the program is diffusing through the target market as there are over ten projects in the pipeline for the next program cycle.

Design Assistance Program Opportunity

There is evidence that program outreach was not that effective in increasing awareness of the SEDAC's Design Assistance program during PY3. Interviews with both program staff and participants indicate that public sector customers and partners were hardly aware of the Design Assistance program, and the way participation in it might have increased savings and incentives for New Construction projects. Only one of the seven participants we interviewed for the four projects was aware of the design assistance offering. Yet, as program staff explained, the Design Assistance program can bolster energy efficiency during the design phase in several ways:

> *If a client comes to us and they were designing a new building we can work with them in a variety of different ways. We can just review and comment on their documents as they progress. We can help them run a (design) charette; we can be part of meetings; we can do basic modeling of the building to (provide) elimination parametrics to help them focus in on what the best strategies would be for their building. –Program Staff*

Program staff noted that they have "recently starting pushing" this program as they notice building picking up:

> *With the economy the way it was there was so little building going on. But we are seeing that starting to pick up, so we are really trying to stay ahead of that and see if we can help push changes and better design from the beginning of the projects…when we get calls (from potential participants), we always urge them to apply for our Design Assistance program if they are still in the design phase. –Program Staff*

Consistent with recent staff efforts to promote the complementary programs, staff mentioned that two PY4 New Construction projects first went through the Design Assistance program, while another two public sector projects participated in the Design Assistance program and may submit a New Construction application late in PY4 or in PY5.

The New Construction program web pages have contained messaging that encourages participation as early in the process as possible:

> *Project Planning and Concept Phase: We are ready to help! Contact the SEDAC New Construction team as early in the design process as possible…The team can offer analysis and technical assistance that can enable you to achieve higher performance and reduce operating costs for the owner and/or tenant. –Program Web Page from Fall 2011*

While this message highlights a few of the positive aspects of working with the SEDAC team early on, it might benefit the program to also highlight that more incentive dollars can result from the "higher performance".

Reframing the Incentive

As described in the Program Challenges section above, some participants were surprised by the building energy modeling and documentation requirements and found them expensive. Program staff suggested that the program possibly reframe the incentive not only as a way to help implement energy efficient design or measures, but also as a way to help cover the cost of the model:

> *Right now we say the incentive is to help pay for the added cost of a better building, but maybe we say the incentive is for the added cost of a better building and computer modeling. So that people feel like it is being paid for and it is not coming out of their pocket. –Program Staff*

Based on participant statements, it seems that some participants spent perhaps as much as 20% of the incentive amount on submitting a building energy model to the program. Due to this unexpected cost, one program partner believes it is difficult to convince customers to pay for the energy model:

> *I think the hardest part is getting the owner or the client to be onboard with (program requirements) from the beginning … If you wait until the end usually it's a much harder sell and … it takes us more work to put (the model and application) together... To go back and ask (the client) for more money for (the model) is tough. –Program Partner*

Thus, the program staff suggestion to change the framing of the incentive would also help alert potential participants to the existence of the building energy model requirement early on.

3.2.6 Effectiveness of Program Processes

Section Summary: Overall participant satisfaction with program processes was mixed. While all participants appreciated the program incentives and found the application process "straightforward", some found the documentation process required to receive the incentives difficult.

In this section, we explore the effectiveness of the program processes in motivating customers and program partners to participate and providing incentives to participants. Although we primarily draw on participant interview data in this section, as will be shown, most of the findings are consistent with the challenges described by program staff in the Program Challenges section above.

Incentives

As described above, participants were grateful to receive incentives. For example, one participant stated:

> *We would have liked to have gotten more grant money for (our project) but…we were happy with what we got. Every little bit helps. –Participant*

Additionally, all participants stated there were no issues in receiving the incentive payments once the necessary paperwork had been completed.

Half the participants could point to how a small amount of program funding nevertheless increased the energy efficiency of the final construction. In two of the four projects, customers could clearly point to how the incentive dollars influenced and supported energy efficient lighting design. However, in two other cases, participants claimed there was no influence of the program incentive on the efficiency of the building. Both of these customers stated that the designs of their respective projects were set before they knew about the program; and, in one case, construction was already complete.

Application Process

All participants found the 'pre-approval' and 'final' application processes "straightforward". Participants tended to distinguish these application processes from the construction documentation and energy model submissions which they found much more "cumbersome". As one participant explained,

> *Those (pre-approval and final applications) are fine. They're very straightforward and they explain exactly what you need to do. Those were easy. –Participant*

Further, participants found DCEO program staff "very helpful" in introducing the program and the application process.

Documentation Process

Consistent with the challenges in the modeling process the program staff described above, two of the three participants who submitted the building energy model and construction documentation to SEDAC found the process difficult. Generally, they did not expect the documentation would require extensive modeling detail beyond what they might have already prepared for LEED and thus were unprepared for the "cumbersome" or expensive process. One participant stated that if the project team knew in advance how much paperwork they would have to submit, they would not have participated in the program. Another participant from the same team explained,

> *It was the single most onerous (set of) reporting requirements that I've experienced in …responding to grants of all types... I spent probably $3,000 getting an architect to ferret out and arrange the information that the grant asked for, because it was so obtuse... –Participant*

Another participant from a different project also expressed surprise with the requirements and the underscored the number of personnel needed to complete the documentation:

> *I was a little bit surprised by the depth and scope of what was required (for the energy model) and I did have to enlist the help of the architect and their engineering consultants and [commissioning] agent and so on to gather some of the data. …(which was) problematic because we had to involve (so many personnel) (and) they were not paid to help with a grant. –Participant*

In both cases, the participants implied or explicitly stated that they did not think it should cost money to complete the applications for grant money, with one participant calling it "counter intuitive".

Participant expectations and understanding of the documentation process appear to correlate with how long they were involved with this program process. Program staff explained that timing can last between one and a half months to five months depending on how quickly they are able to get information from the project team. As program staff explained, in some cases where SEDAC must follow up, "it can take a month or two to get answers to our questions and that makes it take a long time."

Notably, all participants, including those that found the documentation process unexpectedly difficult, reported that SEDAC staff were courteous and helpful. Additionally, unlike the two described above, the third participant, an engineer and designer with some experience with efficiency incentive programs stated that the documentation process was "very straightforward…and went very smoothly. " Hence, the potential exists to change participant perception of the program's documentation process, and as described above, program staff have been working on ways to improve it.

3.3 Cost Effectiveness Review

This section addresses the cost effectiveness of the Public Sector New Construction Program. Cost effectiveness is assessed through the use of the Illinois Total Resource Cost (TRC) test. The Illinois TRC test is defined in the Illinois Power Agency Act SB1592 as follows:

> *'Total resource cost test' or 'TRC test' means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to the system and the participant in the delivery of those efficiency measures, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases.*[12]

Navigant developed an Excel based TRC model that incorporates all relevant program level data including avoided costs, line losses, gross savings, free ridership, program costs and CO_2 reductions. It then calculates a TRC that meets the requirements of the Illinois Power Agency Act SB1592. The two electric distribution companies (EDCs) that pass funds to DCEO's programs, ComEd and Ameren, utilize different avoided costs in calculating the benefits that accrue from energy efficiency programs; therefore Navigant employed each utility's specific avoided costs to their corresponding energy and demand savings from each program.

Results

Table 3-3. Inputs to TRC Model for Public Sector New Construction Program summarizes the unique inputs used to calculate the TRC ratio for the Public Sector New Construction Program in PY3. Most of the unique inputs come directly from the evaluation results presented previously in this report. Measure life estimates were based on similar ComEd programs, third party sources including the California Public Utilities Commission (CPUC) developed Database of Energy Efficiency Resources (DEER) and previous Navigant evaluation experience with similar programs. Program costs data came directly from DCEO. Incremental costs were estimated from program, survey data and similar ComEd programs. Avoided cost data came from both ComEd and Ameren and are the same for all programs.

[12] Illinois Power Agency Act SB1592, pages 7-8.

Table 3-3. Inputs to TRC Model for Public Sector New Construction Program

Item	Value Used
Measure Life	12 years
Participants	4
Annual Gross Energy Savings	702 MWh
Gross Coincident Peak Savings	0.18 MW
Net-to-Gross Ratio	50%
DCEO Administration and Implementation Costs	$1,900
DCEO Incentive Costs	$45,743
Net Participant Costs	$67,014

Based on these inputs, the Illinois societal TRC for this program is 2.44 and the program passes the Illinois TRC test.

Section 4. Conclusions and Recommendations

This section highlights the findings and recommendations from the evaluation of DCEO's PY2 and PY3 Public Sector Nonresidential New Construction Program. Below are the key conclusions and recommendations.

4.1 Conclusions

4.1.1 Program Impacts

There were four completed projects through the PY2 and PY3 program with ex-ante gross savings (i.e., the results expected by the program from the four projects before any adjustments) of 971 MWh. The ex-post gross savings were 702 MWh (165 MWh in Ameren territory and 537 MWh in ComEd territory).

The evaluation analysis reduced the gross impacts by 28% for energy and 38% for demand (Table 4-1). The changes in ex post gross were mainly due to two projects in which a combination of one or more of the following were present: 1) efficiency measures required by code were awarded incentives; 2) the operation of the facility was not accurately represented in the energy model calculations; and 3) the energy model submitted by contractors or vendors was not consistent with the modeling approaches given in ASHRAE 90.1 Appendix G.

Ex-post net savings were 351 MWh (82 MWh for Ameren and 269 MWh for ComEd). The net-to-gross ratio (NTGR) was 0.50 for the program (compared to the ex ante assumption of 1.0). This result is due to two customers, who represent 39% of the expected savings across the four projects, stating that the program had no influence on the energy efficiency choices made on their projects. Both of these customers stated that the designs of their respective projects were set before they knew about the program; and, in one case, construction was already complete. It is a common challenge for new construction programs to get to participants early in the design process. This is particularly challenging for new programs as they enter the market. Thus we are not surprised at the NTG result.[13] The program, as with all new construction programs, will have to work hard at getting in early in the design process and recognizing when they have arrived on the scene too late to affect the efficiency of the building.

[13] As a comparison, ComEd's C&I New Construction program had a NTGR of 0.59 for their first year and 0.65 for their second year while the 2006-2008 California Nonresidential New Construction program had a NTGR of 0.63.

Table 4-1. Program Gross and Net Impacts

	Ex-Ante Gross Savings	Ex Post Gross Savings	Gross Impacts Realization Rate	Ex-Post Net Savings	NTGR (applied to ex-post gross)	Net Impacts Realization Rate
MWh	971	702	72%	351	0.50	36%
MW	0.295	0.182	62%	0.09	0.50	31%

DCEO's net plan target across PY2 and PY3 was 2,807 MWh (737 MWh in Ameren territory and 2,070 MWh in ComEd territory).[14] However, these goals may have been high for the program due to low construction in the sector. Program staff reported that state funding is used within the sector they serve (aside from universities and schools) and there has not been any available funding for ten years. While schools can go to districts if they get bond referendums to pass, this can be a lengthy process. Both issues reduce the likelihood of new construction in the public sector.

4.1.2 Program Processes

Program staff identified several PY2 and PY3 implementation challenges mostly related to 1) receiving the energy model documentation; and 2) motivating customers with few incentive dollars. Program staff are aware that participant satisfaction with program process was mixed. While all participants appreciated the program incentives and found the application process "straightforward", some found the documentation process required to receive incentives difficult due to expense and the level of detail required to complete it. However, all participants we interviewed found DCEO and SEDAC program staff courteous and helpful, allowing participants to successfully progress through the program.

Although incentives tended to represent a large portion (14 to 38%) of the incremental costs associated with energy efficient design, participants tended to view the program incentives as extremely small percentages of the overall project budgets (i.e., 0.05% to 0.6%); yet, they were also grateful to receive them. Further, half the participants could point to how program funding increased the energy efficiency of the final construction.

PY2 and PY3 participant characteristics match program targets. Although program marketing and outreach efforts were modest, the program reached appropriate public sector targets. The

[14] Source: Commonwealth Edison Company's 2008 – 2010 Energy Efficiency / Demand Response Plan, Docket No. 07-0540, November 15, 2007 (Table 2). Ameren Illinois Utilities 2008 – 2010 Energy Efficiency / Demand Response Plan, November 15, 2007 (Table 12)

program will likely benefit from continuing to market and outreach to potential customer and partner participants in the public sector. The program was not able to engage PY3 New Construction participants in the Design Assistance program, limiting the effectiveness of the New Construction program. However, some participants appear to be taking advantage of the Design Assistance program in PY4.

4.2 Recommendations

4.2.1 Impact Recommendations

Our gross impact analysis included an engineering desk review in which we used computer simulation modeling and engineering algorithms. We performed onsite audits of each site to verify installations. Based on our study of the impacts, we make the following recommendations.

SEDAC Project Reports

SEDAC staff completed and sent reports for each project to the DCEO. These reports aided the impact analysis by providing many useful sections describing the analysis methods taken; relevant codes and standards; proposed construction information, including envelope and HVAC equipment; and the energy savings strategies employed. To provide further critical information useful for determining appropriate energy and demand savings, the project reports should be expanded to include information on the baseline systems, building schedules and operating characteristics, floor plans, and specification sheets.

Appropriately Awarded Incentives

For one project, incentives were given for occupancy sensors and VFDs on HVAC fans. For both of these measures, the savings were reduced due to a portion of the equipment being mandated by code. Specifically, the VFDs were required for HVAC fans 15 HP or greater, which accounted for 170 of the 262 HP VFDs installed. In addition, the majority of the controlled lighting was found to be located in classrooms, which are required by code. To improve the effectiveness of incentive dollars, ensure incentives are not awarded for efficiency measures that do not exceed code required levels.

Facility Operation

For one project, lighting occupancy sensors were installed to control the lighting in the hallways of a school building. However, during the day the delay on these lights was set to one hour. This resulted in the lights never turning off during the school day. To more appropriately represent the energy savings realized from completed projects, accurately represent the operation of the facility in the energy model calculations.

ASHRAE 90.1 Appendix G

The energy model submitted for one project was not consistent with the modeling approaches given in ASHRAE 90.1 Appendix G. Specifically, the baseline window area did not match the proposed window areas; the HVAC system type was not consistent with the Appendix G type for the size building; the fan power usage exceeded code allowable fan power; and the heating energy usage was set to zero. It should be noted that the intent of the heating fuel usage being set to zero was to capture the effects of the VRF system installed, however, during the winter months, the heating load is expected to be great enough that heating will still be required. To more appropriately represent the energy savings realized from completed projects, ensure that the energy models submitted by contractors or vendors are consistent with the modeling approaches given in ASHRAE 90.1 Appendix G.

Design Phase Opportunities

This program's NTG was relatively low (50%) due to some customers stating that the projects were designed and complete (or nearly complete) prior to learning about the program. Reaching customers early in the design process could increase the program's impact on project design and energy efficiency. This is probably best achieved by channeling New Construction participants into SEDAC's Design Assistance Program as early as possible.

4.2.2 Process Recommendations

Program staff are already well aware of the main program challenges and are working toward some appropriate solutions. The recommendations we provide here are based on information we collected during interviews we conducted with program staff and participants.

Marketing and Outreach

The mix of PY2 and PY3 customer types, the presence of program partner champions, and feedback provided in the interviews, suggests that the program will benefit from continuing to raise awareness of the program among potential customer and partner participants in the public sector.

Modeling Software Reports

Program staff have found it difficult to communicate exactly what building energy modeling software reports participants need to submit. Over ten software programs qualify[15] and each identifies the necessary modeling reports differently. As of the program staff interviews, the

[15] The program application directs participants to a Department of Energy website that lists qualified software for calculating commercial building tax deductions.

program had not attempted to list the appropriate reports for each software that might facilitate participant documentation. Once several projects are coming into the program, program staff should spend the time to create a list that provides this level of information as it will increase clarity in the process.

Design Assistance Program

Participants would likely benefit from earlier collaboration with SEDAC in their Design Assistance Program. While SEDAC staff are promoting the program in conversation with interested customers, the program's web page could help sell it a little more. The web page messaging highlights a few of the positive aspects of working with the SEDAC team in the design phase, but it might benefit the program to also highlight that more incentive dollars can result from the "higher performance".

Reframing the Incentivec

Some participants were surprised by the building energy modeling and documentation requirements and found them expensive to complete, perhaps as much as 20% of the incentive received. Program staff suggested that the program possibly reframe the incentive not only as a way to help implement energy efficient design or measures, but also as a way to help cover the cost of the model. This is a good idea since it would also help alert potential participants to the existence of the building energy model requirement early on.

Section 5. Appendices

5.1 *Appendix A - Detailed Evaluation Methods*

5.1.1 Impact Evaluation Methods

Data Sources

For all four projects in the population, we based our gross impact evaluation results on electronic and hard copy program documentation, site visits involving visual verification of installed measures and interview of participants' key personnel as well as communications with key program implementation staff.

Gross Program Savings

We performed the following tasks:

- Visually verify installation of efficient equipment (with the exception of envelope components concealed from view)
- Interview site representatives to determine operating characteristics for efficiency improvements
- Review of ex-ante energy model inputs for consistency with installed equipment and expected operation

Net Program Savings

The net analysis creates a ratio to account for attribution of the program activities in the gross savings results. That is, it identifies how much of the gross savings are due to program activities. Our net to gross (NTG) analysis of the program's energy impacts progressed through three stages.

In the first stage we designed an analysis approach based on the self-report approach for determining NTG which is calculated using free ridership and participant spillover (see Equation 1). The free ridership factor is based on three main concepts (see Equation 2), while the spillover factor captures any savings attributable to the program not appearing in the records.

Equation 1

$$NTG = 1 - FR + SO$$

Where:

NTG = net-to-gross ratio
FR = free-ridership factor

SO = participant spillover factor

Equation 2

FR =average of three concepts (PC + PI + CF)

Where:

PC = Program Components Influence
PI = Program Influence
CF = Counter factual[16]

Next, we determined the plan for calculating the final NTG ratio. This analysis approach is provided in Appendix C – Net-to-Gross Analysis Plan (Free Rider Question Concept Map), with the main algorithms shown in Equations 1 and 2.

The second stage of NTG analysis consisted of the interviews with the main decision-makers or those individuals associated with the projects that were most able to give us insight into project design decision-making.

During the third stage of our NTG analysis we examined each respondent we interviewed on a case by case basis to determine whether the value derived from the closed-ended questions in the existing NTG algorithm appeared to adequately reflect the program influence. In all cases, participant responses were consistent with what they stated in other parts of the interview and we concluded that no adjustments to the customers' self responses were necessary. Finally, we calculated a weighted NTG, based on proportional amount of savings of each of the four projects.

5.1.2 Process Evaluation Methods

The process evaluation consisted of qualitative analysis from the in-depth interviews of the program managers, staff, and participants. Our data collection instrument followed the process plan and was created to research specific areas within the program that entailed creation of themes found in the interviewer responses. (See Section 0.)

Data Sources

The process questions were informed by in-depth interviews with program managers, staff, as well as 'program partners' market actors in the design community. We completed one in-depth interview with the DCEO program manager in March 2011, and another with two SEDAC staff

[16] The counterfactual is what would have occurred in the absence of the program.

in September, 2011. We completed in-depth interviews with five customers and two program partners in September 2011. Notably, we interviewed nearly two representatives from each of the four projects.

5.2 Appendix B - In-Depth Interview Guide

DCEO Depth Interview Guide- Public Sector New Construction Decision Maker

Final- August 30, 2011

Purpose

This depth interview guide will be used to attribute the effects of the Public Sector Electric Efficiency Non-Residential New Construction Program on the project under the purview of the respondent. It will also support the process analysis for this program. The interview will be performed by Opinion Dynamics analytical staff via the telephone. We will call the primary contact person as provided by the program manager, but it may be necessary to expand our calls to include other individuals within the project if it appears that others were highly involved in the decision-making process. The numbered questions in this depth interview guide will definitely be asked, while following non-numbered questions are prompts for the analyst to help ensure a complete response that adequately addresses the purpose of the numbered question. As such, not all questions in this guide will be asked as written.

Respondent name:	
Respondent phone number:	
Respondent title:	
Respondent type: (circle one:)	Public client, A&E Design Professional, Other
Public client name:	
Project (in sample)	
Project Type (circle one:)	System/Installation Comprehensive/Design
Interviewer:	
Date:	
Time Start:	

Project Summary (as gleaned from notes)

[INSERT SUMMARY FOR EACH PROJECT]

Introduction

Thank you for taking the time to talk with me today. The Opinion Dynamics evaluation team is currently conducting a study for the Illinois Department of Commerce and Economic Opportunity (DCEO). There are two aims of this interview: first, we would like to get your perspective on the Public Sector New Construction Energy Efficiency Program; and second we would like to find ways to improve the program as much as possible. We would like to get your insight by asking you some questions that should not take any longer than about 25 minutes.

All information provided in this interview will be treated confidentially. The final report will present only aggregated results and will have any identifying information removed.

PROCESS SECTION

Role on Program Projects

Throughout this interview when I ask about the "program" please consider your experience with any combination of the following key staff: Tom Coe at DCEO, Don Fournier at the Smart Energy Design Assistance Center "SEDAC", or any staff working for them.

1. First, could you give me an overview of the project, and your role in it?
   - What was/is your title?
   - What were you responsible for?
   - Who did you work with most?

2. Please tell me about your involvement in the program. Specifically:
   - How long have you worked with the program?
   - Do you have any other projects that might participate in the program?
   - Have you worked on other new construction, building projects in the public sector before?
     - [IF "YES" ASK:] "How would you compare the [INSERT PROJECT NAME} project to the others you have worked on in terms of energy efficiency?

3. Now could you give me a bit more detail on the project, especially in terms of the timeline and the parties involved in the process. (If necessary, "I am trying to

understand how this public sector project differs from something comparable in the private, commercial sector.") Specifically:
- How long did it take to complete this project from start to finish?
- What were the major milestones in the project and in what order did they occur?
- How many major parties or stakeholders were involved in this project?
- How were they involved in the project? When was each most involved?

4. We know there were several people involved in the project, but who was the main decision maker for choices regarding the energy efficiency of the building design or installations? [IF NOT THE INTERVIEWEE, TAKE NAME AND CONTACT INFORMATION.]

5. Were there any other individuals or groups that might have had a big influence on (your/the decision maker's) choice of energy efficient design?

6. Speaking generally, how would you characterize the pressures, if any, that affected the overall energy efficiency of this project?
   - How did they affect the efficiency of the project?
   - Were there any pressures that increased the efficiency of the project?
   - Were there any pressures that decreased the efficiency of the project?

7. Were efforts employed to control up-front costs on the project? (i.e. value engineering)?
   - (If yes, confirm with, "So there were items cut to make the project less expensive?)
   - (If no, follow up with, "Were design items ever cut due to budget shortfalls?")

Awareness of Program

8. Our records show that you may have first been in touch with the program [INSERT FIRST DATE OF CONTACT]. Does this sound about right?
   - How did you first hear about the program?
   - What were your initial impressions?
   - After having projects participate in the program, have your impressions of the program changed?

Value of Program

9. What were your motivations for applying to the program?
   - What did you perceive to be the value(s) of the program?
   - How was the incentive valuable to the project?

10. Since participating in the program, have your impressions of the program or its value changed?

- Is there anything you would have liked to know about the program earlier?
- Is there anything you would have done differently if you were going through the program again?

Program Processes

11. Have the program requirements been clearly explained to you?
    - How about how to participate?
    - Are there any ways you think the program can explain requirements or participation more clearly to participants in the future?

12. Do you think there are any requirements the program should adjust or change?
    - If so, which ones and how?

13. Throughout your involvement with the program, was your communication with program staff what you wanted?
    - What were your expectations for communication with program staff?
    - When you called or emailed staff, did they get back with you quickly?
    - Were they able to effectively communicate with you?

Technical Assistance

14. Did this project receive any technical assistance from SEDAC (If necessary, "SEDAC is the Smart Energy Design Assistance Center (Don Fournier)? If so, how would you describe the technical assistance component of the program?
    - Do you have any suggestions for how to improve it?

[ASK 12-14 IF TECHNICAL ASSISTANCE WAS RECEIVED]

15. Could you please describe how the technical assistance affected the energy efficiency of the project, if at all?
    - Did SEDAC provide whole building energy modeling (simulation) for the project?

16. Could you describe the staff's knowledge of energy efficient design?

17. Could you describe the ability and flexibility of the program staff in meeting your project's needs, preferences, and constraints during the technical assistance period?

Final Application

18. Did you fill out the Final Application for the project (If necessary, "This was a packet of information that included a copy of an electric bill, signed certification, As built construction documents, etc.") If so, what do you think of it?
    - Do you have any suggestions for how to improve it?

Incentive Payment

19. I'd like to confirm that the program paid incentives for [INSERT PROJECT NAME] project. Is this correct?

20. How did you find the payment process?
    - Do you have any suggestions for how to improve it?

Drawbacks

21. What are the main drawbacks of the program, if any?
    - What do you think others like you may find difficult about participating in the program?
    - What might prevent others from participating?

Improvement

22. Can you think of any ways the program could improve?
    - Do you see any ways that the program could help realize greater potential energy saving in the market?
    - Are the program incentives appropriate?
    - If you could change one thing about the program what would it be?

NET-TO-GROSS (Attribution) SECTION

Free Ridership Factor (FR)

Now I'd like to ask a few questions about the design process that resulted in the energy efficient design or installations (i.e., HVAC, envelope, and lighting) that were incented by the program. We need to understand how you (and your client) thought about energy efficiency and what influenced you (and your client) to incorporate energy efficient design or installations into this project.

FR1. How were the energy efficient design or installations incented by the program initiated?
- What were the main reasons they became or stayed a part of this project?

- Aside from those we've talked about so far, were there any other influences on the decision makers that resulted in the energy efficient design or installations that were incented by the program?

FR2. Now could you give me an overview of the program's influence, if any, on the project's energy efficiency?

- What was the most valuable component of the program on the project's energy efficiency?
- Did the program help overcome any challenges related to the energy efficiency of this project?
- How would the final energy efficiency of the project have been different if it had not received incentives or technical assistance?
- In what other ways, if any, would the final efficiency of the project be different if there were no program?

FR3. Would you say you worked with the program staff more around changes to design or changes to specific equipment? We know that design changes often mean equipment changes, but simple equipment changes do not tend to have extensive changes in design (if any).

[NOTE: we need to then ask the attribution questions in line with the answer to this question, i.e., a design change or equipment changes (by Measure #1, Measure #2).]

[For systems projects, flip a coin to determine which equipment changes to ask about first]

FR7. When did you first learn about the program and the incentives available for energy efficient installation and design? Was it during the…

1. pre-design?
2. schematic design?
3. design development?
4. construction documentation?
5. construction phase?
8. Don't know

- Did learning about the program and the available incentives change the energy efficiency of the project at all?

- Did learning about the program and the available incentives increase the resolve to finish the project as planned in terms of the energy efficiency?

FR8. Next, I'm going to ask you to rate the influence of the program as well as other factors that might have influenced the decision to include the [energy efficient design/Measure #1] that was incented by the program for your project. Please use a scale from 0 to 10, where 0 means 'no influence at all' and 10 means 'extremely influential'. If something did not pertain to your project please let me know. [FOR FR3a-g, RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused]

(If needed: "How influential was/were _____ in the DECISION to include the energy efficient design/Measure #1 in the project(s)?)

Q	Question	Response
FR8 a	[ASK IF PARTICIPANT ATTENDED TRAINING] Training sponsored by the program	
FR8 b	The availability of the program incentive	
FR8 c	The program's technical assistance and building performance modeling	
FR8 d	Recommendations from a design professional or contractor that helped you with the choice of the equipment and the specific design	
FR8 e	Recommendations from a DCEO or SEDAC staff person	
FR8 f	Program information	
FR8 g	Program outreach such as email or phone calls with DCEO or SEDAC staff person	
FR8h	Word of mouth from a colleague or information from a professional organization	

FR8 i. Were there any other factors we haven't discussed that were influential in the decision to [use this design/install Measure #1]?

1. Yes; "please specify": _____
96. Nothing else influential
98. Don't Know

[ASK IF FR8 i = YES]

FR8 ii. Using the same zero to 10 scale, how would you rate the influence of this factor on the decision to [use this design/install Measure #1]? [RECORD 0 to 10; 98=Don't Know]

FR9. Thinking about this differently, I would like you to compare the level of program influence with that of other factors on the decision to include the [energy efficient design/specific equipment] in the project(s).
If you were given a total of 100 influence points to divide between the influence of the program and the influence of all other factors on the decision to include [energy efficient design/ Measure #1] in the project, how many points would you give to the influence of the program?
Points given to program: [RECORD 0 to 100; 998=Don't Know] Points given to program: [RECORD 0 to 100; 998=Don't Know]

[ASK IF VALUE ENGINEERING (Q7) OCCURRED AND COMPREHENSIVE PROJECT]

FR10. How influential, if at all, was the program (i.e., incentives, DCEO or SEDAC recommendations) in keeping energy efficient design on the table when aspects of the original design were being cut to control costs? Please use a 0 to 10 scale where, where 0 is "Not at all influential" and 10 is "Extremely influential." [RECORD 0 to 10; 98=Don't know, 99=N/A]

Now I want to ask you a few questions about how this project may have been different if the program had not existed.

FR11. Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the program had not existed, what is the likelihood that the project would have included the same level of energy efficiency in the [design/ Measure #1]? [RECORD 0 to 10; 98=Don't know]

FR12. Using the same scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the program had not existed, what is the likelihood that the project would have included [the same number of energy efficient design features in the final project/ the same number of energy efficient (Measure #1)]? [RECORD 0 to 10; 98=Don't know]

[ASK FR13-14, IF COMPREHENSIVE PROJECT]

FR13. Using the same scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the program had not existed, what is the likelihood that the energy model would have been used as a design tool? [RECORD 0 to 10; 98=Don't know]

FR14. What is the likelihood that independent, third party, non-proprietary data supporting the design vision would have been available if the program had not been involved in this project? Please use the same 0 to 10 scale, where 0 is "Not at all likely" and 10 is "Extremely likely." [RECORD 0 to 10; 98=Don't know; NOTE: This could include financial and energy data]

[ASK FR15, IF SYSTEMS PROJECTS WITH MULTIPLE MEASURES]

FR15. Now I'd like to ask you about [Measure #2]. In terms of how the program or other factors influenced its selection or installation, would you say that this measure reflected the same or nearly the same decision-making as [Measure #1]?

1. Yes (Continue to SO1)
2. No (Ask FR8 to FR14)

[ASK IF FR11 OR FR12 <10]

FR16. Had the program not existed, what specific ("measures" or "design features") would have been used? [PROBE FOR SPECIFIC MEASURES/DESIGN FEATURES] What specific ("measures" or "design features") were actually used on this project? [PROBE FOR SPECIFIC MEASURES/DESIGN FEATURES]

SPILLOVER MODULE

SO1. Was there any other energy efficient design or equipment installation that took place on this project that was influenced by the program but did not receive incentives? [IF YES, "COULD YOU PLEASE DESCRIBE IT?"]

SO2. Since participating in the program, have you (or your client) incorporated any energy efficient systems or equipment into other new construction projects in Illinois?

[IF SO2=YES]

SO3. [Has it or will it/ Have they or will they] receive incentives through the program?

[IF SO3=NO]

SO3. Why not?

CLOSING SECTION

23. Is there anything else that you would like to let us know based on the topics we covered today, including any ways to improve the program if possible or how the program has affected your use of energy efficient measures or design in projects?

Time End _____

5.3 Appendix C – Net-to-Gross Analysis Plan (Free Rider Question Concept Map)

NTGR=1 – FR, where FR = 1-((PI+PC+PT)/3)

Concept	Question	Measure Incentive	Design-Based Incentive	Algorithm Notes
Program Influence (PI score)	FR7	☑	☑	• Design customers who learned about the program after construction documentation or during construction phase are full Free Riders. All others PI scores are based on FR9. • Measure customers who learned about the program late in the construction phase are full Free Riders. All others PI scores are based on FR9.
	FR9	☑	☑	• This item is used for the PI score when FR7 score does not denote a free-rider. The score is divided by 10 to stay consistent with the other concepts.
Program Components (PC score)	FR8 a-gg	☑	☑	• The maximum influence score is taken from across these items and counts as the PC score.
Program Timing and Efficiency (PT score)	FR11	☑	☑	• For Measure customers, the PT score will be the maximum of these two items. • For the Design customers the maximum of these two and FR10 will become the base PT score which may be increased by the additive items (FR13 and FR14) below. • In all cases the final PT score will be reversed to keep it aligned with the other concepts.
	FR12	☑	☑	
	FR10		☑	• (see note above)
	FR13		☑	• These items each add either 10% or 20% to the base PT score for a possible additive range of 0 to 40%. If the respondent states that the counterfactual was "not at all likely" (score of 0-2) then the additive is 20%; if the score is 3-5, then the additive is 10%.
	FR14		☑	