

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

**Evaluation Report:  
Nonresidential New Construction**

**Presented to**

**Commonwealth Edison Company**

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## Section E. Executive Summary

This document provides the results of the PY3 evaluation of the C&I New Construction program. The program joined the ComEd portfolio of programs in PY2 to bring in energy savings as well as help bring about changes in knowledge of energy efficient commercial building practices. The Energy Center of Wisconsin (ECW) implements the program for ComEd as a turn-key program.

The program maintains three ‘tracks’ for projects. The most complex is the comprehensive track in which program implementers are highly involved in the design of the building to help bring about savings by combining all building components into a holistic, integrated and efficient design. The systems track allows for less involvement by the implementer to cost effectively garner savings from lighting and HVAC systems. The small building track contains challenging lighting and daylighting requirements for buildings under 20,000 square foot. While the PY2 program contained 16 systems projects, the PY3 program had a mix of systems (33) and comprehensive (4) track projects.

### *E.1 Evaluation Objectives*

The objectives of the evaluation are to: (1) Quantify net electric energy and peak demand impacts from the projects completed during PY3 (June 2010 to May 2011); and (2) Determine key process-related program strengths and weaknesses and provide recommendations to improve the program, where needed.

### *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 a sample of 15 of the 37 completed projects to assess gross impacts and calculated net impacts using self-reported data from participants as well as a review of email correspondence between the implementation team and participants.

### *E.3 Key Impact Findings and Recommendations*

The program garnered almost twice the overall net goals (Table E.1). Customers are satisfied and find value from the program. Our research finds that the implementation team is running the program well although we do make a few suggested recommendations for their processes (detailed more below and in the report).

**Table E- 1. Program Net Savings – C&I New Construction**

Net Savings Estimates	MWh	MW
ComEd Plan Target	2,490	0
ComEd Reported for PY3	6,258	0
Total PY3 Evaluation-Adjusted Net Savings (ex post)	5,963	1.471

*Source: ComEd Plan Target: Commonwealth Edison Company's 2008 – 2010 Energy Efficiency / Demand Response Plan, Docket No. 07-0540, ComEd Ex. 1.0, November 15, 2007. Targeted net savings include a net-to-gross ratio of 0.8. ComEd Reported: Program Tracking Data from Implementer (ex ante) with a gross realization rate of 0.8 and a net-to-gross ratio of 0.85.*

When comparing the ex-ante results (i.e., the results expected by the program from the 37 projects before any adjustments) to the ex-post gross impacts, the evaluation analysis reduced the gross impacts only by relatively small amounts. (Table E-2) The net-to-gross ratio (NTGR) was 0.65 for the program (compared to the ex ante assumption of 0.85) with a range of 0 to 0.87.

**Table E- 2. Program Gross & Net Savings – C&I New Construction**

	Ex-Ante Gross	Ex-Post Gross	Realization Rate	Ex-Post Net	Net-to-gross Ratio (applied to ex-post gross)
MWh	9,203	9,174	99.7%	5,963	0.65
MW	2.374	2.263	95.3%	1.472	0.65

When we break out the NTGR into the two tracks, we find that the NTGR for systems (n=11) was 0.69, and for comprehensive (n=4) it was 0.54. The comprehensive NTGR is low because representatives from two projects indicated that the program had only some influence (i.e., NTGR scores between .30 and .50) on the energy efficiency of their building. Representatives of the other two projects scored at 0.80 or higher. Even though we calculated the NTGR using all PY3 comprehensive track projects, we emphasize that it is based on only four projects. When there are so few projects, the values shown for the sampled projects in Table E-3 often do not provide indication of what could occur in the future.

**Table E- 3. Sampled Project Only Gross & Net Energy Savings by Track**

Track	Ex-Ante Gross (MWh)	Gross Realization Rate <sup>a</sup>	Ex-Post Gross (MWh)	NTGR <sup>b</sup>	Ex-Post Net (MWh)
Comprehensive (n=4)	2,377	99.7%	2,370	0.54	1,289
Systems (n=11)	5,770	99.7%	5,752	0.69	3,992
Total (n=15)	8,147	99.7%	8,122	0.65	5,281

<sup>a</sup> Realization rate based on sample design at the population level, not at the track level

<sup>b</sup> Total NTGR is weighted based on sampled projects

The gross energy realization rate for PY2 was 85% and the PY2 NTGR was 0.59. In both cases, the PY3 values are improvements over last year's evaluation values (Table E-4). Given the relatively small number of participation (N=16 in PY2 and N=37 in PY3), two years of data can vary by this amount with no particular way to attribute reasons for the change. However, we believe that the improvements to the NTG battery in our data collection instrument helped us to hone in on the most appropriate net value for the program.

**Table E- 4. Program Gross & Net Savings – PY2 and PY3**

	Population (N)	Sample for Impacts (n)	Ex-Ante Gross (MWh)	Gross Realization Rate (MWh)	Ex Post Gross (MWh)	Net-to-gross Ratio (MWh)
PY2	16	14	1,615	85.0%	1,368	0.59
PY3	37	15	9,203	99.7%	9,174	0.65

### **Impact Recommendations**

While our gross impact analysis did not reduce the ex ante energy savings much overall, the information in Table 3-1 shows that there is variation in the ex ante to ex post estimates for the sampled projects. To help reduce that variation, we make the following recommendations:

- » The implementation team should take steps to ensure they update the savings listed in the tracking system to be consistent with the final version of the calculations.
- » The implementation team should review the process for determining and reporting the lighting hours of operation. Specifically, additional questions could be added to the customer interview to account for differences in lighting operation and business hours, control methods, and changes in hours of operation for specific areas.

- » The implementation team should be aware of and take care to ensure they do not provide incentives for redundant equipment that the customer does not expect to operate.
- » Finally, if the implementation team incents technologies that are not specifically covered under IECC 2009, care must be taken to ensure that an appropriate baseline is chosen. For these cases, typically the baseline must be considered to be standard practice and a clear determination of that standard practice should be described.
- » The evaluation team uses the energy interactive effects, demand interactive effects, and peak coincidence factors as documented for the ComEd prescriptive program. We recommend that the systems track measures include these factors in the ex ante estimates of savings where applicable (e.g., lighting measures).

Addressing these areas should improve the accuracy of the claimed savings and ensure that the ex ante claimed savings are consistent with the ex post calculated savings.

#### ***E.4 Key Process Findings and Recommendations***

Similar to last year, program managers faced challenges associated with the economic downturn and the lack of large building construction (the planned cornerstone of the program). Additionally, the program managers indicated difficulty with reaching projects early in the design process; difficulties arising from the program having three separate tracks; and incentive levels. Overall, the implementation team continued to handle these difficulties well, mainly through refining program focus and taking timely, appropriate steps to support the program.

The program had been working steadily with customers of comprehensive projects and PY3 saw the fruits of their labor as the first set of comprehensive projects came through. The program plans to transition to an all-comprehensive track approach over the next few years. Program managers agreed that the increased stringency of IECC 2012 would likely make the systems track obsolete. Additionally, the program was designed to take an early design /comprehensive approach to projects. For example, the program is staffed with building engineers whose expertise is better leveraged over larger projects, maximizing energy savings while minimizing administrative costs otherwise associated with a greater number of smaller projects. By adopting a single comprehensive track approach, the program may be able to streamline its administrative and marketing activities

The program is currently well poised to transition toward this type of program in several ways. The program managers are focusing on transitioning and are preparing for it. For example, they are refining marketing and outreach to stress the benefits of participating in the program earlier in the project design process. Additionally, the program's network with designers is growing through the training component and through prior participation. As one program manager stated, "We've developed (traction) in the market through the relationships we're developing



with the design community.” Further, the program targets the design community in many ways including cold-calling because as one program manager explained, “designers are doing ten to fifteen projects a year.” Having a designer network supports the comprehensive track of the program by increasing the likelihood that designers will channel projects into the program early in the project design cycle.

No different from last year, the participants we interviewed were very satisfied with the program. They continue to believe it is a valuable program, for the available financial incentives and for the information about energy efficient measures and design they learn about from ECW staff. As one market actor stated, “(Working with the program) was fairly easy, the whole process; and I thought it was very beneficial.” Many participants mentioned that ECW staff were extremely helpful throughout the participation process and were knowledgeable about energy efficient design. Participants also found the program valuable in other ways. For example, one customer stated that the program was valuable because the incentives helped “melt internal company resistance” to using energy efficient measures.

### **Process Recommendations**

Given the successful implementation of the program during PY3, we make only a few process recommendations:

#### **Training**

Findings from the participant interviews suggest that many participants are aware of the training sessions through email, indicating that this is one good outreach method. But given that there were several other participants who were not aware of the trainings, this also suggests that the program needs to continue to raise awareness of this program component.

- » Consider using the ECW email signature lines to announce upcoming training sessions.

Nearly all participants we interviewed held very favorable opinions of ECW staff and their communication. Given the amount of email correspondence that takes place during program participation especially during technical assistance, the program could alert relevant market actors to the trainings exactly when they are most involved with the program.

- » Fine tune the message.

In email announcements of the training sessions consider using the subject line or the beginning of the message to acknowledge the recipient’s time constraints, and then follow up with statements, perhaps using attendee quotes’, that capture the relevance and long term value of the program. For example, “We know you think you are too

busy to step away from your projects for even a day, but consider coming to a training past attendees have called... that will maximize savings on your future projects.”

### **Comprehensive Track**

The program appears well-poised to transition to an all comprehensive track program over the next few years. However, interviews with market actor participants suggest that there is still disbelief and reluctance among some customers about the value of the program. To the program’s credit, it is working on developing case studies of comprehensive projects that could be useful to show customers. We make two recommendations to maximize the potential of these materials:

- » Test the case studies with ComEd C&I customers. For example, the program could use focus groups to see how one page case studies targeted at different types of C&I customers are perceived and whether they are compelling.
- » When satisfied that the case study materials are effective, the program should make market actors aware of these materials so that they can use the ComEd materials with reluctant customers.

### **Findings**

Our research finds that the implementation team is running the program well and garnered almost twice the overall net goals. The implementation team continued to handle challenges associated with the economic downturn and the lack of large building construction well, mainly through refining program focus and taking timely, appropriate steps to support the program. Customers are satisfied and find value in the program. The program plans to move towards a comprehensive track and is well poised to transition to this type of program.

### ***E.5 Cost Effectiveness Review***

ComEd uses DSMore™ software for the calculation of the Illinois TRC test. Table E-5 summarizes the unique inputs used in the DSMore model to assess the TRC ratio for the Nonresidential New Construction program in PY3. Most of the unique inputs come directly from the evaluation results presented previously in this report. Measure life estimates and program costs come directly from ComEd. All other inputs to the model, such as avoided costs, come from ComEd and are the same for this program and all programs in the ComEd portfolio.

**Table E-5 Inputs to DSMore Model for Nonresidential New Construction Program**

Item	Value Used
Measure Life	12
Utility Administration and Implementation Costs	\$766,258
Utility Incentive Costs	\$636,446
Net Participant Costs	\$1,212,120

Based on these inputs, the Illinois societal TRC for this program is 1.41 and the program passes the Illinois TRC test.

## Section 1. Introduction to the Program

### 1.1 *Program Description*

The C&I New Construction program began in the second program year (PY2) of the ComEd portfolio of demand side programs. Program year 3, then, is the second year of the program. ComEd and their implementation team have designed the program to capture immediate and long-term energy efficiency opportunities that are available during the design and construction of new buildings, additions, and renovations in the non-residential market. The program provides incentives to improve the efficiency of building systems (e.g., lighting and/or HVAC) in new construction (system track), to improve lighting/daylighting systems beyond the systems track level of efficiency (small business track) as well as through integrated whole building design (comprehensive track). Projects were expected to come from a mix of system, small business, and comprehensive tracks.

Through market preparation activities, this program has also attempted to achieve beneficial impacts that extend beyond the life and scope of the program. Market preparation entails moving the awareness and knowledge gained by designers and architects through program participation into their standard construction practice through an integrated education and training effort. Due to budget limitations, there was no assessment of these activities in PY2 or PY3.

For PY2, the program had net energy savings goals of 596 MWh, while for PY3, these net energy savings goals increased to 2,490 MWh, a 317% increase.

#### 1.1.1 Implementation Strategy

##### **Roles of the Implementation Contractor**

The program is a turn-key approach provided by the Energy Center of Wisconsin (ECW). The program manager at ECW works with the ComEd program manager to implement the program following ComEd protocols and reporting requirements.

##### **Program Timeline**

The program was launched in June 2009.

##### **Program Delivery Mechanisms and Marketing Strategy**

Program implementation activities to achieve energy saving and market preparation objectives are applied through four primary offerings:

1. Targeted Education and Training, Information, and Outreach on integrated design practices and technologies and benefits were provided directly to customers through the program and to the broader market.
2. Technical Assistance Services provide capabilities to teach and help implement energy efficiency designs or measures that the market has not yet fully adopted. Services included facilitation in the design process, reviewing plans and construction documents, assisting with research and product selections and analyzing energy savings.
3. Design Incentives to the design team help offset the costs of developing designs that provide as-built performance that is more energy efficient than their standard practice designs.
4. Measure Incentives to owners and developers help reduce cost barriers to adopting electric energy saving designs and measures that have not yet been accepted as standard practice for construction.

The program channeled projects through one of three participation approaches:

- » ***Comprehensive Track*** offers the highest level of project (“technical”) assistance and financial incentives for custom design solutions. This approach allows the design team the greatest flexibility to meet energy performance goals by adopting integrated design solutions analyzed through whole-building energy simulations. This approach is chosen when project size, schedule, complexity, and interest level justify a significant investment of program resources to achieve the full benefits of integrated building design. Six of the 37 projects completed in PY3 fell within the comprehensive track.
- » ***Systems Track*** is a lower-assistance participation approach that offers a limited menu of financial incentives. This track provides measure incentives to meet performance criteria for improvements in lighting power density, lighting controls, envelope and mechanical equipment. Design incentives are not offered. This approach is chosen for projects where there is limited opportunity for integrated design and for those later in the design process. Thirty-one of the 37 PY3 projects fell within the systems track.
- » ***Small Buildings Track*** offers an opportunity for buildings less than 20,000 square feet to receive incentives for lighting and daylighting. The track provides a combined measure incentive to meet performance criteria for improvements in lighting power density and the incorporation of daylighting strategies and controls. This approach is chosen for any project less than 20,000 square feet that can meet the minimum performance requirements. There were no small building track projects in PY3.

The primary targets of program marketing activities are design professionals such as architects and engineers as well as construction firms. Trainings, monthly presentations, and emails are the main approach to reaching this group. Secondary targets include customers and developers. This group is marketed to using newsletters and bill inserts as the main approach.

## 1.1.2 Measures and Incentives

Projects must comply with the requirements below to earn incentives. Some of the requirements provided here indicate changes in the program incentive design which took place around the end of PY2 and the beginning of PY3. The incentive information comes from various PY3 program documents (e.g., “Systems Track Overview”) that outline the overall approach of the program and each of the three tracks. As there were only systems and comprehensive track projects in PY3, we only provide measure and incentive information for these tracks.

### **Systems**

A Measure Incentives Agreement must be submitted to the Program for approval prior to purchase or installation of energy saving measures. Equipment invoices must be dated after June 1, 2010 to qualify for incentives.

### **Lighting Measures**

The lighting power density (LPD) reduction incentive encourages lighting designs and equipment that provide quality lighting at lower installed wattage. The incentive for reducing lighting power density is calculated on a per square foot (sf) basis for LPD performance relative to the International Energy Conservation Code 2009 table 505.5.2.

For each 0.10 [Watt/sf] below Table 505.5.2 IECC 2009 requirements, the incentive is \$0.03 per square foot.

The maximum payment is \$0.15 per square foot gross lighted area or \$40 per fixture, whichever is lower.

The program may assign a power rating (e.g., watts per fixture) for proposed lighting equipment that is not supported by manufacturer model numbers or specification sheets.

Program staff will make the final determination of affected area for incentive calculation.

Lighting power densities must be based on designs that meet applicable codes and standards and follow industry guidelines for acceptable quantity and quality of light for the space type and tasks.

### **HVAC Measures**

There were several changes made to the HVAC incentives for PY3. They are indicated in the last column in Table 1-1. Notably, they are all due to the program’s adoption of the Prescriptive Program’s HVAC savings assumptions. We describe the requirement changes in the table’s notes.

The efficient HVAC equipment incentive encourages selection of energy efficient air conditioning. The energy performance of the selected equipment must meet or exceed the requirements shown in Table 1-1 below. Qualifying incentive amounts are also shown.

**Table 1-1. HVAC Equipment Type Size Category Qualifying Efficiency Incentive (per ton)**

Equipment Type	Size Category	Qualifying Efficiency	Incentive (per ton)	Change for PY3 (Y/N)
Unitary and Split Air Conditioning Systems and Air Source Heat Pumps	< 65,000 Btu/h (5.4 tons)	14 SEER	\$ 15.00	N
		15 SEER	\$ 30.00	N
	≥ 65,000 Btu/hr <240,000 Btu/h (5.5-20 tons)	12 EER*	\$ 30.00	Y <sup>1</sup>
	≥ 240,000 Btu/h and <760,000 Btu/h (21-63 tons)	10.8 EER*	\$ 30.00	Y <sup>2</sup>
	≥ 760,000 Btu/h (21-63 tons)	10.2 EER*	\$ 30.00	Y <sup>3</sup>
Water-Cooled Chillers	All	Level 1**	\$ 20.00	N
		Level 2**	\$ 40.00	N
Air-Cooled Chillers	All	Level 1**	\$ 20.00	Y <sup>4</sup>
		Level 2**	\$ 40.00	Y <sup>4</sup>
Room Air Conditioners	All	Level 1	\$ 30.00	N
		Level 2	\$ 50.00	N

\*Units with electric resistance heating must have EER values 0.2 higher than the efficiencies listed.

\*\*Unit efficiency for chillers should be provided in kW per ton – IPLV (IPLV = Integrated Part Load Value). Unit efficiency in AC units less than 65,000 Btu/h should be provided in SEER. Unit efficiency for all other equipment should be provided in EER.

<sup>1</sup> The Integrated Part Load Value (IPLV) qualification was dropped and there is no longer a \$15/ton incentive for equipment with 11.5 EER.

<sup>2</sup> The Integrated Part Load Value (IPLV) qualification was dropped; there is no longer a \$15/ton incentive for equipment with 10.5 EER.

<sup>3</sup> The Integrated Part Load Value (IPLV) qualification was dropped; there is no longer a \$15/ton incentive for equipment with 9.7 EER.

<sup>4</sup> The Integrated Part Load Value (IPLV) qualification was dropped; the category was split into two levels and the incentive changed from \$30/ton.

Additionally, the program dropped incentives for packaged terminal air conditioners and heat pumps (PTAC, PTHP) in PY3.

Finally, the Systems track measure incentives limit changed from \$100,000 to \$150,000 per facility per program year (June 1 to May 31).

## Comprehensive

Measure design must produce at least 10% electric energy savings below IECC 2009 baseline. Once this level is achieved, incentives are calculated at \$0.10 per kWh saved. However, measure incentives are limited to \$150,000 per facility per program year (June 1 to May 31), which indicates a change from the PY2 \$100,000 limit.

### 1.2 *Evaluation Questions*

The evaluation sought to answer the following key researchable questions:

#### Impact Questions:

1. What are the gross impacts from this program?
2. What are the net impacts from this program?
3. Did the program meet its energy and demand goals? If not, why not?

#### Process Questions:

The final set of process questions we used to guide this evaluation changed from the set initially proposed in the PY3 Evaluation Plan. The final set was expanded based on insight gathered through meetings with program staff in March 2011 and interviews with them in May 2011. ComEd and ECW indicated interest in other topics not included in the original set of evaluation questions. Additionally the evaluation team found that some questions within the initial set would not adequately capture the PY3 design and implementation of the program. We present the set of questions for our evaluation and then discuss why they changed.

#### **Question Set**

1. What design or implementation changes occurred in PY3?
  - a. How did the program respond to PY3 challenges?
2. What are the characteristics of the customers and program “partners” (which encompass design professionals, trade allies, and construction companies) participating in the programs and is this the expected group for participation?
  - a. Who should be more involved but is not, and how can the program increase their involvement?
3. What are the training opportunities through the program and what are their effects?
  - a. How often do the trainings occur and who is targeted?
  - b. Do the participants find the trainings useful?
  - c. How are participants applying the information learned in the trainings to their current practice?
  - d. Are the trainings fostering a community of educated and trained designers, engineers, and architects?



4. Are the program processes effective for smoothly providing incentives to participants and motivating customers to participate?
  - a. How quickly does the program answer customer and program partner questions?
  - b. Are customers and program partners satisfied with the program processes in which they were involved?
  - c. Is the application process onerous?
5. In what ways could the program develop and improve the comprehensive track portion of the program?
  - a. How could the program more effectively engage customers and/or program partners?
  - b. How could the program help increase the energy and demand impacts?
  - c. What strengths and/or challenges are anticipated in focusing the program on more comprehensive projects?

## **Design/ Implementation Changes and Challenges**

We expanded the questions in this topic. We included “changes” to allow us to document proactive moves made by program staff. We also focused on program “design” to allow us to capture aspects of program implementation affected by design changes.

## **Program Participants**

These questions were all added to the final set, allowing us to document and understand the effects of 1) the growth of the program’s professional partner network and 2) the increase in variety of building types.

## **Training**

Minor changes were made between the original and final set of training questions. Two questions were removed from the original set and replaced by “Are the trainings fostering a community of educated and trained designers, engineers, and architects?” These changes were made because program staff were interested in finding out if the trainings were supporting the development of an educated, practicing community to help recruit designer-led projects into the program’s comprehensive track.

## **Program Processes**

A few changes were made between the original and final set of program processes questions. We removed one question from the original set, and refined another by adding in the motivation component. This helped us capture the value of the program to participants and understand their decision-making around participation. We also added in questions to capture

how well the program communicates with participants and whether the application is as streamlined as possible.

#### **Comprehensive Track**

All the questions on this topic were added into the final set because program staff are very interested in supporting the transition of the program into a program with high emphasis on the comprehensive track program.

## Section 2. Evaluation Methods

As a part of the overall ComEd portfolio, the risk of non-performance by this program is low as the targeted ex ante<sup>1</sup> impacts are a small percent of the portfolio energy savings (0.5%). For this reason, the evaluation activities for PY3 are somewhat limited (about 4% of the overall evaluation budget).

For the Non-Residential New Construction program assessment, the Navigant Consulting team conducted in-depth interviews with the program implementers, ComEd program manager, and participants. The gross impact analysis was based on an engineering desk review using computer simulation modeling and engineering algorithms. The net impact results were based on the self-report method.

The evaluation team used a significant amount of data collected by the program implementer for the impact assessment. This created a cost-effective evaluation process. Based on the experience in our PY2 evaluation, we had allocated budget to perform additional on-site verification for up to five sites. However, this was not required in PY3 as the data was of high quality and sufficient for evaluation purposes.

Based on the budget, we needed to sample from the population of projects for our data collection. We used a stratified, random sampling approach for all in-depth interviews. The Delanius-Hodges approach maximizes precision while decreasing the number of interviews necessary to achieve that precision. All 37 projects were grouped into three strata based on the ex ante energy savings per project and then a prescribed number of projects was randomly selected from each stratum. This process yielded a sample size of 15 with a relative precision value of 0.05 at the 90% confidence level. Across the 15 projects, we interviewed the most highly engaged participants as indicated by the program implementer. The data collection summary for this evaluation is as follows:

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<sup>1</sup> Ex ante refers to the program estimated impact found in the program tracking database.

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

What	Who	How Many	When	Purpose
In-Depth Interview	Program Staff	2	May 2011	Process
In-Depth Interview	Program Participants	13 individuals representing 15 projects	July 2011 to August 2011	Process and Impact
Engineering Review	Data from Program Implementer	15 projects	August 2011 to September 2011	Impact

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

## Section 3. Program Level Results

### 3.1 Impact Results

#### 3.1.1 Verification and Due Diligence

The verification activities for this program were relatively modest given budget constraints. However, similar to last year, we did identify a few issues. During the impact analysis and project file reviews, it was difficult to see how quality control and assurance are being handled by the implementer. It was clear that the implementation team obtained final approval prior to issuance of incentive checks. However, it was not fully clear if there was any additional quality control review of individual project information and savings estimates. Our file reviews revealed some concerns related to data quality control.

Some of the projects had an abundance of project documentation, and it appears the program reviewer did a thorough job reviewing the submitted data and adjusting the savings inputs and calculations appropriately. A few of the projects on the other hand had a distinct lack of supporting documentation and insufficient data to calculate any savings; however, incentives and savings were still approved and reported. The opposite also occurred where a couple participants had provided the necessary information and the projects should have qualified for incentives based on the documentation, but the implementer did not appear to have fully reviewed the files and rejected the measures and incentives.

*An example of lack of documentation occurred for a lighting project.* This project was approved for lighting incentives based on a reduction of overall lighting power density (LPD). The calculations for this project used a specific wattage for the installed fixtures. However, the implementation team did not provide us with specification sheets (and we assume these were not available). Based on the manufacturer website, the wattage used was incorrect. This resulted in the implementation team overestimating savings for this project. In other projects, the evaluation team could not verify fixture wattages because insufficient information was included to identify the fixture.

*An example of improper rejection occurred for an HVAC project:* The implementation team took EERs for numerous rooftop units from the schedule given on the building plans and disqualified 11 rooftop units at each of two sites. When compared to the manufacturer specifications, the evaluation team found the numbers between the building plan and manufacturer specification to be inconsistent and chose to include these 11 rooftop units back in as ex post impacts.

#### 3.1.2 Tracking System Template Review

The systems track templates are easy to follow and provide for a clear description of how the implementation team calculated savings for each project. The template includes the default assumption tables and algorithm inputs, as well as HVAC and Lighting calculation tabs. The

implementation team adds additional tabs or modifies tabs based on individual projects. We note that not all systems track projects utilized this template and use of the template was not limited to systems track projects.

Projects that had the savings calculated by use of custom calculations or building simulation models were much less clear. The implementation team often provided us with multiple iterations of building models or multiple parametric runs were completed in the building models with no clear description of which measures were completed. We found the site visit report to be the most consistent document for determining what measures were completed. In some cases the technical assumptions, or their justifications, were not included in the project documentation.

The disadvantage of spreadsheet-based systems is that they are prone to errors, and this program was not immune to that problem. For example, when a project came to the program, the implementer calculated an initial project savings estimate and entered it in the program tracking spreadsheet. As the implementation team finalized a project, they calculated the updated final savings estimates within each project file, and then updated by hand in the overall program tracking spreadsheet. For three of the reviewed projects, the final project savings estimates calculated in the project file did not match the savings listed in the tracking system.

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

The gross impact engineering review included several adjustments to the program level algorithms and assumptions. PY3 included only both Systems Track projects and Comprehensive Track projects. No Small Business Track projects were completed. While only energy (kWh) savings are necessary for reporting, the program does track peak coincident demand (kW) savings at the request of ComEd.

#### **Systems Track Projects**

##### **Lighting Measures**

For the Systems Track Lighting calculations there are only a few inputs to the ex ante savings algorithms. For lighting energy, the program uses a code minimum baseline LPD based on building occupancy type. The algorithm multiplies this LPD by the building area and by operating hours to calculate the annual energy savings. The program bases the default occupancy types on code and is appropriate. The program bases the area and annual operating hours on participant reported data and plans.

Operating hours are a difficult parameter to establish, as self-reported operating hours are often estimates before a facilities final operating hours are established. Additionally, self-reported numbers typically add time for start-up and closing time, but do not reduce the estimate for

holidays, lights that customers have turned off, burned out lamps, and other factors that would reduce the overall hours. Nor do they account for operating of specific spaces and tend to be more reflective of the facility operation than specific lighting. While participant reported operating hours are often an appropriate estimate, for this program, the operating hour information was often based on data from a third party (such as the company finding incentives for the ultimate user of the building) and did not match up well with business hours.

The evaluation team chose to use customer interviews to verify the lighting hours of operation. The interview included overall hours of operation for the facility as well as typical operating characteristics (schedules, hours of specific spaces, and control method) for significant spaces within the facility. We were not able to complete interviews for two projects. The lighting hours were not changed for these sites.

The ex ante estimated lighting energy savings do not include an interaction factor to adjust for the associated cooling system energy savings when reducing the lighting power density. To account for this, the evaluation team added an Energy Interactive Factor and a Demand Interactive Factor to all lighting projects that vary by building occupancy type. These factors increase electric energy savings somewhat. The evaluation team adopted the ComEd C&I Prescriptive program factors and building types. We recommend that these Energy Interactive Factors be incorporated into the ex ante estimates of savings in future program years.

The evaluation team assessed the calculation algorithms and default Demand Diversity Factors for all lighting projects in our sample. We found them to be appropriate and made no changes.

### **HVAC Measures**

The implementation team estimated ComEd C&I New Construction HVAC savings using predetermined program defaults for different size categories and qualifying Tiers. The defaults do not fully reflect the actual installed efficiencies, but rather a simplified estimate based on program assumptions. To improve savings estimates, the evaluation team used actual installed HVAC unit capacities and AHRI efficiencies based on data from the program files. Because the program staff already records this information as part of the project incentive qualifications and calculations, it would be a simple update to include the calculations within the standard project spreadsheet template.

The evaluation team used the ComEd C&I Prescriptive program default savings algorithms and factors, and included Equivalent Full Load Hours (EFLH) defaults based on occupancy type and size of equipment. The savings algorithms include Coincidence Factors (CF) for calculating Peak Demand Savings, and a Redundancy Factor to account for system over-sizing.

We made project specific adjustments for HVAC unit capacities when AHRI actual capacities were not in the ex ante calculations. Similarly, the evaluation team adjusted several unit efficiencies to reflect the correct AHRI Certified efficiencies.

There were two HVAC units incentivized when the units did not actually qualify for the program. This appeared to be due to using EERs taken from customer plans, which we found to be inconsistent with the manufacturer literature. Alternately, the implementation team did not incent 28 HVAC units that did actually qualify for the program. This was due to incorrect efficiency levels being used or inputting the efficiency into the wrong category for the size unit. For example, small unitary equipment is rated in SEER; however, the efficiency was input into the EER column. For the ex post analysis, these errors were corrected and the savings accounted for appropriately.

The evaluation team chose to use customer interviews to verify the HVAC operation as well. We only used the interview to verify that the customer operated and controlled the equipment in a manner typical of the type of facility. Based on the customer interview, one site had the operation of several of the HVAC units set to zero. The facility was a medical facility and was required to have redundant HVAC systems. In addition, the customer had installed significantly more chiller capacity than would be required for the existing building, due to planned future expansion.

### **Comprehensive Track Projects**

The evaluation team assessed four comprehensive track projects. One project utilized the systems track template, two utilized building simulations, and one used a combination of a building simulation and custom refrigeration system bin calculation to determine the energy and demand savings. For two of the projects, the only measure implemented was the reduced lighting power density. One project included efficient refrigeration. The final project had multiple measures, including shell, HVAC, and lighting measures.

We assessed the lighting project using the same method as described above in the Systems Track section. We interviewed the customer to verify hours of operation and added interactive effects to the analysis.

For the building simulation projects, we reviewed the models to ensure consistency with all provided documentation. This included reviewing the shell characteristics, lighting power densities, and operating schedules. We verified the operating characteristics, such as lighting hour of operation through customer interviews.

We also reviewed the refrigeration project in depth. The only efficiency measure listed for this project was the installation of an ammonia refrigeration system that the implementation team compared to a halocarbon system as the baseline. The implementation team calculated the savings based on an assumed kW/ton profile for each system, but provided no justification for either profile.

IECC 2009 does not cover efficient refrigeration systems. We compared this project to industry standard practice as the most appropriate baseline. The evaluation team received the bid



specifications for the ammonia refrigeration system, but received no information on the halocarbon system. Based on a review of the project documentation and other literature, the use of ammonia refrigeration systems for refrigerated warehouses of this size is standard practice. As such, we zeroed out those impacts.

### 3.1.4 Gross Program Impact Results

For PY3, there were 37 total projects for which incentives were paid out and ex ante savings reported. The breakdown of projects includes 33 systems track projects and 4 comprehensive track projects<sup>2</sup>. As stated earlier, we assessed 15 projects, 11 that were systems track projects and 4 that were comprehensive track projects.

Table 3-1 shows the gross ex ante and ex post savings by project, including individual project realization rates, for the sampled projects.

**Table 3-1. Participant Gross Savings for Sampled Projects**

Project Number	Program Track	ex Ante Savings		ex Post Savings		Realization Rate	
		Peak Demand Reduction (kW)	Energy Savings (kWh/yr)	Peak Demand Reduction (kW)	Energy Savings (kWh/yr)	Peak Demand Reduction RR	Energy Savings RR
1	Systems	8.3	46,527	10.1	73,880	1.22	1.59
2	Systems	18.0	65,786	40.2	102,317	2.23	1.56
3	Systems	17.1	62,432	37.1	90,100	2.17	1.44
4	Systems	31.4	102,698	30.7	142,710	0.98	1.39
5	Systems	33.4	153,753	38.7	202,148	1.16	1.31
6	Systems	502.8	3,562,530	543.1	3,769,021	1.08	1.06
7	Systems	1.8	6,839	2.3	7,035	1.28	1.03
8	Systems	20.0	57,199	19.9	57,199	1.00	1.00
9	Systems	134.2	989,147	131.5	950,219	0.98	0.96
10	Systems	343.3	461,986	124.2	250,194	0.36	0.54
11	Systems	9.5	53,431	11.9	9,645	1.26	0.18
12	Comprehensive	53.0	166,449	53.0	166,449	1.00	1.00
13	Comprehensive	339.0	1,684,172	297.2	1,527,816	0.88	0.91
14	Comprehensive	22.1	182,914	18.8	150,810	0.85	0.82
15	Comprehensive	66.0	239,676	0	0	0	0

<sup>2</sup> The program tracking database originally showed six comprehensive projects, but we later found two to have been incented as a systems projects and report it as such here.

As shown above, we adjusted the energy savings downward for six projects, upward for seven projects, and made no change for two projects. We did assign zero gross impacts for one project. For this site, the baseline standard practice was equal to the efficient practice<sup>3</sup>.

After applying weights based on our sample design, the gross realization rate for energy is  $0.997 \pm 0.062$  and the gross realization rate for demand is  $0.953 \pm 0.052$ . We applied the point estimates back to the population to obtain the gross impacts shown in Table 3-2.

**Table 3-2. Program Level Gross Impacts**

Metric	Ex Ante Gross Impacts	Realization Rate	Ex Post Gross Impacts
kWh	9,202,539	0.997	9,174,146 <sup>a</sup>
kW	2,374	0.953	2,263 <sup>a</sup>

<sup>a</sup>Value does not multiply out exactly as shown using shown realization rate due to rounding.

### 3.1.5 Net Program Impact Results

Our net-to-gross interviews reached participants representing 15 projects and 89% of the ex ante gross impacts. As discussed in the methods section, we carefully reviewed the NTG responses from each of our interviewees and adjusted the NTG algorithm and ratio for 6 of the 15 projects included in our interviews. In four of the cases, the respondent did not appear to be bringing particular information provided elsewhere in the interview to one or more questions in the attribution battery. Thus, we adjusted the scoring to reflect how we believed the respondent should have answered the attribution question considering the other information provided. In three of the four cases, we increased the NTG value and in the remaining one we decreased it. In two more cases, the respondents' statements and rating of the program elements were consistent, but the algorithm was not prepared for their particular case. In these two instances, we adapted the algorithm to better reflect their unique circumstances. We provide the rationale for adjusting each of these six cases below.

**Adjustment #1:** In the first case, there was a high level of evidence ECW helped a project whose decision-makers were focused on cost. ECW helped them to cost-effectively determine the best strategies for realizing design efficiency. This increased the owner's buy-in to efficiency:

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<sup>3</sup> This was an ammonia refrigerant system in a large refrigerated warehouse where ammonia systems are standard practice for the size.

*I think the running of their (ECW's) energy model confirmed or helped establish the priorities of what we could do on our limited budget to get the most energy savings. So out of the different strategies it was pretty easy to spot those that rendered the most savings for the dollars invested in the project. So it helped with the decision making, and of course the incentives realized helped offset some of the costs. And so from the client's point of view, making a decision to move ahead with some of these became pretty straightforward... We weren't sure exactly what all the strategies we would use, but then working with the Energy Center from Wisconsin and analyzing, that kind of set some of our directions. So the leadership was responsible for setting the goal. The design team then gave them viable paths to accomplish that goal. - Participant*

Thus we increased the program influence score from 25 points to 90 points, with the project's NTG value increasing from 0.55 to 0.77.

We made a further adjustment to this project based on evidence in the email record that this project would not have included an energy model as a design tool had it not gone through the program. In the interview, the designer stated that the firm normally creates models for its projects and hence the participant responded to a likelihood question (FR13) suggesting that an energy model would have been used as a design tool in the absence of the program with a "10" ('extremely likely'). However, the email record shows that the same participant requested a copy of ECW's energy model and stated that the firm had not created its own energy model. Thus, we changed the score to a "0" (giving the program maximum credit), further increasing the NTG from 0.77 to 0.84.

**Adjustment #2:** In the second case, there was evidence that ECW's training helped the participant learn about the eQUEST modeling that the participant initially used to model the project. We increased the training score from 1 to 5 (out of 10 possible points), which increased the NTG from 0.22 to 0.35.

**Adjustment #3:** In the third case, the participant stated that they would have used an energy model in absence of the program, but the participant also stated that the program helped with the energy model. Thus we adjusted the Program Timing (for likelihood energy model would have been used as a design tool) from 10 to 5 (giving the program more credit), increasing the NTG from 0.77 to 0.80.

**Adjustment #4:** In the fourth case, nearly every question we asked indicated that this project was a total free rider. Responses included:

*The rebate process in Illinois is onerous and so these people were going to go ahead with their energy efficiency improvements and their construction, but they weren't even going to file for a rebate. So we came in and we said, 'Look... we think we can get you some rebates from Com Ed, just let us try.' - Participant*

*You know (the program) wasn't influential because the project was already on that (energy efficiency) track...And so what we did was we brought in the rebates that were available to them. - Participant*

The respondent sounded exasperated when giving an answer of "2" of 100 influence points to the ComEd program, perhaps emphasizing how little the program mattered. When we followed up with a different person involved with the program, we learned that they customer had already purchased equipment prior to learning about the program. Thus we adjusted the Program Influence score from 2 to 0, decreasing the NTG from 0.01 to 0.

**Adjustment #5:** In the fifth case, the respondent stated that the program became involved with the systems project during the construction phase. The algorithm we designed would generate a NTG score of 0 for this project since the program was involved so late in the process<sup>4</sup> However, the incentives clearly influenced the installation of energy efficient lighting that had still not been installed. Thus we calculated the NTG score assuming that, for the lighting, the program had become involved during the construction documentation phase which increased the NTG value from 0 to 0.87.

**Adjustment #6:** In the sixth case, the project went through the systems track, a track that our algorithm assumed would not be affected by value engineering. Yet the participant implied that value-engineering occurred and that the program kept the energy efficient measures from being cut and when asked, stated that the program was extremely influential in keeping the measures from being cut. Consistent with his answer the Program Timing score was increased, increasing the overall NTG from 0.58 to 0.82.

The NTGR varied across the 15 projects, from 0.0 to 0.87. The final NTGR, though, is not a simple average of these 15. Instead, weighting the project-level NTG values by project savings produced a total program-level NTG ratio of 0.65. This NTG ratio was applied to the population of projects. When applied to the total ex post gross impacts, this NTG ratio yields the final net impacts shown in Table 3-3 below.

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<sup>4</sup> Our data collection instrument incorrectly skipped out systems track projects that the program accepted in the construction phase and the algorithm assigned these customers as free riders. However, we had provided an open ended question about attribution prior to moving forward with the interview. The implementer notes, "Lighting and HVAC designs are frequently addressed in the construction phase of the building and permits are drawn by subcontractors responsible for the work. Also, because these systems are among the last items to be added to the new building, they are susceptible to being 'value engineered', especially if the project is over budget." Based on our questions, we found evidence for both instances described by the implementer in two of the projects (described in Adjustments #5 and #6) and performed the full NTG battery for each customer. These were the only two cases affected by this issue. It did not affect the final NTGR and we have adjusted the guide and algorithm for PY4 calculations.

**Table 3-3. Program Net Impacts**

Metric	Ex Post Gross Impacts	NTG Ratio	Ex Post Net Impacts
kWh	9,174,146	0.65	5,963,195
kW	2,263	0.65	1,471

As outlined in the Net Program Savings section above, we revised the PY2 attribution battery for the PY3 effort to better capture decision-making. Based on the PY3 participant interviews, we believe this is a better instrument both in content and flow. For example, as we described in adjustment #6, the inclusion of open-ended questions allowed us to determine during the interview that we should expand the typical systems questions. As part of the ongoing discussion regarding instrument improvement, we make three points here (see additional improvements to the battery recommended in the LEED Projects section below). First, it is clear that value engineering can occur on non-comprehensive track projects and thus question FR10 should be asked on all projects. Second, systems track projects accepted in the construction phase does not automatically indicate full free ridership and thus interviewees should be asked the full attribution battery. Third, no matter how many refinements are made to the attribution battery, it will likely always be important to contextualize and possibly adjust participant answers based on data collected in other parts of the interview.

### 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 PY3;
- 2) characterizing the partners and customers participating in the program components;
- 3) training opportunities and effectiveness;
- 4) effectiveness of the program processes in motivating customers to participate and providing incentives to participants; and
- 5) comprehensive track effectiveness and development.

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 15 individuals (2 program managers and 13 participants<sup>5</sup>). Although a small number, it is

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<sup>5</sup> Three of the participants were rebate agents and 11 were customers.

consistent with the participant sampling technique where 89% of the impacts are within our sample and reflects the two managers most involved in the program. However, due to the small number, 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

**Program Summary:** Overall, the participants we interviewed were very satisfied with the program and believe it is valuable. All participants found the incentives valuable and participation worthwhile. As one market actor stated, "(Working with the program) was fairly easy, the whole process; and I thought it was very beneficial." Many participants mentioned that ECW staff were extremely helpful throughout the participation process and were knowledgeable about energy efficient design. Participants also found the program valuable in other ways. For example, one customer stated that the program was valuable because the incentives helped "melt internal company resistance" to using energy efficient measures. Among those participants whose projects received energy modeling through the program, they generally valued the resulting, informed, cost-effective decision-making the modeling afforded:

*I think...their energy model confirmed or helped establish the priorities of what we could do on our limited budget to get the most energy savings. So out of the different strategies it was pretty easy to spot those that rendered the most savings for the dollars invested in the project. So it helped with the decision making, and of course the incentives realized helped offset some of the costs. And so from the client's point of view, making a decision to move ahead with some of these (design features) became straightforward. –Market Actor*

Findings also suggest that the training sessions are valuable for educating market actors and helping to establish a community of effective efficiency designers. Further, the program training in combination with technical assistance components combined to help LEED project design teams implement their efficiency intentions.

Market actors also highlighted the program's indirect value in the marketplace as one of many national utility incentive programs focused on increasing C&I efficiency. Rebate agents interviewed in this study stated that utility incentive programs influence prototypical store design at a national level:

*(The program) influences the total picture. When you do these surveys for a national retail chain, you can't think of it as a store by store basis. You have to think of it - how do these programs affect the thinking of the chain? And all I can say is, you know, this is the*

*God's honest truth, these programs do affect the chains that are willing to try to be more energy efficient. -Market Actor*

## 3.2.2 PY3 Implementation Changes

In this section we list and discuss implementation changes that occurred in PY3. We categorize these in two ways. First, we list changes that were relatively easy to implement. Second we discuss those changes that program managers implemented as solutions to more complex issues and challenges.

**Section Summary:** During PY3, the implementation team continued to respond to challenges with timely and appropriately changes that support program development and success.

### Simple Improvements and Changes

Program managers made a number of so-called “minor” changes and “tweaks” to program delivery during PY3. We briefly document these below:

- Enabled by a larger budget, ECW added two staff engineer positions.
- The program rebate cap was raised from \$100,000 to \$150,000 per project and various incentives and requirements for HVAC equipment in the systems track changed (see Section 1.1.2).
- Per a PY2 evaluation recommendation, the program increased clarity around the energy efficiency baseline code used for engineering review.
- The program transitioned from an internal spreadsheets-based tracking system to a centralized online SharePoint tracking system, resulting in what a manager believes is a “much improved” system that multiple people can work in at once.

### Solutions Implemented in Response to Specific Issues

Overall, there were far fewer challenges the program faced in its second full year of implementation, PY3, than the number of challenges it faced in its first year, PY2. As the utility manager stated, “I think it’s been a pretty good year. We ... worked out the kinks in terms of the program delivery process and we’re going to meet our goals.” Throughout the in-depth interviews, program managers identified three main challenges that occurred during PY3. We discuss the challenges here including: a tight construction market; the difficulty with reaching projects early in the design process; difficulties arising from the program having three separate tracks; and incentive levels. Overall, the implementation team continued to handle these difficulties well, mainly through refining program focus and taking timely, appropriate steps to support the program. In the next paragraphs we explore these challenges and explain how the program handled each of them.

First, a tight construction market has been a lingering effect of the down economy, limiting the start up of many larger (i.e., 100,000 square feet or more) new, construction projects. As a result



a smaller number of larger projects have been available in the market for the program to reach. This challenged the program since it was designed in 2008-2009 to incorporate larger, new construction projects through the comprehensive track. Building on changes in PY2 (i.e., adjusting administrative budgets to focus on more systems track projects) program managers made sure program goals were met with the help of several systems track projects, but also steered the program toward comprehensive projects. Meanwhile, as one manager stated, “we found the markets that are still building (i.e., education, healthcare, retail, etc.)” while “relying a lot on our association with professional associations and individual firms within the region that do a lot of work on commercial projects.” In all, the intensified program focus on comprehensive projects during PY3 included 1) increased marketing and outreach efforts, such as using ComEd account managers, cold calling, and leveraging networks of A&E market actors; and 2) continued training and education efforts which helped grow an A&E market actor community motivated to bring projects to the program. Finally, the program recently established an office in Chicago to support face-to-face meetings with potential program participants in and around the city.

Second, as one program manager explained, “The biggest challenge is trying to identify projects early in the design process.” The earlier the program becomes involved with a new construction project, the more likely it is that the project will make use of the technical assistance during the design process and go through the comprehensive track, generally returning maximum energy savings. From the program side, reaching out to projects early on is difficult because, as one program manager explained “there is no good resource out there for us to do that.” On the customer side, there may be a lack of awareness of the program or the technical assistance portion of it. In part, program history helps bridge the divide between customer and program, i.e., the longer the program is in the market the more chances both parties have to learn of and work with each other. Additionally, the efforts identified in the previous paragraph also serve to bring projects into the program earlier. For example, the office in Chicago allows meetings to occur more easily and earlier with potential program participants:

*(The full time staff) will be doing a lot of technical assistance and outreach for the program. He’s a native, worked in the market for six years in Illinois, a registered engineer, mechanical, and has a lot of connections that we’re very excited about. – Program Manager*

As will be explored later, there is evidence that more and more of the A&E design community recognizes that it is beneficial to become involved earlier in the program and intends to do so.

Third, as much as the program currently benefits from having three separate program tracks, it also requires the program to clearly and effectively market the value of each track, and then manage customer expectation differently during the participation process. It is easy for potential participants to become confused as to the nature of the program or what to expect



from it depending in which of the three tracks they first participate. One program manager stated:

*(Misconceptions about the program) have been difficult to address because we have so many tracks, and the amount and the process for going through the program is fundamentally different for every track... Certain clients have multiple projects in the program, some which are taking different paths... So that makes it really hard to convey what the process is, and we do that hopefully in email and by phone, and try and make that as consistent as possible throughout the life of the project. –Program Manager*

Based on participant interviews, it appears that the program is doing a good job of communicating the steps of the program once a customer becomes a participant. The majority of the participants stated that the program requirements were clearly explained to them and that the communication with program staff throughout their involvement with the program was what they wanted. Only one participant we interview stated that the requirements were poorly explained and that the project was confounded by the different program tracks. Although apparently rare, the ordeal demonstrates the attention and resources the program must use to prevent such confusion. Thus, program staff are focused on streamlining the program into only a comprehensive track over the next few years:

*I think a simplified (comprehensive track only) program would make a huge difference to a satisfied customer. ... The three track thing seems arbitrary; (as a customer) if I didn't understand the reasons for doing it the way that we're doing it now, it would irritate me. –Program Manager*

### 3.2.3 Partner and Participant Characteristics

**Section Summary:** In PY3, the program grew its partner network to include more designers, especially architects, and manufacturers. The program also saw a sharp increase in the variety of building types completed in PY3 compared to PY2 including big box stores and industrial projects. Program design and outreach methods were likely responsible for these gains.

#### Partners

As the program matured in PY3, the kind of market actors it worked with changed. Compared to PY2, during PY3 the program worked with more designers, architects, and engineers, the main targets of the program and fewer rebate agents. Since retailer chains often make use of proto-typical store designs that may only be refreshed once every one or two years with little leeway for local modifications, it is difficult for the program to reach the projects during the design phases in which savings can be maximized.

Program managers highlighted two particular successes in the development of their PY3 partner network. One manager stated that the program has developed especially good relationships with architects since program inception:

*I think the greatest strength (of the program during PY3) has been the traction we've developed in the market through the relationships we're developing with the design community and (especially) the architects. We've had some returnees who participated early in the program and they're now bringing us projects that are earlier in design. – Program Manager*

Another manager stated that the program successfully reached out to three manufacturers who have several accounts with national retail chains. Program staff explained the specifications that would qualify the manufacturers' skylights and automated controls for incentives through the small building and comprehensive tracks. Then, ideally, the manufacturers tell their retail clients about the program, and convince them to include the particular equipment in their store design. Retailers, motivated to realize their investment, investigate the program and implement further efficient measures and design. Although there appears to be interest and some buy-in among manufacturers, it is not clear whether or when this outreach will pay off for the program.

## Participants

Compared to PY2 records, PY3 records show a sharp increase in participant variety. In PY2, all 17 projects were classified as retail/service building types. Yet, in PY3, only 57% of the 37 projects were retail/service building types. The remaining 43% of projects was made up of office (14%), industrial (14%), warehouse (8%) school (5%), and hospital (3%) building types. This is an important trend for the program because it was designed to recruit these types of larger projects in order to maximize savings and minimize administrative costs. For example, the average size of the five industrial projects was 175,362 square feet and the average ex ante annual savings per project was 814,661 kWh, compared to 21 retail/service projects with an average of 46,704 square feet and 58,367 kWh of savings.

The change in PY3 building types is in part due to the difference in average project completion timelines, with those among retailers being much shorter than other project types.

*(One) reason that we only saw retail last year is because they have short timelines from start to finish, because they are... very much production oriented. They're set up to put out these stores and roll them out as quickly as possible. So you might see less than 12 months for a build instead of the 18 to 36, which would be typical for (other) new construction. –Program Manager*

However, the increased variety of projects was also caused by strategic program outreach. For example, another reason for the decrease in small retail chain projects was due to the

challenging small building track requirements, i.e., daylighting, which kept many smaller retailers from participating in the program. In this way, the program keeps the administrative costs appropriately balanced with the potential energy savings associated with these projects.

Instead, the program has encouraged the participation among larger projects, including larger retail chains such as ‘big box’ stores, which have been one of the program’s participant targets. Aside from influencing these projects through relationships with manufacturers as described above, the program also reached out to larger retailers in other key ways during PY3. For example, staff presented the program to Com Ed account managers who have relationships with national retailer accounts:

*We’ve given...presentations to account managers at the utility. When (account managers) know the program, they know how it works and how we can support them. They (passed) that on to their (retailer) clients and basically brought them into (the program) for us. –Program Manager*

Another success for the program was completing five industrial projects in PY3. Further, the program will likely complete additional industrial projects:

*We have a lot of like industrial-type projects that are coming in for PY4 that are building warehouse, office, and manufacturing space...which is exciting because they’re huge and we have a chance to really impact the energy savings on all three levels. –Program Manager*

Program managers created an industrial strategy in PY2 in response to the tight construction market and the need to recruit other project types into the program. The original program design did not include industrial sites because establishing an energy baseline is difficult for industrial sites. For example, there is no baseline under IECC 2009 for an industrial process building. Working with industrial projects was difficult for the program because it required coordination with ComEd engineers who provided customized savings for the processing equipment measures for each project while the program analyzed lighting and building envelope measures. Thus, program participants were in contact with two different parties creating the potential for confusion. Thus, going forward, program managers plan to move the engineering analysis to the implementer, ECW.

*It has been a coordination issue: two people ostensibly from the same program reaching out to a client with different phone numbers and email suffixes and questions. So we’re looking forward to bringing it all in and doing it under one roof, to be better coordinated. – Program Manager*

Despite concerns over potential confusion for participants, the two industrial participants we contacted were positive about their interaction with the program. One stated, “Yes (my communication with program staff what I wanted). They were good, they’re really good.” This suggests

that the program has successfully coordinated with Com Ed engineers, or that participants have a balanced perspective on what may be reasonably expected from working with two parties. Given the program's past success in adapting to industrial projects it is likely that it will continue to be successful in taking advantage of the "pretty big industrial base in the Chicago area (- Program Manager)."

## 3.2.4 Training Opportunities and Effectiveness

**Section Summary:** Program managers believe there is good evidence that the trainings are creating a community of satisfied, educated design professionals. Training session evaluations conducted by the program implementer provided managers this evidence. The managers also used the evaluation findings to make appropriate training improvements during PY3. Participant interviews we conducted suggested that the training component is valuable but under-utilized. In this section we make two recommendations for improving program training activities.

The program offers several full day trainings throughout the year that touch on different aspects of designing a building and give an overview of how to participate in the program. The trainings primarily target C&I designers including architects, designers, and engineers (e.g., mechanical, electrical, etc.). In PY3 the program sponsored five trainings reaching 278 attendees and covering the following topics:

- » June 2010- HVAC Technology and Design Solutions-97 attendees
- » October 2010- Lighting and Daylighting with Efficiency-69 attendees
- » December 2010-Direct Digital Control (DDC) systems for high performance buildings systems-42 attendees
- » February 2011- Passive Thermal Design for Energy Efficiency and Indoor Comfort-45 attendees
- » April 2011 Designing High Performance Buildings: Using an integrative design process-25 attendees

Program managers believe there is good evidence that the trainings are creating a community of educated design professionals who 1) understand principles of efficient design; 2) know how to leverage their role during the project to realize efficiency potential among competing interests and priorities; and 3) are motivated to take part in the program. As one manager stated:

*We're giving this particular community a place to have discussions about pushing the envelope and overcoming building owner barriers or mechanical engineer barriers (i.e., between the architect and the mechanical engineer)... and promoting high performance design... They don't get to have these discussions anywhere else as far as I know... They're making connections. They're talking with their colleagues. They're networking.*

*They're talking about cutting edge ideas... So it's been really, really good. – Program Manager*

Program managers also explained that the training works in conjunction with the other program elements including incentives and technical assistance:

*I would say we're impacting the market because we are allowing those conversations (among training attendees) to occur; we're showing (attendees) how (they) can build high performance buildings in this market. We're helping by giving them incentives, providing them with training and (technical assistance). – Program Manager*

In the integrated design training report, the implementer found that 67% of respondents indicated that they believed the New Construction program could help their business implement the ideas in the session, with a majority of these respondents stating that it was at least somewhat likely that they would enroll a project in the Com Ed New Construction program. This is clear evidence that the training session helps channel attendees, principally market actors, into the program. However, we also recommend that the implementer include a follow-up question to determine why the attendee does not believe it likely that s/he will enroll a project in the program, where applicable.<sup>6</sup>

The evaluation team limited its study of the PY3 training activities to program manager and participant interviews due to budgetary restraints. This offers only a limited perspective on training effectiveness because we did not reach out to training attendees who were outside of our sample. However, from those participants we interviewed, we found some evidence for program managers' assertions. We also found one way the program's approach to training can be improved, i.e., the program should increase training awareness and buy-in among participants. Overall, we believe that program managers are developing the training component into an effective tool for educating designers and channeling some customers into the program. In the next paragraphs, we examine the training by reviewing data from three sources: program manager interviews, a white paper written by the program managers<sup>7</sup>, and participant interviews.

Program managers' believe that the trainings are valuable and effective based on the data the program collects following training events. ECW fields two surveys; the first at the end of each training and again some months later (see interim results in Section 5.2). The end-of-session surveys indicate attendee satisfaction and quality of the course content while the later survey

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<sup>6</sup> Additionally, we provide ECW's Interim Results of Training Follow-Up Study Memo in Section 5.4 of this report.

<sup>7</sup> Henry, S., Schiedermayer, K., and Walker, T., (2010); ACEEE; *Integrating Technical Education and Training into Energy Efficiency Program Delivery: A Strategy to Drive Program Participation and Create Short Term Impact and Long Term Market Effects*.

queries about behavioral changes due to the training. Program managers not only used these PY3 survey results to confirm PY3 course quality, they also used PY2 survey results to make two key redesigns for PY3 trainings sessions. First, program managers split the training session by attendee type, with designers, engineers and architects attending one set of classes and installers attending a different set of sessions. Thus, compared to PY2 training sessions, in which there were 395 attendees, PY3 sessions included about 100 fewer participants. However, this is consistent with a program’s goal to make the session more appealing to their primary audience, the design community. One manager explained the rationale:

*We recognized that we really had two audiences with two very different needs. We have more of a trade ally type audience and they want more hands on what’s the latest technology type training session. And then we have the design community, which is the architects, the design engineers, the mechanical, electrical, plumbing, etc., and they want to talk about building design So this is the first year that we actually split the audiences and we started offering more of a trade ally oriented training session for the prescriptive folks and started doing more design type focus for New Construction people. So the attendee numbers have gone down a bit for New Construction because we really are starting to focus on the designers and we’re really starting to use the training as an opportunity to push the New Construction and the envelope type discussions, like passive thermal design. And that will continue. So our attending numbers may not ever be 100 because our target is smaller, but I think the training is definitely effective and much appreciated in this market. . – Program Manager*

Second, in response to attendees requesting a training experience with more depth, the program included a mock design charrette in the integrated design session. A manager stated that this allowed attendees to “get into some great discussions about pushing the envelope and the issues that they deal with.”

In PY2 the program implementer conducted surveys several months after attendees completed the training sessions. The program managers collected data on attendee behavior changes in regard to bringing lighting efficiency into their professions. High proportions of attendees not only made ongoing changes in their approaches to lighting but also passed along ideas and information to colleagues. Further, the majority stated that the PY2 lighting training sessions were influential on these behavioral changes. The managers concluded that “While the response rate was relatively low the given results suggest that the training program is contributing to market transformation.”<sup>8</sup>

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<sup>8</sup> Ibid, p.6-95



Since the training sessions are similar from year to year, it is reasonable to conclude that the PY3 sessions also contributed to market transformation. The implementer's evaluation results appear to support this. First, average overall attendee satisfaction scores were very similar for the two years; the PY2 lighting sessions scores were 4.41 and 4.66 (on a five point scale), and the PY3 courses ranged from 4.59 to 4.71. Second, the majorities (ranging from 51% to 74%) of PY3 attendees in each of the five classes stated that they picked up ideas that their businesses will implement, which was similar to the PY2 lighting majorities (i.e., 68% and 71%).

PY3 participant interviews we conducted also suggest that the training component is valuable but under-utilized. Only about half the participants we interviewed were aware there was training and only one had attended a training session. The attendee found various sessions covering lighting, digital controls, and eQUEST modeling "very enlightening and helpful". When asked whether the training influenced the design of the project submitted to the program, the participant answered, "No question."

We asked those participants who have been aware of trainings, but who have not yet attended to explain why. Most indicated that they found the subject matter interesting. As one participant stated, "(I am interested) in anything to make building designs more energy efficient whether it's to do with lighting or HVAC or anything like that." Another stated, "I think what's currently being offered is interesting and is tempting for us to send someone out there." Yet most participants also indicated that they were too busy to attend. Others suggested that they would attend if the topic was pertinent to what they were currently working on. For example one stated:

*I am sure that (the training session announcements) have been coming through on various emails, but if it hasn't been something that was pertinent to what I was doing at the time I may have ignored it. – Participant*

Findings from the participant interviews suggest that many participants are aware of the training sessions through email indicating that this is one good outreach method. But given that there were several other participants who were not aware of the trainings, this also suggests that the program needs to continue to raise awareness of training sessions possibly through alternate methods. While we did not explore these alternate methods in this evaluation, we can make a few recommendations about training outreach. First, consider using the ECW email signature lines to announce upcoming training sessions. Nearly all participants we interviewed held very favorable opinions of ECW staff and their communication. Given the amount of email correspondence that takes place during program participation especially during technical assistance, the program could alert relevant market actors to the trainings exactly when they are most involved with the program. Second, in the email announcements of the training sessions consider using the subject line or the beginning of the message to acknowledge the recipient's time constraints, and then follow up with statements, perhaps using attendee quotes, that capture the relevance and long term value of the program. For example, "We know you think

you are too busy to step away from your projects for even a day, but consider coming to a training past attendees have called... that will maximize savings on your future projects.”

### 3.2.5 Effectiveness of Program Processes

**Section Summary:** Findings from participant interviews indicate that program processes provided participants a valuable and satisfying experience throughout their participation. Further, program managers stated that there have been no formal complaints made to ComEd. Although in nearly all cases, participants were completely satisfied with all program processes, two issues came up more than once among participants: 1) communicating with multiple sources ostensibly representing the same program; and 2) relatively low incentive levels. We review general participant satisfaction and the few issues across several stages of the program process in the following paragraphs.

The majority of participants stated that the program requirements were clearly explained to them. However, consistent with program manager concern for potential confusion with several program tracks, one participant did not think that the program requirements were clearly explained and stated that there should be clearer distinction between the systems and comprehensive track. For one project that appeared to be submitted across multiple ComEd programs, another participant stated:

*The biggest thing that I could see to improve the program would be to have one point of contact, and that person on the other side would then distribute the information to whatever person it should go to. – Participant*

Another participant who thought the program explained the requirements well, nevertheless suggested that the program upload a particularly helpful PowerPoint presentation to the website:

*ECW provided a slide show where they showed a two column slide that said if this is your situation then you fall under this program; if this is your situation you fall under that; and I think that would help people get a better feeling of which program they really should be applying for and at what point in the stage they need to be applying. – Participant*

Notably, the program managers worked to clarify communication with participants in PY3 by “managing the customer’s expectation.” This means that program staff email participants about subsequent steps within the process and the timing associated with each.

The majority of participants also stated that the application was easy to complete and some even stated nothing could be done to improve it:

*I don’t think you can make it too much better. – Participant*



*No, (I don't think it can be improved). When I looked at it, it seemed pretty simple. – Participant*

However, one respondent suggested that there should be clearer instruction on the website for filling the application out. Consistent with PY2, participant satisfaction with the program application continues to be a positive aspect of the program. As one program manager stated:

*We've reduced (the paperwork) to the absolute minimum we can for this particular utility, and I think it takes away those barriers to participation. I think that's critical to providing satisfaction. – Program Manager*

All participants we interviewed who went through the technical assistance portion of the program were satisfied with it. One participant stated, "I thought they were helpful and it was real straightforward." All participants also found ECW staff knowledgeable about energy efficient designs and measures. One participant stated, "They definitely knew their stuff and were helpful the whole way through." Another stated, "They offered quite a bit of suggestions on ways to help provide a better, more energy efficient design for our client."

All participants we interviewed were satisfied with the verification process calling it "painless", "easy" "fairly smooth", and "super simple." Nearly all participants viewed the incentive payment process similarly. One participant stated, "It was easy and quick." Yet, one complained that the process was slow:

*My project was finished in June and I don't think we actually got ... a rebate till... December and that's not good. – Participant*

Although most participants we interviewed were satisfied with the incentive process, a few thought that the incentive levels should be increased. For example, one participant from a national retailer stated:

*I think they should offer considerable more money. I'm comparing Com Ed to other programs, new construction programs and what I'll say is that we didn't receive very much money from Com Ed. We were somewhat under impressed by the rebates that we received. – Participant*

This is consistent with at least one program managers' view that the incentive levels were too low:

*I feel that the incentives are low on a peer program basis, (compared to) Focus on Energy here in Wisconsin or Savings by Design in California or NYSERDA. I feel like since we're limited to kilowatt hours, it's pretty hard to move the market with the amount of money we have available. – Program Manager*

Notably, program managers are working toward a coordinated program with Nicor Gas that may start in PY4. This would likely provide participants with greater incentive levels.

### 3.2.6 Comprehensive Track Effectiveness

Program managers plan to gradually transition to a comprehensive track only program model over the next few years. Given this focus, the evaluation team asked program managers several questions related to the transition and sought participant feedback from representatives of all four of the comprehensive projects completed in PY3. In this section we present findings from these interview and discuss 1) the rationale for the transition; 2) current strengths of the program that support the transition; 3) current participant understanding of the program; and the 4) the way the program works with LEED projects.

**Section Summary:** Findings generally indicate that the implementation team implemented this comprehensive track well in PY3 and that the program is well aligned to transition to an all-comprehensive program in the future.

#### Rationale

There are several reasons why the program plans to transition to an all-comprehensive track approach over the next few years. First, program managers agreed that the increased stringency of IECC 2012 will likely make the systems track obsolete.

*The main issue that's driving this is a change in the code: IECC 2012. We're anticipating it (may have) savings somewhere between 40 and 60% above the current code. That's huge. ...It's going to impact what our baseline is and the savings that we can capture will be much smaller. That (means) that most of the savings we get from HVAC (and lighting) on ...the systems side is going to go away. There's just nothing that can operate at that level right now. So consequently we're anticipating that the systems track will go away...*

Second, the program was designed to take an early design /comprehensive approach to projects. For example, the program is staffed with building engineers whose expertise is better leveraged over larger projects, maximizing energy savings while minimizing administrative costs otherwise associated with a greater number of smaller projects. As the program matures, there has been an increase in comprehensive projects. In PY2, there were no comprehensive projects completed; in PY3, 11%<sup>9</sup> of the completed projects were comprehensive. Given the increase and

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<sup>9</sup> This portion reflects four comprehensive out of the 37 total projects completed in PY3. Early PY3 program records we received listed six comprehensive projects, but two projects shown as the comprehensive track were later found to be incented through the systems track.

considering the project pipeline, program managers think that as many as 50% of PY4 projects could be completed through the comprehensive track.

Third, by adopting a single comprehensive track approach, the program would be able to streamline its administrative and marketing activities. Program managers also expect that this would reduce customer confusion:

*I think the simplicity in conveying the message is the most important driver of all ...: (A comprehensive track only program would be) far more clear and simple. (If) you have to (explain the various aspects of) three different tracks, ...to somebody and get them to understand, it is next to impossible. You have about thirty seconds before they lose interest in what you're trying to do. So if you can explain one track that's really simple and straightforward in how it works, ...it's a lot easier to get their buy-in. Plus you only have one thing to manage every year. ... - Program manager*

While, as we show below, participants completing any track in the program generally understood that the comprehensive track was potentially more valuable than the others, one systems track participant stated:

*"There could be some great(er) value (other than the systems track but) I don't understand the entire New Construction program. It is my understanding that somebody can actually--before they even start on a project-- send off information and work with the New Construction people to help design energy efficiency, but I am not sure that is the case. -Market Actor*

This suggests that program manager concern regarding customer confusion is legitimate. If only a few market actors are confused by the program offerings this could represent lost opportunities for the program in a tight construction market.

Finally, program managers highlight that the program would benefit from exerting more of an influence on overall project design efficiency which would be reflected in a higher NTG value for the program.

*We know that there's more value in being involved earlier in a project. The ability to influence the design is greater, (and) therefore the net to gross should be greater. - Program Manager*

## Current Strengths

The program is currently well poised to transition toward an all-comprehensive track program in several ways. The program managers are focused on transitioning and are preparing for it. For example, they are refining marketing and outreach to stress the benefits of participating in the program earlier in the project design process:

*Our messaging is ‘get us in early’; ‘take advantage of comprehensive’; ‘it’s the most bang for your buck’; ‘it’s the whole building modeling (and) we give it to you for free; it’s an iterative design process (and) we work with you’; we try to ...move the market to want comprehensive and to not focus so much on systems. –Program Manager*

Additionally, the program’s network with designers is growing through the training component and through prior participation. As one program manager stated, “We’ve developed (traction) in the market through the relationships we’re developing with the design community.”

Further, the program targets the design community in many ways including cold-calling because as one program manager explained, “designers are doing ten to fifteen projects a year.” Having a designer network supports the comprehensive track of the program by increasing the likelihood that designers will channel projects into the program early in the project design cycle.

## Participant View

Findings from participant interviews suggest that recent participant awareness and experience will also support the program’s transition to an all comprehensive track program. First, consistent with the high overall participant satisfaction we have outlined in previous sections of this report, comprehensive participants were very satisfied with key aspects of the comprehensive track including technical assistance, staff knowledge, and working with the staff. One comprehensive track participant stated:

*It was a really collaborative process, everyone (at ECW) was available and working together and everything moved swiftly. –Owner*

Second, many participants of both the systems and the comprehensive tracks understand the value of working with the program earlier through the comprehensive track. For example, one PY3 systems track participant stated:

*I think that if people learn about (the program) enough in advance so that they can actually utilize it (i.e., the free energy modeling) to increase the efficiency and value of the project then it can be really great. –Market Actor*

Third, a few participants stated that they intend to participate in the comprehensive track on future projects. For example, one consulting engineer who had previously worked on a systems track project indicated that the next project will be submitted to the comprehensive track.

*We’re working on a design (for a project) now ...(and) we talked to the guys in the New Construction program...and we’re working on the application now ... and getting it started in the New Construction program the way it was intended. –Market Actor*

Notably, participant awareness, attitudes, and intentions toward the comprehensive track are consistent with program manager view of the way the program can mature into a comprehensive track only program over time:

*We look at systems track and small buildings projects as kind of a quick start option for the program savings. And then once people are familiar with the process, we'll take it in a different direction to kind of support the more holistic (comprehensive) approach. – Program Manager*

Finally, we asked comprehensive track participants about any limitations that might keep them or other customers and market actors from participating in the program. Given their own positive experience, however, most participants could not think of any ways it might be difficult for others to participate. Most also did not find meeting program requirements (i.e., 10% savings against baseline) difficult. Participants suggested that a lack of awareness of the program comprehensive track might be the biggest barrier to participation in it. Below, we outline the few other issues that comprehensive track participants raised for potential comprehensive track participants.

One market actor suggested that it may be difficult to get some customers to believe that Com Ed would support projects that use less of its product:

*They may think it's too good to be true if someone says, 'Oh, they'll give you money for you to do more efficient.' (They think) 'It's the electric company. That doesn't make sense.' –Market Actor*

Notably, project managers are currently working on comprehensive track case studies that might be used to persuade these types of customers to participate. The program would likely benefit from testing these materials with ComEd C&I customers. For example, the program could use focus groups to see how one page case studies targeted at different types of C&I customers are perceived and whether they are compelling. When finished, the program should make market actors aware of these materials so that they can be passed on to reluctant customers.

The same market actor suggested that even if a designer promotes the program, the down economy might make efficiency and the program a “hard sell” to the client:

*Even though this program makes so much sense, many, many people in business are saying, 'Well, I don't really want to do this right now.' So you'd think that this thing would... be an easy sell, but it isn't an easy sell. It's surprisingly challenging. ...(What) happens when the economy turns down, and you really see this (now), is the thinking gets so short term that even if something pays off in a couple of years or three years, people won't do it. –Market Actor*

Overcoming existing market conditions will likely be difficult for the program. Yet, to the program's credit it continues to find ways to meet its goals during the down economy and a tight construction market.

Finally, another market actor suggested that small projects may not seem worth the investment of time and analysis compared to larger projects.

*If you had a very small project, the amount of time invested might equal what it is for a large project... It takes almost the same amount of effort, say, in terms of specifications whether you're doing a 30,000 square foot building or a 300,000 square foot building. So if you've got a tiny project, it may seem burdensome. –Market Actor*

## LEED Projects

The program has been working with LEED projects mainly through the comprehensive track (5 of the 6 comprehensive track projects intended to qualify for LEED). While program managers consider whether they will formalize any LEED-based program offerings, the program currently impacts LEED projects by helping project design teams realize their intentions. Going forward, it may be important to refine attribution questions used to evaluate these program impacts.

As early as PY2, one program manager has been considering whether it might be possible for the program to work with LEED mainly through comprehensive track projects. One way to work with LEED projects would be to offer specific incentives for such projects. However, the manager also acknowledges various difficulties. These difficulties are 1) LEED and program projects use different energy baselines; 2) LEED requires energy modeling after design while the program models as early in the design process as possible; and 3) the timeline to receive the LEED certification is long.

There are two main ways that the program could claim savings from these projects. First, the program might claim the difference between how efficiently the building would have been constructed if it had not gone through the program and how well the building was actually constructed having gone through it. This reflects the difference between designer intentions to qualify for LEED and a possible lack of expertise on their parts to do so. Second, the program might claim savings in the difference between two levels of LEED, e.g., the designers intended to qualify the building for LEED Silver, but by participating in the program participation, the building met the Gold level. In each of these cases, the program's early energy modeling, technical assistance, and incentives would presumably influence greater levels of energy efficiency in the final construction. One program manager explained that the impact the program has is primarily due to the difference in the modeling timing:

*Typically LEED modeling occurs in the early construction phase after all the decisions have been made, and we're really using energy modeling in this program as a design tool.*



*(It's) happening early in the process. So on a number of occasions we've submitted our model months or even a year before the design team gets around to starting a model. So I think (our modeling) has had a profound effect on the decision making process.. – Program Manager*

Participant interview findings indicate that even without a formal LEED offering the program has likely been increasing the energy efficiency of LEED projects through the current program offerings. Even though the projects were intended to qualify for LEED before they were submitted to the program and had LEED consultants working on them, the program often refined efficiency designs or provided the means to realize designs. For example, one designer highlighted the collaboration between ECW and LEED in refining the design:

*(ECW) kind of worked hand in hand with LEED whether it was increasing the thickness or the quality of the insulation between air-conditioned and non air-conditioned areas to incorporating high efficiency roof top units to the layout of the lighting. – Participant*

In another example, a different designer explained that ECW helped the design team find “viable paths” to accomplish their LEED goal:

*We weren't sure exactly what all the strategies we would use, but then working with the Energy Center from Wisconsin and analyzing, that...set some of our directions. So the (project) leadership was responsible for setting the goal. The design team (including ECW) then gave them viable paths to accomplish that (LEED) goal. – Participant*

The program manager also mentioned that in 2012 it is possible that LEED will start requiring earlier modeling and that the program would be in a good position to support that:

*... For LEED 2012, it's been proposed that energy modeling occur as an early phase of design, (i.e.,) schematic design energy modeling. (And) we think that the program's well positioned to support that requirement if it should go through. – Program Manager*

Whether or not the program formalizes a LEED offering, it will undoubtedly remain in a position to support LEED projects. However, it is important that the program be carefully evaluated for the ways it influences these projects. Attribution, i.e., NTG, questions, focus on influences on participant decision-making around energy-efficiency. In this evaluation we found that many LEED participants cited decisions prior to their involvement with the program. Yet, in some cases we increased NTG scores (see Section 0) because the extent to which the program developed their LEED projects was not included in the attribution questions. In future attribution batteries it may be necessary to include the following types of questions for LEED projects:

- » How important was the program in helping to refine an existing energy model?

- » How important was program technical assistance in highlighting ways to achieve design plans?
- » How important were program staff in finding solutions to design problems?
- » How important were program incentives/technical assistance in improving energy efficiency levels to meet a higher level of LEED?

### 3.2.7 Program Theory

There was no program logic model or theory created for this program by the evaluation team. The implementer had already created a model that we reviewed early in the PY2 program cycle and did not revisit in PY3, as there was no need to do so.

## 3.3 Cost Effectiveness Review

This section addresses the cost effectiveness of the Nonresidential 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.<sup>10</sup>*

ComEd uses DSMore™ software for the calculation of the Illinois TRC test.<sup>11</sup> The DSMore model accepts information on program parameters such as number of participants, gross savings, free ridership, program costs and CO<sub>2</sub> reductions. It then calculates a TRC that fits the requirements of the Illinois Legislation.

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<sup>10</sup> Illinois Power Agency Act SB1592, pages 7-8.

<sup>11</sup> Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.



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

## Results

Table 3-4 summarizes the unique inputs used in the DSMore model to assess the TRC ratio for the Nonresidential New Construction program in PY3. Most of the unique inputs come directly from the evaluation results presented previously in this report. Measure life estimates and program costs come directly from ComEd. All other inputs to the model, such as avoided costs, come from ComEd and are the same for this program and all programs in the ComEd portfolio.

**Table 3-4. Inputs to DSMore Model for Nonresidential New Construction Program**

Item	Value Used
Measure Life	12
Utility Administration and Implementation Costs	\$766,258
Utility Incentive Costs	\$636,446
Net Participant Costs	\$1,212,120

Based on these inputs, the Illinois societal TRC for this program is 1.41 and the program passes the Illinois TRC test.

## Section 4. Conclusions and Recommendations

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

### 4.1 Conclusions

Our research finds that the implementation team is running the program well and garnered almost twice the overall net goals. The implementation team continued to handle challenges associated with the economic downturn and the lack of large building construction well, mainly through refining program focus and taking timely, appropriate steps to support the program. Customers are satisfied and find value in the program. The program plans to move towards a comprehensive track and is well poised to transition to this type of program.

The implementation team indicated that there was little communication during the desk review between the evaluation team and themselves. Because of the complexity and extensiveness of project documentation, the implementation team felt this lack of communication might have hurt results. Evaluators and the implementation team plan to discuss improvements in communication channels prior to data collection for PY4.

#### 4.1.1 Program Impacts

The PY3 program garnered over twice their original net energy savings goals of 2,490 MWh. There were no specified demand savings goals.

**Table 4-1. Program Net Impacts Compared to Target**

Net Savings Estimates	MWh	MW
ComEd Plan Target	2,490	0
ComEd Reported for PY3	6,258	0
Total PY3 Evaluation-Adjusted Net Savings (ex post)	5,963	1.471
Net Savings Realization Rate (ex post / plan target)	239%	NA

When comparing the ex-ante results (i.e., the results expected by the program from the 37 projects before any adjustments) to the ex-post gross impacts, the evaluation analysis reduced the gross impacts by 0.003% followed by a reduction from the NTGR. (Table 4-2)

**Table 4-2. 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)
MWh	9,203	9,174	99.7%	5,963	0.65
MW	2.374	2.263	95.3%	1.471	0.65

When we break out the NTGR into the two tracks, we find that the NTGR for systems (n=11) was 0.69, and for comprehensive (n=4) it was 0.54. The comprehensive NTGR is low because representatives from two projects indicated that the program had only some influence (i.e., NTGR scores between .30 and .50) on the energy efficiency of their building. Representatives of the other two projects scored at 0.80 or higher. Even though we calculated the NTGR using all PY3 comprehensive track projects, we emphasize that it is based on only four projects. When there are so few projects, the values shown now (see Table 4-3) often do not provide indication of what could occur in the future.

**Table 4-3. Sampled Projects Only Gross & Net Savings by Track**

Track	Ex-Ante Gross (MWh)	Gross Realization Rate <sup>a</sup>	Ex-Post Gross (MWh)	NTGR <sup>b</sup>	Ex-Post Net (MWh)
Comprehensive (n=4)	2,377	99.7%	2,370	0.54	1,289
Systems (n=11)	5,770	99.7%	5,752	0.69	3,992
Total (n=15)	8,147	99.7%	8,122	0.65	5,281

<sup>a</sup> Realization rate based on sample design at the population level, not at the track level

<sup>b</sup> Total NTGR is weighted based on sampled projects

#### 4.1.2 Program Processes

Program managers have been successful in meeting PY3 energy goals. They have continued to respond to economic challenges in appropriate and timely ways, recruiting a wider variety of participant types into the program. Up from none in PY2, 11% of the PY3 projects were completed through the comprehensive track indicating success in program outreach to the design community and success in the technical assistance portion of the program. Due to several program strengths, the program is well poised to focus on a transition to an all comprehensive track program. Meanwhile, program managers continue to focus on market transformation through the development of a community of educated and trained designers, engineers, and architects.

Participants are generally satisfied or very satisfied with the program and find it valuable, both for the available financial incentives and the information about energy efficient measures and design they learn about from ECW staff. Even though LEED participants had existing intentions to meet increased, above-code efficiency levels, most benefited from working in collaboration with ECW staff to meet their goals. While the training sessions appear to be assisting in the development of an educated, effective design community, only about half the sampled participants were aware of training sessions and only one had attended. This suggests that the program needs to increase marketing around this opportunity.

## **4.2 Recommendations**

### **4.2.1 Impact Recommendations**

While our gross impact analysis did not reduce the ex ante energy savings overall, the information in Table 3-1 shows that there is variation in the ex ante to ex post estimates for the sampled projects. To help reduce that variation, we make the following recommendations:

- » The implementation team should take steps to ensure they update the savings listed in the tracking system to be consistent with the final version of the calculations.
- » The implementation team should review the process for determining and reporting the lighting hours of operation. Specifically, additional questions could be added to the customer interview to account for differences in lighting operation and business hours, control methods, and changes in hours of operation for specific areas.
- » The implementation team should be aware of and take care to ensure they do not provide incentives for redundant equipment that the customer does not expect to operate.
- » Finally, if the implementation team incents technologies that are not specifically covered under IECC 2009, care must be taken to ensure that an appropriate baseline is chosen. For these cases, typically the baseline must be considered to be standard practice and a clear determination of that standard practice should be described.

Addressing these areas should improve the accuracy of the claimed savings and ensure that the ex ante claimed savings are consistent with the ex post calculated savings.

### **4.2.2 Process Recommendations**

Given the successful implementation of the program during PY3, we make only a few process recommendations:

## **Training**

Findings from the participant interviews suggest that many participants are aware of the training sessions through email, indicating that this is one good outreach method. But given that there were several other participants who were not aware of the trainings also suggests that the program needs to continue to raise awareness of this program component.

- » Consider using the ECW email signature lines to announce upcoming training sessions. Nearly all participants we interviewed held very favorable opinions of ECW staff and their communication. Given the amount of email correspondence that takes place during program participation especially during technical assistance, the program could alert relevant market actors to the trainings exactly when they are most involved with the program.
- » In email announcements of the training sessions consider using the subject line or the beginning of the message to acknowledge the recipient's time constraints, and then follow up with statements, perhaps using attendee quotes', that capture the relevance and long term value of the program. For example, "We know you think you are too busy to step away from your projects for even a day, but consider coming to a training past attendees have called... that will maximize savings on your future projects."

The program appears to capture useful data through training session evaluations forms. In particular it asks attendees about the likelihood that they will bring projects into the New Construction Program. One recommendation regarding the training evaluation forms:

- » For attendees stating that it is unlikely that they will bring projects into the program, we recommend that the implementer includes a follow-up question to determine why the attendee does not believe it likely.

## **Comprehensive Track**

The program appears well-poised to transition to an all comprehensive track program over the next few years. However, interviews with market actor participants suggest that there is still disbelief and reluctance among some customers about the value of the program. To the program's credit, it is working on developing case studies of comprehensive projects that could be useful to show customers. We make two recommendations to maximize the potential of these materials:

- » The program would likely benefit from testing these materials with ComEd C&I customers. For example, the program could use focus groups to see how one page case studies targeted at different types of C&I customers are perceived and whether they are compelling.

- » When satisfied that the case study materials are effective, the program should make market actors aware of these materials so that they can be used with reluctant customers.

### **Attribution**

During PY3, the evaluation team made several changes to the attribution (NTG) question battery to better capture the influence of the program accurately. Based on our experience with this battery and based on the directions in which the program is growing, we make the following methods-related recommendations for general and LEED projects.

#### **General**

- » Question FR10, *How influential, if at all, was the program ... in keeping energy efficient design on the table when aspects of the original design were being cut to control costs?* should be asked on all projects since it is clear that value engineering can occur on non-comprehensive track projects.
- » It is important to gather a lot of contextual information through open-ended questions to frame the attribution battery as well as to check respondent scoring. No matter how many refinements are made to the attribution battery, it will likely always be important to contextualize and possibly adjust participant answers based on data collected in other parts of the interview.

#### **LEED**

We found that many LEED participants cited decisions prior to their involvement with the program. Yet, in some cases we increased NTG scores because the extent to which the program developed their LEED projects was not included in the attribution questions. In future attribution batteries it may be necessary to include the following types of questions for LEED projects to uncover program influence:

- » How important was the program in helping to refine an existing energy model?
- » How important was program technical assistance in highlighting ways to achieve LEED design plans?
- » How important were program staff in finding solutions to design problems?
- » How important were program incentives/technical assistance in improving energy efficiency levels to meet a higher level of LEED?

## Section 5. Appendices

### 5.1 *Detailed Evaluation Methods*

#### 5.1.1 Impact Evaluation Methods

##### **Data Sources**

The gross impact analysis used the project files for 15 of the 37 projects. This included a review of four of the six comprehensive projects. In support of this effort, ECW provided complete electronic files for each project. We were assured by the implementation team that the project files included all available documentation for each project, including electronic scans of any paper documents, and found no reason to doubt that assurance. Files included participant applications, implementers' project verification reports, implementers' savings calculation spreadsheets, building simulation files, measure cut sheets, project plans and schedules, copies of email communications between the implementer and participants, and any other submitted supporting documentation. However, some project files lacked sufficient information to verify savings. Where possible during the evaluations, we gathered additional information from manufacturers' websites and catalogs, or the participant's project engineer or project lead was contacted and additional information requested.

For the net to gross analysis, we attempted to interview one participant from each of the 15 projects that were included in the PY3 impact sample. We received hard refusals from two customers. However, we gained back these two refusals in two ways. We had one customer with two projects through the program we had asked about attribution and included both responses on our analysis. Another customer was outside of the impact sample and we did not originally plan to ask him or her attribution questions. However, we did include attribution questions of this customer and included them in our final analysis of net impacts. Additionally, we interviewed two additional customers to obtain information specifically related to comprehensive projects. However, we did not ask these two interviewees net analysis questions, but focused on the process questions. In one case, we did end up asking about attribution and included them in our net analysis. Overall, we completed interviews with 13 individuals representing 15 projects. Additionally, we followed up with individuals outside of the original respondent for one case in an attempt to clarify our net analyses.

##### **Gross Program Savings**

The purpose of the gross impact evaluation is to verify ComEd's original reported gross savings estimates for the program. To accomplish this, we completed a desk review on a sample of the completed projects. The desk review focused on verification of individual project measure quantities and characteristics that the evaluation team used to calculate gross savings estimates for each project.



A specific change was the introduction and use of lighting energy and demand interactive effects when determining the savings for lighting projects. The interaction of lighting heat output with the HVAC system is real and significant. The implementer did not include this interaction when calculating lighting energy savings.

At the measure level, the evaluation team performed an engineering file review to verify program savings for each participant. For the C&I New Construction program, we reviewed a sample of 15 of the 37 completed projects, which included four of the six comprehensive projects. The evaluation team did not perform onsite verification as part of the evaluation for two reasons. The implementation team had already performed onsite verification for the projects and our evaluation did not have sufficient budget for this task. The engineering file review used the documentation available within each project file to verify the specific inputs into the savings algorithms. Where appropriate, we made adjustments to baseline and measure quantities, wattages, efficiencies, hours of use, etc, based on the information within each project file.

The evaluation team then used the adjusted program assumptions and algorithms and the verified inputs to calculate the final ex post gross savings estimates for each project. The results of the sample of projects was then applied to the ex ante gross savings of the population of participants using the ratio adjustment method<sup>12</sup>. The algorithm to extrapolate to the population is shown in Figure 1.

**Figure 1. Ratio Adjustment Algorithm**

$$I_{EP} = \frac{I_{EPS}}{I_{EAS}} * I_{EA}$$

Where  $I_{EP}$  = the ex post<sup>13</sup> population impact

$I_{EA}$  = the ex ante population impact

$I_{EPS}$  = the ex post impact from the sample

$I_{EAS}$  = the ex ante impact from the sample

## 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.

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<sup>12</sup> Judith T. Lessler and William D. Kalsbeek. Nonsampling Error in Surveys. 1992. p. 269.

<sup>13</sup> Ex post refers to the estimated impact found by the evaluation team.



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

$$FR = \text{average of three concepts } (PC + PI + CF)$$

Where:

*PC = Program Components Influence*

*PI = Program Influence*

*CF = Counterfactual<sup>14</sup>*

During the first stage we also reviewed our PY2 approach and how well the previous survey instrument measured attribution. We worked with the program implementer to improve the instrument where necessary, making several changes we believed would measure attribution more accurately. The following changes to the question battery include the question number of the final, re-worked PY3 version provided in Section 5.2.

Added open-end questions at the beginning of the attribution section to 1) understand the broad reasons that energy efficient design or measures were included in the projects, whether that was influenced by the program (FR2<sup>15</sup>) or not (FR1); and 2) to frame the attribution discussion and provide context for the scalar questions;

- » Added questions for national retailer participants about the role of proto-typical store design in the project (FR4) and the direct (FR5) or indirect influence (FR6) of the program on the proto-typical design;

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<sup>14</sup> The counterfactual is what would have occurred in the absence of the program.

<sup>15</sup> Alpha-numeric value refers to the question number in the interview guide

- » Expanded the response set to include relevant construction stages (e.g., pre-design, schematic design, etc.) during which the participant may have first learned about the program (FR7);
- » Included building performance modeling (FR8c) and program outreach activities (FR8f) as specific program components that may have influenced the participant's decision-making;
- » Added a question about the role of the program in preventing cuts of energy efficiency improvements during value engineering on comprehensive track projects (FR10);
- » Added a question about the likelihood of the energy model being used as a design tool in the absence of the program (FR13); and
- » Added a question about the likelihood that independent, third party, non-proprietary data supporting the design vision being available in the absence of the program (FR14).

Finally, we determined the plan for calculating the final NTG ratio. This analysis approach is provided in 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. Despite the careful modifications to the question battery and analysis approach, while interviewing we found that the approach did not always best reflect what the respondents were describing during the interview. For example, we had assumed that value engineering would be a relevant issue only in comprehensive track projects, yet it was clearly an issue in at least one systems track project and so we included the associated question and scoring in the analysis.

Thus, 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. For all customers in our net analysis, we also reviewed the email correspondence between the implementer and the project contacts for additional context around program attribution. During this review we believed there was good reason to adjust the NTG algorithm in 6 of 15 cases. We achieved high inter-rater reliability<sup>16</sup> by building consensus at each step for why and how each

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<sup>16</sup> Inter-rater reliability comes about through separate analysis of the same data to come to a conclusion and then achieving consensus through discussion. This technique is used to reduce the bias that can be introduced when a

case should be adjusted if at all. Following the adjustments, we calculated a weighted NTG, based on proportional amount of savings at each project in our sample.

## 5.1.2 Process Evaluation Methods

The process evaluation consisted of qualitative analysis from the in-depth interviews of the program managers and customer/market actors. 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 5.2.)

### Data Sources

The process questions were informed by in-depth interviews with program managers, as well as market actors (e.g., design contractors, lighting engineers, rebate agents<sup>17</sup>, etc.) and customer program participants. We completed two in-depth interviews with the ComEd and program implementation team program managers during May, 2011. We completed in-depth interviews with eight market actors and four customers from June to August 2011. Because some market actors participated in multiple projects, our interviews reached representatives from 15 of the 37 projects completed in PY3. Notably, we interviewed representatives from all six of the PY3 comprehensive track projects.

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single person makes judgments. For this analysis two different analysts reviewed the information to determine specific changes to a net-to-gross ratio.

<sup>17</sup> Market actors whose job includes finding rebates and incentives for their clients, mainly retail chains.

## COMED IN-DEPTH INTERVIEW GUIDE- SMART IDEAS FOR YOUR BUSINESS NEW CONSTRUCTION DECISION MAKER

### FINAL

### Purpose

This depth interview guide will be used to attribute the effects of the Commercial New Construction Program on the projects under the purview of the respondent. It will also support the process analysis for this program. They will be performed by ODC analytical staff via the telephone. We will call the primary contact person as provided by ECW, 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:)	Developer/owner, A&E Design Professional, Other
Company name:	
Project (in sample)	
Project Type (circle one:)	System Comprehensive
Interviewer:	
Date:	
Time Start:	

## **Introduction**

Thank you for taking the time to talk with me today. The Opinion Dynamics evaluation team is currently conducting a study for Com Ed. There are two aims of this interview: first, we'd like to get your perspective on the Commercial New Construction Program; and second we'd like to find ways to improve the program as much as possible. We'd like to get your insight by asking you some questions that should not take any longer than about 20 minutes.

## **PROCESS SECTION**

### ***Role on Program Projects***

Throughout this interview when I ask about the "program" or "New Construction program" please consider your experience with Com Ed, ECW (the Energy Center of Wisconsin), or any combination of the two as they relate to the [PROJECT NAME].

1. Please tell me about your involvement in the New Construction program. Specifically:
  - How long have you worked with the program?
  - What is your role on the project(s) that are in the program?
  - How many projects do you have participating in the program?
  - Please describe the nature of the project(s). (Note: we may know this for PY3, but want to be sure our numbers match their expected projects.)
  - Please specify the track(s), either comprehensive or systems, to which your projects were assigned. If you cannot recall, did the building receive energy modeling?
2. I'd like to confirm that the program paid incentives for [INSERT PROJECT NAME] project. Is this correct?
3. 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? [IF NOT THE INTERVIEWEE, TAKE NAME AND CONTACT INFORMATION.]
4. 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***

5. How did you first hear about the program?
  - What do you perceive to be the value(s) of the program?

- After having projects participate in the program, have your impressions of the program changed?

## **Training**

6. Have you attended any program-related training events?
7. Are you aware of any training events available through the program?

[ASK IF AWARE OF, BUT NOT ATTENDED A TRAINING EVENT]

8. Why have you not attended any training events? Under what conditions might you attend one in the future?

[ASK IF ATTENDED]

9. How did you hear about the event?
10. What did you think of the training?
  - Probe for:*
    - *What was your expectation for the training?*
    - *How did it compare to your expectations?*
    - *Was the information you received or the event itself valuable to you? Why or why not?*
11. Did you attend the first training before or after you had submitted a project to the program?
12. Did you learn anything in the training that helped you design or build energy efficiency into the building? If so, please describe.

## **Program Processes**

13. 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?
14. Do you think there are any requirements the program should adjust or change?
  - If so, which ones and how?
15. Did you fill out the program application for the project? If so, what do you think of it?

- Do you have any suggestions for how to improve it?

16. How would you describe the technical assistance component of the program?

- Do you have any suggestions for how to improve it?

[IF COMPREHENSIVE PROJECT, ASK 17-19:]

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?

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

19. Could you describe the role the program's whole building energy modeling (simulation) played in your project?

[ASK ALL]

20. How would you describe the verification process of the program?

- Do you have any suggestions for how to improve it?

21. How did you find the payment process?

- Do you have any suggestions for how to improve it?

22. 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?

### ***Additional Comprehensive Project Questions***

[ASK IF COMPREHENSIVE PROJECT]

23. What were the main ways that the program helped you bring energy efficiency into your projects, if any?

- How would your projects be affected if there were no program?

24. What are the main drawbacks of the program, if any?

- What do you think others like you may find to be barriers to participating in the program?
- Is it a challenge to meet the 10%-against-baseline level of savings?
- What might prevent others from participating?



25. 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. So first could you give me an overview of how the energy efficient design or installations incented by the program were initiated? What were the main reasons they became or stayed a part of this project?

FR2. Now could you give me an overview of the influence, if any, of the Com Ed program on the implementation of the energy efficient design or installations?

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]

[ASK FR4 IF NATIONAL RETAILER]

FR4. Does [NATIONAL RETAILER] typically follow existing, proto-typical store design during new construction, gut rehab, or extensive remodeling projects?

1. Yes (IDENTIFY AS PROTO-TYPICAL DESIGN AND GO TO FR5)
2. No (NOT PROTO-TYPICAL DESIGN AND GO TO FR7)

[ASK FR5 AND FR6 IF PROTO-TYPICAL DESIGN]

For the next two questions, I will ask you about the direct and indirect influence of the Com Ed program on the energy efficiency of this project. By direct influence I mean any way the Com Ed program in particular may have influenced this project. This may have included Com Ed incentives, ECW technical assistance, or other recommendations coming from the program.

FR5. Overall, how influential was the Com Ed program directly on the energy efficiency of this project using a 0 to 10 scale, where 0 is “no influence at all” and 10 is “extremely influential”.

By indirect influence I mean any influence the Com Ed program may have had as one of many national utility incentive programs that might have influenced prototypical new construction design at [RETAILER].

FR6. And overall, how influential was the Com Ed program indirectly on the energy efficiency of this project using a 0 to 10 scale, where 0 is “no influence at all” and 10 is “extremely influential”.

FR7. Now I am going to ask you some questions that may sound similar but I have to ask them in order to have consistency across many interviews. When did you first learn about Com Ed’s New Construction 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? (If Comprehensive Project, SKIP TO S01)
5. construction phase? (If Comprehensive or Systems Project, SKIP TO S01)
8. Don't know

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 think of 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
FR8a	[ASK IF PARTICIPANT ATTENDED TRAINING] Training sponsored by the program	
FR8b	The availability of the program incentive	
FR8c	The program's technical assistance and building performance modeling	
FR8d	Recommendations from a ComEd/ECW staff person	
FR8e	Program information	
FR8f	Program outreach including Lunch & Learns, press releases, email or phone calls from ECW	

FR8g. Were there any other program 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 FR8g = YES]

FR8gg. 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]

[SKIP FR9 IF NATIONAL RETAILER]

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 Com Ed 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 New Construction 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 (Q4) OCCURRED AND COMPREHENSIVE PROJECT]

FR10. How influential, if at all, was the program (i.e., incentives, Com Ed or ECW 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 New Construction 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 New Construction 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 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 New Construction 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]

[For systems projects with multiple measures ask:]

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 S01)
2. No (Ask FR8 to FR14)

## ***SPILLOVER MODULE***

- S01. 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?"]
- S02. Since participating in Com Ed's New Construction program, have you (or your client) incorporated any energy efficient systems or equipment into other new construction projects in Com Ed territory?

[IF S02=YES]

- S03. [Has it or will it/ Have they or will they] receive incentives through the program?

[IF S03=NO]

- S03. Why not?

## **CLOSING SECTION**

26. 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

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### 5.3 Net-to-Gross Analysis Plan (Free Rider Question Concept Map)

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

Concept	Question	Systems Track		Comprehensive Track		Algorithm Notes
		Local Customer	National Customer	Local Customer	National Customer	
Program Influence (PI score)	FR7	☑	☑	☑	☑	<ul style="list-style-type: none"> <li>Comprehensive customers who learned about the program after construction documentation or during construction phase are full Free Riders. All others PI scores are based on FR5 or FR9.</li> <li>Systems customers who learned about the program late in the construction phase are full Free Riders. All others PI scores are based on FR5 or FR9.</li> </ul>
	FR5		☑		☑	<ul style="list-style-type: none"> <li>This item is used for the PI score when FR7 score does not denote a free-rider.</li> </ul>
	FR9	☑		☑		<ul style="list-style-type: none"> <li>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.</li> </ul>
Program Components (PC score)	FR8 agg	☑	☑	☑	☑	<ul style="list-style-type: none"> <li>The max influence score is taken from across these items and counts as the PC score.</li> </ul>
Program	FR11	☑	☑	☑	☑	<ul style="list-style-type: none"> <li>For Systems projects, the PT score will be the max of these two items.</li> </ul>

Timing and Efficiency (PT score)	FR12	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> <li>For the Comprehensive projects, the max of these two and FR10 will become the base PT score which may be increased by the additive items (FR13 and FR14) below.</li> <li>In all cases the final PT score will be reversed to keep it aligned with the other concepts.</li> </ul>
	FR10			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> <li>(see note above)</li> </ul>
	FR13			<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<ul style="list-style-type: none"> <li>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%.</li> </ul>



**5.4**      *ECW's Interim Results of Training Follow-Up Study Memo*



455 Science Drive, Suite 200  
Madison, Wisconsin 53711

## DRAFT MEMO

**DATE** September 30, 2011

**TO** Sandra Henry, ComEd

**FROM** Ingo Bensch and Karen Koski, ECW

**CC** Kathryn Schiedermayer, ECW

**SUBJECT** *Interim Results of Training Follow-Up Study*

We have followed up with attendees of four of five training events we are tracking as part of the ComEd Training Follow-up Evaluation study. So far, we are seeing positive responses to the training events themselves and high intentions to implement training concepts, but modest follow-through on those intentions in the half-year after the training. Attendee responsiveness has been low to our electronic inquiries (e-mail and web survey), so we have needed to resort to more time-consuming and expensive telephone follow-ups. We'd appreciate an opportunity to present on a conference call, answer any questions you have, and discuss next steps for this study.

The table below lists the five training events we are tracking and their disposition in our study.

Training event	Training date	Attendees	Respondents to immediate evaluation	Dates of Follow-up	Respondents to follow-up evaluation
Lighting and Daylighting with Efficiency	October 6, 2010	69	38	April 26, 2011	29
Direct Digital Control Systems	December 7, 2010	42	22	May 9, 2011	15
Passive Thermal Design for Energy	February 10, 2011	45	25	August 3, 2011	23
Designing High Performance Buildings Using an Integrative Design Process	April 14, 2011	25	22	September 12, 2011	3
Lighting and Daylighting Design: Beyond Footcandles	June 2, 2011	33	37	not yet completed	n/a

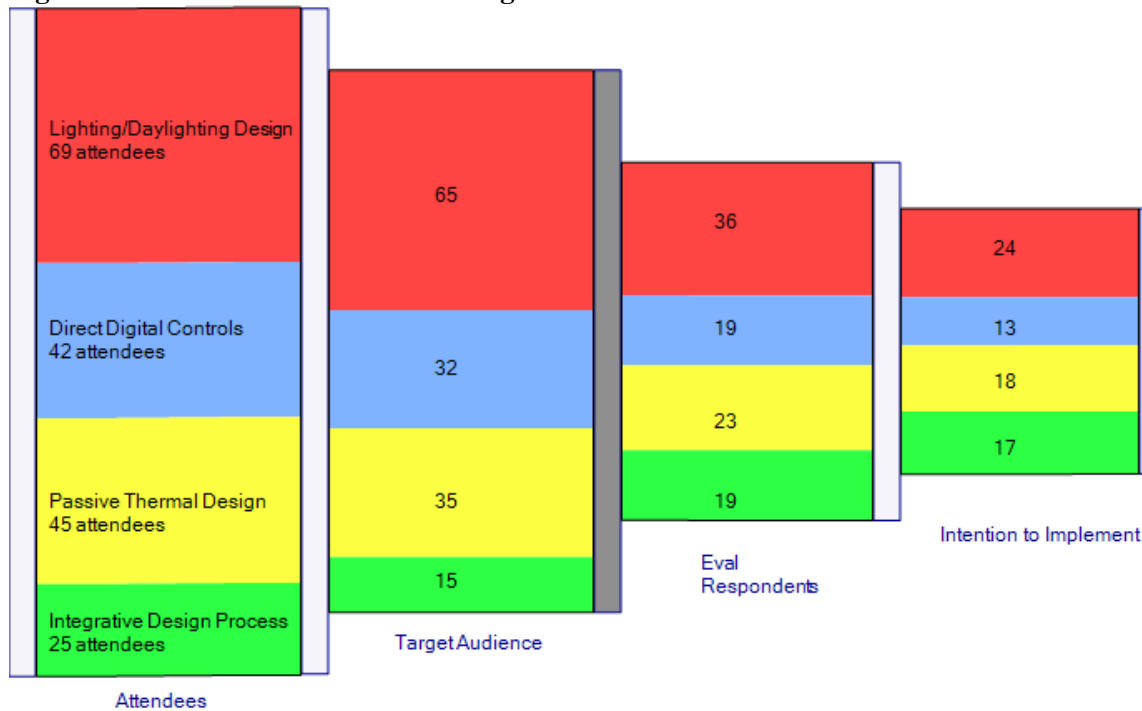
## High Intention to Implement

We request attendees at all of our training events to complete an immediate evaluation questionnaire to gauge satisfaction with the event. Most of these questionnaires include a series of questions that inquire whether the attendee learned anything new that he or she would investigate further or planned to implement. For all four training events, attendees communicated a high rate of intended future implementation of training concepts. Seventy-four percent of 97 attendees who were members of the event's targeted audience indicated an intention to implement something they learned at the training event.

The figure below displays this result graphically by training event. The two left-most columns show the number of attendees at each event and the share that belonged to the training's target audience. We track target audience members to distinguish among attendees who have an opportunity to apply the technical skills presented at the training directly in their work and those attendees who participated in the training for other reasons. The majority of attendees (147 of 181, or 81%) are members of the target audience. The rest of our results below show only the target audience's responses.

We received immediate evaluation feedback from 97 of the targeted attendees (a 66% response rate), and 72 of those respondents (74%) indicated that they had picked up an idea at the training that they intended to implement in their jobs. This result shows enthusiasm for the training topic and a desire to change existing practices in some way.

**Figure1: Results of Immediate Training Evaluation**



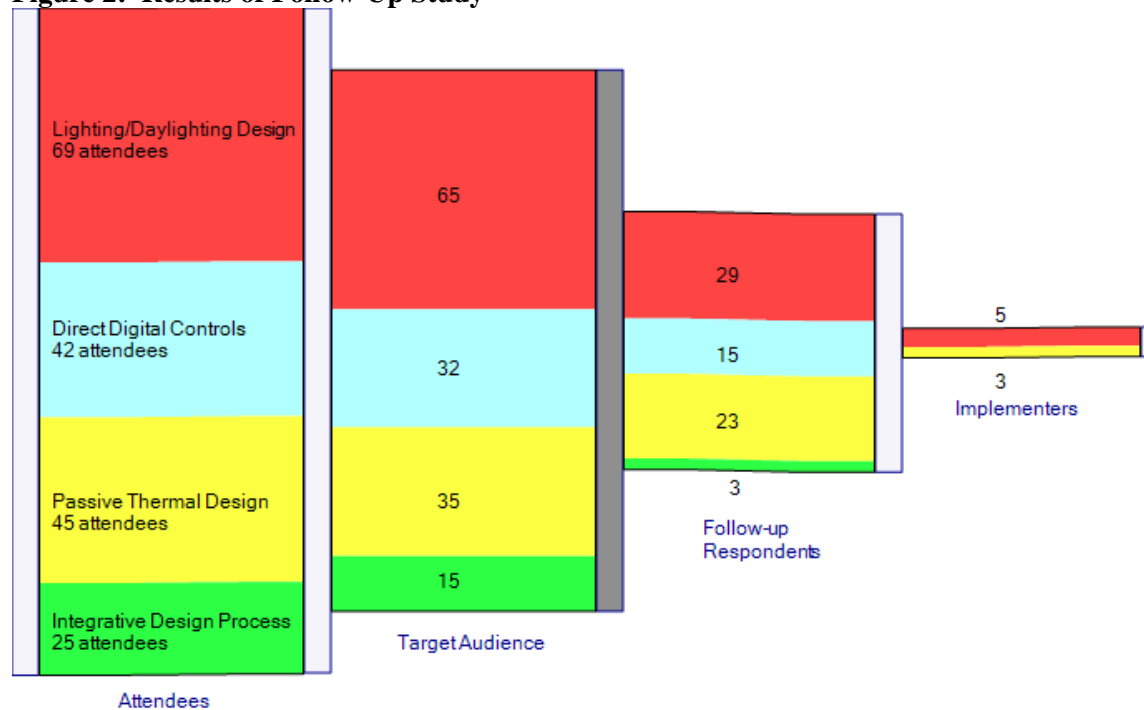
## Modest Numbers of Training-Induced Implementors So Far

We followed up with training attendees between five and six months after the training to determine whether target audience members had changed any practices as a result of the training. As shown in the figure below, response rates to these follow-ups were much lower than to our initial event evaluation. In all, we managed to complete a follow-up survey or interview with 70 of 147 target audience members for a 48 percent response rate.

For two of the training events – Lighting/Daylighting Design and Passive Thermal Design – we made two requests for the attendee to complete an online survey and followed up with non-respondents by telephone to conduct the survey that way. For one training – Direct Digital Controls – we attempted telephone interviews with the attendees. The follow-ups for the fourth training – Integrative Design Process – are in progress; we have completed two rounds of e-mailed requests for attendees to answer an online survey.

Of the 70 respondents, eight indicated that they had done something different in a project as a result of the training. Five of these had taken the Lighting/Daylighting Design training, and three had taken the Passive Thermal Design training.

**Figure 2: Results of Follow-Up Study**



We don't know how the non-respondents to our follow-up efforts would compare to the attendees we did reach. If they implemented training concepts at a similar rate, the four training events would have influenced about 16 attendees' building designs so far. However, there are plausible arguments for why the non-respondents may differ from those who responded. It's possible that the non-respondents are busier and working on more projects, thereby having more opportunity to implement training concepts. On the other hand, they could also have chosen not to respond because the training no longer registered and they had nothing to report.

The difference between the intention to implement and actual implementation is likely due to a combination of several factors:

1. Enthusiasm generated at training wanes, leading to some intentions being forgotten or pushed to a backburner.
2. It takes time for change to occur.
3. Attendees with good intentions face barriers that take additional effort, time, or external assistance to overcome.

We expected attendees to have had an opportunity to implement their desired changes by the time we followed up with them, but it is clear that some respondents had not yet had an opportunity to implement their intentions. For example, we were surprised to learn that only seven of the 29 respondents who attended the Lighting/Daylighting Design training had worked on a new building, major renovation, or major lighting project since attending the training. Hence, our assessment of who was a member of the target audience may have been off or lighting-related professionals do not encounter major lighting projects as frequently as we anticipated.

## Significance of the Implemented Training Concepts

While the number of implementers is too small to make broad generalizations about the training events' effects on building design and energy usage, the individual implementer's situations are useful indicators of the degree of change that has happened in the half-year after implementers attended ComEd training. We wrote up the eight implementers' stories – as gleaned from their survey responses – in brief case studies below.

These case studies highlight the great variability in projects and levels of implementation. Most implementers appear to be in a good position to repeat the changes they made on at least one building, as they typically work on numerous building projects annually. The actual changes made since the training varied from some that may or may not have any effect on energy usage to a fairly comprehensive consideration of efficient technology in one building. The size of projects involved ranged from small – even including a residential building – to a building of 100,000 ft<sup>2</sup>.

### Case Study 1: Lighting and Daylighting with Efficiency

Case 1 – An Electrical Engineer/Project Manager thought the training was basic but good and has used new technology on project(s) since training. For a 12,000 sq ft education building lighting retrofit project they used occupancy sensors, daylight harvesting, and tuning of systems for energy savings - all influenced from the training. They used products suggested in the training for LED's and reduced wattage T-8's. They used daylighting on the project with side lighting on an existing building, with advice from the training used in implementing a working design. They used occupancy sensors and a DLH controller using advice from the training. Their lighting power density for this project was under 1.1 watts per sq ft, and this is lower than what they have done in the past for similar projects. If they would have followed what they have done in the past the lighting density would have been between 1.1 and 1.4 watts per sq ft. They typically work on 20-30 new building, major renovation and/or major lighting projects a year. They do not take advantage of any of the services ComEd offers for commercial new construction projects. No suggestions on how ComEd could better serve them but they think ComEd is already doing well by working with DCEO.

Case 2 – Someone who works on retrofits of existing buildings thought the training was very good – one of the better programs they have attended. For a 50,000 sq ft commercial renovation project the training made them think differently in providing advice on product usages of LED, T8, etc. They used products suggested in the training for LED's, reduced wattage T-8's, and high efficiency T-8's. They also incorporated daylighting design features and lighting controls into the project. The lighting power density for this project was about the same as similar projects they have done in the past. They typically work on many major renovation projects a year and have not taken advantage of any of the services ComEd offers for commercial new construction since they work on retrofits of existing buildings not new construction.

Case 3 – A Manufacturer's Engineer thought the training was an excellent program with an excellent presenter and since the training they have pursued solar modeling more intensely. For a 100,000 sq ft commercial office project they downloaded and attempted to model daylighting

as discussed in the training. They already were using the products suggested in the training for lighting (reduced wattage T-8's and high efficiency T-8's) and lighting controls (Lutron Quantum and EcoSystem). They incorporated daylighting design features with building orientation, facade, and side lighting using advice from the training. They lighting density for the project was 1 watt per sq ft which is the same as similar projects they have done in the past. They typically work on over 100 new building, major renovation and/or major lighting projects a year. They do not take advantage of any of the services ComEd offers for commercial new construction projects.

Case 4 – An Engineer thought the training was run very well and had good information. On a new school project they used a different light source than they would have otherwise and used portions of the section from the training when the instructor spoke about different lighting technologies. They used products suggested in the training for LED's and the training made them feel more confident in their product selection. They used switches, occupancy sensors and daylighting sensors where applicable and the training reinforced the importance in using them. The lighting power density was higher than it has been for similar projects they have done in the past. They typically work on 20 new building, major renovation and/or major lighting projects a year. They do not take advantage of the services offered by ComEd for commercial new construction projects. They suggest charging less for trainings.

Case 5 – A Designer thought the training was helpful although it was a little more oriented to new construction and since the training they have put in some skylights. For an industrial lighting renovation project they incorporated daylighting into the design and the training reinforced that they should do that. The lighting power density was about the same as for similar projects they have done in the past. They typically work on 25 new building, major renovation and/or major lighting projects a year. They do not take advantage of the services offered by ComEd for commercial new construction projects.

## **Case Study 2: Passive Thermal Design for Energy Efficiency and Indoor Comfort**

Case 1 – A Lead Consultant thought the training was great. For a 110,000 sq ft recreational facility that began as a low-energy design they incorporated an assessment of the building materials in relation to the sun and earth (massing and programming), a holistic thermal comfort evaluation and employed multiple, seasonal building operation modes as well as stack ventilation into the design. They typically work on 15-20 new building, major renovation and/or major HVAC overhaul projects a year. They do not take advantage of any of ComEd's commercial new construction services because they are based out of Iowa.

Case 2 – A Sustainability Advisor thought the training content and instructor were excellent. Although they could not point to a specific project they have included a holistic thermal comfort evaluation and employed multiple, seasonal building operation modes on projects as well as double curtain wall, earth coupling to pre-cool the building, chilled beam, stack ventilation, operable windows, and active solar control into their projects since the training. They typically work on 30 new building, major renovation and/or major HVAC overhaul projects a year. They have taken advantage of the comprehensive track services offered by ComEd for commercial new construction projects.



Case 3 – A Lead Architect thought the training was informative. Since the training they worked on a small 1200 sq ft residential project that did not begin as a low energy design, they included a holistic thermal comfort evaluation and employed multiple, seasonal building operation modes on projects as well as operable windows and active solar control. They typically work on 12 new building, major renovation and/or major HVAC overhaul projects a year. They do not take advantage of any of ComEd's commercial new construction services and given this economy and the influx of residential remodel work, a program directing architects on how best retrofit an existing residential structure would be greatly appreciated