

**Smart Ideas for Your Business
Standard Program
PY7 Evaluation Report**

FINAL

**Energy Efficiency/Demand Response Plan:
Plan Year 7
(6/1/2014-5/31/2015)**

**Presented to
Commonwealth Edison Company**

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Prepared by:

Kevin Grabner and Charles Ampong
Navigant

Antje Flanders and Ann Speers
Opinion Dynamics Corporation



www.navigant.com



Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant Consulting, Inc.
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606

Contact:

Randy Gunn, Managing Director 312.583.5714 Randy.Gunn@Navigant.com	Jeff Erickson, Director 608.497.2322 Jeff.Erickson@Navigant.com	Rob Neumann, Assoc. Dir. 312.583.2176 Rob.Neumann@Navigant.com
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E. Executive Summary

This report presents a summary of the findings and results from the impact and process evaluation of the ComEd PY7¹ Smart Ideas for Your Business® Standard Incentives Program (Standard Program). ComEd offers prescriptive incentives for common energy efficiency measures under the Standard Program to facilitate the implementation of cost-effective energy efficiency improvements for non-residential (commercial and industrial) customers. Eligible measures include energy-efficient indoor and outdoor lighting, HVAC equipment, refrigeration, Energy Management Systems (EMS), commercial kitchen equipment, variable speed drives, compressed air equipment and other qualifying products. DNV GL is the program implementation contractor, responsible for day-to-day operations of the program.

The Standard Program’s design and structure remained largely unchanged from PY6, though updates were made to incentive levels as well as forecasted spending. Key program changes in PY7 included adding new measures, continuous integration of segmented offerings into the overall business strategy and consolidation of trade ally activities and leverage across business programs. In addition to the lighting, HVAC, and other measures carried over from PY6, the PY7 program began offering targeted new system installation opportunities (e.g., indoor and outdoor lighting systems) by offering incentives that “bundle” equipment and controls technologies. These Advanced Lighting System incentives are available only through Advanced Lighting System Trade Allies. ComEd stopped accepting pre-approval applications for the PY7 Standard Program effective March 2, 2015, after the program-allocated budget for PY7 was fully reserved.² Program marketing and outreach activities were also scaled back to accommodate the program changes.

The Standard Program PY7 evaluation moved toward implementing more real-time evaluations by establishing sampling waves within the program year so that sampled projects were scheduled for earlier engineering review and onsite monitoring and verification (M&V) to ensure resolution of critical impact issues ahead of delivery of the annual evaluation report. Navigant assigned projects into lighting and non-lighting end-use categories for sampling, analysis and reporting. Sampled measures with deemed gross savings were verified using the Illinois Statewide Technical Reference Manual (TRM version 3.0).³ Savings from non-deemed measures were researched through engineering file reviews and onsite M&V, and recommendations were made for addition or amendment to the TRM as appropriate. The PY7 net verified savings were calculated based on net-to-gross ratio (NTGR) estimates from past evaluation research (PY5) and established by a consensus process with the Illinois Statewide Advisory Group (SAG).⁴

¹ The PY7 program year began June 1, 2014 and ended May 31, 2015.

² ComEd paid out incentives earmarked for the PY7 Standard Program in the first nine months of PY7, based on a kWh energy savings goal set by state legislation. Thus effective March 2, 2015, ComEd no longer accepted PY7 Pre-Approval Applications or PY7 Final Applications without an approved PY7 Pre-Application. PY8 Pre-Approval Applications began acceptance on or after March 2, 2015 (Source: ComEd Standard PY7 Talking Points v3.docx).

³ State of Illinois Technical Reference Manual v3.0. Final as of June 24, 2014, effective June 1, 2014.
http://ilsagfiles.org/SAG_files/Technical Reference Manual

⁴ Source: ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

E.1. Program Savings

Table E-1 summarizes the electricity savings from the Standard Program.

Table E-1. PY7 Total Program Electric Savings

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	224,023	NA	28.92
Verified Gross Savings	225,492	59.18	27.81
Verified Net Savings	180,799	47.25	22.31

Source: ComEd tracking data and Navigant team analysis.

See Section 7.4 (Appendix – PJM Data and Findings) for detail on peak demand calculations.

E.2. Program Savings by End-Use Grouping

Table E-2 below summarizes program savings by end-use category assigned by Navigant to each project, based on the predominant energy savings measure types. If a project energy savings were more than half lighting or entirely lighting, Navigant defined it as a “Lighting” project. All other projects were defined as “Non-lighting” in the evaluation.

Table E-2. PY7 Program Results by End-Use Category

Savings Category	Lighting End-Use	Non-Lighting End-Use	Overall Program
Energy Savings (MWh)			
Ex Ante Gross Savings	177,007	47,016	224,023
Ex Ante Gross Savings (%)	79%	21%	100%
Verified Gross Realization Rate	1.01‡	0.98‡	1.01‡
Verified Gross Savings	179,257	46,235	225,492
Net to Gross Ratio (NTGR)	0.81†	0.77†	0.80†
Verified Net Savings	145,198	35,601	180,799
Verified Net Savings (%)	80%	20%	100%
Confidence Level/Rel Precision	90/3	90/18	
Coincident Peak Demand Savings (MW)⁵			
Ex Ante Gross Savings	22.51	6.41	28.92
Ex Ante Gross Savings (%)	78%	22%	100%
Verified Gross Realization Rate	1.00‡	0.83‡	0.96‡
Verified Gross Savings	22.46	5.35	27.81
Net to Gross Ratio (NTGR)	0.81†	0.77†	0.80†
Verified Net Savings	18.19	4.12	22.31
Verified Net Savings (%)	82%	18%	100%
Confidence Level/Rel Precision	90/2	90/27	

Source: ComEd tracking data and Navigant team analysis.

† A deemed value. Source: ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

‡ Realization rate is based on PY7 evaluation research findings. Reported program gross savings results have been rounded.

E.3. Impact Estimate Parameters for Future Use

In the course of our PY7 research, the evaluation researched parameters used in impact calculations including those in the Illinois TRM. Some of those parameters are eligible for deeming for future program years or for inclusion in future versions of the TRM. In this report we present the results from calculating NTG using the historical approach (the same method used in recent years), as can be found in Appendix 7.1.3. A separate memo to ComEd covers free-ridership and spillover analysis from participant responses based on the proposed Illinois Statewide NTG Methodologies document (IL-NTG Methods).⁶ Table E-3 provides the evaluation team’s estimate of free-ridership and spillover based on PY7 research using our historical approach. The table also shows proposed gross unit savings for refrigeration cycling dryers for inclusion in future versions of the TRM.

⁵ Summer peak demand savings are shown. Winter peak demand savings for PJM reporting were estimated based on secondary research and onsite metering for PY7 sample of projects. See Section 7.4 (Appendix – PJM Data and Findings) for detail on peak demand calculations.

⁶ IL-TRM_Attach A_IL-NTG Methods_10_02_15_DRAFT.docx

Table E-3. Impact Estimate Parameters for Future Use

Parameter	Value	Data Source
Lighting Measures		
Free-ridership	0.31	PY7 Evaluation Research. Based on historical net-to-gross approach
Spillover	0	
NTGR (historical approach)	0.69	
Non-Lighting Measures		
Free-ridership	0.32	PY7 Evaluation Research. Based on historical net-to-gross approach
Spillover	0	
NTGR (historical approach)	0.68	
Other Measures (proposed gross savings)		
Cycling Refrigerated Compressed Air Dryer	Thermal Mass (kWh/CFM=10.8, KW/CFM=0.001)	Recommend for TRM (V5) deeming
Cycling Refrigerated Compressed Air Dryer	Variable Speed (kWh/CFM=14.21, KW/CFM=0.003)	
Cycling Refrigerated Compressed Air Dryers	Digital Scroll (kWh/CFM=16.28, KW/CFM=0.002)	

Source: Evaluation Analysis

E.4. Program Volumetric Detail

Evaluation reviewed PY7 Standard Program tracking data and found that a total of 1,949 customer participants completed 2,864 projects. Participants installed a total of 4,977 measures with lighting end-use projects exceeding non-lighting end-use projects by a margin of approximately four to one. Program participation detail is presented below in Table E-4.

Table E-4. PY7 Volumetric Findings Detail

Participation	Lighting End-Use	Non-Lighting End-Use	Total
Customer Participants*	1,589	360	1,949
Total Measures**	4,148	829	4,977
Installed Projects	2,364	500	2,864

Source: ComEd tracking data and Navigant team analysis.

* This is unique site address and end-use category.

** This is a project-level measure count based on type of measure, not quantities installed.

E.5. Results Summary

The following table summarizes the key metrics from PY7.

Table E-5. PY7 Results Summary

Participation	Units	PY7
Net Energy Savings	MWh	180,799
Net Peak Demand Reduction	MW	22.31
Net Demand Reduction	MW	47.25
Gross Energy Savings	MWh	225,492
Gross Peak Demand Reduction	MW	27.81
Gross Demand Reduction	MW	59.18
Program Energy Realization Rate (Lighting)†	%	101%
Program Energy Realization Rate (Non-Lighting)‡	%	98%
Program NTG Ratio (Lighting)†	%	81%
Program NTG Ratio (Non-Lighting)†	%	77%
Total Measures Installed	#'s	4,977
Ex Ante Lighting Savings	%	79%
Ex Ante Refrigeration savings	%	3%
Ex Ante VSD/HVAC/COMP Air savings	%	12%
Ex Ante EMS savings	%	6%
Projects completed	#'s	2,864
Customers touched	#'s	1,949

Source: ComEd tracking data and Navigant team analysis.

† A deemed value. Source: ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which can be found on the IL SAG website here: <http://www.ilsag.info/net-to-gross-framework.html>

E.6. Findings and Recommendations

The following provides insight into key program findings and recommendations.⁷

Verified Gross Impacts and Realization Rates

Finding 1. The overall verified gross realization rate for the Standard Program is 1.01 for energy savings and 0.96 for peak demand savings. The verified gross realization rate for all lighting measures is 1.01 for energy savings and 1.00 for peak demand savings. The lighting measures with the largest impact and realization rate of less than 1.0 are the DLC qualified interior LED luminaires and occupancy sensor lighting. The evaluation team made adjustments to the occupancy sensor savings similar to previous years (i.e., adjusted energy savings factor based

⁷ Numbered findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

on actual occupancy sensor type), which resulted in a lower realization rate. ComEd is currently addressing the issue with occupancy sensors through an update to the TRM (v5.0). The low realization rate for the LED measure is due to a change from cooled to uncooled space type based on evaluation review of project files or on-site findings.

Recommendation 1. ComEd should ensure that the space type recorded in the inspection reports gets properly recorded in the database, particularly the question “what is the estimated percentage of conditioned space?” under the *Other Details* section of the inspection forms. Additionally, ComEd should (1) add calculations in the lighting work papers for each type of non-conditioned facility (i.e., hours as deemed by the TRM by space type and waste heat factor of 1.0); and (2) add an additional field in the database which would trigger usage of these unconditioned savings values.

Finding 2. The verified gross realization rate for all non-lighting end use measures is 0.98 for energy savings and 0.83 for demand savings. The non-lighting measures with the largest impact and a realization rate less than 1.0 are chillers, variable speed drives (VSDs), and refrigerated cycling compressed air dryers. The evaluation set energy savings to zero for one chiller project (26821) and two VSD projects (24947 and 26698). The installed chiller did not meet full load efficiency requirements in the Illinois TRM. In addition, all chiller projects’ peak savings were calculated using the IPLV (part load efficiency) and not the full load efficiency as dictated by the Illinois TRM. This resulted in all chiller measure peak savings being reduced.

Recommendation 2. ComEd should ensure that the VSD projects are meeting the automatic controls requirements. This could be accomplished by highlighting the requirement on the application or application approval checklist or other program materials. Navigant is aware that ComEd’s updates to the chiller work papers for PY8 uses the full load efficiency of the chiller for peak savings and the IPLV for energy savings. Navigant will review the PY8 work papers to verify the savings input assumptions.

TRM Updates and Tracking System

Finding 3. The refrigerated compressed air cycling dryers in the ComEd work papers has seen large changes to the savings values over the last few program cycles. This measure is not defined in the statewide IL-TRM. The evaluation team reviewed the appropriateness of the savings values for this measure based on a combination of metered data and customer interviews collected during PY7 evaluation and a review of deemed values in other sources including TRMs from other jurisdictions. The evaluation found that the Standard Program appears to be overestimating the savings from refrigerated cycling dryers.

Recommendation 3. ComEd should adopt the evaluation defined savings values for refrigerated cycling dryers recommended for inclusion in the TRM Version 5 update process.

Finding 4. There are discrepancies between the ComEd work papers and the Illinois TRM for the LED refrigerated case lighting measure, including operating hours and waste heat factor.

Recommendation 4: The ComEd work papers should be updated to use the operating hours and waste heat factors referenced in the Illinois TRM. The ComEd work papers should also be updated to claim freezers and refrigerated cases separately or a weighted average value should be used which weights both the wattage reduction and the waste heat factors. In

addition, the application and the ComEd work papers should be updated for open cases to clearly state the savings are per foot of lamp and not per foot of case.

Program Participation

Finding 5. The program stopped accepting pre-applications early in PY7 when its target budget was met. The number of installed projects in the Standard Program decreased by 23 percent from PY6 to PY7, and the ex ante energy savings decreased by 17 percent from PY6 to PY7. The ex ante lighting energy savings declined from 212,649 MWh in PY6 to 177,007 in PY7, a 17 percent reduction. Ex ante non-lighting energy savings declined from 58,620 in PY6 to 47,061 MWh in PY7, a 20 percent reduction.

Process Evaluation

Finding 6. Participants' survey suggest that the Standard Program process is running smoothly. Participants tend to be satisfied with their overall program experience and note several benefits of participating. Strong areas of the Standard Program are the incentive amounts, types of measures offered, and participants' relationships with vendors. For participants, the primary drawbacks are the enrollment and approval timelines, plus the time and resources it takes for them to participate.

Finding 7. Awareness of the Business Energy Analyzer (BEA) and General Energy Assessments (GEA) Smart Ideas technical offerings is low among Standard Program participants, and less than half of the aware participants have actually used these offerings. Nonetheless, interest in both offerings is high among customers that were aware of the program but who have not yet participated. These trends suggest two related findings. First, there appears to be a gap between interest in technical services and use of such services. This highlights an opportunity for ComEd to inform additional customers about its technical services offerings. Second, overall low awareness of these offerings among Standard Program participants implies that most participants enrolled in the program without any channeling support. This is the case for smaller, lighting-based projects in particular.

Recommendation 5. ComEd should explore whether technical services marketing strategies can be enhanced to better lead customers from awareness, to interest, to participation. Based on our PY7 findings about how participants prefer to learn about energy efficiency opportunities, we recommend building on vendors and existing ComEd marketing channels. Given that participants noted that the primary benefits of participating in the Standard Program are financial, it may also be useful to clearly show how participating in technical services can facilitate financial benefits.

Recommendation 6. ComEd's termination of accepting pre-approval applications before the effective program year end due to completion of reserved program allocated budget, should be gauged against program satisfaction risk, considering that (as noted above) participants see financial incentives as the primary benefits of participating in the Standard Program. When it appears likely that the program will stop taking applications mid-year, Navigant recommends that ComEd should create a mechanism that informs participants how the program is performing and set expectations for the availability of funding, while monitoring expectations of participants satisfaction.

1 Introduction

1.1 Program Description

ComEd offers standard incentives for common energy efficiency measures under the ComEd Smart Ideas for Your Business® Standard Incentives Program (Standard Program) to facilitate the implementation of cost-effective energy efficiency improvements for non-residential (commercial and industrial) customers. Eligible measures include energy-efficient indoor and outdoor lighting, HVAC equipment, refrigeration, commercial kitchen equipment, variable speed drives, Energy Management Systems (EMS), compressed air equipment and other qualifying products.

To participate, an eligible customer submits an application with project documentation, including project specification sheets and copies of dated invoices for the purchase and installation of the measures. The Standard Program offers pre-determined incentives and a streamlined application to help facilitate participation. Lighting retrofit projects make up the largest percentage of ex ante gross energy savings for this program, 79 percent compared to 21 percent from non-lighting projects in PY7.

Trade allies and service providers are a key part of the strategy to promote the program to customers. The Standard Program’s design and structure remained largely unchanged from PY6 even though updates were made to incentive levels as well as forecasted spend. These updates include adding new measures to the Standard Program, continuous integration of segmented offerings into the overall business strategy, and consolidation of trade ally activities and leverage across business programs. In addition to the lighting, HVAC and other measures carried over from PY6. The PY7 program began offering targeted new system installation opportunities (e.g., indoor and outdoor lighting systems) by offering incentives that “bundle” equipment and controls technologies. These Advanced Lighting System incentives are available only through Advanced Lighting System Trade Allies. Updates to incentive levels were made to VSDs and EMS. ComEd also offered incentives for refrigeration Night Covers and Advanced Controls for existing packaged RTUs.. ComEd also removed CFLs from the Standard Program effective March 2, 2015. ComEd stopped accepting pre-approval applications for the PY7 Standard Program effective March 2, 2015, after program allocated budget for PY7 applications was fully reserved.⁸ Program marketing and outreach activities were also scaled back to accommodate the program changes.

1.2 Evaluation Objectives

The evaluation team identified the following key researchable questions for PY7.

1.2.1 Impact Questions

1. What are the program’s annual total verified gross savings? What are the verified gross savings from lighting measures? What are verified gross savings from non-lighting measures?

⁸ ComEd paid out incentives earmarked for the PY7 Standard Program in the first nine months of PY7, based on a kWh energy savings goal set by state legislation. Thus effective March 2, 2015, ComEd no longer accepted PY7 Pre-Approval Applications or PY7 Final Applications without an approved PY7 Pre-Application. PY8 Pre-Approval Applications began acceptance on or after March 2, 2015 (Source: ComEd Standard PY7 Talking Points v3.docx).

2. What is the research estimate of gross savings (energy, peak demand, and total demand) for the Standard Program, using field measurement and verification (M&V) and engineering research to estimate savings?
3. What are the program's verified net savings?
4. What is the researched value for net-to-gross (NTG) ratio?
5. Are the ex-ante per-unit gross impact savings correctly implemented by the tracking system and reasonable for this program?
6. What updates are recommended for the Illinois Technical Reference Manual (TRM)? What are the results of field data collection?

1.2.2 Process Questions

The process evaluation effort for PY7 addressed the following questions:

1. Effectiveness of business program delivery and processes
2. Effectiveness of Standard Program implementation
3. Customer and program partner experience and satisfaction with the program

2 Evaluation Approach

The evaluation approach for the PY7 Standard Program continued the gross impact, net impact, and process evaluation activities that were conducted from PY1 through PY6. For deemed measures, Navigant verified ex ante gross savings against the values and algorithms provided in the Illinois Statewide Technical Reference Manual (TRM)⁹. For non-deemed measures with custom variable inputs, Navigant conducted evaluation research to verify gross impacts. In PY7, Navigant assigned projects into lighting and non-lighting end-use categories for sampling, analysis and reporting of gross and net impacts. Sampling was designed to achieve a 90/10 level of confidence and relative precision separately for lighting and non-lighting, for gross and net research.

The Standard Program PY7 evaluation moved towards real-time evaluations by establishing more sampling waves within the program year so that sampled projects were scheduled for earlier engineering review and onsite monitoring and verification (M&V) to ensure resolutions of critical impact issues ahead of delivery of draft annual evaluation report.

The net-to-gross ratio (NTGR) estimates used to calculate net verified savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group¹⁰ based on PY5 evaluation research. The evaluation team conducted free-ridership and spillover research with participating PY7 Standard Program customers described in Appendix 7.1.3.

The evaluation team conducted a targeted process evaluation specific to the Standard Program focusing on customer experiences and satisfaction and awareness of the Business Energy Analyzer and General Energy Assessments.

2.1 Overview of Data Collection Activities

The core data collection activities included verification of the program tracking data, on-site measurement and verification (M&V) of sampled projects, engineering file review of sampled projects, and a telephone survey of participating customers. The full set of data collection activities is shown in the following table.

⁹ State of Illinois Technical Reference Manual v3.0. Final as of June 24, 2014 effective June 1, 2014.
http://ilsagfiles.org/SAG_files/Technical Reference Manual

¹⁰ Source: ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which can be found on the IL SAG website here: <http://www.ilsag.info/net-to-gross-framework.html>

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	Completes Achieved	When	Comments
Onsite M&V Audit	Participating Customers	34	34	June-September 2015	Comprised of 12 lighting and 22 non-lighting projects for the gross impact analysis
Engineering Review	Participating Customers	86	86	May-September 2015	Comprised of 43 lighting and 43 non-lighting projects for the gross impact analysis
Telephone Survey	Participating Customers	120	121	September and October 2015	Data collected for NTG (free-ridership and spillover) research for future use
Telephone Interviews	Influential Trade Allies Triggered by Customer Responses	2-10	2	September and October 2015	Data collected for free-ridership estimation for future use

Source: Navigant

2.2 *Verified Savings Parameters*

Table 2-2 below presents the sources for parameters that were used in the verified gross and net savings calculations and indicate which were examined through PY7 evaluation research and which were deemed.

Table 2-2. Verified Gross and Net Savings Parameter Data Sources

Input Parameters	Data Source(s)	Deemed or Evaluated?
Installed Quantities	Program tracking data analysis (September 28, 2015 extract); PY7 evaluation on-site M&V.	Evaluated
Deemed Lighting Measure Savings Parameters: Hours of Use (HOU), Peak Load Coincidence Factor, Energy and Demand Interactive Effects	Illinois TRM v3.0	Deemed†‡
Lighting Measure Delta Watts (where deemed by the Illinois TRM)	Illinois TRM v3.0	Deemed†‡
Lighting Measure Delta Watts not deemed by the Illinois TRM	Program documentation and PY7 M&V	Evaluated
Deemed HVAC, Food Service/Other, and Refrigeration Measures, principally: Electric Chillers, PTAC/PTHP, Guest Room Energy Management Controls, HVAC Variable Speed Drives, Air Compressor with Integrated VSD, EC Motors, Anti-Sweat Heater Controls	Illinois TRM v3.0	Deemed†‡
Non-deemed Non-lighting Measures, principally: Industrial Variable Speed Drives, Energy Management Control Systems, Refrigeration Display Case/Doors; Refrigerated Cycling Dryers, Transformers, Demand Control Ventilation, Laboratory measures	Program documentation and PY7 M&V	Evaluated
Gross Realization Rate	PY7 evaluation M&V and Program tracking data analysis	Evaluated
Lighting and Non-Lighting NTG Ratios	Illinois Stakeholder Advisory Group process	Deemed†

† Source: *ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx*, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

‡ State of Illinois Technical Reference Manual v3.0. Final as of June 24, 2014 effective June 1, 2014. http://ilsagfiles.org/SAG_files/TechnicalReferenceManual

2.2.1 Verified Gross Program Savings Analysis Approach

The verified gross savings analysis reviewed the ex-ante measure type to determine whether it is covered by the Illinois TRM or whether it is a non-deemed measure that is subject to retrospective per unit savings adjustment of custom variables. The measure type (deemed or non-deemed) dictated the verification approach.

- The savings verification process independently verified program savings achieved through prescriptive measures defined in the Illinois TRM. This process verified that the TRM was applied correctly and consistently by the program, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operational. The results of savings verification are expressed as a verified gross savings realization rate (verified ex post savings divided by ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

- Measures with fully custom or partially-deemed ex-ante savings were subject to retrospective evaluation adjustments to gross savings on custom variables. For fully custom measures in the Standard Program, Navigant considered all algorithm and parameter values to be open to evaluation adjustment. For partially-deemed measures, we applied TRM algorithms and deemed parameter values where specified by the TRM, and used evaluation research to verify custom variables. For measures with custom variables, ComEd provided work paper documentation of savings, but verified savings were based on engineering review, billing data review, and on-site M&V (including metering) of sampled measures to determine eligibility and per unit savings.

The evaluation activities to verify gross energy savings of the Standard Program were conducted in these steps:

1. Used the Illinois TRM and engineering review of tracking data to assess correct implementation of deemed values, and reasonableness of non-deemed values in the ex-ante gross savings estimates. We categorized ex ante measures as lighting or non-lighting. If a project energy savings were more than half lighting or entirely lighting, Navigant defined it as a “Lighting” project. All other projects were defined as “Non-lighting” in the evaluation. Navigant found that nearly all projects contained either all lighting or all non-lighting measures.
2. Implemented a stratified random sampling design of lighting and non-lighting measures to select 120 projects (consisting of 55 lighting and 65 non-lighting projects) from the population of 2,364 Standard project applications and 4,977 Standard measures. Sampling was done in two waves with three sub-strata based on size. Sample sizes were designed to provide a 90/10 confidence and precision level for program-level savings separately for lighting and non-lighting gross savings verification.
3. Conducted on-site visits and measurement and verification (M&V) activities on a sample of 34 Standard projects (12 lighting and 22 non-lighting) selected from the 120 projects to support deemed and non-deemed measure savings verification and measure-level research. Lighting projects selected for on-site verification tended to be very large or complex projects. The selection of non-lighting projects for on-site verification was driven by project size and the need to site-verify non-deemed, non-lighting measures.
4. Conducted an engineering review of project files and energy savings estimates on the remaining 86 projects from the sample of 120 projects to support deemed and non-deemed measure savings verification and program-level research.
5. The verified gross savings are the product of verified per unit savings and verified measure quantities.

2.2.2 Verified Net Program Savings Analysis Approach

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). In PY7, the NTGR estimates used to calculate the net verified savings were based on past evaluation research and defined through a

consensus-building process managed by the SAG as documented in a spreadsheet.¹¹ The SAG process assigned separate NTG values for lighting and non-lighting savings.

The evaluation team conducted free-ridership and spillover research with participating PY7 Standard Program customers described in Appendix 7.1.3. In this report we present the historical approach for estimating program NTGR (free-ridership and spillover), as can be found in Appendix 7.1.3. A separate memo to ComEd has been developed that covers free-ridership and spillover analysis from participant responses based on the proposed Illinois Statewide NTG Methodologies document recently developed in the Fall of 2015 (IL-NTG Methods).¹² The participant survey instrument is included in Appendix 7.5.

2.3 Process Evaluation

In PY7, the Navigant team conducted a limited process evaluation for the Standard Program, focusing on participant satisfaction with program delivery and awareness of program offerings. We conducted a computer assisted telephone interviewing (CATI) survey with participating customers to inform PY7 research questions.

The survey sample was designed to support the net impact analysis and targeted 120 completed interviews with PY7 Standard Program participants. The team completed 121 interviews in September and October, 2015. We asked all respondents a series of questions to estimate free-ridership and participant spillover, and a series of questions to support the process evaluation. The CATI survey instruments used for this evaluation are included in Appendix 7.5

¹¹ Source: ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

¹² IL-TRM_Attach A_IL-NTG Methods_10_02_15_DRAFT.docx

3 Gross Impact Evaluation

The Standard Program in PY7 achieved overall verified gross savings of 225,492 MWh. The verified gross savings for lighting end-use measures is 179,257 MWh at a gross realization rate of 1.01 for energy and 1.00 for demand savings. The verified gross savings for non-lighting measures is 46,235 MWh at a gross realization rate of 0.98 for energy and 0.83 for demand savings. Results of our PY7 evaluation activities to verify the Standard Program savings are presented in this section.

3.1 Tracking System Review

Navigant conducted a consistency check on the Standard Program tracking system to validate the PY7 data¹³. The tracking system stores lookup values for per unit energy and demand savings and reported ex-ante energy and demand savings. Navigant found that the values were consistent with the Illinois TRM (v3.0) deemed values and with per unit savings values produced by DNV GL in the ComEd work papers¹⁴ for non-deemed measures and custom variables in the Standard Program. We examined values for per unit energy savings and coincident peak demand at the measure level in the following manner:

- Reviewed project documentation at the measure-level for the sampled projects to verify participation and tracking system entries;
- Checked documentation of invoiced quantities and installed measure characteristics and confirmed match with tracking system; and
- Confirmed compliance with eligibility and confirmed deemed measure input values using the Illinois Statewide Technical Reference Manual (IL-TRM v3.0).

Navigant presented early feedback to ComEd and DNV GL of our evaluation findings¹⁵ on program ex ante savings calculations, Illinois Technical Reference Manual (TRM) compliance, work papers, and tracking database issues for consideration during the PY8 work paper and ex ante savings review process. Our findings indicated that the ex ante energy and demand savings for most of the measures within lighting, variable speed drives (VSDs), refrigeration and HVAC equipment were consistent with the TRM. There are measures found to have discrepancies and Navigant recommends these to be further examined by ComEd and DNV GL. These measures are the DLC qualified LED luminaires and Occupancy Sensor lighting, LED refrigerated case lighting, HVAC VSDs, refrigerated cycling dryers, VSD for air compressors, and electric chillers. Most of the tracking system savings for new non-lighting measures introduced in PY7 (e.g. EMS and advance controls for Rooftop systems end-use measures) are either partially deemed or based on custom assumptions. Where tracking system review findings indicated the need for an adjustment to ex ante savings, we applied adjustments only to sampled projects. Details of the findings are presented in the Section 6 and Appendix 7.2. We acknowledge that ComEd and DNV GL have produced a revision of the work papers that perhaps address most of the findings in this report. We will review the work papers as part of the PY8 evaluation.

¹³ PY7 tracking database extract dated 9/28/2015 downloaded from the ComEd SharePoint.

¹⁴ PY7 ComEd Measure Workpapers 3-25-15.pdf

¹⁵ ComEd PY7 Standard Incentive Program Interim MV Report 2015 09 30_clean.docx

3.2 Program Volumetric Findings

Evaluation review of the PY7 Standard Program tracking data found that a total of 1,949 customer participants completed 2,864 projects. Participants installed a total of 4,977 measures, with lighting end-use projects exceeding non-lighting end-use projects by a margin of approximately four to one. The PY7 Program participation detail is presented in Table 3-1 below.

Table 3-1. PY7 Volumetric Findings Detail

Participation	Lighting End-Use	Non-Lighting End-Use	Total
Customer Participants*	1,589 (82%)	360 (18%)	1,949
Total Measures**	4,148 (83%)	829 (17%)	4,977
Installed Projects	2,364 (83%)	500 (17%)	2,864

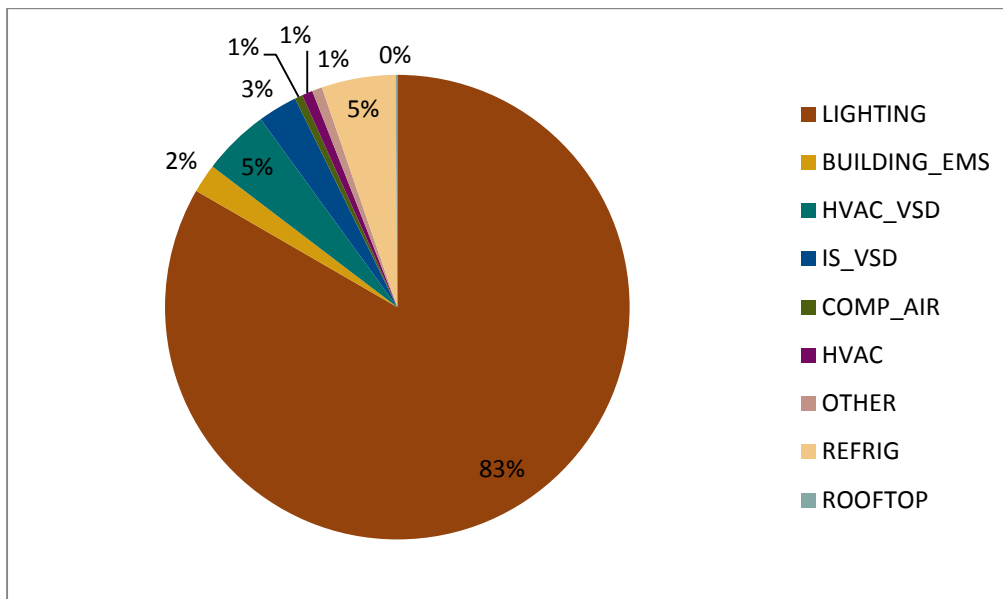
Source: ComEd tracking data and Navigant team analysis.

* This is unique site address and end-use category.

** This is a project-level measure count based on type of measure, not quantities installed.

Breakdown of the installed measures by end-use category are provided in Figure 3-1.

Figure 3-1. Number of Measures Installed by Type



Source: Evaluation Analysis

In terms of savings, the lighting measures contributed 79 percent of the ex ante gross savings (3 percent from advanced lighting installations). The VSDs/HVAC equipment including Rooftop systems, Compressed Air systems and Industrial Systems VSDs (IS_VSDs) contributed 12 percent of the ex ante savings. Energy Management Systems (EMS) had a share of 6 percent and refrigeration measures 3 percent of the ex ante savings.

Compared to PY6, the Standard Program PY7 participation shows an overall decrease of 23 percent in the number of projects (lighting projects decreased by 14 percent and non-lighting projects decreased by almost 50 percent), and 14 percent of customers. These changes resulted in a 17 percent decrease in the total ex ante gross savings from PY6 to PY7. The ex ante lighting energy savings declined from 212,649 MWh in PY6 to 177,007 in PY7, a 17 percent reduction. Ex ante non-lighting energy savings declined from 58,620 in PY6 to 47,061 MWh in PY7, a 20 percent reduction. The changes in PY7 are in part due to ComEd’s decision to stop accepting pre-applications by the end of the third quarter of PY7.

3.3 Gross Program Impact Parameter Estimates

The EM&V team conducted research to validate the parameters that were not specified in the TRM. The results are shown in Table 3-2.

The verified gross energy realization rate (defined as the ratio of the verified gross energy savings to ex-ante gross energy savings as reported in the tracking system) was estimated as 101 percent for the lighting sample projects (at 90 confidence level and 3 percent relative precision for energy) and 98 percent for the non-lighting sample projects (at 90 confidence level and 18 percent relative precision for energy).

A discussion on the savings verification research findings is presented in Appendix 7.1.

Table 3-2. Verified Gross Savings Parameters

Gross Savings Input Parameters	Value	Deemed or Evaluated? ‡
Quantity	Varies	Evaluated
Measure Type and Eligibility	Varies	Evaluated
Gross Savings per Unit, Sampled Deemed Measures	Varies	Deemed
Gross Savings per Unit, Sampled Non-Deemed Measures	Varies	Custom Variables Evaluated
Verified Realization Rate on Ex-Ante Gross Savings (Lighting)	1.01 (kWh), 1.00 (kW)	Evaluated
Lighting RR Confidence Level/Rel Precision (± %)	90/3 (kWh), 90/2 (kW)	Evaluated
Verified Realization Rate on Ex-Ante Gross Savings (Non-Lighting)	0.98 (kWh), 0.83 (kW)	Evaluated
Non-Lighting RR Confidence Level/Rel Precision (± %)	90/18 (kWh), 90/27 (kW)	Evaluated

Source: Navigant Analysis

‡ State of Illinois Technical Reference Manual version 3.0 from <http://www.ilsag.info/technical-reference-manual.html>.

3.4 Verified Gross Program Impact Results

The resulting total program verified gross energy savings is 225,492 MWh (179,257 MWh for lighting measures and 45,235 MWh for non-lighting measures) and coincident peak demand savings of 27.81 MW (22.46 MW for lighting measures and 5.35 MW for non-lighting measures). Table 3-3 shows verified gross savings in the lighting and non-lighting groupings.

Table 3-3. PY7 Verified Gross Impact Savings Estimates by Measure Type

	Sample Size	Gross Energy Savings (MWh)	90/10 Significance	Gross Peak Demand Savings (MW) ¹⁶	90/10 Significance
Lighting Measures					
Ex-Ante Gross Savings		177,007		22.50	
Verified Gross Realization Rate	55	101%	Yes	100%	Yes
Verified Gross Savings		179,257		22.46	
Non-Lighting Measures					
Ex-Ante Gross Savings		47,016		6.41	
Verified Gross Realization Rate	65	98%	No	83%	Not
Verified Gross Savings		46,235		5.35	
PY7 Total					
Ex-Ante Gross Savings		224,023		28.92	
Verified Gross Realization Rate	120	101%	Yes	96%	Yes
Verified Gross Savings		225,492		27.81	

Source: ComEd Tracking Data and Navigant team analysis.

† The precision estimates on verified gross realization rates are shown in Table 3-2.

The energy savings realization rate for non-lighting measures is improved compared with PY6, though the lighting realization rate is slightly less than PY7 (though still greater than 1.0). Savings for non-lighting measures have inconsistent realization rate results across end-use and measures types, and evaluation adjustments were both higher and lower. Appendix 7.1 presents sample level realization rates by measure and includes commentary on reasons for variation from 100 percent. Additionally, research findings are presented in Appendix 7.1.

¹⁶ Summer peak demand savings are shown. Winter peak demand savings for PJM reporting were estimated based on secondary research and onsite metering for PY7 sample of projects. See Section 7.4 (Appendix – PJM Data and Findings) for detail on peak demand calculations.

4 Net Impact Evaluation

Navigant calculated verified net energy savings for the PY7 Standard Program separately for lighting and non-lighting end-use categories by multiplying the PY7 verified gross savings by a deemed net-to-gross ratio (NTGR). The NTG values of 0.81 for lighting and 0.77 for non-lighting used to calculate PY7 verified net savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG)¹⁷ based on PY5 evaluation research. As shown in Table 4-1 below, the Standard Program achieved verified net savings of 180,799 MWh and verified net peak demand savings of 22.31 MW.

Table 4-1. PY7 Verified Net Impact Savings Estimates by Measure Type

	Sample Size	Gross Energy Savings (MWh)	90/10 Significance	Gross Peak Demand Savings (MW)	90/10 Significance
Lighting Measures					
Ex-Ante Gross Savings		177,007		22.50	
Verified Gross Realization Rate	55	101%	Yes	100%	Yes
Verified Gross Savings		179,257		22.46	
NTGR		0.81		0.81	
Verified Net Savings		145,198		18.19	
Non-Lighting Measures					
Ex-Ante Gross Savings		47,016		6.41	
Verified Gross Realization Rate	65	99%	No	83%	No
Verified Gross Savings		46,235		5.35	
NTGR		0.77	Yes	0.77	
Verified Net Savings		35,768		4.12	
Program Total					
Ex-Ante Gross Savings		224,023		28.92	
Verified Gross Realization Rate	120	101%	Yes	96%	Yes
Verified Gross Savings		225,492		27.81	
NTGR		N/A	Yes	N/A	
Verified Net Savings		180,799		22.31	

Source: Evaluation Team analysis.

The EM&V team conducted participating customer free ridership and spillover research in PY7 for potential future application. The historical research methods and results are presented in Appendix 7.1.3.

¹⁷ Source: ComEd_NTG_History_and_PY7_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

5 Process Evaluation

The PY7 process research questions fell under two main topics: 1) participant experience and satisfaction with the program delivery and processes, and 2) participant awareness and participation in additional business program offerings. The evaluation examined awareness of and participation in two Smart Ideas for Your Business technical services offerings: the Online Business Energy Analyzer and General Energy Assessments. We researched these topics using data from the PY7 Standard Program participant survey, described in Section 2.3.

Overall, we found the following:

- Customers tend to be satisfied with the overall Smart Ideas for Your Business program. The participant survey data suggest that the program is running smoothly in terms of measures and incentive amounts, but that there is room to streamline or clarify the program enrollment and project approval process; and
- Participants in the Standard Program are relatively unaware of two Smart Ideas technical offerings (Business Energy Analyzer and General Energy Assessments). Few customers aware of the Business Energy Analyzer have used it, whereas almost half of customers aware of the General Energy Assessment program have received one. Interest in both offerings is high among customers that were aware of the program but who have not yet participated.

5.1 Program Process and Satisfaction

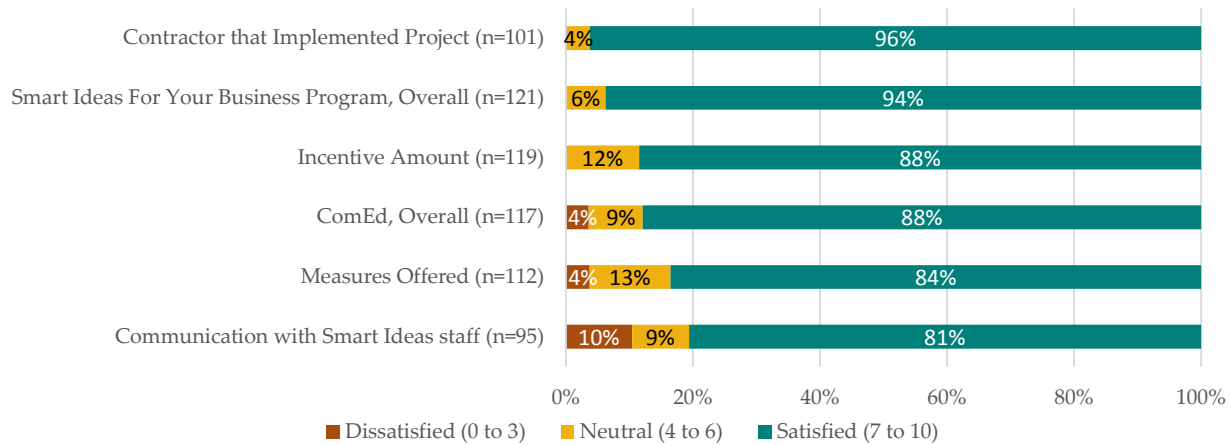
5.1.1 Participant Satisfaction

Standard Program participants report high levels of satisfaction with the overall Smart Ideas for Your Business program (94 percent¹⁸), and also tend to be satisfied with individual aspects of the program (Figure 5-1). For example, most participants who worked with a contractor to implement their energy efficiency measures are highly satisfied with the contractor (96 percent). Participants also tend to be satisfied with program incentive amounts (88 percent) and the types of measures offered by the program (84 percent). While most participants are also satisfied with their interactions with ComEd program staff (81 percent), this is the area in which participants are most often dissatisfied¹⁹ (10 percent). Communications with program staff have previously tended to be the area of relatively lower satisfaction (e.g., PY4).

¹⁸ Giving a rating of 7, 8, 9, or 10 on a 0 to 10 scale, where 0 is very dissatisfied and 10 is very satisfied.

¹⁹ A rating of 0, 1, 2, or 3 on a 0 to 10 scale, where 0 is very dissatisfied and 10 is very satisfied.

Figure 5-1. Participant Satisfaction with Program Elements



Source: Evaluation Team analysis.

Customers participating in the program feel that the main program benefits are financial in nature. When asked about benefits of participating, participants most frequently cite benefits like saving energy and money (66 percent) and receiving the program incentives (26 percent). Other, less frequently mentioned benefits include the ability to install and use better quality and/or newer equipment (7 percent), doing projects that are good for the environment (6 percent), reducing maintenance costs (4 percent), or other benefits (6 percent) like knowledge and information, technical assistance, and/or ability to make improvements sooner than otherwise possible.

We also asked participants to report perceived drawbacks of participating in the program. Notably, most customers (58 percent) do not see any drawbacks to program participation. Of those who do, the most-frequently noted drawbacks relate to application and approval processes. Specifically, participants find that program paperwork is burdensome (11 percent) and that the approval timeline is lengthy (15 percent), occasionally to the point that it impacts routine project design and installation processes.

On balance, nearly all PY7 participants (96 percent) would recommend the Smart Ideas for Your Business Program to other companies like their own. Most customers also plan to participate in the future (82 Percent). Together, these stated plans signal that program participants have had favorable experiences with PY7 program process and outcomes.

5.1.2 Marketing and Outreach

Participants suggest that there are two main ways to best provide energy efficiency information to companies like their own. Participants report that the best ways are through ComEd emails (30 percent) and other forms of ComEd outreach (37 percent) like account managers, the ComEd website, bill inserts, and seminars. A smaller portion of participants prefer vendors, suppliers and contractors (15 percent), or other avenues like word-of-mouth, industry groups, trade events, their property management companies and/or corporate headquarters (11 percent, combined).

PY7 participants tend to first learn about the program through vendors or ComEd outreach channels. A majority of PY7 participants first learned about the Smart Ideas for Your Business Program through their supplier, contractor, or vendor (58 percent), and an additional 20 percent learned about the program through ComEd’s emails, account managers, website, on-bill notifications, or other marketing efforts.

Across all outreach channels, 28 percent of participants first learned about the Smart Ideas program through their most-preferred outreach channel. Generally, this group of participants tends to be recruited through, and prefer learning about energy efficiency opportunities from, their contractor, their ComEd account manager, or other forms of ComEd marketing. In contrast, no participants recalled first learning about the program through email, but 30 percent of participants suggested that ComEd emails are the best way to reach their company about future energy efficiency opportunities.

5.2 *Awareness and Participation in Technical Services Offerings*

5.2.1 **Business Energy Analyzer**

ComEd offers an online Business Energy Analyzer (BEA) tool to help commercial and industrial customers analyze their overall energy use and learn about energy-saving tips. The BEA uses the business’ actual energy usage data, identifies high-usage periods, and suggests ways to save energy based on these data. The number of unique users interacting with the BEA website provides an indication of how many ComEd customers are using the BEA. According to program staff, there are 507 registered users, of which 49 (10 percent) completed a total of 170 unique interactions this year (e.g., selecting "Get Started," "Take Action," or "Mark as Complete").

The PY7 participant survey explored several topics surrounding the BEA, including awareness of the tool, history of use, and likelihood to use it in the future. Overall, few participants in the Standard Program are aware of the BEA (16 percent). Participants who installed non-lighting projects during PY7 are more likely to be aware of the BEA, compared to participants who installed lighting projects (31 percent relative to 13 percent). Awareness does not vary systematically between participants who installed either medium or large projects (of any end use) and those who installed small projects. Levels of awareness are also similar across participants who are employees of the company that received the ComEd incentive, employees of energy-related service companies, and contractors.

Among participants aware of the BEA, 13 percent have previously used it. Most that are aware of, but have not yet used, the BEA are either somewhat or very interested in doing so within the next year (67 percent). The few participants who are not interested in using the BEA (5 out of 21) reported that they are not interested in doing so because they already had a different energy audit (1 of 5), do not need the information (2 of 5), or because they do not have time to use the tool (2 of 5).

5.2.2 **General Energy Assessments**

Introduced in PY4, the Smart Ideas Program offers customers on-site energy audits, called general energy assessments.²⁰ These assessments are free to the customer and consist of a two-hour walk through of the customer’s facility conducted by a ComEd engineer. The assessments help customers identify the most

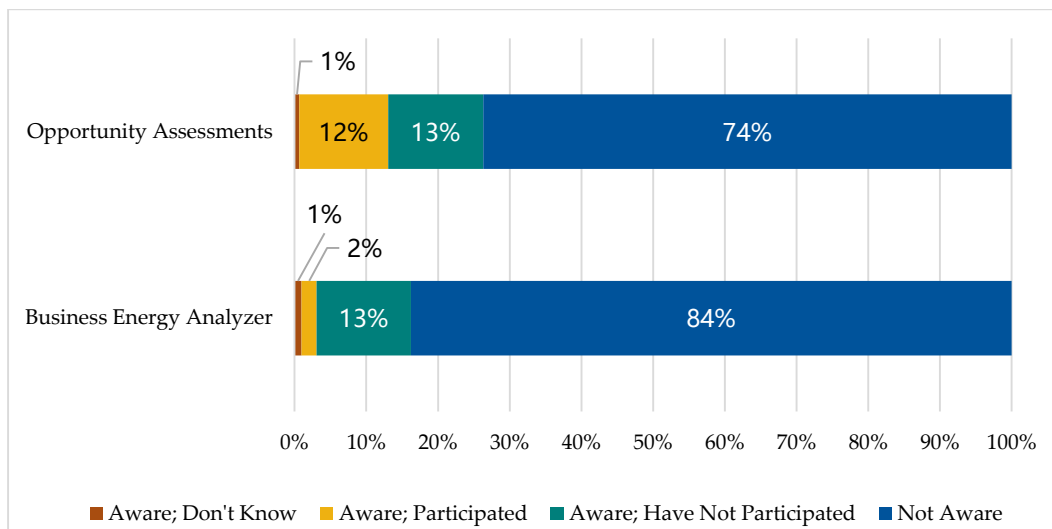
²⁰ In prior program years, the general energy assessments were also called “Smart Ideas Opportunity Assessments.”

economically feasible projects, find trade allies that can help implement the potential project, locate incentives for the projects, calculate estimated returns on investment, and complete and submit application paperwork. Assessments are advertised on the ComEd website.

Overall, 26 percent of PY7 Smart Ideas program participants are aware of ComEd’s general energy assessments. Awareness is noticeably higher among certain participant sub-groups. First, participants with non-lighting projects are more often aware of the assessments than participants with lighting projects (58 percent, relative to 19 percent). Second, participants who installed medium or large projects are more often aware of facility assessments than participants who installed small projects (41 percent versus 21 percent).

Among participants aware of the assessments, almost half have previously completed an assessment (47 percent). Non-lighting program participants make up the majority of assessment recipients (59 percent). Of those who are aware of the assessments but have not yet completed one, 71 percent report that they are somewhat or very interested in receiving an assessment within the next year.

Figure 5-2. Respondent Awareness and Participation in Technical Services Offerings



Source: Evaluation Team analysis.

The PY6 cross cutting process research suggested that about half of assessment recipients (58 percent) complete at least one project recommended in the assessment, and that about half of those completing projects do so through the Smart Ideas program.²¹ Given that the assessments are effective in channeling customers into the Smart Ideas incentive programs, increasing awareness and participation in this offering may still help to achieve savings goals.

²¹ C&I Cross-Cutting Evaluation: PY6 C&I Process Analysis Report

6 Findings and Recommendations

This section summarizes the key impact and process findings and recommendations. Overall, the Standard Program performed very well in PY7 with 180,799 MWh of net energy savings, which exceeded planned net savings (160,901 MWh)²² by 12 percent, although program participation (number of projects) appears to have decreased from last year, partly due to ComEd’s decision to stop accepting pre-applications by the end of the third quarter of PY7.

Verified Gross Impacts and Realization Rates

Finding 1. The overall verified gross realization rate for the Standard Program is 1.01 for energy savings and 0.96 for peak demand savings. The verified gross realization rate for all lighting measures is 1.01 for energy savings and 1.00 for peak demand savings. The lighting measures with the largest impact and realization rate of less than 1.0 are the DLC qualified interior LED luminaires and occupancy sensor lighting. The evaluation team made adjustments to the occupancy sensor savings similar to previous years (i.e., adjusted energy savings factor based on actual occupancy sensor type), which resulted in a lower realization rate. ComEd is currently addressing the issue with occupancy sensors through an update to the TRM (v5.0). The low realization rate for the LED measure is due to a change from cooled to uncooled space type based on evaluation review of project files or on-site findings.

Recommendation 1. ComEd should ensure that the space type recorded in the inspection reports gets properly recorded in the database, particularly the question “what is the estimated percentage of conditioned space?” under the *Other Details* section of the inspection forms. Additionally, ComEd should (1) add calculations in the lighting work papers for each type of non-conditioned facility (i.e., hours as deemed by the TRM by space type and waste heat factor of 1.0); and (2) add an additional field in the database which would trigger usage of these unconditioned savings values.

Finding 2. The verified gross realization rate for all non-lighting end use measures is 0.98 for energy savings and 0.83 for demand savings. The non-lighting measures with the largest impact and a realization rate less than 1.0 are chillers, variable speed drives (VSDs), and refrigerated cycling compressed air dryers. The evaluation set energy savings to zero for one chiller project (26821) and two VSD projects (24947 and 26698). The installed chiller did not meet full load efficiency requirements in the Illinois TRM. In addition all chiller projects’ peak savings were calculated using the IPLV (part load efficiency) and not the full load efficiency as dictated by the Illinois TRM. This resulted in all chiller measure peak savings being reduced.

Recommendation 2. ComEd should ensure that the VSD projects are meeting the automatic controls requirements. This could be accomplished by highlighting the requirement on the application or application approval checklist or other program materials. Navigant is aware that ComEd’s updates to the chiller work papers for PY8 uses the full load efficiency of the chiller for peak savings and the IPLV for energy savings. Navigant will review the PY8 work papers to verify the savings input assumptions.

²² ComEd PY7 Goals.xlsx (received 2015-04-30)

TRM Updates and Tracking System

Finding 3. The refrigerated compressed air cycling dryers in the ComEd work papers has seen large changes to the savings values over the last few program cycles. This measure is not defined in the statewide IL-TRM. The evaluation team reviewed the appropriateness of the savings values for this measure based on a combination of metered data and customer interviews collected during PY7 evaluation and a review of deemed values in other sources including TRMs from other jurisdictions. The evaluation found that the Standard Program appears to be over estimating the savings from refrigerated cycling dryers.

Recommendation 3. ComEd should adopt the evaluation defined savings values for refrigerated cycling dryers recommended for inclusion in the TRM Version 5 update process.

Finding 4. There are discrepancies between the ComEd work papers and the Illinois TRM for the LED refrigerated case lighting measure, including operating hours and waste heat factor.

Recommendation 4: The ComEd work papers should be updated to use the operating hours and waste heat factors referenced in the Illinois TRM. The ComEd work papers should also be updated to claim freezers and refrigerated cases separately or a weighted average value should be used which weights both the wattage reduction and the waste heat factors. In addition, the application and the ComEd work papers should be updated for open cases to clearly state the savings are per foot of lamp and not per foot of case.

Finding 5. The Illinois TRM defines savings for single VSD air compressors less than 40 HP. Savings are based upon different operating hours based upon the number of shifts at the facility, compressor HP, and the compressor factor for the baseline and VSD compressor. The ComEd work papers do not include the methodology used for VSD air compressor savings. In addition, the majority of incented compressors are over 40 HP. It is not clear how the ComEd work papers calculate savings, although it is expected a blend of the Illinois TRM operating hours were used. The TRM does not specify actual hours should be used if known. The evaluation did not verify the gross savings with the actual hours on the application, but used them to pick the shift hours that were closest and appropriate from the TRM.

Recommendation 5: ComEd should include VSD air compressor savings in the ComEd work papers and define assumptions made.

Finding 6. For the no-loss condensate drain measure, the Illinois TRM defines the average CFM reduction as 3 CFM per drain. The ComEd work papers use 6.5 CFM reduced per drain. The ComEd work papers use the Illinois TRM methodology and values for the other parts of the analysis, however the TRM deems the compressed air system pressurized hours at 6,316 hours instead of 5,702 hours weighted average as used in the work papers and ex ante gross savings calculation.

Recommendation 6: ComEd should update the no-loss condensate work papers to be consistent with the Illinois TRM.

Finding 7. The IL TRM (v3.0) does not include default values for airfoil and backward inclined fans with outlet dampers. The ComEd work papers appear to be using an incorrect savings

factor for outlet dampers; currently the work papers use the savings factor for outlet dampers with inlet guide vane.

Recommendation 7: ComEd should update the work papers to use the TRM (v4.0), which has new methodology and set of options for calculating savings for VSDs, including input values for airfoil and backward inclined fans with outlet dampers. ComEd should clearly define the constraints of each VSD fan and pump category. VSDs that do not fit these constraints should be custom calculated. Special care needs to be taken with high head applications such as well pumps, domestic water booster pumps, and boiler feed water pumps.

Program Participation

Finding 8. The program stopped accepting pre-applications early in PY7 when its target budget was met. The number of installed projects in the Standard Program decreased by 23 percent from PY6 to PY7, and the ex ante energy savings decreased by 17 percent from PY6 to PY7. The ex ante lighting energy savings declined from 212,649 MWh in PY6 to 177,007 in PY7, a 17 percent reduction. Ex ante non-lighting energy savings declined from 58,620 in PY6 to 47,061 MWh in PY7, a 20 percent reduction.

Finding 9. A brief set of questions in the PY7 NTG process CATI survey were asked of participants who received a “Zero T12 Reward”. Participant responses suggest that the T12 market is transitioning but not transformed to HP T8s. Although only seven participants responded to the T12 questions (about one fourth of the respondents of PY6), it is notable that more than three-quarters of the respondents noted they did not have trouble finding replacement T12 lamps. More than half the respondents were noticing failures due to either lamp or ballast. Some customers are experiencing failures and anticipating near-term replacements, while others are not seeing failures and are not having trouble replacing T12 lamps. This suggests that the market was not yet transformed in PY7.

Recommendation 8. The Standard Program in PY8 should continue focusing on the T12 market since it is still transitioning.

Process Evaluation

Finding 10. Participant survey responses suggest that the Standard Program process is running smoothly. Participants tend to be satisfied with their overall program experience and note several benefits of participating. Strong areas of the Standard Program are the incentive amounts, types of measures offered, and participants’ relationships with vendors. For participants, the primary drawbacks are the enrollment and approval timelines, plus the time and resources it takes for them to participate.

Finding 11. Awareness of the Business Energy Analyzer (BEA) and General Energy Assessments (GEA) Smart Ideas technical offerings is low among Standard Program participants, and less than half of the aware participants have actually used these offerings. Nonetheless, interest in both offerings is high among customers that were aware of the program but who have not yet participated. These trends suggest two related findings. First, there appears to be a gap between interest in technical services and use of such services. Second, overall low awareness of these offerings among Standard Program participants implies that most

participants enrolled in the program without any channeling support. This is the case for smaller, lighting-based projects in particular.

Recommendation 9. ComEd should explore whether technical services marketing strategies can be enhanced to better lead customers from awareness, to interest, to participation. Based on our PY7 findings about how participants prefer to learn about energy efficiency opportunities, we recommend building on vendors and existing ComEd marketing channels. Given that participants noted that the primary benefits of participating in the Standard Program are financial, it may also be useful to clearly show how participating in technical services can facilitate financial benefits.

Recommendation 10. ComEd’s termination of accepting pre-approval applications before the effective program year end due to completion of reserved program allocated budget, should be gauged against program satisfaction risk, considering that (as noted above) participants see financial incentives as the primary benefits of participating in the Standard Program. When it appears likely that the program will stop taking applications mid-year, Navigant recommends that ComEd should create a mechanism that informs participants how the program is performing and set expectations for the availability of funding, while monitoring expectations of participants satisfaction.

Net-to-Gross Estimates

Finding 12. Evaluation research of free-ridership conducted on PY7 participants based on historical methods found a value of 31 percent for lighting and 32 percent for non-lighting. The NTG (without spillover) for lighting decreased from 0.73 in PY6 to 0.69 in PY7, and for non-lighting projects increased from 0.62 to 0.68. The PY7 sample design produced a plus or minus 9 percent relative precision for lighting and also plus or minus 6 percent relative precision for non-lighting projects at a 90 percent confidence level. Using the recent proposed Illinois statewide NTG methods, evaluation estimated six different ways of free-ridership for consideration by ComEd and the SAG to decide which option is best for inclusion in the TRM. Findings from these analyses are provided in a separate memo to ComEd and the SAG.

7 Appendix

7.1 Impact Evaluation Findings and Approaches

7.1.1 Gross Research Impact Results

The gross impact evaluation results presented in Section 3 differentiated between savings verification of deemed measures and input values and site-specific engineering research estimates of non-deemed measure savings. Savings verification sought to verify eligibility, quantity, and compliance with claimed deemed per unit savings values defined in the Illinois Technical Reference Manual (TRM). Gross impact evaluation of non-deemed measures involved collecting data from supporting project documentation and on-site measurement and verification (M&V) to estimate site-specific measure savings for custom variables.

Two separate evaluation estimates of gross savings are presented in this report: a savings verification estimate presented in the body of the report that uses the TRM approach for measures covered by the TRM, and a research estimate that applies all evaluation research without regard to the TRM status of measures. The research estimates are presented only in Appendix 7.1.

The evaluation activities to verify gross energy savings and produce a research estimate of the Standard Program were conducted in these steps:

1. Used the Illinois TRM and engineering review of tracking data to assess correct implementation of deemed values, and reasonableness of non-deemed values in the ex-ante gross savings estimates. If a project energy savings were more than half lighting or entirely lighting, Navigant defined it as a “Lighting” project. All other projects were defined as “Non-lighting” in the evaluation. Navigant found that nearly all projects contained either all lighting or all non-lighting measures. Projects with a mix of lighting and non-lighting measures provided only about one percent of program ex ante gross savings.
2. Implemented a stratified random sampling design of lighting and non-lighting measures to select 120 projects (consisting of 55 lighting and 65 non-lighting projects) from the population of 2,364 Standard project applications and 4,977 Standard measures. Sampling was done in two waves with three sub-strata based on size. Sample sizes were designed to provide a 90/10 confidence and precision level for program-level savings separately for lighting and non-lighting gross savings verification.
3. Conducted on-site visits and measurement and verification (M&V) activities on a sample of 34 Standard projects (12 lighting and 22 non-lighting) selected from the 120 projects²³ to support deemed and non-deemed measure savings verification and measure-level research. Lighting projects selected for on-site verification tended to be very large or complex projects. The selection of non-lighting projects for on-site verification was driven by project size and the need to site-verify non-deemed, non-lighting measures. On-site data collection occurred primarily during the

²³ ComEd PY7 Goals.xlsx (received 2015-04-30)

June 1 through August 31 summer peak period. Performance measurements included spot measurements and run-time hour data logging for selected measures.

4. Conducted an engineering review of project files and energy savings estimates on the remaining 86 projects from the sample of 120 projects to support deemed and non-deemed measure savings verification and program-level research.
5. Conducted a quality control review of the research findings impact estimates and the associated draft site reports and implement any necessary revisions.
6. Produced an estimate of verified gross savings (kWh and kW) using the TRM for savings verification.
7. Produced a research estimate of gross savings (kWh and kW) using all evaluation findings.
8. Produced a gross realization rate (which is the ratio of the evaluated gross savings to ex-ante gross savings as reported in the tracking system) for the sample and applied to the total program ex-ante gross savings, using sampling-based approaches that are described in greater detail below. Gross realization rates were produced for savings verification and the research estimate.

The product of the ex ante gross savings times the gross realization rate is an evaluation estimate of gross savings for the Standard Program.

Impact Evaluation Gross Verified Findings

The table below presents the verified gross realization rate (for energy savings and demand), the percent of sample energy savings, and any notes or recommendations Navigant had to address discrepancies by measure. Navigant has also assigned a priority (high, medium or low) based on evaluation risk and percent of program savings. Note that these percentages were weighted in order to calculate the overall program level gross realization rates presented in the body of the report.

Table 7-1. Measure Level Gross Impact Results

Measure	% of Sample Energy Savings	RR kWh Verified	RR kW Verified	Notes on Realization Rate	Recommendation	Priority
2' Lamp and Ballast	0.002%	2.74	2.74	One project - these were 4' U T12 as opposed to 2' T12/T8 as assumed	ComEd could add U-lamp baseline to work paper	Low
4' HP T8 to 4' Linear LED Lamp	0.002%	1.01	1.01	One project with adjusted delta watts	Minor adjustment	Low
Daylighting Controls	0.01%	1.00	1.00	RR = 1, no action needed	NA	
Delamp 4'	0.05%	0.63	0.63	RR driven down by one project - where T8 lamps were removed as opposed to T12	If higher degree of accuracy is desired, ComEd could track type of lighting removed	Low
Delamp 4' with reflector	0.51%	1.10	1.11	More T12s delamped for this measure	If higher degree of accuracy is desired, ComEd could track type of lighting removed	Low

Measure	% of Sample Energy Savings	RR kWh Verified	RR kW Verified	Notes on Realization Rate	Recommendation	Priority
Delamp 8' with reflector	0.09%	1.08	1.08	More T12s delamped for this measure	If higher degree of accuracy is desired, ComEd could track type of lighting removed	Low
DLC Qualified Interior LED Luminaires	13.43%	0.86	0.86	Reasons for RR less than 1: change from cooled to uncooled space type, change wattage to match project files/TRM, change from cooled to uncooled space type. There was one project where we found additional LEDs on-site versus what was reported.	ComEd should add a field in the tracking system which tracks cooled vs uncooled space type for buildings.	Medium
DLC Qualified Outdoor LED Luminaires	8.29%	1.06	NA	One project (24081) had LEDs not included in the Ex ante. Navigant verified this project could have 95,537 kWh more savings. Other projects adjustments included changes to wattage and HOU for outdoor space	ComEd should ensure actual project specs reflect claimed savings and the TRM building type requirements	Low
DLC Qualified Parking Garage LED Luminaires - Garage/24-7	0.38%	1.00	1.00	RR = 1, no action needed	NA	
Exit Signs	0.01%	1.16	1.76	Change is due to changing from weighted average baseline to actual	NA	
Exterior Advanced lighting control system	0.02%	1.00	N/A	Verified RR = 1, no action needed	NA	
Exterior DLC Qualified LED Luminaires	3.37%	1.00	N/A	Verified RR = 1, no action needed	NA	
Exterior/Garage HW CFL - 61W - 120W - Exterior	0.02%	1.01	N/A	RR = 1, no action needed	NA	
Exterior/Garage HW CFL - 61W - 120W - Exterior	0.03%	1.36	N/A	Adjustment from assumed wattages to actual resulted in upwards adjustment.	NA	
HP T8 (4') and ballast	0.03%	1.22	1.00	No action needed; one project had high realization rate because ComEd work paper space types do not exactly align with TRM work papers - change was due to going from K-12 school to high school/middle school	NA	
Occupancy Sensor Lighting	2.54%	0.87	0.99	Same occupancy sensors adjustments being made as in previous years (going from weighted average ESF to actual)	ComEd is adjusting ESF in TRM	Action already taken
Occupancy Sensor Plus Daylighting Controls	0.14%	0.86	0.86	Same occupancy sensors adjustments being made as in previous years (going from weighted average ESF to actual)	ComEd is adjusting ESF in TRM	Action already taken
Occupancy Sensors - Garage	0.01%	1.89	N/A	High RR due to one project - it was 24/7 usage which increased kW and kWh	NA	
One 8-ft T12 Lamp to two 4-ft HP T8 Lamps and Ballast	0.31%	1.00	1.00	RR = 1, no action needed	NA	
One 8-ft T12 Lamp to two 4-ft RW T8 Lamps and Ballast	0.72%	1.54	1.54	ComEd's assumptions for delta watts for this measure appear to be conservative	NA	
New T5/T8 Fixture	17.42%	1.08	1.01	Adjusted savings due to changes in wattage or quantity based on project specification and documentation	ComEd should ensure actual project specs reflect claimed savings and the TRM building type requirements	Low

Measure	% of Sample Energy Savings	RR kWh Verified	RR kW Verified	Notes on Realization Rate	Recommendation	Priority
Photocell + Timeclock	0.20%	1.00	N/A	RR = 1, no action needed	NA	
Photocells	0.001%	1.00	N/A	RR = 1, no action needed	NA	
Reduced Wattage T8 (4) and Ballast	0.23%	1.00	1.03	RR = 1, no action needed	NA	
Sensor Controlled Parking Garage Bi-Level Fixture	1.36%	0.96	0.93	RR slightly lower than one because one project adjusted wattages to actual, which resulted in smaller delta watts than assumed in the work papers	NA	
Time Clocks for Lighting	0.03%	0.85	N/A	Adjustments due to using actual wattage and facility type.	NA	
Air Compressor with Integrated VSD	3.71%	0.95	1.05	Assumptions were not clear; contributed to variation in realization rate	The TRM defines savings for single VSD air compressors less than 40 HP, but the majority of incedent compressors are over 40 HP. The ComEd work papers do not include the methodology used for VSD air compressor ex ante savings. ComEd should include VSD air compressor savings in the ComEd work papers and define the assumptions made.	Medium
Air Cooled Chiller	0.11%	0.97	0.43	One project - TRM calculations are based on full-load efficient, whereas work papers calculate using IPLV efficiency. See notes also on other chiller types below.	The TRM savings are based upon the incremental improvement of efficiency using IPLV for kWh and Full Load kW per ton for kW savings. The ComEd application form only collects the IPLV efficiency of the chiller and does not collect the Full Load efficiency. The ComEd work paper demand savings uses the Full Load improvement for the first 10%, but the incremental demand improvement incorrectly uses the incremental improvement of the IPLV instead of the Full Load efficiency. ComEd should collect Full Load chiller efficiency and use for the demand savings calculation.	Medium
Air Cooled Chiller >= 150 Tons	1.97%	0.87	0.71	See comments on air cooled chiller, additionally, adjustments were made to EFLH	ComEd may reconsider average hourly assumptions for this measure	Medium
Air-Side Economizer	0.69%	0.96	N/A	Capacities of AHU were less than what is specified in ex-ante savings	ComEd could use actual AHU capacity in savings calculations	Low
Anti-sweat control system	0.03%	1.00	N/A	RR = 1, no action needed	NA	
Commercial Kitchen Demand Ventilation Control (New)	1.17%	1.00	1.00	RR = 1, no action needed	NA	
Commercial Kitchen Demand Ventilation Control (Retrofit)	0.33%	0.94	0.94	One project is driving down RR (27399), this is because project files found that ventilation fan is 0.18 HP (ex-ante savings using 2 HP fan)	ComEd could use actual fan HP or have tiers of fan HP in ex-ante savings calculations	Low
Cooling lockout based on outside air temperature	0.10%	1.00	N/A	RR = 1, no action needed	NA	

Measure	% of Sample Energy Savings	RR kWh Verified	RR kW Verified	Notes on Realization Rate	Recommendation	Priority
Demand Control Ventilation for Garage	12.17%	0.99	N/A	This measure for garage is not deemed in TRM - only one project had RR less than 1, but it was the largest. From the site report: The ComEd work paper case studies show reductions in fan energy consumption of approximately 95% after the installation of DCV. This is in line with the reductions in operating hours seen at the parking garage, however, the spot measures showed that the fan loading at this facility is relatively low.	For less evaluation risk, ComEd could consider adding Garage space type to the DCV measure in the TRM.	Medium
Demand Control Ventilation for Office Space	0.42%	1.20	N/A	This measure is deemed in TRM - RR are greater than one, mainly due to adjusted to actual vs weighted averages for inputs, suggesting ComEd assumptions may be conservative	If higher degree of accuracy is desired, ComEd's ex-ante savings could use kWh for space type noted in TRM (as opposed to an average)	Low
Differential Enthalpy Economizer	0.66%	0.58	0.02	This is due to one project - used actual schedules and set points found in project documentation reduced savings. Additionally, using the WTHI peak period instead of assuming the average demand savings reduced peak demand savings for all measures. During peak WTHI period the fans are running near full capacity - no economizer savings	ComEd should reconsider assumptions for schedules and set points of economizer measure. Additionally, ComEd should revisit assumptions for peak savings, i.e., use WTHI for peak period to calculate demand	Low
EC motor Reach-In	0.13%	0.00	0.00	These are new refrigerated cases with integrated ECM (as opposed to cases retrofit with ECM), thus they are ineligible for savings.	Add to application or approval checklist to note if ECM are installed on new or existing cases (new cases are not eligible).	Low
EC Motor Walk-in	0.05%	0.00	0.00	These are new refrigerated cases with integrated ECM (as opposed to cases retrofit with ECM), thus they are ineligible for savings	Add to application or approval checklist to note if ECM are installed on new or existing cases (new cases are not eligible)	Low
ECM motors on Fan-Powered Boxes	0.03%	0.67	0.67	ECM motors for this project were 0.33 and work paper assumes 0.5	Add custom input (quantity) in database and track motor size.	Low
Existing Digital EMS	8.35%	0.17	N/A	This measure is not deemed - the ex-post savings used billing analysis which resulted in low savings - suggesting ComEd assumptions might be revisited. The % reductions in the work paper are based on all program year's custom projects.	ComEd might revisit % savings reduction for this measure and include in this % reduction estimate for any additional data collected for the Standard/Custom programs.	Medium
Floating Head Pressure Control - Condensing Unit - Low Temperature	0.41%	0.42	0.42	Ex-ante savings are not consistent with ComEd work papers - claim different kw/HP and kWh/HP. Additionally using trend data found that the refrigeration energy consumption is 92.3% of baseline, whereas ex-ante savings were approximately 20%. The reference document from ex-ante estimates that FHPC saved 7.7%	Match ex-ante database savings with the work paper savings. Adjust work paper savings so that calculated savings are in line with the reference document 7.7% savings.	Low
Floating Head Pressure Control - Condensing Unit - Medium Temperature	0.13%	0.42	0.42			

Measure	% of Sample Energy Savings	RR kWh Verified	RR kW Verified	Notes on Realization Rate	Recommendation	Priority
Hot Food Holding Cabinet	0.02%	0.50	0.50	Hot food holding cabinets installed were the 1/2 size cabinets	Add an additional database line items for 1/2 size hot food holding cabinets	Low
Ice Maker 1001-1500 lbs/day	0.01%	1.90	1.91	RR are higher due to using actual energy efficiency specifications of installed units - suggests that ComEd's work paper assumptions are conservative	NA	
Ice Maker 101-200 lb/day	0.001%	3.93	4.03			
Ice Maker 501-1000 lbs/day	0.002%	2.48	2.50			
Install VFD on Evaporative Condenser Fan	0.20%	1.11	0.68	Measure is not deemed - RR is due to using actual metered data to build load profile. Additionally, see comments for VSDs below	See VSD measures below	
Install VFD on Other Fan	0.25%	0.63	1.41			
Install VFD on Process Pump	1.01%	1.14	-3.47			
LED Refrigerated Case Lighting - Closed Case	0.21%	1.01	1.35	The savings are consistent with the ComEd work papers but not the Illinois TRM; ComEd work papers use the OH TRM and PGE references	ComEd should make work paper savings consistent with the IL TRM	Low
LED Refrigerated Case Lighting - Open Case	0.50%	2.48	2.88			
Lighting Controls - Closed Refrigerated Case	0.07%	1.46	7.74	Not deemed - used lighting logger data to calculate savings	NA	
Low Pressure Drop Filters	0.05%	0.00	0.00	Did not meet requirements outlined by the IL TRM. The Illinois TRM requires that the installed equipment has a pressure drop not exceeding 1 psi at the time of installation and not exceeding 3 psi at the time of element change. The product brochure for the installed equipment shows that the filters have a pressure drop of approximately 2.9 psi when new and 3.7 psi at the time of element change.	Ensure that TRM requirements are met through applications or incentive approval checklist	Low
New or Retrofit Cooler Display Case w/Doors	0.48%	0.90	1.00	RR due to one project - measure not defined in TRM so used metered data	NA	
New or Retrofit Freezer Display Case w/Doors	3.63%	0.96	1.00			
No-Loss Condensate Drains	0.06%	1.66	1.59	RR higher due to using actual CFM specification as opposed to an average	NA	
Optimal start/stop	1.09%	1.22	N/A	Billing analysis is used for this project - RR were 1, 1.62 and 0 for these projects	ComEd might collect additional information to ensure the measure meets work paper assumptions.	
Pneumatic to wireless DDC thermostat	2.37%	0.18	N/A	Billing analysis found that savings were 9% as opposed to 47% claimed. On-site summary claimed that 80% of the thermostats did not have a functioning setback	ComEd might collect additional information on thermostat schedules to ensure the measure meets work paper assumptions.	Medium
Pumping Eff. Improvements	0.06%	1.20	2.99	Custom analysis, RR was higher because original pumps were oversized for the operation	NA	

Measure	% of Sample Energy Savings	RR kWh Verified	RR kW Verified	Notes on Realization Rate	Recommendation	Priority
Refrigerated Cycling Dryers	0.51%	0.43	0.24	Savings are low because ComEd was using the 6/14 work papers as opposed to the 3/15. We are using the methodology submitted for inclusion in TRMv5.0, which is approximately in line w/ the 3/15 work papers	Will be addressed by deeming this measure in the TRM	Action Already Taken
VSD - Boiler Feedwater Pump, w/All Types	0.08%	0.00	N/A	<p>These two projects were set to zero: 24947 and 26698. They are both VSD projects where automatic controls were not installed. For both projects the VSDs were set manually at reduced speeds but this does not meet program requirements. The application does not make the requirements for this measure clear. (We are sure if the customer is aware of these requirements in other documents). A second issue with VSDs that is highlighted in 24549 is that the IL TRM (v3.0) does not have backward inclined/airfoil fans with outlet dampers as a fan type which is listed in their reference document (CT PSD 2008). In addition, the ComEd work papers need to be updated to use the correct savings factor for the outlet dampers instead of using the inlet guide vanes for backward fans. It should also add inlet guide vanes for backward fans.</p> <p>26821 is a chiller project which was set to zero. There were also other chiller projects with the same issue as with this project. The ComEd application does not collect the full load efficiency of the chillers. Upon further review several chillers did not meet the full load requirement that is outlined in the Illinois TRM as well as building code. In these cases the chiller savings were set to 0. In addition all chiller projects had the issue of the peak savings being calculated on the IPLV (part load efficiency) which the ComEd application did collect and not the full load efficiency as dictated by the Illinois TRM. This resulted in all chiller measure peak savings being reduced.</p>	<p>ComEd should clearly define the constraints of each VSD fan and pump category. VSDs that do not fit these constraints should be custom calculated. Special care needs to be taken with high head applications such as well pumps, domestic water booster pumps, and boiler feed water pumps. ComEd should update the VSD work papers to use the TRM (v4.0), which has new methodology and set of options for calculating savings for VSDs, including airfoil and backward inclined fans with outlet dampers.</p> <p>The ComEd application and work papers need to collect and use the full load efficiency of the chiller for peak savings and the IPLV for energy savings. Application should note whether chiller meets program requirements</p>	Medium
VSD - Chilled Water Pump, w/All Types	0.09%	3.29	N/A			
VSD - Condenser Water Pump, w/All Types	0.27%	2.07	1.00			
VSD - Hot Water Circulation Pump, w/All Types	0.91%	0.50	N/A			
VSD - Return Air Fan, Other w/On/Off	0.10%	1.21	1.00			
VSD - Return Fan, Backward Inclined w/Discharge Damper	0.06%	3.85	1.99			
VSD - Return Fan, Backward Inclined w/Inlet Guide Vanes	0.03%	3.29	1.00			
VSD - Supply Air Fan, Other w/On/Off	1.72%	1.82	0.99			
VSD - Supply Fan, Backward Inclined w/Discharge Damper	0.10%	3.85	1.99			
VSD - Supply Fan, Backward Inclined w/Inlet Guide Vanes	0.12%	3.29	0.99			
VSD - Supply Fan, Backward Inclined w/On/Off	0.23%	1.00	1.00			
VSD - Supply Fan, Forward Curved w/On/Off	1.23%	1.80	1.00			
VSD - Water Supply/Waste Water Pump, w/All Types	0.77%	1.71	1.73			
VSD on Chilled Water Pump w/Other Base Control	0.95%	0.44	0.48			
Water Cooled Chiller - Centrifugal <300 tons	0.40%	0.89	0.10			
Water Cooled Chiller - Centrifugal >=600 tons	2.41%	0.43	0.04			
Water Cooled Chiller - Scroll or Helical Rotary >= 300 tons	0.36%	0.90	0.10			

Source: Navigant Team Analysis

In addition to the notes above, Navigant also made standard adjustments to the verified savings as follows:

1. Navigant changed the verified business type to be in accordance with project documentation or on-site findings and these adjustments result in evaluation verified gross realization rates both higher and lower than 1.0.
2. Navigant made adjustments to delta watts on some lighting measures; this type of adjustment affected demand and energy savings. The order of operation Navigant used to identify delta watts is as follows:
 - a. Actual wattage if provided in the project files or on-site,
 - b. Wattage value provided by TRM, if listed,
 - c. Wattage assumption based on ComEd work papers
3. Navigant also made changes from a blended average used in the work paper assumptions (for example, assumption of an average baseline wattage of incandescent and fluorescent fixtures) to actual. Most often correction to this blended average resulted in an upwards correction, however, for the occupancy sensor measure, this more often resulted in a downwards correction.
4. Navigant made changes to custom engineering calculations in those cases where the measures were not deemed by the TRM.

Research Findings Gross Program Impact Summary Results

Table 7-2 summarizes the evaluation research findings gross program impacts derived for the PY7 Standard Program.

Table 7-2. Summary of Research Findings Gross Realization Rates and Savings Estimates

End-Use Segment	MWh, Ex Ante Gross Savings	MWh, Research Finding Gross Savings	MWh RR	MW, Ex Ante Gross Savings	MW, Research Finding Gross Savings	MW RR
Lighting	177,007	172,744	0.98	22.50	23.03	1.02
Non-Lighting	47,016	44,923	0.96	6.41	5.52	0.86
Total	224,023	217,909	0.97	28.92	28.54	0.99

Source: Evaluation analysis

Sampling Design (Savings Verification and Research Estimate)

The sample draw for PY7 gross impact evaluation was designed to provide a 90/10 level confidence and relative precision for gross impact realization rate results for lighting measures, non-lighting measures, and the overall program. Strata were defined by project size (separately for lighting and non-lighting projects) based on ex-ante gross energy savings boundaries that placed about one-third of program-level savings into each stratum.

For lighting projects, stratum 1 consisted of large projects with project-level ex-ante energy savings greater than 340,000 kWh, stratum 3 consisted of small projects with ex-ante gross energy savings less than 107,000 kWh, and stratum 2 consisted of the medium sized projects in between. Similarly, for non-lighting projects, stratum 1 consisted of large projects greater than 192,000 kWh, stratum 3 consisted of small projects less than 68,000 kWh, and stratum 2 consisted of the medium sized projects in between.

Sampling was done in two waves that were roughly proportional to the populations they represented. The first wave of sampling was conducted on projects with a status of paid in a March 15, 2015 database extract. The second and final wave of sample projects was drawn from a July 23, 2015 tracking system extract of projects paid after the March 15, 2015 extract.

Table 7-3 below provides the sample selection by end-use category and stratification. Overall the sample represented 19 percent (43,493 MWh) of the population ex ante savings of 224,023 MWh.

Table 7-3. Profile of the PY7 Population and Gross Savings Verification Sample by End-Use Strata

Population Group	Population Summary			Sample		
	Sampling Strata	Number of Projects (N)	Ex Ante Claimed Gross Savings, MWh	MWh Weights	Number of Project (n)	Ex Ante MWh
Lighting Wave 1	1	57	32,949	19%	15	11,507
	2	226	41,883	24%	15	2,975
	3	1,483	46,793	26%	15	662
Lighting Wave 2	1	40	26,646	15%	4	5,739
	2	80	14,681	8%	3	359
	3	478	14,054	8%	3	150
Lighting Subtotal		2,364	177,007	100%	55	21,392
Non-Lighting Wave 1	1	21	7,257	15%	16	5,405
	2	72	7,725	16%	12	1,362
	3	266	6,258	13%	12	571
Non-Lighting Wave 2	1	30	20,184	43%	11	13,528
	2	29	3,216	7%	8	967
	3	82	2,375	5%	6	269
Non-Lighting Subtotal		500	47,016	100%	65	22,101
Program Total		2,864	224,023	100%	120	43,493

Source: ComEd tracking data and Navigant analysis.

Table 7-4 below provides a comparison of the population profile to the sample, analyzed by measure technology types for sampled projects that align with end uses. The project count of the sample provides an indication of the end-use distribution of sampled projects due to the weighting approach of sampled projects to develop the population mean for the realization rate. The sample reflects the dominance of lighting.

Table 7-4. Profile of the PY7 Population and Gross Savings Verification Sample by End-use Type

End-use Group	Population Summary			Sample			
	Number of Project (N)	Ex Ante Claimed Gross Savings, MWh	MWh Weights	Number of Project (n)	Ex Ante MWh	Sample MWh Weights	Sampled MWh % of Population
LIGHTING	2,364	177,007	79%	55	21,392	49%	12%
HVAC_VSD	125	13,925	6%	25	8,786	20%	63%
COMP_AIR	22	567	0%	2	75	<1%	13%
BUILDING_EMS	61	13,007	6%	5	5,608	13%	43%
IS_VSD	85	7,465	3%	16	2,439	6%	33%
REFRIG	161	7,096	3%	7	2,527	6%	36%
ROOFTOP	2	348	0%	1	287	1%	82%
HVAC	27	3,903	2%	7	2,057	5%	53%
OTHER	17	706	0%	2	322	1%	46%
TOTAL	2,864	224,023	100%	120	43,493	100%	19%

Source: Utility tracking data and Navigant analysis.

Note: Ex-Ante slightly different because this uses consolidated end-use classification

Navigant compared the sample building type distribution to the program population to check if the sample reasonably represents the population distribution. Navigant used an iterative approach to draw a sample until we were able to capture a reasonable representation of building type distribution at the conclusion of wave 2. This approach did not support 90/10 gross impact realization rate results at the business type level, but nonetheless provided useful information for the most prominent building types. Details are shown in Table 7-5 below.

Table 7-5. Profile of the PY7 Population and Gross Savings Sample by Business Type

Business Type	Gross MWh, Population		Project Count, Sample		Gross MWh, Sample	
Retail/Service	52,495	23%	19	16%	4,236	10%
Office	27,704	12%	16	13%	7,557	17%
Light Industry	22,850	10%	19	16%	2,954	7%
Warehouse	41,830	19%	8	7%	6,784	16%
Grocery	9,676	4%	9	8%	2,769	6%
Heavy Industry	16,074	7%	12	10%	3,778	9%
Medical	6,825	3%	6	5%	2,022	5%
Restaurant	3,045	1%	2	2%	72	0%
College / University	1,731	1%	4	3%	646	1%
Hotel/Motel	1,681	1%	2	2%	381	1%
K-12 School	2,525	1%	2	2%	1,132	3%
Miscellaneous	37,587	17%	21	18%	11,161	26%
Total	224,023	100%	120	100%	43,493	100%

Source: Utility tracking data and Navigant analysis.

Engineering Review of Project Files

For each selected project, the EM&V team performed an in-depth application review to assess the engineering methods, parameters and assumptions used to generate all ex-ante impact estimates. For each measure in the sampled project, engineers estimated ex post gross savings based on their review of documentation and engineering analysis.

To support this review, ComEd provided project documentation in electronic format for each sampled project. Documentation included some or all of scanned files of hardcopy application forms and supporting documentation from the applicant (invoices, measure specification sheets, and vendor proposals), pre-inspection reports and photos (when required), post inspection reports and photos (when conducted), calculation spreadsheets, a project summary report, and important email and memoranda.

On-Site Data Collection

The EM&V team completed on-site surveys for a subset of 34 of the 120 customer applications sampled. For most projects on-site sources include interviews that are completed at the time of the on-site, visual inspection of the systems and equipment, EMS data downloads, spot measurements, and short-term monitoring (e.g., less than four weeks).

The EM&V team developed an analysis plan for each project selected for on-site data collection. Each plan explains the general gross impact approach used (including monitoring plans), provides an analysis of the current inputs (based on the application and other available sources at that time), and identifies

sources that will be used to verify data or obtain newly identified inputs for the ex post gross impact approach.

The engineer assigned to each project first calls to set up an appointment with the customer. During the on-site audit, the engineer collects data identified in the analysis plan, including monitoring records (such as instantaneous spot watt measurements for relevant equipment, measured temperatures, data from equipment logs and EMS/SCADA system downloads), equipment nameplate data, system operation sequences and operating schedules, and, of course, a careful description of site conditions that might contribute to baseline selection.

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

Site-Specific Impact Estimates

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

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

For this study, summer peak hours are defined as non-holiday weekdays between 1:00 PM and 5:00 PM Central Prevailing Time (CPT) from June 1 to August 31. Winter peak hours are defined as non-holiday weekdays between 6:00AM and 8:00AM CPT, and between 5:00PM and 7:00PM CPT, from January 1 and February 28. This is in accordance with the PJM manual 18, *PJM Capacity Market*, effective October 16, 2015.²⁴

Peak demand savings for both baseline and post retrofit conditions are the average demand kW savings for the 1 PM to 5 PM CPT weekday time period for summer, and 6 AM to 8 AM CPT and 5 PM to 7 PM CPT weekday time period for winter.²⁵ If this energy savings measure is determined to have weather

²⁴ Manual 18b, page 65-67: (<https://www.pjm.com/~media/documents/manuals/m18.ashx>)

²⁵ The Winter Weather Standard is the dry bulb temperature adjusted (by 0.5 °F) for wind speed above 10 mph. The measurements were for Hour Ending 19:00 on RTO peak days."

dependency then the summer peak kW savings are based on the zonal weighted temperature humidity index (WTHI) standard, and the winter peak kW savings are based on the zonal wind speed-adjusted temperature (WWP) standards posted by PJM (there is also PJM Zonal Winter Weather Standards similar to summer WTHI). The zonal WTHI and WWP are the mean of the zonal WTHI values or WWP values on the days in which PJM peak load occurred in the past sixteen years (1998-2014). This mean ComEd WTHI value is 81.6 demand savings for summer is the difference in kW between the baseline and post retrofit conditions. Similarly, the ComEd WWP value is 14.5 demand savings for winter is the difference in kW between the baseline and post retrofit conditions.

After completion of the engineering analysis, the EM&V team prepares a site-specific draft impact evaluation report that summarizes the M&V plan, the data collected at the site, and all of the calculations and parameters used to estimate savings. Each draft site report underwent engineering review and comment, providing feedback to each assigned engineer for revisions or other improvements. Each assigned engineer then revised the draft reports as necessary to produce the final site reports.

Research Evaluation Findings for the Gross Impact Sample

The results of the on-site M&V and engineering file reviews determined the measure-level verified gross savings for the sampled projects. The findings for adjustments made to the research savings are summarized below.

1. Navigant found that three projects were identified as ineligible and were marked as zeroes. These projects are outlined in Table 7-6 below. These projects were marked as zeroes in both the verified and research findings.
2. In 26 of the 120 sampled projects the difference between the verified and research energy savings was greater than 5 percent. The vast majority of the difference in research and verified savings is due to using actual metered data found while on-site. The overall hours of operation or full load hours found on-site were slightly less than assumptions made in the work papers or TRM in PY7.
3. Other adjustments made are similar to the verified savings (see Table 7-1. Measure Level Gross Impact Results).
4. The EM&V team made changes to custom engineering calculations in those cases where the measures were not deemed by the TRM.

Table 7-6. Navigant Comments on Projects with Zero Savings

Project Number	Navigant Comments
24947	24947 and 26698 are both VSD projects where automatic controls were not installed. For both projects the VSDs were set manually at reduced speeds but this does not meet program requirements. The application does not make the requirements for this measure clear (we are unsure if the customer is aware of these requirements in other documents).
26698	A second issue with VSDs that is highlighted in 24549 is that the IL TRM (v3.0) did not have savings input assumptions for backward inclined and airfoil fans with outlet dampers as a fan type, which is listed in their reference document (CT PSD 2008). In addition the ComEd work papers need to be updated to use the correct savings factor for the outlet dampers instead of using the inlet guide vanes for backward fans. It should also add inlet guide vanes for backward fans. ComEd should update the work papers to use TRM (v4.0), which has updated savings inputs parameters for airfoil and backward inclined fans with outlet dampers.
26821	26821 is a chiller project. There were also other chiller projects with the same issue as with this project. The ComEd application does not collect the full load efficiency of the chillers. Upon further review several chillers did not meet the full load requirement that is outline in the Illinois TRM as well as building code. In these cases the chiller savings were set to 0. In addition all chiller projects had the issue of the peak savings being calculated on the IPLV (part load efficiency) which the ComEd application did collect and not the full load efficiency as dictated by the Illinois TRM. This resulted in all chiller measure peak savings being reduced. The ComEd application and work papers need to collect and use the full load efficiency of the chiller for peak savings and the IPLV for energy savings.

Participant Survey Responses to Impact Questions

A brief set of questions in the participant survey was asked for those who received a “Zero T12 Reward”. Table 7-7 identifies the survey question or issue that was addressed, the participant responses, and conclusions. Overall, seven customers responded to one or more questions; this is about one fourth of the customers that answered in PY6. The question set is triggered if the customer received a zero T12 bonus.

Table 7-7. Participant Responses to CATI T12 Lighting Impact Questions

Survey Question	Participant Responses	EM&V Conclusion
What are lighting contractors and suppliers telling you about these changes in federal standards?	Three of four participants noted that lighting contractors are telling them T12s will no longer be available due to federal standards.	
Prior to participating in the program, did you consider trying to maintain your T12 system with spare or compliant T12 lamps and electronic T12 ballasts?	Three participants answered yes and four participants answered no	This suggests the T12 market is transitioning but not transformed to HP T8s. It is notable that more than three-quarters of the respondents noted they did not have trouble finding replacement T12 lamps.
Were you experiencing a noticeable amount of failures in the T12 system due to aging T12 lamps or ballast?	Four participants answered "yes" and three participants answered "no"	More than half the respondents were noticing failures due to either lamp or ballast. Some customers are experiencing failures and anticipating near-term replacements, while others are not seeing failures and are not having trouble replacing T12 lamps.
Did you have any troubles finding replacement T12 lamps?	Four participants answered "no" and two participants answered "yes"	
If you had not participated in the program, when would you have replaced your T12 lighting?	Two respondents noted "2 or more years", one answered "within one year" and 4 answered don't know or refused	
Are you aware that you received a bonus incentive for removing ALL of the T12 fixtures at your facility?	Six answered yes and one answered no	There is a much smaller sample population than last year, yet about the same % of participants noted that they would not have installed the same amount or removed the same amount of T12 fixtures. This suggests that the market was not yet transformed in PY7.
Without the bonus incentive how likely is it that you would have installed the SAME AMOUNT of new lighting equipment as you installed through the Smart Ideas program?	Four answered "not at all" or "not very" likely, one answered "somewhat likely", one answered "very likely"	
Without the bonus incentive how likely is it that you would have REMOVED the SAME AMOUNT of old T12 fixtures as you did through the Smart Ideas program?	Four answered "not very" or "not at all" likely, two answered "very likely".	

Source: Participant survey

Research Findings Realization Rate for the PY7 Standard Program

The EM&V team used a stratified ratio estimation technique to estimate evaluation research findings gross energy savings for the Standard Program. The research findings use all available data collected through M&V to make a gross savings estimate, without being constrained by algorithms or assumptions defined in the Illinois TRM. The stratified ratio estimation technique follows the steps outlined in the California Evaluation Framework²⁶. These steps are matched to the stratified random sampling method that was used to create the sample for the program savings verification effort. The standard error was used to estimate the error bound around the estimate of evaluation research findings gross energy savings realization rate. The research findings gross realization rates and relative precision at 90 percent confidence interval for lighting and non-lighting end-uses are summarized in Table 7-8 below.

²⁶ TecMarket Works, et al., *The California Evaluation Framework*, Chapter 13, Sampling. June 2004

Table 7-8. Research Findings Realization Rates and Relative Precision

Population Group	Sampling Strata	Mean kWh RR	kWh Relative Precision at 90% Level of Confidence ± %	Mean KW RR	KW Relative Precision at 90% Level of Confidence ± %
Lighting	1	0.96	10%	1.02	7%
	2	0.98	8%	1.06	6%
	3	0.98	4%	0.99	4%
Non-Lighting	1	0.75	22%	0.57	61%
	2	1.18	20%	1.11	11%
	3	1.33	46%	1.28	43%
Program Total		0.97	5%	0.99	6%

Source: Evaluation analysis

Research findings:

1. The savings verification and research findings results share the same evaluation adjustments on the following parameters: eligibility, quantities, business type, and measure type. They differ on these evaluation adjustments: savings per eligible unit installed. Where the verification savings per unit relies on deemed values and ComEd savings documentation, the research findings incorporate all available site-specific data gathered and evaluation engineering judgments to estimate the actual savings at each site evaluated. This research data includes customer interviews, spot measurements, analysis of equipment trend data, short term metering and data logging, and engineering review of equipment specifications. On some measures where site data was not collected (generally the file review sample), the research findings often concluded the deemed value or DNV GL PY7 work papers provided the best available assumptions.
2. The research findings has slightly lower gross realization rate on energy savings for lighting end-use (0.98) when compared with savings verification (1.01) because lighting hours of use on some projects were slightly lower higher than the deemed assumption, based on metering from on-site visits. Other adjustments were made to baseline assumptions based on additional information found on-site or in the project files. This research-based adjustment was not applied in the savings verification estimate of TRM measures.
3. The research findings estimate a lower realization rate on energy savings for the non-lighting end-use (0.96) when compared with savings verification (0.98) for reasons including using trend data analysis for some eligible HVAC variable speed drive measures increased energy savings above deemed estimates.
4. Our estimate of the research findings realization rate estimate on peak demand reduction for lighting (1.02) was slightly higher to the savings verification realization rate (1.00), this is from adjustments to quantity and space type.
5. We estimated a higher research realization rate on peak demand reduction for non-lighting (0.86) when compared with savings verification peak demand reduction realization rate (0.83) due to the net sum of lower evaluation research adjustments on several measures, primarily HVAC variable speed drives and chillers.

7.1.2 Recommendations for Illinois TRM Updates

The ComEd Standard Program offers prescriptive incentives on many measures that are not in the Illinois TRM, but most lack the program volume to make the case for adding as new measures to the Illinois TRM. On the other hand, Navigant in collaboration with the program implementer (DNV GL) developed a work paper for the refrigerated cycling dryer savings, which Navigant recommends ComEd should adopt as the measure is recommended for inclusion in the TRM Version 5 update process. ComEd may consider making adjustments to measures already deemed in the TRM, including adding inlet guide vanes for backwards fans to the VSD measure and adding the “garage” space type to the demand control ventilation measure.

7.1.3 Research Findings Net Program Impact Results

The primary objective of the evaluation research net savings analysis for the Standard Program was to determine the program's net effect on customers’ electricity usage. After gross program impacts have been assessed, net program impacts are derived by estimating a net-to-gross (NTG) ratio that quantifies the percentage of the gross program impacts that can be reliably attributed to the program.

For PY7 participants, we conducted evaluation research to estimate the level of free-ridership and participant spillover. Quantifying free-ridership requires estimating what would have happened in the absence of the program. A customer self-report method, based on data gathered during participant telephone interviews, was used to estimate the free-ridership for this evaluation. The existence of spillover in PY7 participants was quantitatively examined by identifying spillover candidates through questions asked in the participant telephone interviews. In this report we present the historical approach for estimating program free-ridership and spillover. A separate memo to ComEd will be developed and that will cover free-ridership and spillover analysis from participant responses based on the proposed Illinois Statewide NTG Methodologies document (IL-NTG Methods).

7.1.3.1 Free-Ridership

Basic Rigor Free-Ridership Assessment

Free ridership was assessed using a customer self-report approach following the framework that has been used for several ComEd and Ameren business programs for the past few years. This method calculates free-ridership using data collected during participant telephone interviews concerning the following three items:

- A **Program Components** score that reflected the influence of the most important of various program and program-related elements in the customer’s decision to select the specific program measure at this time.
- A **Program Influence** score that captured the perceived importance of the program (whether rebate, recommendation, or other program intervention) relative to non-program factors in the decision to implement the specific measure that was eventually adopted or installed. This score is cut in half if they learned about the program after they decided to implement the measures.
- A **No-Program** score that captures the likelihood of various actions the customer might have taken at this time and in the future if the program had not been available. This score accounts for deferred free ridership by incorporating the likelihood that the customer would have installed program-qualifying measures at a later date if the program had not been available.

Each of these scores represents the highest response or the average of several responses given to one or more questions about the decision to install a program measure. The rationale for using the maximum value is to capture the most important element in the participant’s decision making. This approach and scoring algorithm were identical to that used for the ComEd Custom program and the Ameren Illinois C&I rebate program, and similar to that used for gas C&I programs.

Standard Rigor Free-Ridership Assessment

For projects that receive greater program funding levels in excess of \$50,000, an effort is made during the customer telephone interview to more completely examine project influence sources in order to allow for any analyst-determined adjustments to customer self-reported score calculations using the Basic approach outlined above. Additional survey batteries examine other project decision-making influences including the vendor, ComEd Account Manager, corporate policy for efficiency improvements and so on. Any adjustments made on this basis are carefully documented and the rationale for any adjustments is provided, to ensure their transparency to the reviewer.

In a Standard Rigor Free-Ridership Assessment, program influence through vendor or ComEd Account Manager recommendations is incorporated into the Program Components score, if a follow-up interview has been triggered. The purpose of this additional component is to assess the influence of the program on vendors for programs that are vendor-driven, where the utility has specific outreach and assistance efforts targeting vendors. The vendor or Account Manager interviews provide insight into multiple points of program influence exerted into large and often complex participating customer organizations. Follow-up interviews are triggered only where the customer had not already assigned a maximum program influence score to one of the other program components, and the interview result may affect the final NTG score.

The calculation of free-ridership for the Standard Program is a multi-step process. The survey covers a battery of questions used to assess net-to-gross ratio for a specific end-use and site. Responses are used to calculate a Program Components score, a Program Influence score and a No-Program score for each project covered through the survey. These three scores can take values of 0 to 10 where a lower score indicates a higher level of free-ridership. The calculation then averages those three scores to come up with a project-level free-ridership level. If the customer has additional projects at other sites covering the same end-use, the survey asks whether the responses also apply to the other projects. If that is the case, the additional projects are given the same score. The net-to-gross scoring approach is summarized in Table 7-9.

Table 7-9. Net-to-Gross Scoring Algorithm (Free-Ridership only) for the PY7 Standard Program

Scoring Element	Calculation
<p>Program Components score. The maximum score (scale of 0 to 10 where 0 equals not at all influential and 10 equals very influential) among the self-reported influence level the program had for:</p> <ul style="list-style-type: none"> A. Availability of the program incentive B. Recommendation from utility program staff person C. Information from utility or program marketing materials D. Endorsement or recommendation by utility account manager E. Other factors (recorded verbatim) F. Information provided through technical assistance received from utility or implementation contractor field staff G. Vendor Score (when triggered) H. Account Manager Score (when triggered) 	<p>Basic Rigor: Maximum of A, B, C, D, and E</p> <p>Standard Rigor: Maximum of A, B, C, D, E, F, and participant score on vendor or account manager when confirmed as program influenced by interview with G or H</p>
<p>Program Influence score. "If you were given a TOTAL of 100 points that reflect the importance in your decision to implement the <ENDUSE>, and you had to divide those 100 points between: 1) the program and 2) other factors, how many points would you give to the importance of the PROGRAM?"</p>	<p>Points awarded to the program (divided by 10). Divide by 2 if the customer learned about the program AFTER deciding to implement the measure that was installed</p>
<p>No-Program score. "Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely," if the utility program had not been available, what is the likelihood that you would have installed exactly the same equipment?" The NTG algorithm computes the Likelihood Score as 10 minus the respondent's answer (e.g., the likelihood score will be 0 if extremely likely to install exactly the same equipment if the program had not been available).</p> <p>Adjustments to "Likelihood score" are made for timing: "Without the program, when do you think you would have installed this equipment?" Free-ridership diminishes as the timing of the installation without the program moves further into the future.</p>	<p>Interpolate between Likelihood Score and 10 to obtain the No-Program score, where if "At the same time" or within 6 months then the No Program score equals the Likelihood Score, and if 48 months later then the No Program Score equals 10 (no free-ridership)</p>
<p>Project-level Free-ridership (ranges from 0.00 to 1.00)</p>	<p>1 – Sum of scores (Program Components, Program Influence, No-Program)/30</p>
<p>"Our records show that <COMPANY> also received an incentive from <UTILITY> for a <different end use> project at <same ADDRESS>. Was the decision making process for the <different end use> project the same as for the <ENDUSE> project we have been talking about?"</p>	<p>If participant responds "same decision," assign free-ridership score to other end-uses of the same project</p>
<p>"Our records show that <COMPANY> also received an incentive from <UTILITY> for <number> other <ENDUSE> project(s). Was it a single decision to complete all of those <ENDUSE> projects for which you received an incentive from <UTILITY> or did each project go through its own decision process?"</p>	<p>If participant responds "single decision," assign free-ridership score to same end-use of the additional projects (projects with separate project ID's)</p>
<p>PY7 Project level Net-to-Gross Ratio (free-ridership only)</p>	<p>1 – Project level Free-ridership</p>

Source: Evaluation team

In PY7, 36 of 121 respondents in our sample went through the standard rigor approach. Two projects triggered follow-up interviews. Non-program influences were weighed against program influences in the Program Components score on a project-by-project basis. No adjustments were made to increase or decrease free-ridership for non-program influences, based on a qualitative review of participant responses.

In PY7, the evaluation team examined NTG ratios accounting for free-ridership only (FR-only) for two subgroups of the overall population: lighting and non-lighting. The additional NTG ratio subgroup tables were requested in previous program years based on review of evaluation reports. The NTG (without spillover) for lighting decreased from 0.73 in PY6 to 0.69 in PY7, and for non-lighting projects increased from 0.62 to 0.68. The PY7 sample design produced a plus or minus 9 percent relative precision for lighting and also a plus or minus 6 percent relative precision for non-lighting projects at a 90 percent confidence level.

The NTG ratio and relative precision at a 90 percent confidence level for projects with lighting energy savings, based only on the lighting portion of project-level savings, is provided in Table 7-10.

Table 7-10. NTG Ratio (FR-only) and Relative Precision at 90% Confidence Level – Lighting

Sample Strata	Population (N=2364)	NTG Interviews (n=61)	NTG Sample (n=65)	Sample kWh Wgts.	Relative Precision ± %	Low	NTGR Mean	High
1	97	21	21	1.27	11%	0.64	0.71	0.79
2	306	20	22	1.20	11%	0.66	0.74	0.81
3	1,961	20	22	1.29	25%	0.46	0.62	0.77
Total	2,364	61	65	1,00	9%	0.63	0.69	0.75

Source: Evaluation analysis. The NTG in this table does not include spillover.

The NTG ratio and relative precision at a 90 percent confidence level for projects with non-lighting energy savings, based on the variable speed drive, HVAC equipment, IS_VSD, EMS, Air Compressors, Other, or Refrigeration portion of project-level savings, is provided in Table 7-11. Based on these results, we recommend applying the NTG findings to non-lighting measures.

Table 7-11. NTG Ratio (FR-only) and Relative Precision at 90% Confidence Level – Non-Lighting

Sample Strata	Population (N=500)	NTG Interviews (n=60)	NTG Sample (n=60)	Sample kWh Wgts.	Relative Precision ± %	Low	NTGR Mean	High
1	51	15	15	0.58	38%	0.46	0.74	1.01
2	101	23	23	0.23	13%	0.49	0.56	0.63
3	348	22	22	0.18	18%	0.51	0.62	0.74
Total	500	60	60	1.00	6%	0.63	0.68	0.72

Source: Evaluation analysis. The NTG in this table does not include trade ally spillover.

The NTG ratios from PY5 through PY7 evaluation research on Standard Program participants are summarized in Table 7-12.

Table 7-12. NTG Ratio and Relative Precision at a 90% Confidence Level – Overall

Program Year	Relative Precision ± %	Low	NTGR Mean	High
PY5 (Adjusted for Free-ridership Only) †				
Lighting	5%	0.70	0.74	0.78
Non-Lighting	8%	0.63	0.69	0.74
PY6 (Adjusted for Free-ridership Only) †				
Lighting	6%	0.69	0.73	0.77
Non-Lighting	6%	0.58	0.62	0.66
PY7 (Adjusted for Free-ridership Only) †				
Lighting	9%	0.63	0.69	0.75
Non-Lighting	6%	0.63	0.68	0.72

Source: Evaluation analysis

† When quantified, the spillover rate is added to this mean result.

7.1.3.2 Spillover

The evidence of spillover from the CATI participant survey for the Standard Program is presented in Table 7-13 below.

Table 7-13. PY7 Standard Program Spillover Evidence from the Participant Telephone Survey

Spillover Question	Evidence of Spillover
Since receiving an incentive for the project we just discussed, did you install any ADDITIONAL energy efficiency measures at this facility or at your other facilities within ComEd's service territory that did NOT receive incentives through any utility or government program?	Of the 121 survey respondents, 29 (24%) said "Yes" 16 of the 29 did not plan to apply for a utility incentive in the future and were asked further questions for spillover analysis
On a scale of 0-10, where 0 means "no influence" and 10 means "greatly influenced," how much did your experience with the Smart Ideas program influence your decision to install high efficiency equipment on your own?	Scoring for the 16 remaining candidates is as follows: (0) "Don't Know" (12) Rating of 0 to 3 (3) Rating of 4 to 7 (1) Rating of 8 to 10s
PY7 Spillover Candidates (influence 8 or higher)	1 participant from 121 survey respondents (1%)
Of the 1 spillover candidate, evaluation review of additional responses to confirm candidate understood the question and may have had electric energy saving spillover projects in ComEd territory.	The only one spillover candidate indicated that High-bay Fixture lighting replacement was installed. The candidate response was inadequate when asked why the purchase of this equipment without the incentive available through the Smart Ideas program. The candidate refused a call back for follow-up questions about the equipment installed outside of the program. On these bases, the evaluation determined that not adequate survey information is available for spillover estimate for PY7.
PY6 Spillover Candidates (influence 8 or higher)	5 participants from 121 survey respondents (4%)

Source: Evaluation analysis

The only spillover candidate indicated that they replaced a highbay lighting fixture. Follow up questions with the participant produced inadequate responses to enable the evaluation team to determine the likelihood of spillover. The candidate refused a call back for follow-up questions about the equipment installed outside of the program. On this basis, the evaluation determined that there is not enough information or demonstrable evidence of spillover from this candidate that can be quantified. Thus we determined participant spillover was zero from this sample in PY7. However, we believe the spillover estimate from our previous C&I wide spillover study is still valid and will include that estimate (0.01 combined participant and nonparticipant) in our draft recommendation for PY9 NTG values.

7.2 Detailed Process Approach and Sample Disposition

In PY7, the Navigant team conducted a limited process evaluation for the Standard Program, focusing on participant satisfaction with program delivery and awareness of program offerings. We conducted a

computer assisted telephone interviewing (CATI) survey with participating customers to inform PY7 research questions.

The survey sample was designed to support the net impact analysis and targeted 120 completed interviews with PY7 Standard Program participants. The team completed 121 interviews in September and October, 2015. We asked all respondents a series of questions to estimate free-ridership and participant spillover, and a series of questions to support the process evaluation. The CATI survey instruments used for this evaluation are included in Appendix 7.5.

The sampling unit for the telephone survey was the unique program participant. The initial survey sample frame included 2,864 projects, completed by 1,744 unique program participants. Projects were classified by end-use (lighting or non-lighting) and energy savings (large, medium, and small), using ex-ante energy impacts reported in the tracking database. Each project was placed into one of six end-use/impact size strata. Participants who completed both a Standard project and a Custom project were removed from the Standard Program survey sample.²⁷ For remaining participants that completed multiple projects, we designated one project as the interview project. To support the free ridership analysis, we then asked if the other projects were part of the same decision process.

The final sample frame for the CATI survey consisted of 1,728 participants. To meet precision targets for the impact analysis, we over-sampled non-lighting projects and projects with larger savings.

For the process analysis, the evaluation team developed survey weights for each end-use stratum. These weights reflect the fact that the six strata were not surveyed in proportion to their representation in the population, as described above. For each stratum, we estimated a survey weight by dividing the stratum’s share of the overall population by its share of survey responses. We applied the following weights to responses to the process questions (Table 7-14).

Table 7-14. Process Weights

Process Stratum†	End Use Stratum	Impact Size Stratum	Number of Contacts in Population	Number of Completes	Weight
L1	Lighting	Large	79	21	0.2610
L2	Lighting	Medium	227	20	0.7875
L3	Lighting	Small	1,098	20	3.8090
NL1	Non-Lighting	Large	47	15	0.2174
NL2	Non-Lighting	Medium	88	23	0.2655
NL3	Non-Lighting	Small	205	22	0.6465
TOTAL			1,744	121	

Source: Evaluation analysis

²⁷ Given the smaller population of Custom projects, we prioritized interviewing contacts about their Custom Program participation. For sample weighting, we retained the Custom Program projects in the project population.

7.2.1 Survey Disposition

Table 7-15 shows the final dispositions for the participant survey.

Table 7-15. Sample Dispositions for NTG and Process Analysis

Sample Disposition	Value
Completed Interviews (I)	121
Partial Interviews (P)	3
Refusal and break off (R)	75
Non-Contact (NC)	249
Other (O)	0
Unknown Eligibility Non-Interview (U)	72
Non-eligible (e)	37
Total Phone Numbers Used	557
Response Rate†	23.5%
Cooperation Rate‡	60.8%

Source: Evaluation analysis

† The following formulas were used to calculate the AAPOR Response Rate 3 (RR3):

$RR3 = I / (I + P + R + NC + O + (E * U))$ where $E = (I + R + NC) / (I + R + NC + e)$

‡ The following formula was used to calculate cooperation rate: $I / (I + P + R)$

7.3 TRM Recommendations

The refrigerated compressed air dryer measure in the ComEd work papers has undergone several revisions over the last few program years. This measure is not defined in the statewide Illinois TRM. The history of this measure in the work papers is shown in Table 7-16.

Table 7-16. Refrigerated Air Dryer Measure Savings History

Program Year	Source	All Refrigerated		Thermal Mass		Variable Speed		Digital Scroll	
		kWh	kW	kWh	kW	kWh	kW	kWh	kW
PY6	No Work papers	40.00	0.00	-	-	-	-	-	-
PY7	Work papers 6-5-14	27.26	0.01	-	-	-	-	-	-
PY8	Work papers 3-25-15	-	-	4.79	0.001	15.57	0.003	14.77	0.002

Source: Evaluation analysis of ComEd Work papers

The evaluation team worked with the DNV-GL staff to develop a work paper for refrigerated cycling dryers and recommended for inclusion in the TRM Version 5 update process. Three separate calculations were done corresponding to the three types of cycling dryers previously listed. Table 7-16. provides the recommended savings for energy and demand savings per cubic meter of air derived from replacing a standard non-cycling refrigerated air dryer with a new cycling air dryer.

Table 7-17. Refrigerated Air Dryer Measure Recommended TRM Savings

Program Year	Source	Thermal Mass		Variable Speed		Digital Scroll	
		kWh/CFM	kW/CFM	kWh/CFM	kW/CFM	kWh/CFM	kW/CFM
PY8	Proposed for TRM (V5.0)	10.80	0.001	14.21	0.0026	16.28	0.0023

Source: Evaluation analysis

In a study done for the Compressed Air Challenge, several different non-cycling and cycling dryers were selected across various manufacturers to determine the average full load kW/CFM for both a non-cycling and cycling refrigerated dryer. The CAGI datasheets were used to gather the measured kW and CFM for the equipment.²⁸

²⁸ Compressed Air Challenge: Compressed Air Best Practice; “Cycling Air Dryers – Are Savings Significant?” Fox, Timothy J. and Marshall, Ron. <http://www.compressedairchallenge.org/library/articles/2011-11-CABP.pdf>

The following calculation methodology was used to determine the energy usage for dryers:

$$\text{Demand (kW/CFM)} = \text{kW/CFM} * (\text{ECe} - \text{ECxd})$$

$$\text{Energy (kWh/CFM)} = (\text{kW/CFM}) * (\text{ECe} - \text{ECxe}) * (\text{HOURS})$$

where,

$$\text{kW/CFM} = \text{Average kW/CFM for the equipment} = 0.007 \text{ kW/CFM}^{29}$$

ECxd = Part-load % energy consumption for baseline dryer type, peak demand savings

$$\text{ECxd} = 0.875$$

ECxe = Part-load % energy consumption for baseline dryer type, energy savings

$$\text{ECxe} = 0.843$$

ECe = Part-load % energy consumption of a specific energy efficient dryer type

Table 7-18. Part-load % Energy Consumption of Specific Energy Efficient Dryer Type

Dryer Type	ECe, Energy Savings	ECe, Demand Savings
Thermal-Mass Dryer	0.573	0.729
VSD Dryer	0.487	0.501
Digital Scroll Dryer	0.435	0.551

Source: Evaluation analysis

HOURS = Compressed air system pressurized hours, depending on shift. If unknown, use weighted average. This value is the weighted average of facility owner responses from the DOE evaluation of the Compressed Air Challenge. Facility owners with compressed air systems were surveyed detailing the number of shifts their facilities operated.

Table 7-19. Compressed Air System Pressurized Hours

Shift	Hours ³⁰	Distribution of Facilities by ³¹	Weighted Hours
Single Shift	1,976	16%	316
Two Shifts	3,952	23%	909
Three Shifts	5,928	25%	1,482
Four Shifts or Continual Operation	8,320	36%	2,995
Total weighted average			5,702

Source: Evaluation analysis

²⁹ Ibid.

³⁰ Illinois Statewide Technical Reference Manual For Energy Efficiency Version 3.0. Effective June 1st, 2014. Page 399.

³¹ DOE evaluation of the Compressed Air Challenge, section 2.1.5 Facility Operating Schedules.

Non-cycling dryer energy usage (baseline):

For the baseline of a non-cycling dryer, it is estimated that the part-load percent energy consumption is 0.875 demand and 0.843 for energy savings. Using the above equations:

$$\text{Non-cycling dryer kW/CFM} = (0.007 \text{ kW/CFM}) * (0.875) = 0.006 \text{ kW/CFM}$$

$$\text{Non-cycling dryer kWh/CFM} = (0.007 \text{ kW/CFM}) * (0.843) * (5,702 \text{ hours}) = 33.65 \text{ kWh/CFM}$$

The following calculation methodology was used to determine the post energy usage for the three types of cycling dryers (efficient case):

$$\text{Demand (kW/CFM)} = \text{kW/CFM} * (\text{ECx})$$

$$\text{Energy (kWh/CFM)} = (\text{kW/CFM}) * (\text{ECx}) * (\text{HOURS})$$

where,

$$\text{kW/CFM} = \text{Average kW/CFM for the equipment} = 0.007 \text{ kW/CFM}$$

$$\text{ECx} = \text{Part-load \% energy consumption of Thermal Mass Dryer} = 0.573$$

$$\text{Variable Speed Dryer} = 0.487$$

$$\text{Digital Scroll Dryer} = 0.435$$

$$\text{HOURS} = \text{Compressed air system pressurized hours} = 5,702 \text{ hours};$$

Energy Savings Calculations for Efficient Equipment (baseline – efficient case):

$$\text{Thermal Mass Dryer kWh/CFM (Energy)} = (0.007 \text{ kW/CFM}) * (0.843 - 0.573) * (5,702 \text{ hours}) = 10.80 \text{ kWh/CFM}$$

$$\text{Variable Speed Dryer kWh/CFM (Energy)} = (0.007 \text{ kW/CFM}) * (0.843 - 0.487) * (5,702 \text{ hours}) = 14.21 \text{ kWh/CFM}$$

$$\text{Digital Scroll Dryer kWh/CFM (Energy)} = (0.007 \text{ kW/CFM}) * (0.843 - 0.435) * (5,702 \text{ hours}) = 16.28 \text{ kWh/CFM}$$

Summer Coincidence Peak Demand Savings:

$$\text{Demand (kW/CFM)} = \text{kW/CFM} * (\text{ECx})$$

$$\text{ECx} = \text{Part-load \% peak demand consumption of}$$

$$\text{Thermal Mass Dryer} = 0.729$$

$$\text{Variable Speed Dryer} = 0.501$$

$$\text{Digital Scroll Dryer} = 0.551$$

$$\text{Thermal Mass Dryer kW/CFM (Demand)} = (0.007 \text{ kW/CFM}) * (0.875 - 0.729) = 0.001 \text{ kW/CFM}$$

$$\text{Variable Speed Dryer kW/CFM (Demand)} = (0.007 \text{ kW/CFM}) * (0.875 - 0.501) = 0.0026 \text{ kW/CFM}$$

$$\text{Digital Scroll Dryer kW/CFM (Demand)} = (0.007 \text{ kW/CFM}) * (0.875 - 0.551) = 0.0023 \text{ kW/CFM}$$

7.4 PJM Data and Findings

Program Name and ComEd Program Year

Standard Incentive Program

Program Year 7 (PY7) – June 1, 2014 – May 31, 2015

Ex-Post Gross Peak Demand (MW) Savings

The PJM summer ex-post gross coincident peak demand savings was 27.81 MW (22.46 MW for lighting and 5.35 MW for non-lighting end use measures).

The PJM winter ex-post gross coincident peak demand savings was 28.74 MW (23.17 MW for lighting and 5.57 MW for non-lighting end use measures).³²

List parameters included in the ex-post gross peak demand calculation.

- (a) Non-coincident kW reduction
- (b) kW of baseline equipment
- (c) kW of replacement equipment
- (d) Coincidence Factor
- (e) Demand interactive effect
- (f) Installation rates
- (g) kW of baseline equipment during Performance Hours
- (h) kW of replacement equipment during Performance Hours
- (i) Summer PJM coincidence factor (CF) defined by weekday's 1-5pm Central Prevailing Time Zone, between June 1 and August 31, and non-holidays
- (j) Winter PJM coincidence factor (CF) defined by weekdays between 6am-8am and 5pm-7pm Central Prevailing Time Zone, between January 1 and February 28, and non-holidays

For lighting measures, the algorithms used to calculate demand savings were:

- (a) *Non-coincident kW reduction = kW of baseline equipment - kW of replacement equipment*
- (b) *PJM Coincident kW reduction = non-coincident kW savings * Coincidence Factor * Demand interactive effect * Installation Rate*

For non-lighting measures, the algorithms used to calculate demand savings were:

- (c) *PJM Coincident kW reduction = kW of baseline equipment during Performance Hours - kW of replacement equipment during Performance Hours*

Include a brief explanation of the evaluation methodology used to derive ex-post gross demand savings for your program.

The Standard Program evaluation approach for demand savings verification followed the International Performance Measurement and Verification Protocol (IPMVP) Options (as referenced in PJM Manual 18B, Section 7) including *Option A: Partially Measured Retrofit Isolation/Stipulated Measurement*, *Option B: Retrofit Isolation / Metered Equipment* and other acceptable measurement and verification methodologies.

³² Summer peak coincidence factors were taken from the IL TRM and onsite M&V. Winter peak coincidence factor for commercial and industrial lighting and non-lighting were taken from onsite M&V and secondary research (including Connecticut TRM, 2013 PSD_ProgramSavingsDocumentation-Final110112).

For lighting measures, Option A was employed, supplemented by other acceptable M&V methodologies, as described below. For non-lighting measures, Options A and B were employed.

The savings calculations are accomplished using methods that include short-term monitoring-based assessments, simulation modeling (e.g., DOE-2), bin models, application of ASHRAE methods and algorithms, analysis of pre- and post-installation billing and interval data, and other specialized algorithms and models. Customer-supplied data from energy management systems (EMS) or supervisory control and data acquisition (SCADA) systems are often used when available for onsite measurements.

Generally, the ex post impact evaluation incorporates the following methodologies:

- a. Selection of a sample from the population of projects that meets the PJM requirements for statistical accuracy and precision as detailed in Manual 18B, Section 9 (the evaluation conducted on-site M&V at 34 sites in the program year 2014 (12 lighting and 22 non-lighting sites).
- b. Develop a site-specific M&V plan for the representative sample of program projects. Each M&V plan details the data collection and analysis approach to be undertaken, following a careful review of relevant documents stored in ComEd’s online tracking system.
- c. Implement a site-specific data collection approach for each sampled project including verification that measures are installed and operational, and whether or not the as-built condition will generate the predicted level of savings.
- d. Observed post-installation operating schedule and system loading conditions.
- e. A thorough validation of baseline selection, including appropriateness of a retrofit baseline versus standard replacement on failure, to justify the use of the PJM “Current Load” baseline versus a “Standard Baseline”.
- f. Development of stipulated and measured engineering parameters that contribute to the impact calculations. Complete ex post engineering-based estimates of summer peak demand (kW) impact for each sampled project.
- g. Prepare a detailed, site-specific impact evaluation report for each sampled site.
- h. Carry out a quality control review of the ex post impact estimates and the associated draft site reports and implement any necessary revisions.

A verified gross realization rate (which is the ratio of the ex post demand gross savings-to-reported tracking savings) is then estimated for the sample, by sampling stratum, and applied to the population of reported tracking savings, using sampling-based approaches. The result is an ex post estimate of gross savings for the program.

Realization Rate on Demand Savings:

Overall program realization rate on summer coincident peak demand savings: 0.96

Realization rate on summer coincident peak demand savings for lighting measures: 1.00

Realization rate on summer coincident peak demand savings for non-lighting measures: 0.83

Navigant did not estimate realization rate on winter peak savings and ComEd did not track winter peak savings. Winter peak savings shown in this report are based on evaluation research.

Precision Estimate on Demand Savings:

Overall program precision estimate on summer coincident peak demand savings: 4 percent at 90 percent confidence, one tail.

Precision estimate on summer coincident peak demand savings for lighting measures: 2 percent at 90 percent confidence, one tail.

Precision estimate on summer coincident peak demand savings for non-lighting measures: 27 percent at 90 percent confidence, one tail.

Navigant did not estimate precision on winter peak savings. ComEd did not track winter peak savings. Winter peak savings shown in this report are based on evaluation research.

List parameters included in the precision estimate calculation – i.e., what are researched values, what are deemed values?

- (a) Sample mean peak demand savings
- (b) T-distribution score of samples
- (c) Error bound around the sample mean

The precision estimate is based on researched values of ex post coincident peak demand savings for the sample, the t-distribution values are based on research sample sizes, and the error bound is a calculated value.

Peak Demand or Coincident Peak Demand:

Does your data track demand savings during a “peak” period, in addition to year-round? If so, please report the “peak” or “coincident-peak” demand savings.

ComEd’s program tracking database tracks the ex ante gross coincident summer peak demand savings. The ex-post gross summer coincident peak demand savings for the program year 2014 was 27.81 MW (22.46 MW for lighting and 5.35 MW for non-lighting end use measures). The ex-post gross winter coincident peak demand savings for the program year 2014 was 28.33 MW (22.76 MW for lighting and 5.57 MW for non-lighting end use measures).

How is “peak demand” defined in your program or program tracking data?

If your data includes “peak” demand, please indicate how your program tracking data defines the program’s “peak demand period” and the source of this data (i.e. program tracking database).

ComEd’s coincident peak demand savings for both baseline and post retrofit conditions are defined as the average demand kW savings for the 1 PM CPT to 5 PM CPT non-holiday weekday time period for summer, and 6 AM CPT to 8 AM CPT and 5 PM CPT to 7 PM CPT non-holiday weekday time period for winter.³³ If this energy savings measure is determined to have weather dependency then the summer peak kW savings are based on the zonal weighted temperature humidity index (WTHI) standard, and the winter peak kW savings are based on the zonal wind speed-adjusted temperature (WWP) standards posted by PJM (there is also PJM Zonal Winter Weather Standards similar to summer WTHI). The zonal WTHI and WWP are the mean of the zonal WTHI values or WWP values on the days in which PJM peak load occurred in the past sixteen years (1998-2014). This mean ComEd WTHI value is 81.6 demand savings for summer is the difference in kW between the baseline and post retrofit conditions. Similarly, the ComEd WWP value is 14.5 demand savings for winter is the difference in kW between the baseline and post retrofit conditions.

³³ The Winter Weather Standard is the dry bulb temperature adjusted (by 0.5 °F) for wind speed above 10 mph. The measurements were for Hour Ending 19:00 on RTO peak days.”

What are the hours, days and months associated with the program tracking system’s “peak demand period?” Is the peak demand period in your program’s tracking data defined in the same way as PJM’s peak demand period?

The summer coincident peak demand period in the ComEd tracking database is defined as non-holiday weekdays between 1:00 PM and 5:00 PM Central Prevailing Time (CPT) from June 1 to August 31. Winter peak hours are defined as non-holiday weekdays between 6:00AM and 8:00AM, and between 5:00PM and 7:00PM Central Prevailing Time (CPT), from January 1 and February 28. This is in accordance with the PJM manual 18, *PJM Capacity Market*, effective October 16, 2015.

Non-Peak Demand or Non-Coincident Peak Demand:

Does your data track demand savings throughout the year, regardless of whether the demand occurs during a “peak” period? If so, then it is “non-peak” demand or “non-coincident” peak demand savings.

ComEd tracking data for demand savings reports the summer coincident peak demand reduction consistent with the PJM conditions as shown above.

The IL TRM doesn’t list any winter peak coincidence factors and winter peak savings. ComEd did not track winter peak savings for the population of projects in PY7. Navigant determined the winter peak estimate for the population of projects in PY7 based on the following approach.

$$\begin{aligned} \text{Winter peak estimate (lighting population)} &= \text{lighting sample winter peak savings} / \text{lighting sample summer} \\ &\text{peak savings} * \text{lighting population summer peak savings (all based on research savings estimates)} \\ &= 23.17 \text{ MW} \end{aligned}$$

$$\begin{aligned} \text{Winter peak estimate (non-lighting population)} &= \text{non-lighting sample winter peak savings} / \text{non-lighting} \\ &\text{sample summer peak savings} * \text{non-lighting population summer peak savings} \\ &= 5.57 \text{ MW} \end{aligned}$$

The evaluation team estimated the winter peak coincidence factors for a sample of lighting projects that received onsite metering and applied that to calculate the lighting sample winter peak savings. We also relied on secondary data sources for commercial and industrial lighting and non-lighting winter peak coincidence factors for the sample that metering data were not readily available.³⁴

³⁴ Winter peak coincidence factor for commercial lighting were taken from Navigant/Itron study (ComEd Commercial Lighting Winter Peak CF Recommendations_2015_02_19.pdf). Winter peak coincidence factors for non-lighting commercial measures were sourced from the Connecticut TRM (Connecticut Program Savings Document, 8th ed. for 2013 Program Year).

7.5 Participating Customer Survey

**COMED SMART IDEAS FOR YOUR BUSINESS PROGRAM
PARTICIPATING CUSTOMER SURVEY – STANDARD PROJECTS
PY7 DRAFT September 22, 2015**

INTRODUCTION

[READ IF CONTACT=1]

Hello, this is _____ from Opinion Dynamics calling on behalf of ComEd. This is not a sales call. May I please speak with <PROGRAM CONTACT>?

Our records show that <COMPANY> recently installed <ENDUSE> that received an incentive from ComEd. When signing the application form, you also agreed to support evaluation efforts of the ComEd Smart Ideas for Your Business Program which includes participating in surveys like this one. I was told you're the person most knowledgeable about this project. Is this correct? [IF NOT, ASK TO BE TRANSFERRED TO MOST KNOWLEDGABLE PERSON OR RECORD NAME & NUMBER.]

This survey will take about 20 minutes. Is now a good time? [If no, schedule call-back]

[READ IF CONTACT=0]

Hello, this is _____ from Opinion Dynamics calling on behalf of ComEd. I would like to speak with the person most knowledgeable about recent changes in cooling, lighting or other energy-related equipment for your firm at this location.

[IF NEEDED] Our records show that <COMPANY> recently installed <ENDUSE> that received an incentive from ComEd. When signing the application form, you also agreed to support evaluation efforts of the ComEd Smart Ideas for Your Business Program which includes participating in surveys like this one. I was told you're the person most knowledgeable about this project. Is that correct? [IF NOT, ASK TO BE TRANSFERRED TO MOST KNOWLEDGABLE PERSON OR RECORD NAME & NUMBER.]

This survey will take about 20 minutes. Is now a good time? [If no, schedule call-back]

SCREENING QUESTIONS

S1 Which of the following statements best characterizes your relation to <COMPANY>?

1. (I am an employee of <COMPANY> (THIS CATEGORY SHOULD INCLUDE THE OWNER/PRESIDENT/PARTNER ETC. OF THE COMPANY.))
2. (My company provides energy-related services to <COMPANY>)
3. (I am a contractor and was involved in the installation of energy efficient equipment for this project)
00. (Other, specify) (PUT OWNER/PRESIDENT/PARTNER ETC. OF THE COMPANY IN 1)
98. (Don't know)
99. (Refused)

[READ if S1<1] This survey asks questions about the energy efficiency upgrades for which <COMPANY> received an incentive at <ADDRESS>. Please answer the questions from the perspective of <COMPANY>. For example, when I refer to "YOUR COMPANY", I am referring to <COMPANY>. If you are not familiar with certain aspects of the project, please just say so and I will skip to the next question.

- A1. Just to confirm, between June 1, 2014 and May 31, 2015 did <COMPANY> participate in ComEd’s Smart Ideas for Your Business Program at <ADDRESS>? (IF NEEDED: This is a program where your business received an incentive for installing one or more energy-efficient products.)
- 1 (Yes, participated as described)
 - 2 (Yes, participated but at another location)
 - 3 (NO, did NOT participate in program)
 - 00 (Other, specify)
 - 98 (Don’t know)
 - 99 (Refused)

[SKIP A2 IF A1=1,2]

- A2. Is it possible that someone else dealt with the energy-efficient product installation?
- 1 (Yes, someone else dealt with it)
 - 2 (No)
 - 00 (Other, specify)
 - 98 (Don’t know)
 - 99 (Refused)

[IF A2=1, ask to be transferred to that person. If not available, thank and terminate. If available, go back to A1]

[IF A1=2,3,00,98,99: Thank and terminate. Record dispo as “Could not confirm participation”.]

Before we begin, I want to emphasize that this survey will be primarily about the <ENDUSE> you installed through the Smart Ideas for Your Business Program at <ADDRESS>.

[IF PROMOTIONAL_CODE=2014 Zero T12 Bonus THEN zero_t12 =1]

[ASK IF zero_t12 =1, ELSE SKIP TO NTG MODULE]

T12 Lighting

My first few questions are about T12 lamps.

- L8a1 Are you aware that federal standards for lighting equipment recently changed so that there are now restrictions on the production of T12 lamps for sale in the U.S?
- 1 Yes
 - 2 No
 - 00 (Other, specify)
 - 98 (Don't know)
 - 99 (Refused)

[Note: Energy Independence and Security Act (EISA) of 2007 raised standards for a variety of lamp types. For linear fluorescent lamps, new standards restrict the production of T12 lamps. New standards went into effect July 2012.]

- L8b1 What are lighting contractors and suppliers telling you about these changes in federal standards?
- 1 Never mentioned Federal standard

- 00 Other (RECORD VERBATIM)
- 98 (Don't know)
- 99 (Refused)

- L8c1 Prior to participating in the program, did you consider trying to maintain your T12 system with spare or compliant T12 lamps and electronic T12 ballasts?
 - 1 Yes
 - 2 No
 - 8 (Don't know)
 - 9 (Refused)

- L8d1 Were you experiencing a noticeable amount of failures in the T12 system due to aging T12 lamps?
 - 1 Yes
 - 2 No
 - 8 (Don't know)
 - 9 (Refused)

- L8e1 Were you experiencing a noticeable amount of failures in the T12 system due to aging T12 ballasts?
 - 1 Yes
 - 2 No
 - 8 (Don't know)
 - 9 (Refused)

- L8f1 Did you have any troubles finding replacement T12 lamps?
 - 01 Yes
 - 02 No
 - 96 Not applicable
 - 98 (Don't know)
 - 99 (Refused)

- L8g1 If you had not participated in the program, when would you have replaced your T12 lighting?
 - 1 (Within one year)
 - 2 (Between 1 and 2 years)
 - 3 (2 or more years later)
 - 8 (Don't know)
 - 9 (Refused)

- LP1a Are you aware that you received a bonus incentive for removing ALL of the T12 fixtures at your facility?
 - 1 Yes
 - 2 No
 - 8 (Don't know)
 - 9 (Refused)

[ASK IF LP1a=1, ELSE SKIP TO NEXT MODULE]

LP1b Without the bonus incentive how likely is it that you would have installed the SAME AMOUNT of new lighting equipment as you installed through the Smart Ideas program? Would you say...

- 1 Very likely
- 2 Somewhat likely
- 3 Not very likely
- 4 Not at all likely
- 8 (Don't know)
- 9 (Refused)

LP1c Without the bonus incentive how likely is it that you would have REMOVED the SAME AMOUNT of old T12 fixtures as you did through the Smart Ideas program? Would you say...

- 1 Very likely
- 2 Somewhat likely
- 3 Not very likely
- 4 Not at all likely
- 8 (Don't know)
- 9 (Refused)

PY7 NET-TO-GROSS FREE-RIDERSHIP MODULE

Variables for the net-to-gross free-ridership module:

<NTG> (B=Basic rigor level, S= Standard rigor level. All questions here are asked if the standard rigor level is designated. Basic rigor level is designated through skip patterns.)

<UTILITY> (ComEd)

<PROGRAM> (Name of energy efficiency program)

<ENDUSE> (Type of measure installed; from program tracking dataset) The ENDUSE read-ins note the higher efficiency or energy efficient nature of upgrade equipment that was installed instead of the less efficient standard practice equipment in pre-planned upgrades and replace-on-failure scenarios. This responds to a comment from ComEd on the EPY5 survey that the survey make this distinction clear to respondent.

<TECH_ASSIST> (If participant conducted Feasibility Study, Audit, or received Technical Assistance through the program; from program tracking database)

<OTHERPTS> (Variable to be calculated based on responses. Equals 1- minus response to N3p.)

<MSAME> (Equals 1 if same customer had more than one project of the same measure type; from program tracking database)

<NSAME> (Number of additional projects of the same measure type implemented by the same customer; from program tracking database)

<FDESC> (Type of project of a different measure type at the same facility; from program tracking database)

<TA_fl> (1=contractor is a registered trade ally; 2=contractor is not a registered trade ally)

P1 Who was the most influential in identifying and recommending that you install the <ENDUSE>?

1. (me/respondent)
2. (contractor)
3. (engineer)
4. (architect)
5. (manufacturer)
6. (distributor)
7. (Owner)
- 8 (Project manager)
9. (ComEd Representative/Program Staff)
00. (Other, specify)
98. (Don't know)
99. (Refused)

P2 And who informed you about the availability of an incentive through ComEd's Smart Ideas Program?

1. (me/respondent)
2. (contractor)
3. (engineer)
4. (architect)
5. (manufacturer)

- 6. (distributor)
- 7. (ComEd Account Manager)
- 8. (owner/developer)
- 9. (project manager)
- 11. (ComEd Representative/Program Staff)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

VENDOR INFORMATION

I would like to get some information on the VENDORS that may have helped you with the installation of this equipment.

- V1 Did you work with a contractor or vendor that helped you with the CHOICE of this equipment?
- 1 Yes
 - 2 No
 - 8 (Don't Know)
 - 9 (Refused)

[IF V1=1 ASK V2, IF NOT SKIP]

- V2 Who was the contractor or vendor you worked with? [OPEN END]

[ASK IF V1<>1, IF NOT SKIP]

- V2a Did you work with a contractor or vendor that helped you with the INSTALLATION of this equipment?
- 1 Yes
 - 2 No
 - 8 (Don't Know)
 - 9 (Refused)

[IF V2a=1 ASK V2b, IF NOT SKIP]

- V2b Who was the contractor or vendor you worked with? [OPEN END]

[SKIP TO V4 IF V1=2, 8, or 9]

- V3 Did you also use a DESIGN or CONSULTING Engineer?
- 1 (Yes)
 - 2 (No)
 - 8 (Don't know)
 - 9 (Refused)

[IF V3=1 ASK V3a, ELSE SKIP]

- V3a Who was the DESIGN or CONSULTING Engineer you worked with? [OPEN END]

- V4 Did your utility account manager assist you with the project that you implemented through the <UTILITY> <PROGRAM>?
- 1 (Yes)
 - 2 (No, don't have a utility account manager)
 - 3 (No, have a utility account manager but they weren't involved)
 - 8 (Don't know)
 - 9 (Refused)

NET-TO-GROSS FREE-RIDERSHIP BATTERY

I'd now like to ask a few questions about the <ENDUSE> you installed through the program.

- A2aa. Did this new energy efficiency equipment that you installed through the program replace existing equipment, was it added to control or work directly with existing equipment, or was it additional stand-alone equipment?
- 1 Replaced existing equipment
 - 2 Added to control or work directly with existing equipment
 - 3 Additional stand-alone equipment
 - 00 Other (record VERBATIM)
 - 98 (Don't know)
 - 99 (Refused)

[SKIP ER1 IF A2aa=2,3,98,99]

- ER1. Which of the following statements best describes the performance and operating condition of the equipment you replaced through the program?
- 1 Existing equipment was functioning without significant problems
 - 2 Existing equipment was functioning, but it was obsolete
 - 3 Existing equipment was functioning, but with significant problems
 - 4 Existing equipment had failed or did not function
 - 96 Not applicable, ancillary equipment (VSD, EMS, controls, etc.) or additional stand-alone equipment
 - 00 Other (RECORD VERBATIM)
 - 98 (Don't know)
 - 99 (Refused)

- N00 In deciding to do a project of this type, there are usually a number of reasons why it may be undertaken. In your own words, can you tell me why you decided to install this equipment? Were there any other reasons?

DO NOT READ

- 1 (To replace old or outdated equipment)
- 2 (As part of a planned remodeling, build-out, or expansion)
- 3 (To gain more control over how the equipment was used)
- 4 (The maintenance downtime and associated expenses for the old equipment were too high)
- 5 (Had process problems and were seeking a solution)

- 6 (To improve equipment performance)
- 7 (To improve the product quality)
- 8 (To comply with codes set by regulatory agencies)
- 9 (To comply with company policies regarding regular/normal maintenance/replacement policy)
- 10 (To get an incentive from the program)
- 11 (To protect the environment)
- 12 (To reduce energy costs)
- 13 (To reduce energy use/power outages)
- 14 (To update to the latest technology)
- 15 (To meet corporate goals or mandates)
- 00 (Other (RECORD VERBATIM))
- 98 (Don't know)
- 99 (Refused)

N2 When did you first learn about ComEd's Smart Ideas for your Business Program? Was it BEFORE or AFTER you decided to install the <ENDUSE> that qualified for the incentive? (NOTE TO INTERVIEWER: the "<ENDUSE>" refers to the specific energy efficient equipment installed through the program.)

- 1 (Before)
- 2 (After)
- 8 (Don't know)
- 9 (Refused)

N3 Next, I'm going to ask you to rate the importance of ComEd's Smart Ideas for your Business Program as well as other factors that might have influenced your decision to install the <ENDUSE> that qualified for the incentive. Please use a scale from 0 to 10, where 0 means not at all important and 10 means extremely import. [FOR N3a-n, RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused]

(If needed: How important in your DECISION to install the equipment was...)

N3b. Availability of the PROGRAM incentive

[ASK IF N3b=8, 9, 10]

N3bb. Why do you give it this rating? [OPEN END; 98=Don't know; 99=Refused]

[ASK N3d IF V1=1]

N3d. Recommendation from an equipment vendor or contractor that helped you with the choice of the equipment

N3e. Previous experience with this type of equipment

N3f. Recommendation from a ComEd or DNV/GL program staff person

[SKIP N3ff IF NTG=B]

[ASK N3ff IF N3f=8, 9, 10]

N3ff. Why do you give it this rating?

N3h. Information from Smart Ideas or ComEd marketing materials

[SKIP N3hh IF NTG=B]

[ASK IF N3h=8, 9, 10]

N3hh. Why do you give it this rating?

[ASK N3i IF V3=1]

N3i. A recommendation from a design or consulting engineer

N3j. Standard practice in your business/industry

[SKIP N3k IF V4>1]

N3k. Endorsement or recommendation by a ComEd account manager

[SKIP N3kk IF NTG=B]

[ASK IF N3k=8, 9, 10]

N3kk. Why do you say that?

N3l. Corporate policy or guidelines

N3m. Payback on the investment

N3n. Were there any other factors we haven't discussed that were influential in your decision to install the <ENDUSE>?

00 [Record verbatim]

96 (Nothing else influential)

98 (Don't Know)

99 (Refused)

[ASK N3nn IF N3n=00]

N3nn. Using the same zero to 10 scale, where 0 means not at all important and 10 means extremely important, how would you rate the influence of this factor? [RECORD 0 to 10; 98=Don't Know; 99=Refused]

[ASK IF N3e=8,9,10]

N3ee. You indicated that previous experience with this type of equipment was important in your decision to install the <ENDUSE> that qualified for the ComEd incentive. Was this previous experience associated with equipment you installed with an earlier ComEd incentive, or did you install that equipment on your own?

1. (With ComEd incentive)

2. (On my own/No ComEd incentive)

3. (Both)

8. (DK)

9. (Refused)



Thinking about this differently, I would like you to compare the importance of the ComEd Smart Ideas for Your Business Program with the importance of other factors in installing the <ENDUSE>.

[READ IF (N3D, N3I, N3J, N3L)=8,9,10 OR (N3EE=2,8,9); ELSE SKIP TO N3p]

You just told me that the following other factors were important:

[READ IN ONLY ITEMS WHERE THEY GAVE A RATING OF 8 OR HIGHER]

[READ IF N3D=8,9,10 and TA_fl<>1] (N3d) Equipment Vendor recommendation

[READ IF N3E=8,9,10 and N3EE=2,8,9 (N3e) Previous experience with this measure

[READ IF N3I=8,9,10 and TA_fl<>1] (N3I) Recommendation from a design or consulting engineer

(N3j) Standard practice in your business/industry

(N3l) Corporate policy or guidelines

N3p If you were given a TOTAL of 100 points that reflect the importance in your decision to install the <ENDUSE> that qualified for the incentive, and you had to divide those 100 points between: 1) the program and 2) other factors, how many points would you give to the importance of the PROGRAM?

Points given to program: [RECORD 0 to 100; 998=Don't Know; 999=Refused]

[CALCULATE VARIABLE "OTHERPTS" AS: 100 MINUS N3p RESPONSE; IF N3p=998, 999, SET OTHERPTS=BLANK]

N3o And how many points would you give to other factors? [RECORD 0 to 100; 998=Don't Know; 999=Refused] [The response should be <OTHERPTS> because both numbers should equal 100. If response is not <OTHERPTS> ask INC1]

INC1 The last question asked you to divide a TOTAL of 100 points between the program and other factors. You just noted that you would give <N3p RESPONSE> points to the program. Does that mean you would give <OTHERPTS> points to other factors?

1 (Yes)

2 (No)

8 (Don't know)

9 (Refused)

[READ IF INC1=2] "The points you gave to the program and to other factors should add up to 100, but they currently add up to <SUM OF N3p and N3o RESPONSE>. Let's go back to the points you would give to the program." THEN GO BACK TO N3p]

CONSISTENCY CHECK #1: PROGRAM COMPONENTS SCORE VS. PROGRAM IMPORTANCE SCORE

[ASK IF (N3p>70 AND ALL OF (N3b, N3c, N3f, N3h, AND N3k)=0,1,2), ELSE SKIP TO N4aa]

N4 You just gave <N3p RESPONSE> points to the importance of the program, I would interpret that to mean that the program was quite important to your decision to install the <ENDUSE>. Earlier, when I asked about the importance of individual elements of the program I recorded some

answers that would imply that they were not that important to you. Just to make sure I have recorded this properly, I have a couple questions to ask you.

N4a When asked about THE AVAILABILITY OF THE PROGRAM INCENTIVE, you gave a rating of ...<N3B RESPONSE> ... out of ten, indicating that the program incentive was not that important to you. Can you tell me why the incentive was not that important?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

N4c When I asked you about THE RECOMMENDATION FROM A <UTILITY> PROGRAM STAFF PERSON, you gave a rating of ...<N3F RESPONSE> ... out of ten, indicating that the information provided was not that important to you. Can you tell me why the information provided was not that important?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

N4d When asked about THE INFORMATION from the <PROGRAM> or <UTILITY> MARKETING MATERIALS, you gave a rating of ...<N3H RESPONSE> ... out of ten, indicating that this information from the program or utility marketing materials was not that important to you. Can you tell me why this information was not that important?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

[SKIP N4e IF V4>1 or N3k=96,98,99]

N4e When asked about THE ENDORSEMENT or RECOMMENDATION by YOUR UTILITY ACCOUNT MANAGER, you gave a rating of <N3K RESPONSE> ... out of ten, indicating that this Account manager endorsement was not that important to you. Can you tell me why this endorsement was not that important?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

[ASK IF N3p<30 AND ANY ONE OF (N3b, N3c, N3f, N3h, OR N3k=8,9,10) ELSE SKIP TO N5]

N4aa You just gave <N3p RESPONSE> points to the importance of the program. I would interpret that to mean that the program was not very important to your decision to install the <ENDUSE>. Earlier, when I asked about the importance of individual elements of the program I recorded some answers that would imply that they were very important to you. Just to make sure I understand, would you explain why the program was not very important in your decision to install this equipment?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

Now I would like you to think about the action you would have taken with regard to the installation of the <ENDUSE> that qualified for the incentive if the utility program had not been available.

N5 Using a likelihood scale from 0 to 10, where 0 is “Not at all likely” and 10 is “Extremely likely”, if the Smart Ideas for Your Business Program had not been available, what is the likelihood that you would have installed exactly the same ENERGY EFFICIENT equipment? [RECORD 0 to 10; 98=Don't know; 99=Refused]

[ASK IF N5>0, ELSE SKIP TO N8]

N7x Using the same likelihood scale from 0 to 10, if the utility program had NOT been available, what is the likelihood that you would have installed exactly the same project or efficiency of equipment within 12 months of when you installed your <ENDUSE> project? [RECORD 0 to 10; 98=Don't know; 99=Refused]

N7a Without the program, when do you think you would have installed the <ENDUSE>? (Prompt, if necessary. If N7x<7, start prompting with “more than 1 year to 2 years later”.)

- 0 (at the same time you did)
- 1 (up to 6 months later)
- 2 (7 months to 1 year later)
- 3 (more than 1 year up to 2 years later)
- 4 (more than 2 years up to 3 years later)
- 5 (more than 3 years up to 4 years later)
- 6 (more than 4 years later)
- 8 (Don't know)
- 9 (Refused)

[ASK N7b IF N7a=6]

N7b. Why do you think it would have been over 4 years later?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

CONSISTENCY CHECK #2: INCENTIVE VS. NO PROGRAM SCORE

[ASK N5a-d IF N3b=8,9,10 AND N5=8,9,10]

N5a I have a follow-up question on one of your earlier responses. When you answered ...<N3B RESPONSE> ... for the question about the influence of the incentive, I would interpret that to mean that the incentive was quite important to your decision to install. Then, when you answered <N5 RESPONSE> for how likely you would be to install the same equipment without the incentive, it sounds like the incentive was not very important in your installation decision.

I want to check to see if I am misunderstanding your answers or if the questions may have been unclear. Will you explain the role the incentive played in your decision to install this efficient equipment?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

N5b Would you like for me to change your score on the importance of the incentive that you gave a rating of <N3B RESPONSE> or change your rating on the likelihood you would install the same equipment without the incentive which you gave a rating of <N5 RESPONSE> and/or we can change both if you wish?

- 1 (Change importance of incentive rating)
- 2 (Change likelihood to install the same equipment rating)
- 3 (Change both)
- 4 (No, don't change)
- 8 (Don't know)
- 9 (Refused)

[ASK IF N5b=1,3]

N5c How important was... availability of the PROGRAM incentive? (IF NEEDED: in your DECISION to install the equipment) [Scale of 0 to 10, where 0 means not at all important and 10 means extremely important; 98=Don't know, 99=Refused]

[ASK IF N5b=2,3]

N5d If the utility program had not been available, what is the likelihood that you would have installed exactly the same equipment? [Scale of 0 to 10, where 0 means "Not at all likely" and 10 means "Extremely likely"; 98=Don't know, 99=Refused]

CONSISTENCY CHECK #3: TIMING OF INSTALLATION DECISION VS. ALL THREE PROGRAM SCORES

[ASK IF N2=2 AND (ANY OF N3b/N5c, N3f, N3h=8,9,10 OR N3p>70 OR N5/N5d<3)]

N5e In response to an earlier question, you noted that you learned about the program AFTER you had already decided to install the <ENDUSE> that qualified for the incentive. However, based on

- READ IF N3b/N5c=8,9,10: “the rating of <N3b/N5c RESPONSE> you gave to the program incentive”
- READ IF N3f=8,9,10: “the rating of <N3f RESPONSE> you gave to the recommendation from a ComEd or DNV/GL program staff person”
- READ IF N3h=8,9,10: “the rating of <N3h RESPONSE> you gave to information you received through the Smart Ideas or ComEd marketing materials”
- READ IF N3p>70: “the <N3p RESPONSE> you allocated to the program”
- READ IF N5/N5d<3: the likelihood of only <N5/N5d> out of 10 that you would have installed exactly the same equipment without the program,

it sounded like the program was important in your decision to install the high efficiency equipment.

I want to make sure I’m understanding your answers correctly, or if the questions may have been unclear. Will you explain the role the incentive program played in your selection of the efficiency level of the installed equipment as well as the scope of the project? [OPEN END; 98=Don’t Know, 99=Refused]

PAYBACK BATTERY [ASK N9-N10b IF N3m=6,7,8,9,10]

I’d like to find out more about the payback criteria <COMPANY> uses for its investments.

N9 What is the payback cut-off point <COMPANY> uses (in months) before deciding to proceed with an investment? Would you say... (IF NEEDED: The payback period is the amount of time it takes for the energy savings created by a project to pay for the project cost.)

- 1 0 to 6 months
- 2 7 months to 1 year
- 3 more than 1 year up to 2 years
- 4 more than 2 years up to 3 years
- 5 more than 3 years up to 5 years
- 6 Over 5 years
- 7 (Don’t have a cut-off point)
- 8 (Don't know)
- 9 (Refused)

[IF n9=7, SKIP TO N11]

N10 Does your company generally install equipment that meets the required financial cut-off point?

- 1 (Yes)
- 2 (No)
- 8 (Don't know)
- 9 (Refused)

N10a Without the program's incentive, would the <ENDUSE> project have met your company's payback cut-off point?

- 1 Yes
- 2 No
- 8 (Don't know)
- 9 (Refused)

[ASK IF N10a=2,8,9, ELSE SKIP TO N11]

N10b With the program's incentive, did the <ENDUSE> project meet your company's payback cut-off point?

- 1 Yes
- 2 No
- 8 (Don't know)
- 9 (Refused)

CORPORATE POLICY BATTERY [ASK N11-N17 IF N3L= 8,9,10 AND NTG=S]

N11 Does your organization have a corporate environmental policy to reduce environmental emissions or energy use? Some examples would be to "buy green" or use sustainable approaches to business investments.

- 1 (Yes)
- 2 (No)
- 8 (Don't know)
- 9 (Refused)

[ASK N12-N17 IF N11=1]

N12 What specific corporate policy influenced your decision to adopt or install the <ENDUSE> through the <UTILITY> program?

- 00 [RECORD VERBATIM]
- 98 (Don't know)
- 99 (Refused)

N13 Had that policy caused you to adopt <ENDUSE> at this facility before participating in the <UTILITY> program?

- 1 (Yes)
- 2 (No)
- 8 (Don't know)
- 9 (Refused)

N14 Had that policy caused you to adopt <ENDUSE> at other facilities before participating in the <UTILITY> Program?

- 1 (Yes)
- 2 (No)
- 3 (No other facilities)
- 8 (Don't know)
- 9 (Refused)

[ASK N15-N16 IF N13=1 OR N14=1]

N15 Did you receive an incentive for a previous installation of <ENDUSE>?

- 1 (Yes)
- 2 (No)
- 8 (Don't know)
- 9 (Refused)

[ASK N16 IF N15=1]

N16 To the best of your ability, please describe.... [Record VERBATIM; 98=Don't know; 99=Refused]

- a. the amount of incentive received
- b. the approximate timing
- c. the name of the program that provided the incentive

[ASK N17 IF N13=1 OR N14=1]

N17 If I understand you correctly, you said that <COMPANY> 's corporate policy has caused you to install <ENDUSE> previously at this and/or other facilities. I want to make sure I fully understand how this corporate policy influenced your decision versus the <UTILITY> program. Can you please clarify that?

- 00 [Record VERBATIM]
- 98 (Don't know)
- 99 (Refused)

STANDARD PRACTICE BATTERY [ASK N18-N22 IF N3j=8,9,10 AND NTG=S]

N18 Approximately, how long has use of <ENDUSE> been standard practice in your industry?

- M [00 Record Number of Months; 98=Don't know, 99=Refused]
- Y [00 Record Number of Years; 98=Don't know, 99=Refused]

N19 Does <COMPANY> ever deviate from the standard practice?

- 1 (Yes)
- 2 (No)
- 8 (Don't know)
- 9 (Refused)

[ASK IF N19=1]

N19a Please describe the conditions under which <COMPANY> deviates from this standard practice.

- 00 [Record VERBATIM]

- 98 (Don't know)
- 99 (Refused)

- N20 How did this standard practice influence your decision to install the <ENDUSE> through the <PROGRAM>?
 - 00 [Record VERBATIM]
 - 98 (Don't know)
 - 99 (Refused)

- N20a Could you please rate the importance of the <PROGRAM>, versus this standard industry practice in influencing your decision to install the <ENDUSE>. Would you say the <PROGRAM> was...
 - 1 Much more important
 - 2 Somewhat more important
 - 3 Equally important
 - 4 Somewhat less important
 - 5 Much less important
 - 8 (Don't know)
 - 9 (Refused)

- N21 What industry group or trade organization do you look to establish standard practice for your industry?
 - 00 [Record VERBATIM]
 - 98 (Don't know)
 - 99 (Refused)

- N22 How do you and other firms in your industry receive information on updates in standard practice?
 - 00 [Record VERBATIM]
 - 98 (Don't know)
 - 99 (Refused)

DESIGN ASSISTANCE

- N23 Who provided the most assistance in the design or specification of the <ENDUSE> you installed through the <PROGRAM>? (If necessary, probe from the list below.)
 - 1 (Designer)
 - 2 (Consultant)
 - 3 (Equipment distributor)
 - 4 (Installer)
 - 5 (<UTILITY> account manager)
 - 6 (<PROGRAM> staff)
 - 00 (Other, specify)
 - 98 (Don't know)
 - 99 (Refused)

[SKIP N24 IF N23=98, 99]

- N24 Please describe the type of assistance that they provided.
- 00 Record VERBATIM
 - 98 Don't know
 - 99 Refused

ADDITIONAL PROJECTS

[ASK N26 IF MSAME=1]

Our records show that <COMPANY> also received an incentive from <UTILITY> for <NSAME> other <ENDUSE> project(s).

- N26 Was it a single decision to complete all of those <ENDUSE> projects for which you received an incentive from <UTILITY> or did each project go through its own decision process?
- 1 (Single Decision)
 - 2 (Each project went through its own decision process)
 - 00 (Other, specify)
 - 98 (Don't know)
 - 99 (Refused)

PY7 SPILLOVER MODULE

Thank you for discussing the new <ENDUSE> that you installed through the ComEd Smart Ideas Program. Next, I would like to discuss any energy efficient equipment you might have installed OUTSIDE of the program.

- SP1 Since receiving an incentive for the project we just discussed, did you install any ADDITIONAL energy efficiency measures at this facility or at your other facilities within ComEd's service territory that did NOT receive incentives through any utility or government program?
- 1 (Yes)
 - 2 (No)
 - 8 (Don't know)
 - 9 (Refused)

[ASK IF SP1=1, ELSE SKIP TO S0]

SP1a. Do you plan to apply for incentives for these energy efficiency measure(s) through a utility program in the future?

- 1 (Yes)
- 2 (No)
- 8 (Don't know)
- 9 (Refused)

[ASK IF SP1a=1, ELSE SKIP TO SP2]

SP1b. Which program(s) do you plan to apply to for incentives for these measures?

- 1 (Standard/Prescriptive Program)
- 2 (Custom Program)
- 00 (Other, specify)
- 98 (Don't know)
- 99 (Refused)

SP1c. Approximately when do you plan to apply for incentives through these programs?
77 Record VERBATIM

[ASK SP2 IF SP1a=2, ELSE SKIP TO S0]

SP2 On a scale of 0-10, where 0 means "no influence" and 10 means "greatly influenced," how much did your experience with the Smart Ideas program influence your decision to install high efficiency equipment on your own? [SCALE 0-10; 98=Don't know, 99=Refused]

[SKIP IF SP2=DK/REF]

SP2a Why did you give it this rating? [OPEN END]

[ASK IF SP2>7, ELSE SKIP TO S0]

SP3 What was the first measure that you installed? (IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.)

- 1 (Lighting: T8 lamps)
- 2 (Lighting: T5 lamps)
- 3 (Lighting: Highbay Fixture Replacement)
- 4 (Lighting: CFLs)
- 5 (Lighting: Controls / Occupancy sensors)
- 6 (Lighting: LED lamps)
- 7 (Cooling: Unitary/Split Air Conditioning System)
- 8 (Cooling: Room air conditioners)
- 9 (Cooling: Variable Frequency Drives (VFD/VSD) on HVAC Motors)
- 10 (Motors: Efficient motors)
- 11 (Refrigeration: Strip curtains)
- 12 (Refrigeration: Anti-sweat controls)
- 13 (Refrigeration: EC motor for WALK-IN cooler/freezer)
- 14 (Refrigeration: EC motor for REACH-IN cooler/freezer)
- 00 (Other, specify)
- 96 (Didn't install any measures)
- 98 (Don't know)
- 99 (Refused)

[SKIP TO S0 IF SP2=96, 98, 99]

SP4 What was the second measure? (IF RESPONSE IS GENERAL, E.G., "LIGHTING EQUIPMENT", PROBE FOR SPECIFIC MEASURE. PROBE FROM LIST, IF NECESSARY.)

- 1 (Lighting: T8 lamps)
- 2 (Lighting: T5 lamps)
- 3 (Lighting: Highbay Fixture Replacement)
- 4 (Lighting: CFLs)
- 5 (Lighting: Controls / Occupancy sensors)
- 6 (Lighting: LED lamps)
- 7 (Cooling: Unitary/Split Air Conditioning System)
- 8 (Cooling: Room air conditioners)
- 9 (Cooling: Variable Frequency Drives (VFD/VSD) on HVAC Motors)
- 10 (Motors: Efficient motors)
- 11 (Refrigeration: Strip curtains)
- 12 (Refrigeration: Anti-sweat controls)
- 13 (Refrigeration: EC motor for WALK-IN cooler/freezer)
- 14 (Refrigeration: EC motor for REACH-IN cooler/freezer)
- 00 (Other, specify)
- 96 (There was no second measure)
- 98 (Don't know)
- 99 (Refused)

SP5 I have a few questions about the FIRST measure that you installed. (If needed, read back measure: <SP3 RESPONSE>). Why did you purchase this equipment without the incentive available through the Smart Ideas program? [MULTIPLE RESPONSE, UP TO 3]

- 1 (Takes too long to get approval)
- 2 (No time to participate, needed equipment immediately)
- 3 (The equipment did not qualify)
- 4 (The amount of the incentive wasn't large enough)
- 5 (Did not know the program was available)
- 6 (There was no program available)
- 7 (Had reached the maximum incentive amount)
- 00 (Other, specify)
- 98 (Don't know)
- 99 (Refused)

[ASK SP5a IF SP5=3, ELSE SKIP TO SP6]

SP5a Why didn't the equipment qualify? [OPEN END]

[SKIP TO SP7 if SP4=96, 98, 99]

SP6 I have a few questions about the SECOND measure that you installed. (If needed, read back measure: <SP4 RESPONSE>). Why did you purchase this equipment without the incentive available through the Smart Ideas program? [MULTIPLE RESPONSE, UP TO 3]

- 1 (Takes too long to get approval)
- 2 (No time to participate, needed equipment immediately)
- 3 (The equipment did not qualify)
- 4 (The amount of the incentive wasn't large enough)
- 5 (Did not know the program was available)
- 6 (There was no program available)
- 7 (Had reached the maximum incentive amount)
- 00 (Other, specify)
- 98 (Don't know)
- 99 (Refused)

[ASK SP6a IF SP6=3, ELSE SKIP TO SP7]

SP6a Why didn't the equipment qualify? [OPEN END]

SP7. Thank you for sharing this information with us. We may have follow-up questions about the equipment you installed outside of the program. Would you be willing to speak briefly with a member of our team?

- 1 (Yes)
- 2 (No)
- 98 (Don't know)
- 99 (Refused)

PROCESS MODULE

I'd now like to ask you a few general questions about your participation in the Smart Ideas for Your Business program as well as some other services ComEd offers to their business customers.

Program Processes and Satisfaction

[IF S1<>1 SKIP TO S1A]

PR1a How did you first hear about the Smart Ideas program?

1. (ComEd Account Manager)
2. (ComEd Website)
3. (Email from ComEd)
4. (Other ComEd marketing)
5. (Contractor)
6. (Supplier/Vendor)
7. (Friend/colleague/word of mouth)
00. (Other, specify)
98. (Don't know)
99. (Refused)

PR1b In general, what is the best way of reaching companies like yours to provide information about energy efficiency opportunities like the Smart Ideas for Your Business program? [MULTIPLE RESPONSE, UP TO 3]

1. (ComEd Account Manager)
2. (ComEd Website)
3. (Email from ComEd)
4. (Other ComEd marketing)
5. (Contractor)
6. (Supplier/Vendor)
00. (Other, specify)
98. (Don't know)
99. (Refused)

PR2a What do you see as the main benefits to participating in the Smart Ideas for Your Business program? [MULTIPLE RESPONSE, UP TO 3]

1. (Energy Savings/Saving money)
2. (Good for the Environment)
3. (Lower Maintenance Costs)
4. (Better Quality/New Equipment)
5. (Rebate/Incentive)
6. (Able to make improvements sooner)
00. (Other, Specify)
98. (Don't know)
99. (Refused)

PR2b What do you see as the drawbacks to participating in the program? [MULTIPLE RESPONSE, UP TO 3]

1. (Paperwork too burdensome)
2. (Incentives not high enough/not worth the effort)
3. (Program is too complicated)
4. (Cost of equipment)
00. (Other, specify)
96. (No drawbacks)
98. (Don't know)
99. (Refused)

PR3 On a scale of 0 to 10, where 0 is very dissatisfied and 10 is very satisfied, how would you rate your satisfaction with... [96=not applicable, 98=Don't know, 99=Refused]

- a. the incentive amount
- b. the communication you had with the Smart Ideas program staff
- c. the measures offered by the program (If needed: this is the equipment that is eligible for an incentive under the program)
- d. [ASK IF V2a=1] the contractor you worked with to implement the <ENDUSE> project
- e. the Smart Ideas program overall
- f. ComEd overall

PR4a Would you recommend this program to other companies like yours?

- 1 (Yes)
- 2 (No)
- 8 (Don't know)
- 9 (Refused)

PR4aa Why not? [OPEN END; 98=Don't know, 99=Refused]

PR4b Do you plan to participate in the program again in the future?

1. Yes
2. No
3. Maybe
8. (Don't know)
9. (Refused)

My final questions are about two other services that ComEd offers to their business customers.

Business Energy Analyzer

ComEd's Smart Ideas Program provides a free online Business Energy Analyzer. The Energy Analyzer is an online tool that combines electricity bill data and other information about your facility to produce interactive energy usage graphs and charts. It then provides energy-savings tips that apply directly to your facility.

B1 Prior to this survey, had you heard of ComEd's online Business Energy Analyzer?

- 1 Yes
- 2 No
- 8 (Don't know)
- 9 (Refused)

[ASK IF B1 = 1]

- B2 Has your company already used the Business Energy Analyzer?
- 1 Yes
 - 2 No
 - 8 (Don't know)
 - 9 (Refused)

[ASK IF B2 < 1, ELSE SKIP TO FA1]

The Analyzer can be used for energy benchmarking. It can also be used to compare company energy use across years, or to other companies.

- B3 How would you rate your level of interest in using the Energy Analyzer tool within the next year? Would you say that you are...?
- 1 Very interested
 - 2 Somewhat interested
 - 3 Not very interested
 - 4 Not at all interested
 - 8 (Don't know)
 - 9 (Refused)

[ASK IF B3=3,4]

- B3a Why did you give that rating? [MULTIPLE RESPONSE, UP TO 3]
- 1 (Have already had audit/assessment)
 - 2 (I don't need this type of information)
 - 00 (Other, specify)
 - 98 (Don't know)
 - 99 (Refused)

Facility Audits

My final questions are about Opportunity Assessments offered by ComEd. Opportunity Assessments are two-hour free facility visits. A ComEd energy advisor audits the facility and its equipment for potential electrical savings, and provides a recommendations for energy-saving changes and upgrades.

- FA1 Prior to this survey, were you aware that ComEd offers Opportunity Assessments? (IF NEEDED: These assessments are also called "General Energy Assessments.")
- 1 Yes
 - 2 No
 - 8 (Don't know)
 - 9 (Refused)

[ASK IF FA1 = 1]

- FA2 Has your company received a ComEd Opportunity Assessment at this or another facility?
- 1 Yes
 - 2 No
 - 8 (Don't know)
 - 9 (Refused)

[ASK IF FA2 > 1]

Information provided through Opportunity Assessment includes recommended energy efficient upgrades as well as estimated savings, costs, and available incentives.

- FA3 How would you rate your level of interest in receiving a free Opportunity Assessment within the next year? Would you say that you are...?
- 1 Very interested
 - 2 Somewhat interested
 - 3 Not very interested
 - 4 Not at all interested
 - 8 (Don't know)
 - 9 (Refused)

[ASK IF FA3=3,4]

- FA3a Why did you give that rating? [MULTIPLE RESPONSE, UP TO 3]
- 1 (Have already had audit/assessment)
 - 2 (I don't need this type of information)
 - 00 (Other, specify)
 - 98 (Don't know)
 - 99 (Refused)