NAVIGANT

ComEd Small Business Energy Savings Impact Evaluation Report

Energy Efficiency / Demand Response Plan: Plan Year 9 (PY9) (6/1/2016-12/31/2017)

Presented to
Commonwealth Edison Company

DRAFT

March 6, 2018

Prepared by:

Paul Higgins
Navigant Consulting, Inc.

Charles Ampong
Navigant Consulting, Inc.

Mack Shaughnessy
Navigant Consulting, Inc.

www.navigant.com

NAVIGANT

ComEd Small Business Energy Savings Impact Evaluation Report

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. Director
312.583.2176
Rob.Neumann@Navigant.com

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd's PY9 Small Business Energy Savings (SBES) Program. It documents a summary of the energy and demand impacts for the total program by measure and delivery channel. The appendices present the impact analysis methodology and detail. PY9 covers dates June 1, 2016 through December 31, 2017.

2. PROGRAM DESCRIPTION

The SBES Program is designed to assist qualified ComEd non-residential customers[1] to achieve electric energy savings by educating them about energy efficiency (EE) opportunities through no-cost on-site energy assessments conducted by preapproved, specially-trained Trade Allies (TAs) and installation of no-cost Direct-Install (DI) measures.[2] Further savings are available to participating customers through incentives of 30 to 75 percent offered for select Contractor-Installed (CI) measures. The program is funded under the Illinois Power Agency (IPA) portfolio. Nexant, Inc. (Nexant) is the implementation contractor for the SBES Program throughout ComEd's service territory.

Notable program changes made from PY8 to PY9 include:

- Removal of direct-install LED measures
- Addition of direct-install Advanced Power Strips
- Decreased incentives for most of fluorescent lighting measures
- Increased incentives and promotion for new LED indoor and outdoor lighting features
- Emphasis on optional comprehensive measures, focusing on non-lighting program measures

Additional program changes included: no pre-approval or waitlist project applications in advance of the program year; and new smart thermostat cards and campaign fact sheets.

The program had 9,024 participants[3] in PY9 and implemented 122,844 measures[4], as shown in Table 2-1.

[1] To qualify, participants must be ComEd commercial or industrial customers with monthly peak demand levels no greater than 100 kW.
[2] No-cost direct-install measures include low-flow showerheads and faucet aerators, pre-rinse spray valves, vending machine controls, cooling and vending misers, and LED lamps.
[3] Participants represent a count of unique ComEd account numbers.
[4] For evaluation reporting purposes, if a measure quantity is not reported in the tracking system unit (watt reduced, horsepower), Navigant counted the quantity for the data record as one.

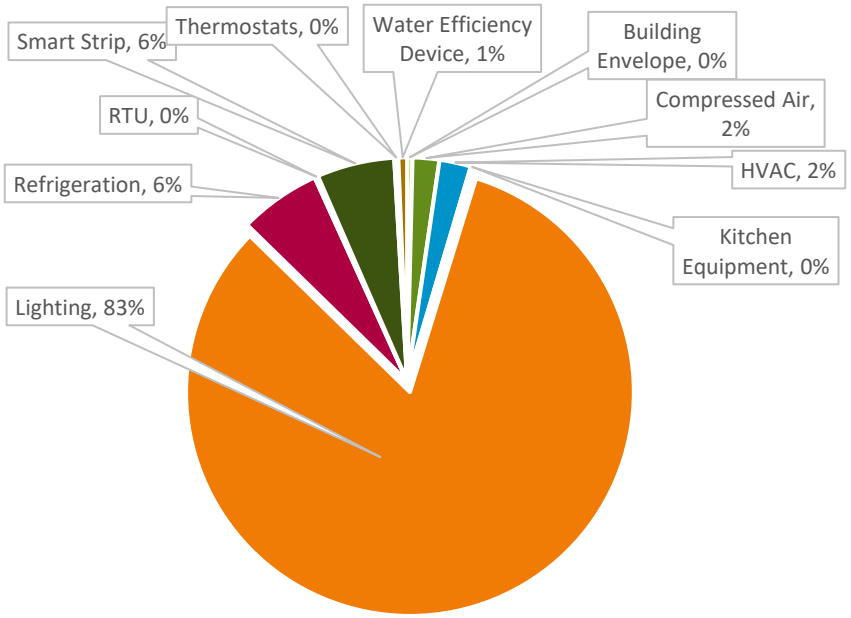
Table 2-1. PY9 Volumetric Findings Detail

Channel	Total Participants	Total Measures	Total Projects	Direct Install Projects	Prescriptive Projects
AC Replacement	155	562	158	1	158
Basic SBES	5,404	74,670	5,718	882	5,658
Indoor LED and Controls Promotion	1,619	16,322	1,662	191	1,662
Lighting Retrofit Promotion	72	8,898	74	12	74
Multi-Family Common Area	1	9	1	-	1
Outdoor LED and Controls Promotion	1,378	10,379	1,398	108	1,398
Past Customer + Outdoor LED and Controls Promotion	2	16	2	2	2
Past Customer Promotion	537	4,524	543	96	543
RTU Promotion	54	375	58	-	58
Summer Campaign	191	7,089	194	79	194
Total	9,024*	122,844	9,808*	1,371	9,748

Source: ComEd tracking data and Navigant team analysis.
*Unique participants: excludes 696 customers with more than one project.
†Unique projects: 1,311 projects had prescriptive and direct install measures with kWh and KW savings.

Figure 2-1 shows the PY9 measure mix as the proportion of measures installed by end-use.

Figure 2-1. Proportion of Measures Installed by End-Use



Source: Evaluation Analysis

3. Program Savings

Table 3-1 summarizes the incremental energy and demand savings the SBES Program achieved in PY9.

Table 3-1. PY9 Total Annual Incremental Savings

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	281,516	NR*	43.310
Program Gross Realization Rate	100%	NR	90%
Verified Gross Savings	281,829	62.800	39.070
Program Net-to-Gross Ratio (NTGR)	0.91	0.91	0.91
Verified Net Savings	256,465	57.150	35.550

Source: ComEd tracking data and Navigant team analysis.
* NR = Not Reported. Estimates of ex ante demand were not reported in the tracking database provided to the evaluation team.

4. Program Savings by Measure

The following tables show program electric and demand savings by measure end-use. The SBES Program had more than 80 individual measures in PY9; a measure-by-measure breakdown is included in Section 7. The lighting measures contributed the most savings, with 89 percent of the verified gross and net MWh savings. The non-lighting measures contributed 11 percent, of which 8 percent were realized from refrigeration measures, and the remaining 4 percent from other measures.

Table 4-1. PY9 Energy Savings by Measure

End Use Type	Research Category	Ex Ante Gross Savings (MWh)	Verified Gross Realization Rate	Verified Gross Savings (MWh)	NTGR *	Verified Net Savings (MWh)	Technical Measure Life	Persistence	Effective Useful Life (EUL)†
Lighting	Lighting	256,290	98%	251,223	0.91	228,613	NA	NA	8 - 16
Non-lighting	Building Envelope	7	100%	7	0.91	6	NA	NA	15
	Compressed Air	2,834	94%	2,662	0.91	2,422	NA	NA	5 - 15
	HVAC	3,597	100%	3,597	0.91	3,273	NA	NA	5 - 15
	Kitchen Equipment	476	100%	476	0.91	433	NA	NA	5 - 15
	Refrigeration	16,793	133%	22,374	0.91	20,360	NA	NA	5 - 16
	RTU‡	699	101%	707	0.91	644	NA	NA	15
	Advanced Power Strip	426	91%	389	0.91	354	NA	NA	4
	Thermostats	302	100%	302	0.91	275	NA	NA	8
	Water Efficiency Device	92	100%	92	0.91	83	NA	NA	5 - 10
Total		281,516	100%	281,829	0.91	256,465			

Source: ComEd tracking data and Navigant team analysis.
*A deemed value. Source: ComEd_NTG_History_and_PY9_Recommendations_2016-02-26_Final.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.
† EUL is a combination of technical measure life and persistence. It is used to calculate CPAS. EUL values in Table 4-1 are expressed as range of the measures that make up the end-use category.
‡ Roof Top Units – Single Package and Split System Unitary Air Conditioners.

Table 4-2 PY9 Demand Savings by Measure

End Use Type	Research Category	Ex-Ante Gross Demand Reduction (MW)	Verified Gross Realization Rate	Verified Gross Demand Reduction (MW)	NTGR*	Verified Net Demand Reduction (MW)
Lighting	Lighting	NR†	NA	54.470	0.91	49.560
Non-lighting	Building Envelope	NR	NA	0.000	0.91	0.000
	Compressed Air	NR	NA	3.590	0.91	3.270
	HVAC	NR	NA	0.590	0.91	0.540
	Kitchen Equipment	NR	NA	0.030	0.91	0.030
	Refrigeration	NR	NA	1.390	0.91	1.260
	RTU	NR	NA	0.700	0.91	0.630
	Advanced Power Strip	NR	NA	0.050	0.91	0.050
	Thermostats	NR	NA	0.000	0.91	0.000
	Water Efficiency Device	NR	NA	1.980	0.91	1.810
Total		NR	NA	62.800	0.91	57.150

Source: ComEd tracking data and Navigant team analysis.
* A deemed value. Source: ComEd_NTG_History_and_PY9_Recommendations_2016-02-26_Final.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.
† NR = Not Reported. Estimates of ex ante demand were not reported in the tracking database provided to the evaluation team.

Table 4-3. PY9 Peak Demand Savings by Measure

End Use Type	Research Category	Ex-Ante Gross Peak Demand Reduction (MW)	Verified Gross Realization Rate	Verified Gross Peak Demand Reduction (MW)	NTGR*	Verified Peak Net Demand Reduction (MW)
Lighting	Lighting	38.710	87%	33.770	0.91	30.730
Non-lighting	Building Envelope	0.000	100%	0.000	0.91	0.000
	Compressed Air	3.410	100%	3.410	0.91	3.100
	HVAC	0.030	289%	0.090	0.91	0.080
	Kitchen Equipment	0.030	100%	0.030	0.91	0.030
	Refrigeration	0.760	183%	1.390	0.91	1.260
	RTU	0.330	100%	0.330	0.91	0.300
	Advanced Power Strip	0.030	126%	0.040	0.91	0.040
	Thermostats	0.000	100%	0.000	0.91	0.000
	Water Efficiency Device	0.010	100%	0.010	0.91	0.010
Total		43.310	90%	39.070	0.91	35.550

Source: ComEd tracking data and Navigant team analysis.
* A deemed value. Source: ComEd_NTG_History_and_PY9_Recommendations_2016-02-26_Final.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.

5. Impact Analysis Findings and Recommendations

5.1 Impact Parameter Estimates

Navigant estimated verified unit savings for each program measure using impact algorithm sources found in the TRM v5.0 or through secondary research. Table 5-1 presents the key parameters and the references used in the verified gross and net savings calculations.

Table 5-1. Verified Gross Savings Parameters

Measure	Ex Ante Gross Value (kWh/unit)	Verified Gross Value (kWh/unit)	Deemed* or Evaluated?	Source (TRM V5.0)
Building Envelope	Varies	Varies	Evaluated	Research
Compressed Air System	Varies	Custom inputs with TRM adjustment	Partially Deemed/ Evaluated	Section 4.7, Research
HVAC	Varies	Most verified as acceptable with comments. See tacking system review section	Partially Deemed/ Evaluated	Section 4.4, Research
Kitchen Equipment	Varies	Varies	Deemed	Section 4.2
Lighting	Varies	Varies. Adjusted based on hours of use or building type interactive effects	Deemed	Section 4.5
Refrigeration	Varies	Most verified as acceptable with comments. See tacking system review section	Deemed	Section 4.6
RTU	Varies, average of types	Varies, acceptable as is	Partially Deemed/ Evaluated	Section 4.4.15†, Research
APS (Tier 1, 5-plug)	61.84 kWh	56.5 kWh	Deemed	Section 5.2.1
Thermostats	Varies	Acceptable as is with adjustment based on reported building type using TRM	Deemed	Section 4.4
Water Efficiency Device	Varies	Varies	Deemed	Section 4.3

* Illinois Statewide Technical Reference Manual for Energy Efficiency Version 5.0, available at: http://www.ilsag.info/technical-reference-manual.html.
† Illinois Statewide Technical Reference Manual for Energy Efficiency Version 6.0, available at: http://www.ilsag.info/technical-reference-manual.html.

5.2 Other Impact Findings and Recommendations

The following describes the key program findings and recommendations. Further detail behind these findings and recommendations is in Section 7. With respect to measure-level recommendations, Nexant has confirmed a number of these findings and plans to update the measure workbook for calendar year 2018.

The PY9 SBES program involved pre- and post-overlap adjustments with the Instant Discounts (ID) program. The SBES-ID overlap adjustment results in a reduction in the savings for lighting because some lighting products incentivized through the SBES program are also incentivized through the ID program. Because these measures are tracked under both programs and each cannot claim full savings for these measures, adjustments are made to properly allocate the savings between the two programs. The PY9 overlap resulted in a reduction in the lighting savings by 941 MWh, changing the pre-overlap ex ante savings from 282,457 MWh to the post overlap adjustment ex ante savings of 281,516 MWh.

Verified Gross Impacts and Realization Rate

Finding 1. The PY9 SBES Program achieved 281,829 MWh of verified gross energy savings and 39.07 MW of verified gross peak demand reduction. The overall verified gross program realization rate for energy savings was 100 percent.

Finding 2. The verified savings values presented in Table 3-1 reflect adjustment for overlap[5] with the Instant Discounts (ID) Program. The overlap resulted in a reduction of 941 MWh and less than 1 MW peak demand for both SBES ex ante and verified gross savings due to a 50 percent split in savings for certain LED measures.

Recommendation 1: Adjust the tracking system inputs to adequately track the allowable split or percentage kWh and KW savings for measures due to overlap with the Instant Discount Program. Clearly identify in the SBES tracking system, measures that receive savings adjustments due to overlap.

Finding 3: Although the overall program realization rate for energy savings was 100 percent, there was variability in the realization rates at the measure level. Navigant made evaluation adjustments to measure-level per-unit savings values for some end-use categories to comply with the TRM. For further detail on these adjustments and associated recommendations, please see the "Tracking System Review" in Section 7.

Recommendation 2: Correct the following values for lighting building type mappings:

- "Warehouse" building type has incorrect "fixture annual operating hours" value in the measure workbook
- "Low-Use Small Business" has an incorrect "Waste Heating Cooling Factor Energy (WHFE)" value in the measure workbook
- In some cases, "Healthcare Clinic" per-unit ex ante savings values in tracking data do not match the measure workbook.

Recommendation 3: Correct the peak demand reduction calculation for the "LED Decorative" measure in the measure workbook to pull the correct savings inputs into the equation.

Recommendation 4: Correct the peak demand savings calculation for the "LED Refrigerated Display Case Lighting" measure in the measure workbook so that the "feet" input is only factored once.

Recommendation 5: Calculate savings for fixtures and occupancy sensors individually then sum the values to calculate total savings when the measures are installed together ("250W MH to 4L 4F T8 Fixture with Fixture Mounted Occupancy Sensor" and "400W MH to 6L 4F T8 Fixture with Fixture Mounted Occupancy Sensor"). The peak demand savings calculation should include peak demand savings from the occupancy sensor.

Recommendation 6: Ensure "Savings Control Factor (SCF)" algorithm inputs for lighting control measures not defined in the TRM match the values assigned in the source document (e.g. PA TRM).

[5] The PY9 SBES program involved pre- and post-lamp sales overlap adjustments with the Instant Discounts (ID) Program. The SBES-ID overlap adjustment results in a reduction in the savings for lighting since some lighting products incentivized through the SBES program are also incentivized through the ID program. Adjustments are made to properly allocate the savings between the two programs since these measures are tracked under both programs and each cannot claim full savings for these measures. The PY9 overlap resulted in a reduction in the lighting savings by 941 MWh, changing the pre-overlap ex ante savings from 282,457 MWh to the post overlap adjustment ex ante savings of 281,516 MWh.

Recommendation 7: Based on the TRM coincidence factor of zero for exterior lighting, the evaluation set the peak demand of "Outdoor: LED Channel Sign LTE 2 Feet" measure to zero. If the program determines that there is evidence of peak savings whether summer or winter peak, it should be brought before the Illinois Technical Advisory Committee (TAC) for review.

Recommendation 8: Use the correct "kW controlled" value of 0.305 per the TRM when calculating savings for the "Wall Mounted Occupancy Sensor" measure. Use the corresponding building type "WHFd" input when calculating peak demand reduction for "Wall Mounted Occupancy Sensor" and "Fixture Mounted Occupancy Sensor" measures.

Recommendation 9: Use the specific deemed savings value of 131 kWh when claiming savings for the "Night Covers-Vertical Open; Remote Condensing; Medium Temperature - 35 F to 55 F" measure per the TRM.

Recommendation 10: Ensure the correct peak demand savings value defined in the measure workbook for the "EC Motor for Reach-in Cooler or Freezer" measure is used in the tracking data.

Recommendation 11: Consider using the ComEd Standard Program workpaper-deemed values of 2,209 kWh for energy savings and 0.255 kW for peak demand savings for the "EC Motor with Evaporator Fan Controls for Walk-in Cooler and Freezer" measure.

Recommendation 12: Consider using the deemed peak demand reduction value of 0.0246 kW from the ComEd Standard Program workpaper for the "Restroom Exhaust Fan Occupancy Sensor" measure.

Recommendation 13: Consider using the "heating and cooling run hours" values per the TRM when calculating savings for the "Variable Speed Drive on HVAC Fan or Pump LTE 5 HP" and "Variable Speed Drives for HVAC Supply and Return Fans LTE 5 HP" measures.

Recommendation 14: If Nexant plans to continue calculating savings for the "Compressed Air Leak Repair" measure using lighting annual operating hours, use "screw-based bulb" annual operating hours per the measure workbook. Otherwise, per the TRM, use an hours input based on the number of working shifts at the building. Appropriate documentation of facility shift hours must be provided for verification.

Recommendation 15: Consider collecting the actual installed specs of the Seasonal Energy Efficiency Ratio of the energy efficient equipment (SEERee) and the Integrated Energy Efficiency Ratio of the energy efficient equipment (IEERee) inputs to calculate RTU measure savings. This is required by the TRM (v6.0) for CY2018 and beyond. Additionally, use the "EFLH" specific to the climate zone the measure was installed in when possible.

Recommendation 16: Consider providing more information about the type of icemaker installed to use more specific deemed values and algorithms provided in the TRM. Correct the equation used to calculate savings for the "ENERGY STAR Ice Maker 501-1500 lbs per day" to match the regression model in the measure workbook.

Recommendation 17: Consider which Advanced Power Strips (APS) defined in the TRM best represents the APS installed by the SBES Program and use the associated deemed values. Evaluation determined the claimed savings were best fit to the Tier 1, five plug APS type.

Recommendation 18: Recode building types to names where savings are defined by the TRM for smart thermostats.

Program Participation

Finding 4: The program incented 9,808 projects and installed more than 122,844 measures in PY9. Of the 9,808 projects, 58 percent were implemented through the basic SBES Program channel and 31 percent were implemented through the indoor and outdoor LED and control promotion channels. The remaining 11 percent were shared among other program offerings, with the most projects from past customer promotions (6 percent of projects, involving lighting, HVAC, compressed air and other measures).

6. Appendix 1. Impact Analysis Methodology

6.1 Verified Gross Program Savings Analysis Approach

Navigant determined verified gross savings for each program measure by:

1. Reviewing the savings algorithm inputs in the measure workbook for agreement with the TRM or secondary research.
2. Validating that the savings algorithm was applied correctly.
3. Cross-checking per-unit savings values in the tracking data with the verified values in the measure workbook or in Navigant's calculations if the workbook did not agree with the TRM.
4. Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

Additionally, this verification approach was supplemented by an engineering file review of a random sample of 20 SBES project files, and verified the quantity, building types and invoices were adequately tracked.

The ex ante kWh savings for the following measures were split 50 percent due to the SBES overlap with the Instant Discounts Program - the following measures also had relatively similar incentive levels across the two programs:

- Hard wired LED exit retrofit kits
- LED Decorative
- LED Directional MR
- LED Directional PAR 20
- LED Directional PAR 30
- LED Directional PAR 38
- LED Directional R/BR
- LED Exit Signs
- LED Omnidirectional

Navigant reduced the verified deemed kWh savings and peak demand savings for these measures by 50 percent to be consistent with the claimed kWh savings due to the overlap. The peak demand savings were adjusted 50 percent less, in cases where the overlap adjustment was not applied to ex ante demand savings.

6.2 Verified Net Program Savings Analysis Approach

Navigant calculated verified net energy and demand (coincident peak and overall) savings by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). In PY9, the NTGR estimates used to calculate the net verified savings were based on past evaluation research and defined by a consensus process through SAG, as documented in a spreadsheet.[6]

7. Appendix 2. Impact Analysis Detail

7.1 Program Savings by Channel and Project Type

Table 7-1 presents program net savings by program channel.

[6] Source ComEd_NTG_History_and_PY9_Recommendations_2016-02-26_Final.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

Table 7-1 PY9 Verified Net Savings by Program Channel

Channel	Ex Ante Gross Savings (MWh)	Verified Gross kWh Realization Rate	Verified Gross Savings (MWh)	Verified Gross Peak Demand Reduction (MW)	NTGR*	Verified Net Savings (MWh)	Verified Net Peak Demand Reduction (MW)
AC Replacement	2,001	101%	2,028	0.32	0.91	1,846	0.30
Basic SBES	158,974	100%	159,668	24.00	0.91	145,298	21.84
Indoor LED and Controls Promotion	52,610	98%	51,477	10.44	0.91	46,844	9.50
Lighting Retrofit Promotion	1,161	94%	1,089	0.22	0.91	991	0.20
Multi-Family Common Area	14	100%	14	-	0.91	12	-
Outdoor LED and Controls Promotion	55,445	101%	55,753	2.21	0.91	50,735	2.02
Past Customer + Outdoor LED and Controls Promotion	18	94%	17	-	0.91	16	-
Past Customer Promotion	4,290	115%	4,922	0.68	0.91	4,479	0.62
RTU Promotion	840	100%	844	0.12	0.91	768	0.11
Total	**281,516**	**100%**	**281,829**	**39.07**	**0.91**	**256,465**	**35.55**

Source: ComEd tracking data and Navigant team analysis.
*Source ComEd_NTG_History_and_PY9_Recommendations_2016-02-26_Final.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

Table 7-2 presents program net savings by project type. Direct install measures included APS, kitchen and bath aerators, showerhead, pre-rinse spray valve, reach-in novelty coolers, and beverage and snack machine controls. Adjustment to savings from APS measure reduced the realization of direct install measures to 97 percent. Other adjustments were applied to prescriptive measures, as documented in detail below in the tracking system review section.

Table 7-2 PY9 Verified Net Savings by Project Type

Project Type	Ex Ante Gross Savings (MWh)	Verified Gross MWh Realization Rate	Verified Gross Savings (MWh)	Verified Gross Peak Demand Reduction (MW)	NTGR*	Verified Net Savings (MWh)	Verified Net Peak Demand Reduction (MW)
Direct Install	1,207	97%	1,170	0.15	0.91	1,065	0.14
Prescriptive	280,309	100%	280,659	38.92	0.91	255,400	35.41
Total	**281,516**	**100%**	**281,829**	**39.07**	**0.91**	**256,465**	**35.55**

Source: ComEd tracking data and Navigant team analysis.
*Source ComEd_NTG_History_and_PY9_Recommendations_2016-02-26_Final.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

7.2 Tracking System Review

Navigant downloaded the final tracking data and measure workbook for the SBES PY9 impact evaluation from the ComEd Evaluation Share file site. We relied on the following documents to verify the per-unit savings for each program measure:

- Final PY9 tracking database file: “SBES_PY9_EOY_Evaluation_Data_Rev0_01122018.xlsx”.
- Measure workbook of default savings: “SBES PY9 Measure Workbook_kWh&Therm_03062017.xlsx”.
- ComEd Standard Program Workpapers “PY9 ComEd Measure Workpapers.pdf”.
- Illinois Technical Reference Manual (TRM v5.0) for deemed input parameters or secondary evaluation research to verify any custom inputs used in the ex ante calculations.

The following sections provide tracking system review findings, associated recommendations, and an outline of the differences between the ex ante and verified savings estimates for each measure by end-use. The findings and recommendations are the same as those presented in Section 5.2.

Each section contains a table that provides the quantity installed[7], realization rates, and Effective Useful Lifetime (EUL) estimates for each measure that is included in the end-use category.

7.2.1 Lighting

Lighting measures have an overall savings realization rate (RR) of 98 percent and represent 89 percent of total program savings.

[7] This quantity represents the values provided in the tracking data and are not grouped by unit as shown in Table 2-1.

Table 7-3 Lighting Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
2-Foot T8 Lamp and Ballast	Lamp	657	100%	17,285	100%	3.86	15
250W MH to 4L 4F T8 Fixture with Fixture Mounted Occupancy Sensor	Each	28	90%	13,619	257%	4.12	15
3-Foot T8 Lamp and Ballast	Lamp	75	105%	4,955	100%	1.24	15
4-Foot T8 Lamp and Ballast	Lamp	12,308	97%	618,528	100%	127.28	15
400W MH to 6L 4F T8 Fixture with Fixture Mounted Occupancy Sensor	Each	1,079	95%	793,717	207%	212.07	15
8-Foot T12 Lamp to RW T8 Lamp and Ballast	Lamp	66	101%	6,072	100%	0.82	15
8-Foot T12 Lamp to two 4-Foot T8 Lamps and Ballast	Lamp	13,929	101%	761,594	100%	147.76	15
Daylighting Controls	Watt Controlled	8,724	91%	9,081	100%	1.92	8
Dimming technology	Watt Controlled	122,653	90%	130,628	100%	26.55	8
Fixture Mounted Occupancy Sensor	Each	21,729	96%	3,676,034	86%	2,385.80	8
Hard wired LED exit retrofit kits	Kit	322	100%	29,970	100%	2.47	16
Induction Fixtures	Watt Reduced	3,205	101%	11,861	100%	2.58	15
LED Decorative	Each	776	101%	28,143	84%	6.40	15
LED directional MR	Each	320	100%	19,382	100%	4.91	15
LED directional PAR 20	Each	109	100%	8,097	100%	1.77	15
LED directional PAR 30	Each	873	101%	54,854	100%	12.19	15
LED directional PAR 38	Each	708	100%	92,730	100%	23.12	15

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
LED Directional R/BR	Each	1,866	100%	137,466	100%	31.36	15
LED exit signs	Sign	248	100%	22,872	100%	1.95	16
LED Fixtures	Watt Reduced	28,011,875	98%	107,732,448	100%	21,380.11	15
LED Omnidirectional	Each	4,771	100%	464,976	100%	104.67	15
LED Refrigerated Display Case Lighting	Lamp	10,827	100%	3,362,651	17%	399.90	15
New T8/T5 Fixtures with Electronic Ballasts	Watt Reduced	1,028,150	103%	4,180,744	100%	837.58	15
Occupancy Sensors Plus Daylighting Controls	Watt Controlled	98,000	93%	141,051	100%	27.39	8
Occupancy sensors with dimming technology	Watt Controlled	115,191	91%	162,287	100%	30.91	8
Outdoor: 250-399W Metal Halide Lamp to Ceramic Discharge Metal Halide Lamp	Lamp	10	100%	2,007	100%	-	15
Outdoor: Dimming Technology	Watt Controlled	16,731	92%	23,141	100%	-	8
Outdoor: Induction Fixtures	Watt Reduced	25,771	100%	114,982	100%	-	15
Outdoor: LED Channel Sign LTE 2 Feet	Letter	105	100%	15,694	0%	-	15
Outdoor: LED Fixtures	Watt Reduced	20,026,765	100%	89,354,019	100%	-	15
Outdoor: New T8/T5 Fixtures with Electronic Ballasts	Watt Reduced	67,960	100%	303,218	100%	-	15
Outdoor: Occupancy Sensors Plus Daylighting Controls	Watt Controlled	46,309	91%	78,515	100%	-	8
Outdoor: Occupancy Sensors with Dimming Technology	Watt Controlled	7,592	91%	12,872	100%	-	8
Outdoor: Photocell with Time Clock	Watt Controlled	27,520	100%	36,480	100%	-	8

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Outdoor: Photocells	Watt Controlled	1,431,160	100%	364,660	100%	-	8
Outdoor: Time Clocks for Lighting	Watt Controlled	185,391	116%	231,606	100%	-	8
Outdoor: TLED(Type C)	Watt Reduced	16,552	100%	73,852	100%	-	15
Remove 4-Foot Lamp	Lamp	1,095	102%	142,724	100%	27.96	11
Remove 4-Foot Lamp and Install Reflector	Lamp	3,304	93%	404,715	100%	82.67	11
Remove 8-Foot Lamp	Lamp	1	105%	212	100%	0.05	11
Remove 8-Foot Lamp and Install Reflector	Lamp	1,142	94%	279,808	100%	54.73	11
TLED(Type C)	Watt Reduced	2,944,547	100%	11,738,510	100%	2,324.95	15
Wall Mounted Occupancy Sensor	Each	12,763	57%	2,955,032	52%	2,458.46	8

Source: ComEd tracking data and Navigant team analysis.

Value Mapping for certain Building Types – Input discrepancies for the following building types impacted calculations for all lighting measures:

- **Warehouse "Fixture Annual Operating Hours":** The measure workbook used 5,087 whereas the TRM (table in section 4.5) shows 5,242.
- **Low-Use Small Business "Waste Heat Cooling Factor Energy" (WHFe):** The measure workbook used 1.24 whereas the TRM (table in section 4.5) shows 1.31.
- **Healthcare Clinic:** Per-unit values typically do not match the measure workbook for this building type. Examples include project IDs SBES9_35787 (LED fixture), SBES9_36441 (Remove 4-Foot Lamp and Install Reflector).

Recommendation 2:[8] Correct the following values for lighting building type mappings:

- "Warehouse" building type has incorrect "fixture annual operating hours" value in the measure workbook
- "Low-Use Small Business" has an incorrect "Waste Heating Cooling Factor Energy (WHFE)" value in the measure workbook
- In some cases, "Healthcare Clinic" per-unit ex ante savings values in tracking data do not match the measure workbook.

LED Decorative - This measure has a peak demand reduction realization rate of 84 percent because the peak demand savings value was calculated using different baseline and efficient wattages than were used for the energy savings calculation. See PY9 measure workbook[9] tab "Screw-In LED" cells C16 to AO16, which pull from cells E55 and F55 instead of E54 and F54.

Recommendation 3: Correct the peak demand reduction calculation for the "LED Decorative" measure in the measure workbook to pull the correct inputs into the equation.

[8] Recommendations are the same as those in "Impact Findings and Conclusions" in section 5.
[9] SBES PY9 Measure Workbook_kWh&Therm_03062017.xlsx

LED Refrigerated Display Case Lighting – This measure has a peak demand reduction realization rate of 17 percent because the measure workbook value (see "Display Case Lighting" tab) incorrectly factored the "feet" input two times.

Recommendation 4: Correct the peak demand reduction calculation for the "LED Refrigerated Display Case Lighting" measure in the measure workbook so that the "feet" input is only factored once.

"250W MH to 4L 4F T8 Fixture with Fixture Mounted Occupancy Sensor" and "400W MH to 6L 4F T8 Fixture with Fixture Mounted Occupancy Sensor" – The energy savings realization rates for these measures are below 100 percent because Navigant calculated savings from the light fixture and occupancy separately, then summed them. The peak demand reduction realization rate is roughly 200 percent because the calculation in the measure workbook doesn't include peak demand savings from the occupancy sensor.

Recommendation 5: Calculate savings for fixtures and occupancy sensors individually then sum the values to calculate total savings when the measures are installed together ("250W MH to 4L 4F T8 Fixture with Fixture Mounted Occupancy Sensor" and "400W MH to 6L 4F T8 Fixture with Fixture Mounted Occupancy Sensor"). The peak demand savings calculation should include peak demand savings from the occupancy sensor.

Lighting Controls – For the "Outdoor: Photocell with Time Clock" and "Outdoor: Photocells" measures, Navigant used the values calculated by Nexant as they agreed with the "ComEd Standard Program Year 9" workpaper[10]. For the other lighting control measures that did not have savings defined in the TRM, Navigant verified the calculation method and inputs using the Pennsylvania TRM 2016 section 3.1.3 (PA TRM)[11]. The savings equation is defined as:

$$\Delta kWh = kW_{controlled} \times HOU \times (SVG_{ee} - SVG_{base}) \times \left(1 + IF_{energy}\right)$$

Navigant found that Nexant used an IF_{energy} value of 0.095 for all non-exterior building types. PA TRM table 3-9 in section 3.1.1 dictates that comfort cooled buildings should use a value of 0.031 for non-electric heat, -0.142 for electric heat, and zero for unknown. Because this information was not provided in the tracking data, Navigant used a value of zero for each building type.

The $(SVG_{ee} - SVG_{base})$ portion of the algorithm represents the savings control factor (SCF). Navigant validated the SCF values used in the measure workbook for each measure and used the SCF given by PA TRM Table 3-4 in section 3.1.1. Table 3 compares the SCF values Navigant used (PA TRM SCF) with the values in the measure workbook (Nexant SCF).

[10] ComEd Standard Program Year 9 Measure Workpapers. Version 2.0 effective June 1, 2016.
[11] Pennsylvania Public Utility Commission Technical Reference Manual, Effective June 2016.

Table 7-4 Lighting Control SCF Input Comparison

Measure	PA TRM SCF	Nexant SCF
Daylighting Controls	28%	30%
Dimming technology	31%	30%
Occupancy Sensors Plus Daylighting Controls	38%	38%
Occupancy sensors with dimming technology	38%	38%
Outdoor: Dimming Technology	31%	30%
Outdoor: Occupancy Sensors Plus Daylighting Controls	38%	38%
Outdoor: Occupancy Sensors with Dimming Technology	38%	38%
Outdoor: Time Clocks for Lighting	28%	24%

Source: Navigant analysis of tracking data, PA TRM

Recommendation 6: Ensure "Savings Control Factor (SCF)" algorithm inputs for lighting control measures not defined in the TRM match the values assigned in the source document (e.g. PA TRM).

Outdoor: LED Channel Sign LTE 2 Feet – This measure appears to have been installed outside but the tracking data reported peak demand savings. When a lighting measure is installed outside, "exterior" building type algorithm inputs are used and peak demand savings are zero.

Recommendation 7: Based on the TRM coincidence factor of zero for exterior lighting, the evaluation set the peak demand of "Outdoor: LED Channel Sign LTE 2 Feet" measure to zero. If the program determines that there is evidence of peak savings whether summer or winter peak, it should be brought before the Illinois Technical Advisory Committee (TAC) for review.

Wall and Fixture Mounted Occupancy Sensors – The wall mounted occupancy fixture measure has a realization rate of 57 percent because the measure workbook used a "kW controlled" algorithm input value of 0.517 for remote mounted occupancy sensors instead of the correct value of 0.305 for wall mounted occupancy sensors, per IL TRM section 4.5.10. Both the wall and fixture mounted occupancy sensors have peak demand realization rates below 100 percent due to using the same "WHFd" savings algorithm input for every building type.

Recommendation 8: Use the correct "kW controlled" value of 0.305 per the TRM when calculating savings for the "Wall Mounted Occupancy Sensor" measure. Use the corresponding building type "WHFd" input when calculating peak demand reduction for "Wall Mounted Occupancy Sensor" and "Fixture Mounted Occupancy Sensor" measures.

7.2.2 Refrigeration

Refrigeration measures have an overall savings RR of 133 percent and represent eight percent of total program savings.

Table 7-5 Refrigeration Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Anti-Sweat Heater Controls for Glass Door Cooler or Refrigerator	Linear Foot	18,723	100%	10,176,424	100%	-	12
Auto Closer for Walk-in Cooler	Each	590	100%	506,297	100%	165.90	8
Auto Closer for Walk-in Freezer	Each	81	100%	170,049	100%	10.10	8
Direct Install: Reach-in (Novelty) Cooler Controls	Each	67	100%	73,756	100%	-	5
EC Motor for Reach-in Cooler or Freezer	Motor	58	100%	18,188	80%	1.77	15
EC Motor for Walk-in Cooler or Freezer	Motor	607	100%	221,722	100%	23.27	15
EC Motor with Evaporator Fan Controls for Walk-in Cooler and Freezer	Motor	4,127	259%	8,296,054	250%	957.67	15
ENERGY STAR Glass Door Freezer	Each	1	100%	1,836	100%	0.20	12
ENERGY STAR Solid Door Freezer	Each	13	100%	10,284	100%	1.10	12
ENERGY STAR Solid or Glass Door Refrigerator	Each	12	100%	6,392	100%	0.68	12
Evaporator Fan Controls for walk-in coolers	Motor	83	100%	36,330	100%	4.53	16
Night Covers-Vertical Open; Remote Condensing; Medium Temperature - 35 F to 55 F	Linear Foot	120	58%	14,305	100%	-	5
Strip Curtains for Cooler	Door	854	100%	327,953	100%	38.86	6
Strip Curtains for Freezer	Door	185	100%	500,673	100%	57.24	6

Source: ComEd tracking data and Navigant team analysis.

Night Covers-Vertical Open; Remote Condensing; Medium Temperature - 35 F to 55 F - This measure has a realization rate of 58 percent because Navigant used the deemed savings value from TRM section 4.6.9 for this specific measure. The measure workbook uses an average energy savings value for all night cover types. However, the measure name provides all necessary information to choose the specific deemed value of 131 kWh from the IL TRM.

Recommendation 9: Use the specific deemed savings value of 131 kWh when claiming savings for the "Night Covers-Vertical Open; Remote Condensing; Medium Temperature - 35 F to 55 F" measure per the TRM.

EC Motor for Reach-in Cooler or Freezer – This measure has a peak demand savings realization rate of 80 percent because the value for "EC Motor for Walk-in Cooler or Freezer" was used instead of the correct value for "EC Motor for Reach-in Cooler or Freezer" in the tracking data. This value is correct in the measure workbook.

Recommendation 10: Ensure the correct peak demand savings value defined in the measure workbook for the "EC Motor for Reach-in Cooler or Freezer" measure is used in the tracking data.

EC Motor with Evaporator Fan Controls for Walk-in Cooler and Freezer - Navigant found that the measure workbook calculated ex ante savings by adding savings for the "Evaporator Fan Controls for Walk-In Coolers" measure to an average of the savings values for the "EC Motor for Walk-in Cooler or Freezer" and "EC Motor for Reach-in Cooler or Freezer" measures. The IL TRM does not define savings for these measures installed together. The ComEd Standard Program workpaper defines a savings algorithm and deemed savings values for this measure, taken from the Wisconsin TRM[12]. Navigant reviewed the Wisconsin TRM and determined that the deemed savings values were reasonable. Navigant used the deemed savings values defined in the ComEd Standard Program workpaper and Wisconsin TRM as verified savings values for this measure in the analysis, resulting in a realization rate of 259 percent.

Recommendation 11: Consider using the ComEd Standard Program workpaper-deemed values of 2,209 kWh for energy savings and 0.255 kW for peak demand savings for the "EC Motor with Evaporator Fan Controls for Walk-in Cooler and Freezer" measure.

7.2.3 HVAC

HVAC measures have an overall savings RR of 100 percent and represent one percent of program savings.

[12] Wisconsin Focus on Energy Technical Reference Manual, Effective October 22, 2014.

Table 7-6 HVAC Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Economizer with DCV	Ton	7,308	100%	2,622,436	100%	-	15
Restroom Exhaust Fan Occupancy Sensor	Fan	2,393	100%	348,421	0%	53.57	8
Room Air Conditioner	Ton	1	100%	37	100%	0.07	9
Tankless Water Heater 5gpm	Each	4	100%	10,891	100%	1.24	5
Variable Speed Drive on HVAC Fan or Pump LTE 5 HP	Horsepower	145	100%	108,433	100%	12.79	15
Variable Speed Drives for HVAC Supply and Return Fans LTE 5 HP	Horsepower	162	100%	182,675	100%	14.17	15

Source: ComEd tracking data and Navigant team analysis.

Restroom Exhaust Fan Occupancy Sensor – No ex ante peak demand reduction was reported for this measure. Because this measure is not defined in the TRM, Navigant used the deemed peak demand savings value for miscellaneous buildings type from the ComEd Standard Program workpaper.

Recommendation 12: Consider using the deemed peak demand reduction value of 0.0246 kW from the ComEd Standard Program workpaper for the "Restroom Exhaust Fan Occupancy Sensor" measure.

"Variable Speed Drive on HVAC Fan or Pump LTE 5 HP" and "Variable Speed Drives for HVAC Supply and Return Fans LTE 5 HP" – These measures use "hours of use" values for lighting fixtures instead of the "heating and cooling run hours" values, per TRM sections 4.4.17 and 4.4.26.

Recommendation 13: Consider using the "heating and cooling run hours" values per the TRM when calculating savings for the "Variable Speed Drive on HVAC Fan or Pump LTE 5 HP" and "Variable Speed Drives for HVAC Supply and Return Fans LTE 5 HP" measures.

7.2.4 Compressed Air

Compressed air measures have an overall savings RR of 94 percent and represent one percent of total program savings.

Table 7-7 Compressed Air Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Air Compressors with Integrated VSD LTE 40 HP	Horsepower	1,915	100%	857,107	100%	275.65	10
Compressed Air Leak Repair	Horsepower	5,857	83%	758,522	100%	2,568.13	5
Compressed Air Pressure Reduction	Compressor	18	100%	18,873	100%	6.39	5
Direct Install: High-Efficiency Air Nozzles	Each	1,233	100%	278,416	100%	89.53	15
Efficient Refrigerated CA Dryer	CFM	2,355	100%	5,525	100%	1.77	10
No-Loss Condensate Drains	Each	584	100%	503,930	100%	162.06	10

Source: ComEd tracking data and Navigant team analysis.

Hours Based on Work Shifts – Each of the compressed air measures (except "Compressed Air Leak Repair") uses the TRM lighting "hours of use" value of 2,954 hours for Low-use Small Business buildings to calculate savings for compressed air systems, instead of TRM v5.0 values based on the number of work shifts at the building the measure was installed in. TRM section 4.7.5 provides the opportunity to determine the project hours based on the shifts of operation. These would be reasonable values to use for the following measures:

- Air Compressors with Integrated VSD LTE 40 HP
- Direct Install: High-Efficiency Air Nozzles
- Efficient Refrigerated CA Dryer

TRM section 4.7.3 provides a deemed hours of use value of 6,136 for the "No-Loss Condensate Drains" measure.

Compressed Air Leak Repair – This measure has a savings realization rate of 83 percent due to some records with "hours of use" values. Project IDs SBES9_35834 and SBES9_36242 are examples of records that used TRM lighting "fixture annual operating hours" instead of "screw-based bulb annual operating hours." The measure workbook calculates savings using the "screw-based bulb annual operating hours."

Recommendation 14: If Nexant plans to continue calculating savings for the "Compressed Air Leak Repair" measure using lighting annual operating hours, use "screw-based bulb" annual operating hours per the measure workbook. Otherwise, per the TRM, use an hours input based on the number of working shifts at the building. Appropriate documentation of facility shift hours must be provided for verification.

7.2.5 RTU

RTU measures have an overall RR savings of 101 percent and represent less than one percent of total program savings.

Table 7-8 RTU Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Early Replacement for Air Cooled AC (GT 5 ton and LTE 10 ton)	Ton	1,793	101%	330,096	100%	152.46	15
Early Replacement for Air Cooled AC (GT10 ton and LTE 20 ton)	Ton	1,176	101%	182,239	100%	83.04	15
Early Replacement for Air Cooled AC (LTE 5 ton)	Ton	824	102%	119,293	100%	62.03	15
End of life Replacement for Air Cooled AC (GT 10 ton to LTE 20 ton)	Ton	125	101%	7,406	100%	3.19	15
End of life Replacement for Air Cooled AC (GT 5 ton and LTE 10 ton)	Ton	54	101%	3,817	100%	1.87	15
End of life Replacement for Air Cooled AC (LTE 5 ton)	Ton	8	103%	788	100%	0.37	15

Source: ComEd tracking data and Navigant team analysis.

Navigant found that the measure workbook calculates savings for “early replacement” and “end of useful lifetime” RTUs based on averages of TRM (v6.0) deemed SEER and EER values. To correctly choose these deemed values, more information would need to be provided on the equipment type and subcategory (split system, single package) for the measure.

The realization rates above 100 percent for RTU measures are caused by ex ante savings calculations using an average of the “EFLH” vales for climate zones one and two. Navigant used the EFLH specific to the climate zone the measure was installed in.

Recommendation 15: Consider collecting the actual installed specs of the Seasonal Energy Efficiency Ratio of the energy efficient equipment (SEERee) and the Integrated Energy Efficiency Ratio of the energy efficient equipment (IEERee) inputs to calculate RTU measure savings. This is required by the TRM (v6.0) for CY2018 and beyond. Additionally, use the “EFLH” specific to the climate zone the measure was installed in when possible.

7.2.6 Kitchen Equipment

Kitchen equipment measures have an overall savings RR of 100 percent and represent less than one percent of program savings.

Table 7-9 Kitchen Equipment Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Direct Install: Beverage Machine Controls	Each	187	100%	274,475	100%	-	5
Direct Install: Snack Machine Controls	Each	2	100%	624	100%	-	5
ENERGY STAR Hot Food Holding Cabinet Full Size	Each	1	100%	8,470	100%	0.63	12
ENERGY STAR Ice Maker 501-1500 lbs per day	Each	3	100%	2,942	100%	0.56	10
Kitchen Fan with DCV	Each	36	100%	146,961	100%	24.90	15

Source: ComEd tracking data and Navigant team analysis.

ENERGY STAR Ice Maker 501-1500 lbs per day – Savings for this measure were calculated using a regression model that was trained with data points from the different types of icemakers and Harvest Rate (pounds of ice made per day) (H) values in the TRM. Navigant found that in implementing the equation of the model to calculate savings, Nexant used the incorrect coefficient value for "H" as shown in the graphic (see cell N82 and associated graphic on the "Ice Maker" tab of the measure workbook).

Recommendation 16: Consider providing more information about the type of icemaker installed to use more specific deemed values and algorithms provided in the TRM. Correct the equation used to calculate savings for the "ENERGY STAR Ice Maker 501-1500 lbs per day" to match the regression model in the measure workbook.

7.2.7 Advanced Power Strip

Advanced Power Strips (Tier 1, 5-plug) have an overall savings RR of 91 percent and represent less than one percent of total program savings.

Table 7-10 Advanced Power Strips Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Direct Install: Advanced Power Strip	Each	6,890	91%	354,249	126%	39.75	4

Source: ComEd tracking data and Navigant team analysis.

The ex ante savings estimate for the APS measure was calculated using an algorithm from the Pennsylvania TRM but included an extra input not outlined in the algorithm. Navigant believes the estimated ex ante savings value and description of the measure correspond to the "Advanced Power Strip – Tier 1" (5-plug) measure defined by IL TRM section 5.2.1 and used the TRM-deemed values for energy and peak demand reduction instead. As a result, the realization was for this measure is 91 percent for energy savings and 126 percent for peak demand reduction.

Recommendation 17: Consider which Advanced Power Strips (APS) defined in the TRM best represents the APS installed by the SBES Program and use the associated deemed values. Evaluation determined the claimed savings were best fit to the Tier 1, five plug APS type.

7.2.8 Smart Thermostats

Smart thermostats have an overall savings RR of 100 percent and represent less than one percent of total program savings.

Table 7-11 Smart Thermostats Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Programmable Thermostat - Continuous Fan Mode During Occupied Period	Each	94	100%	259,216	100%	-	8
Programmable Thermostat - Intermittent Fan Mode During Occupied Period	Each	258	100%	15,932	100%	-	8

Source: ComEd tracking data and Navigant team analysis.

Navigant found that Nexant calculated savings for smart thermostats installed in buildings that the TRM does not define savings for. For these buildings, Nexant used default values for the “restaurant” building type, which was an average of the savings for “fast food” and “full service” restaurant types.

Recommendation 18: Recode building types to names where savings are defined by the TRM for smart thermostats.

7.2.9 Water Efficiency

Direct install water efficiency measures have an overall savings RR of 100 percent and represent less than one percent of total program savings.

Table 7-12 Water Efficiency Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Direct Install: Aerator (Bathroom) - Low Flow	Each	662	100%	55,185	100%	8.24	9
Direct Install: Aerator (Kitchen) - Low Flow	Each	103	100%	10,470	100%	1.57	9
Direct Install: High Efficiency Pre-Rinse Spray Valve	Each	13	100%	16,387	100%	-	5
Direct Install: Showerhead - Low Flow	Each	4	100%	1,249	100%	0.15	10

Source: ComEd tracking data and Navigant team analysis.

7.2.10 Building Envelope

Building envelope measures have an overall savings RR of 100 percent and represent less than one percent of total program savings.

Table 7-13 Building Envelope Measures Impact Detail

Measure	Unit Basis	Quantity Installed	Verified Gross kWh Realization Rate	Verified Net Savings (kWh)	Verified Gross Peak Demand Reduction Realization Rate	Verified Net Peak Demand Reduction (kW)	EUL
Cool Roof - A.C. Equipment NOT on Roof	Square Foot	4,588	100%	334	100%	0.79	15
Weather Stripping	Door	463	100%	5,825	100%	-	15

Source: ComEd tracking data and Navigant team analysis.

8. APPENDIX 3. TRC DETAIL

[We will add this section in the second draft.]