



ComEd Elementary Energy Education Evaluation Report

FINAL

**Energy Efficiency / Demand Response Plan:
Program Year 8 (PY8)
(6/1/2015-5/31/2016)**

**Presented to
Commonwealth Edison Company**

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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 joint Commonwealth Edison Company (ComEd) PY8 ¹ Elementary Energy Education (EEE) program. ComEd offers this program jointly with Nicor Gas, Peoples Gas, and North Shore Gas. The EEE program’s primary focus is to produce electricity and natural gas savings in the residential sector by motivating fifth grade students and their families to reduce energy consumption from water heating and lighting in their homes. Additionally, the EEE program aims to increase participation in other ComEd programs via cross-marketing and increased customer awareness of energy efficiency issues. Because ComEd and the implementation contractor Resource Action Programs (RAP) invested significant time and resources into re-designing the program in PY7, there were no significant changes made in PY8.

E.1. Program Savings

Table E-1 summarizes the electricity savings from the ComEd PY8 EEE program.

Table E-1. PY8 Total Program Electric Savings

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	1,791	N/A	0.168
Verified Gross Savings	1,734	6.474	0.186
Verified Net Savings	1,700	4.920	0.183

Source: ComEd tracking data and Navigant team analysis.

E.2. Program Savings by Measure

Table E-2 summarizes the PY8 EEE program savings by measure type.

¹ The PY8 program year began June 1, 2015 and ended May 31, 2016.

Table E-2. PY8 Program Results by Measure

Research Category	Ex Ante Gross Savings (MWh)	Ex Ante Gross Demand Reduction (MW)	Verified Gross Savings (MWh)	Verified Gross Peak Demand Reduction (MW)	Verified Gross Realization Rate	NTGR	Verified Net Savings (MWh)	Verified Net Peak Demand Reduction (MW)
Showerheads	702.4	0.039	641.6	0.037	91%	1.05†	673.6	0.039
Kitchen Aerators	289.2	0.036	285.8	0.036	99%	1.04†	297.2	0.037
Bathroom Aerators	60.4	0.043	61.0	0.039	101%	1.04†	63.4	0.041
CFLs	470.2	0.046	469.3	0.046	100%	0.83†	389.5	0.038
Water Heater Temperature Setbacks	7.3	<0.01	15.1	<0.01	207%	1.00	15.1	<0.01
Shower Timers	261.1	<0.01	261.2	0.027	100%	1.00	261.2	0.027
Total	1,790.6	0.168	1,733.8	0.186	97%		1,700.0	0.183

Source: ComEd tracking data and Navigant team analysis.

† A deemed value. Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx, IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>. Accessed: September 28, 2016.

E.3. Impact Estimate Parameters for Future Use

The net-to-gross (NTG) values for electric savings measures were all deemed as 1.0 for program year 9 (PY9), based on the Illinois Stakeholder Advisory Group’s consensus process.²

E.4. Program Volumetric Detail

The program distributed 13,474 kits in PY8 and distributed 121,266 measures as shown in the following table.

² “1.0 agreed to by SAG consensus” Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx, IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

Table E-3. PY8 Volumetric Findings Detail

Participation	Measures Distributed
Number of Total Kits Distributed	13,474
Number of Measures/Kit	9
Number of Showerheads Distributed	13,474
Number of CFLS Distributed	40,422
Number of Bathroom Aerators Distributed	26,948
Number of Kitchen Aerators Distributed	13,474
Number of Water Heater Temperature Setback Instructions Distributed	13,474
Number of Shower Timers Distributed	13,474
Number of Total Measures Distributed	121,266

Source: ComEd tracking data and Navigant team analysis.

E.5. Results Summary

The following table summarizes the key metrics from PY8.

Table E-4. Verified PY8 Results Summary

Participation	Units	PY8
Net Savings	MWh	1,700
Net Demand Reduction	MW	4.920
Net Peak Demand Reduction	MW	0.183
Gross Savings	MWh	1,733.8
Gross Demand Reduction	MW	6.474
Gross Peak Demand Reduction	MW	0.186
Program Realization Rate	%	97%
CFLs Distributed	#	40,422
Showerheads Distributed	#	13,474
Faucet Aerators Distributed	#	26,948
Kitchen Aerators Distributed	#	13,474
Water Heater Temp. Setback Instructions Distributed	#	13,474
Shower Timers Distributed	#	13,474
Total Kits Distributed	#	13,474

Source: ComEd tracking data and Navigant team analysis.

E.6. Findings and Recommendations

The following provides insight into key program findings and recommendations.³ The program performed well in PY8, exceeding energy savings and participation targets for the year with high marks for customer satisfaction.

Program Participation

Finding 1. The program distributed 13,474 kits to schools in the ComEd service area, exceeding the original participation target of 13,256 kits.

Finding 2. The return rate of the student survey forms for the program overall was 44 percent, exceeding the target of 40 percent. The return rate is statistically significant to calculate the custom inputs that are allowed when determining unit savings for each measure.

Verified Gross Program Savings and Realization Rate

Finding 3. Navigant's review of the ex-ante calculations for the EEE program resulted in verified gross savings of 1,733.8 MWh and demand savings of 0.186 MW. The verified gross realization rate for energy savings is 97 percent. The verified gross realization rate for peak demand savings is 111 percent.

Process Evaluation

Finding 4. The program is performing well. Comments about the program from parents and teachers are generally uniformly positive. Of the 160 teachers in the ComEd service territory who responded to the educator evaluation questions asked by RAP, 97 percent of them said they would participate in the program again.

Tracking System Review

Finding 5. The implementer used the total survey population (including those reporting gas hot water heating) in the in-service rate calculation for showerhead and aerator measures.

Recommendation 1. The implementer should include only those participants who reported electric hot water heating for the showerhead and aerator measures.

³ 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.

1. INTRODUCTION

1.1 Program Description

This report includes Navigant Consulting Inc.'s (Navigant's) findings and recommendations from the impact and process evaluation of the joint Commonwealth Edison Company (ComEd) Plan Year 8 (PY8) Elementary Energy Education (EEE) program.⁴ ComEd offered this program jointly with Nicor Gas, Peoples Gas, and North Shore Gas. The EEE program is implemented by Resource Action Programs (RAP) and is branded "SUPER SAVERS." In PY8, the program targeted fifth grade students in public and private schools that are customers of Nicor Gas or jointly ComEd and Nicor Gas, ComEd and Peoples Gas, and ComEd and North Shore Gas. Schools received an invitation to participate and register to receive program materials; alternatively, schools could register on the program website to join a waiting list if the program was fully-enrolled when they registered. Schools that had previously participated in the program were also invited to participate. The program used a "teacher-lead instruction" program model where the teacher could choose to teach the curriculum over five or ten days and focus on one kit measure per day. After the lesson, students took home a kit that included water conservation measures; instruments to measure water and ambient temperature, as well as water flow rates; CFLs; shower timers; and a student survey form where participants used the form to report details of their family's participation. Students and teachers were incentivized to return the student survey forms with a \$50 mini-grant for each class that complete and return 80 percent of the forms. RAP based the program's savings on the installation rate of implemented measures reported in the student survey form against the number of kits that were reported taken home.

The EEE program's primary focus is to produce electricity and natural gas savings in the residential sector by motivating students and their families to take steps through reducing energy consumption for water heating and lighting in their home. A secondary goal of the program is to reduce residential use of water. Additionally, the EEE program aims to increase participation in other ComEd, Nicor Gas, Peoples Gas and North Shore Gas programs via cross-marketing and increased customer awareness of energy efficiency issues.

1.2 Evaluation Objectives

The objectives for the PY8 evaluation were to determine the program's verified gross and net savings and determine if the program met its energy and demand savings targets. Navigant conducted limited process research for the EEE program in PY8.

⁴ This program is jointly administered with Nicor Gas, Peoples Gas and North Shore Gas. The PY8 program year began June 1, 2015 and ended May 31, 2016 which is the same time period as Gas Program Year 5 (GPY5). This report includes electric impacts only. Impacts from natural gas measures are included in separate evaluation reports.

2. EVALUATION APPROACH

For this impact evaluation, gross savings were evaluated by (1) reviewing the implementer-submitted work papers to assure that savings were calculated correctly and in adherence with Illinois TRM v4.0 and (2) cross-checking totals with the tracking system. Navigant calculated verified net savings using a net-to-gross (NTG) ratio based on previous evaluation research and approved through the Illinois Stakeholder Advisory Group (IL SAG) consensus process.⁵ Navigant conducted a limited process evaluation that included in-depth interviews with program staff.

2.1 Overview of Data Collection Activities

The core data collection activities included in-depth interviews with program staff and review of the program tracking database. The full set of data collection activities is shown in the following tables.

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	Completes Achieved	When	Comments
Program Tracking Database	Participants	All	All	July – August 2016	Source of information for verified gross analysis
In Depth Interviews	Program Manager/Implementer Staff	4	4	September 2016	Included staff from ComEd, Nicor Gas, Peoples Gas, North Shore Gas, and RAP.

Table 2-2. Additional Resources

Reference Source	Author	Application	Gross Impacts
Illinois Technical Reference Manual	Illinois Energy Efficiency Stakeholder Advisory Group (SAG)	EEE Measure Impact Analysis	X
Student Survey Form	From RAP	Impact Analysis	X

2.2 Verified Savings Parameters

Navigant calculated verified gross and net program impacts for six types of measures with deemed savings values: low-flow showerheads, kitchen and bathroom faucet aerators, CFLs, water heater setback, and shower timers. These measures account for all quantifiable PY8 electric savings.

2.2.1 Verified Gross Program Savings Analysis Approach

Verified gross savings (energy and coincident peak demand) resulting from the PY8 program are calculated by multiplying the total quantity of units by the measure level unit savings.

Unit savings are calculated using the algorithms from the Illinois TRM v4.0; unit savings are then multiplied by the quantity, which is the number of each type of measure distributed. The Illinois TRM deems most input parameters for showerheads, faucet aerators, water heater temperature setback and CFLs (for detailed description of engineering algorithms and inputs used, see Section 3.3).

The following table presents the deemed input parameter source that Navigant used by measure. The Illinois TRM v4.0 allows for custom values to be used for household size, in-service rate, single- vs multi-family housing type split, and CFL baseline wattage. Navigant based these values on the student survey form data. Navigant also calculated savings for single family homes separately from multi-family homes

⁵ Illinois Stakeholder Advisory Group, ilsag.info

given the different variable values defined for these groups in the TRM, including household size and showers per household.

Table 2-3. Verified Savings Parameter Data Sources

Gross Savings Input Parameters	Deemed † Input Data Source
Showerheads	Illinois TRM v4.0 – Section 5.4.5
Kitchen Aerators	Illinois TRM v4.0 – Section 5.4.4
Faucet Aerators	
CFLs	Illinois TRM v4.0 – Section 5.5.1
Hot Water Heater Temperature Setback	Illinois TRM v4.0 – Section 5.4.6
Shower Timers	Custom Calculation

† Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx, IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>. Accessed: September 28, 2016.

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 PY8, the NTGR estimates used to calculate the net verified savings were based on past evaluation research and defined through a consensus process through SAG as documented in a spreadsheet.⁶

2.3 Process Evaluation

A limited process evaluation was conducted for PY8. It was based on interviews with program staff and the implementation contractor and the analysis of parent and teacher survey responses collected by RAP.

Navigant conducted interviews with ComEd, Nicor Gas, Peoples Gas and North Shore Gas program managers as well as with the RAP implementation staff in the summer of 2016. These interviews discussed the program’s energy savings and participation, as well as changes implemented in PY8.

⁶ Source:, IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>. Accessed: September 28, 2016.

3. GROSS IMPACT EVALUATION

Navigant's review of the ex ante calculations for the ComEd PY8 Elementary Energy Education program resulted in verified gross savings of 1,733.8 MWh and demand savings of 0.186 MW. The verified gross realization rate for energy savings is 97 percent. The verified gross realization rate for peak demand savings is 111 percent.

3.1 Tracking System Review

RAP's tracking system and savings documentation for PY8 consisted of:

1. A spreadsheet containing energy savings estimates, including custom inputs,
2. The student survey form-survey data which included contact information and selected responses to process questions from parent/guardians,
3. Raw survey data, including all the responses from the student survey form (additionally the implementer provided a copy of the survey which included a data map for these responses, and
4. Teacher survey data which included responses to process questions provided by teachers. The algorithms and inputs for unit savings calculations were contained in the energy savings spreadsheet.

Key findings include:

1. Overall, Navigant received all applicable data needed in order to conduct the gross impact analysis. Navigant found the spreadsheets well-labeled and easy to follow.
2. There were some discrepancies in the custom inputs for each of the calculations. These discrepancies were between what the implementer provided and what Navigant calculated using the raw survey data. For the in-service rate calculation (ISR), Navigant included only those participants who reported electric hot water heating for the showerhead and aerator measures. The implementer used the total survey population (including those reporting gas hot water heating) in their ISR calculation.
3. The main difference between the ex ante and ex post savings for the hot water heater setback measure is that Navigant did not count an energy savings penalty for those participants who reported increasing the temperature of their water heater setting. Instead, we removed those participants from the savings calculations.
4. Navigant discovered an order of magnitude difference between RAP's and Navigant's calculations for the peak demand savings. Navigant believes that this could be the result of a misplaced decimal in RAP's calculations.

3.2 Program Volumetric Findings

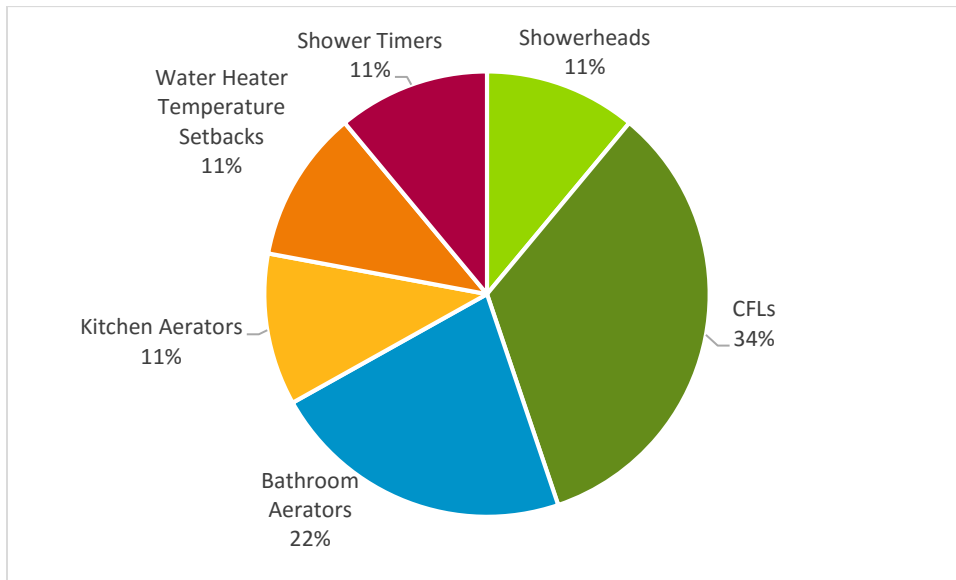
The EEE program distributed 13,474 kits in PY8. Table 3-1 shows the number of measures distributed and Figure 3-1 shows the same information, graphically.

Table 3-1. PY8 Volumetric Findings Detail

Participation	Measures Distributed
Number of Total Kits Distributed	13,474
Number of Measures/Kit	9
Number of Showerheads Distributed	13,474
Number of CFLS Distributed	40,422
Number of Bathroom Aerators Distributed	26,948
Number of Kitchen Aerators Distributed	13,474
Number of Water Heater Temperature Setback Instructions Distributed	13,474
Number of Shower Timers Distributed	13,474
Number of Total Measures Distributed	121,266

Source: ComEd tracking data and Navigant team analysis.

Figure 3-1. Number of Measures Distributed by Type



Source: Evaluation Analysis

3.3 Gross Program Impact Parameter Estimates

As described in Section 2.2.1, energy and demand savings were estimated using Illinois TRM v4.0. The Illinois TRM deems most input parameters for showerheads, faucet aerators, CFLs and hot water heater temperature setback.

Navigant used the student survey form data to calculate or adjust several input parameters. The following tables show each input variable by measure, values used by Navigant and the implementer, and whether that variable was deemed by the TRM or if a custom input was allowed. There was some difference in the custom inputs calculated by Navigant and the custom inputs provided by the implementer. Measure level findings are described in the following sections.

3.3.1 Showerheads and Aerators

For the in-service rate calculation (ISR), Navigant included only those participants who reported electric hot water heating for the showerhead and aerator measures. The implementer used the total survey population (including those reporting gas hot water heating) in their ISR calculation. This accounts for most of the difference between ex ante and ex post savings for the showerhead and aerator measures. Additionally, there were small differences between RAP and Navigant in the number of people per household and hours used. The equations for these measures are presented below and Table 3-2, Table 3-3 and Table 3-4 show the comparison of inputs for these measures

Equation 1. Showerhead Savings Equation and Inputs, IL TRM v4.0 Section 5.4.5

$$\text{Verified Gross Annual kWh Savings} = \%ElectricDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * SPCD * 365.25 / SPH) * EPG_electric * ISR$$

$$\text{Verified Gross Annual kW Savings} = \text{Verified Gross Annual kWh Savings} / \text{Hours} * CF$$

Where:

- %ElectricDHW* = proportion of water heating supplied by electric resistance heating
- GPM_base* = Flow rate of the baseline showerhead
- GPM_low* = As-used flow rate of the low-flow showerhead
- L_base* = Shower length in minutes with baseline showerhead
- Household* = Average number of people per household
- SPCD* = Showers Per Capita Per Day
- 365.25* = Days per year, on average.
- SPH* = Showerheads Per Household so that per-showerhead savings fractions can be determined
- EPG_electric* = Energy per gallon of hot water supplied by electric
- ISR* = In service rate of showerhead
- Hours* = Annual electric DHW recovery hours for showerhead use
- CF* = Coincidence Factor for electric load reduction

Equation 2. Aerator Savings Equation and Inputs, IL TRM v4.0 Section 5.4.4

$$\text{Verified Gross Annual kWh Savings} = \%ElectricDHW * ((GPM_base * L_base - GPM_low * L_low) * Household * 365.25 * DF / FPH) * EPG_electric * ISR$$

$$\text{Verified Gross Annual kW Savings} = \text{Verified Gross Annual kWh Savings} / \text{Hours} * CF$$

Where:

- %ElectricDHW* = proportion of water heating supplied by electric resistance heating
- GPM_base* = Flow rate of the baseline aerator
- GPM_low* = As-used flow rate of the low-flow aerator
- L_low* = Average retrofit length faucet use per capita for all faucets in minutes
- L_base* = Average baseline length faucet use per capita for all faucets in minutes
- Household* = Average number of people per household
- 365.25* = Days per year, on average.
- DF* = Drain Factor
- FPH* = Faucets Per Household
- EPG_electric* = Energy per gallon of hot water supplied by electric
- ISR* = In service rate of aerator
- Hours* = Annual electric DHW recovery hours for faucet use per faucet
- CF* = Coincidence Factor for electric load reduction

Table 3-2. Showerhead Custom and Deemed Values Comparison

Value, Navigant	Value, Implementer	Variable	Source	Deemed/Custom	Discrepancy?
0.249	0.249	%ElectricDHW	Survey - HCU6	Custom	-
2.35	2.35	GPM_base	IL TRM 5.4.5	Deemed	-
1.5	1.5	GPM_low	Specifications	Actual	-
7.8	7.8	L_base	IL TRM 5.4.5	Deemed	-
7.8	7.8	L_low	IL TRM 5.4.5	Deemed	-
365.25	365.25	days/year	IL TRM 5.4.5	Deemed	-
4.821	4.832	Household SF	Survey - HCU2	Custom	Yes
4.867	4.832	Household MF	Survey - HCU2	Custom	Yes
0.600	0.600	SPCD	IL TRM 5.4.5	Deemed	-
1.79	1.79	SPH SF	IL TRM 5.4.5	Deemed	-
1.30	1.30	SPH MF	IL TRM 5.4.5	Deemed	-
0.117	0.117	EPG_electric	IL TRM 5.4.5	Deemed	-
0.361	0.411	ISR SF	Survey - HA1	Custom	Yes
0.418	0.411	ISR MF	Survey - HA1	Custom	Yes
0.712	0.712	%SF	Survey - HCU1	Custom	-
0.288	0.288	%MF	Survey - HCU1	Custom	-
501	503	Hours - SF	IL TRM 5.4.5	Custom (based on household)	Yes
506	503	Hours - MF	IL TRM 5.4.5	Custom (based on household)	Yes
0.0278	0.0278	CF	IL TRM 5.4.5	Deemed	-

Source: Navigant Analysis

Table 3-3. Kitchen Aerator Custom and Deemed Values Comparison

Value, Navigant	Value, Implementer	Variable	Source	Deemed/Custom	Discrepancy
0.249	0.249	%ElectricDHW	Survey - HCU6	Custom	-
1.39	1.39	GPM_base	IL TRM 5.4.4	Deemed	-
0.94	0.94	GPM_low	IL TRM 5.4.4	Deemed	-
4.5	4.5	L_base	IL TRM 5.4.4	Deemed	-
4.5	4.5	L_low	IL TRM 5.4.4	Deemed	-
365.25	365.25	days/year	IL TRM 5.4.4	Deemed	-
4.821	4.834	Household SF	Survey - HCU2	Custom	Yes
4.867	4.834	Household MF	Survey - HCU2	Custom	Yes
0.75	0.75	DF	IL TRM 5.4.4	Deemed	-
1	1	KFPH	IL TRM 5.4.4	Deemed	-
0.097	0.097	EPG_electric	IL TRM 5.4.4	Deemed	-
0.313	0.331	ISR SF	Survey - HA2	Custom	Yes
0.364	0.331	ISR MF	Survey - HA2	Custom	Yes
0.712	0.712	%SF	Survey - HCU1	Custom	-
0.288	0.288	%MF	Survey - HCU1	Custom	-
177	177	Hours - SF	IL TRM 5.4.4	Custom (based on household)	-
178	177	House - MF	IL TRM 5.4.4	Custom (based on household)	Yes
0.022	0.022	CF	IL TRM 5.4.4	Deemed	-

Source: Navigant Analysis

Table 3-4. Bathroom Aerator Custom and Deemed Values Comparison

Value, Navigant	Value, Implementer	Variable	Source	Deemed/ Custom	Discrepancy
0.249	0.249	%ElectricDHW	Survey - HCU6	Custom	-
1.39	1.39	GPM_base	IL TRM 5.4.4	Deemed	-
0.94	0.94	GPM_low	Specifications	Deemed	-
1.6	1.6	L_base	IL TRM 5.4.4	Deemed	-
1.6	1.6	L_low	IL TRM 5.4.4	Deemed	-
365.25	365.25	days/year	IL TRM 5.4.4	Deemed	-
4.821	4.834	Household SF	Survey - HCU2	Custom	Yes
4.867	4.834	Household MF	Survey - HCU2	Custom	Yes
0.9	0.9	DF	IL TRM 5.4.4	Deemed	-
2.83	2.83	BFPH - SF	IL TRM 5.4.4	Deemed	-
1.5	1.5	BFPH - MF	IL TRM 5.4.4	Deemed	-
0.0795	0.0795	EPG_electric	IL TRM 5.4.4	Deemed	-
0.094	0.110	ISR SF, Installed both aerators	Survey - HA2	Custom	Yes
0.119	0.110	ISR MF, Installed both aerators	Survey - HA2	Custom	Yes
0.239	0.225	ISR SF, Installed one aerator	Survey - HA2	Custom	Yes
0.242	0.225	ISR MF, Installed one aerator	Survey - HA2	Custom	Yes
0.71	0.71	%SF	Survey - HCU1	Custom	-
0.29	0.29	%MF	Survey - HCU1	Custom	-
26.6	30.6	Hours - SF	IL TRM 5.4.4	Custom (based on household)	Yes
50.7	30.6	Hours - MF	IL TRM 5.4.4	Custom (based on household)	Yes
0.022	0.022	CF	IL TRM 5.4.4	Deemed	-

Source: Navigant Analysis

3.3.2 CFLs

To calculate ISR for the CFL measure, Navigant categorized the participant population between single or multi-family housing. RAP used the single-family values for the total survey population in the ISR calculation. This accounts for the difference between ex ante and ex post savings for the CFL measure. The equation for this measure is presented below and Table 3-5 shows a comparison of inputs for this measure.

Equation 3. CFL Savings Equation and Inputs, IL TRM v3.0 Section 5.5.1

$$\text{Verified Gross Annual kWh Savings} = ((\text{WattsBase} - \text{WattsEE}) / 1000) * \text{ISR} * \text{Hours} * \text{WHF}_e$$

$$\text{Verified Gross Annual kW Savings} = ((\text{WattsBase} - \text{WattsEE}) / 1000) * \text{ISR} * \text{WHF}_d * \text{CF}$$

Where:

WattsBase installed = Baseline wattage, based on lumens of CFL bulb and program year
WattsEE = Actual wattage of CFL purchased / installed
ISR = In Service Rate, the percentage of units rebated that are actually in service.

Hours = Average hours of use per year
WHFe = Waste heat factor for energy to account for cooling energy savings from efficient lighting
WHFd = Waste heat factor for demand to account for cooling savings from efficient lighting.

Table 3-5. CFL Custom and Deemed Values Comparison

Value, Navigant	Value, Implementer	Variable	Source	Deemed/Custom	Discrepancy
43	43	WattsBase	IL TRM 5.5.1	Deemed	-
13	13	WattsEE	Specifications	Actual	-
938	938	Hours	IL TRM 5.5.1	Deemed	-
1.06	1.06	WHFe - SF	IL TRM 5.5.1	Deemed	-
1.04	1.04	WHFe - MF	IL TRM 5.5.1	Deemed	-
0.577	0.572	ISR - SF 1	Survey - HA4	Custom	Yes
0.557	0.572	ISR - MF 1	Survey - HA4	Custom	Yes
0.484	0.474	ISR - SF 2	Survey - HA5	Custom	Yes
0.445	0.474	ISR - MF 2	Survey - HA5	Custom	Yes
0.418	0.408	ISR - SF 3	Survey - HA6	Custom	Yes
0.378	0.408	ISR - MF 3	Survey HA6	Custom	Yes
0.71	0.71	%SF	Survey - HCU1	Custom	-
0.29	0.29	%MF	Survey - HCU1	Custom	-
1.11	1.11	WHFd - SF	IL TRM 5.5.1	Deemed	-
1.07	1.07	WHFd - MF	IL TRM 5.5.1	Deemed	-
0.095	0.095	CF	IL TRM 5.5.2	Deemed	-

Source: Navigant Analysis

3.3.3 Hot Water Heater Setbacks

The main difference between the ex ante and ex post savings for the hot water heater setback measure is that Navigant did not count an energy savings penalty for those participants who reported increasing the temperature of their water heater setting. Instead, we removed those participants from the savings calculations. The equation for this measure is presented below and Table 3-6 shows a comparison of inputs for this measure.

Equation 4. Hot Water Temperature Setback Savings Equation and Inputs, IL TRM v3.0 Section 5.4.6

$$\text{Verified Gross Annual kWh Savings} = 86.4 \text{ kWh} * (T_{pre} - T_{post}) / 15 * \% \text{electric DHW}$$

$$\text{Verified Gross Annual kW Savings} = \Delta \text{kWh} / \text{Hours} * CF$$

Where:

- 86.4 kWh = Estimate of savings derived in UL and CLP Program Savings Documentation, 2010.
- T_{pre} = Actual hot water setpoint prior to adjustment
- T_{post} = Actual new hot water setpoint, which may not be lower than 120 degrees
- 15 = Delta watts used to derive the UL and CLP Program Savings Documentation estimate.
- Hours = 8766

CF = Summer Peak Coincidence Factor for measure

Table 3-6. Hot Water Heater Setback Custom and Deemed Values Comparison

Value, Navigant	Value, Implementer	Variable	Source	Deemed/ Custom	Discrepancy
0.083	0.083	U (Overall heat transfer coefficient of tank)	IL TRM 5.4.6	Deemed	-
24.99	24.99	Surface area of storage tank	IL TRM 5.4.6	Deemed	-
4.33	2.01	(Tpre-Tpost)	Survey - HA8/HA9	Custom	Yes
8766	8766	Hours	IL TRM 5.4.6	Deemed	-
3412	3412	Conversion from Btu to kWh	IL TRM 5.4.6	Deemed	-
0.98	0.98	RE_electric	IL TRM 5.4.6	Deemed	-
1	1	CF	IL TRM 5.4.6	Deemed	-
0.190	0.198	ISR	Survey – HA7	Custom	Yes

Source: Navigant Analysis

3.3.4 Shower Timers

The shower timer savings are calculated as 19.4 kWh per kit distributed based on the PY7 evaluation results. The realization rate for this measure is 100 Percent. The equation for this measure is presented below and Table 3-7 shows the PY7 inputs used for this deemed savings value.

Equation 5. Shower Timer Energy Savings Equation

$$\Delta kWh = \%Electric\ DHW \times Water\ Flow\ (GPM) \times (Baseline\ Shower\ Time - EEM\ Shower\ Time) \times Household\ Users \times Days\ per\ year \times SPCD \times Usage\ Factor \times EPG_Electric$$

Table 3-7. Shower Timer Inputs and Variables

Value, Navigant	Variable	Notes on values
1.95	GPM Water Flow	Average for sample calculated using base case GPM (from the TRM) and efficient case (GPM from the low-flow shower head in the kit) multiplied by the participant reported in-service rate (ISR) of the efficient showerhead supplied in the kit
7.8	Baseline shower time, minutes	Assumed value from TRM v3.0
3.07	Household Users	Calculated from Q10B, how many family members use the shower timer?
0.18	%FossilD HW (Electric)	Calculated from reported values on the NTG survey, this factor adjusts for shower timers that were distributed to houses with electric water heaters.
0.60	SPCD	Showers Per Capita per Day. Assumed value from TRM v3.0
0.31	Usage Factor	Calculated from survey question Q10, provides the percent of time shower timers were used by the sample of respondents. A response of "Always" is assigned a Usage Factor of 100% or 1.00. Other responses: "Often" (0.50), "Occasionally" (0.15); "Never" (0.00)
5.47	EEM Shower time, minutes	Calculated based on shower timer specifications and reported usage calculated from NTG survey question Q10C. For this sample of users, the shower timer saves 2.33 minutes (7.80 – 5.47)
365.25	days/year	Assumed value from TRM v3.0
0.117	EPG_Electric	Assumed value from TRM v3.0

Sources: Survey responses, Illinois TRM v3.0, and Navigant analysis

3.4 Verified Gross Program Impact Results

The program achieved verified gross savings of 1,733.8 MWh, verified gross demand reduction of 6.474 MW and verified gross peak demand reduction of 0.186 MW. Table 3-8 presents program savings at the measure group level.

Table 3-8. PY8 Verified Gross Impact Savings Estimates by Measure Type

	Sample Size	Gross Energy Savings (MWh)	Gross Peak Demand Savings (MW)	Gross Demand Savings (MW)
CFLs				
Ex Ante Gross Savings		470.23	0.046	N/A
Verified Gross Realization Rate	Census	100%	100%	N/A
Verified Gross Savings		469.25	0.046	0.731
Kitchen Aerators				
Ex Ante Gross Savings		289.21	0.036	N/A
Verified Gross Realization Rate	Census	99%	99%	N/A
Verified Gross Savings		285.77	0.036	1.614
Bathroom Aerators				
Ex Ante Gross Savings	Census	60.40	0.043	N/A
Verified Gross Realization Rate		101%	90%	N/A
Verified Gross Savings		60.98	0.039	1.785
Showerheads				
Ex Ante Gross Savings		702.4	0.039	N/A
Verified Gross Realization Rate	Census	91%	95%	N/A
Verified Gross Savings		641.56	0.037	1.296
Water Heater Setback				
Ex Ante Gross Savings		7.27	0.001	N/A
Verified Gross Realization Rate	Census	207%	207%	N/A
Verified Gross Savings		15.07	0.002	0.002
Shower Timers				
Ex Ante Gross Savings		261.13	0.003	NA
Verified Gross Realization Rate	Census	100%	1,017%	NA
Verified Gross Savings		261.19	0.027	1.047
Total				
Ex Ante Gross Savings		1,790.64	0.168	N/A
Verified Gross Realization Rate	Census	97%	111%	N/A
Verified Gross Savings		1,733.81	0.186	6.474

Source: Navigant Analysis

Table 3-9 shows the unit savings by measure as well as the total kit savings. These unit savings values contain in-service rate and are multiplied by the single family to multi-family proportion.

Table 3-9. PY8 Unit Savings by Measure

Measure	Energy Unit Savings (kWh)	Peak Demand Unit Savings (kW)	Demand Unit Savings (kW)
Showerhead (1.5 GPM) - Single Family	29.28	0.0017	0.0584
Showerhead (1.5 GPM) - Multi Family	18.33	0.0011	0.0377
Kitchen Aerator (1.5 GPM) - Single Family	14.37	0.0018	0.0814
Kitchen Aerator (1.5 GPM) - Multi Family	6.83	0.0008	0.0383
Bathroom Aerator (1.0 GPM) Installed one - Single Family	1.36	0.0011	0.0510
Bathroom Aerator (1.0 GPM) Installed one - Multi Family	1.06	0.0005	0.0209
Bathroom Aerator (1.0 GPM) Installed Both - Single Family	1.07	0.0009	0.0400
Bathroom Aerator (1.0 GPM) Installed Both - Multi Family	1.04	0.0005	0.0206
13-watt CFL 1 - Single Family	9.92	0.0010	0.0137
13-watt CFL 1 - Multi Family	3.80	0.0004	0.0051
13-watt CFL 2 - Single Family	8.31	0.0008	0.0115
13-watt CFL 2 - Multi Family	3.04	0.0003	0.0041
13-watt CFL 3 - Single Family	7.18	0.0007	0.0099
13-watt CFL 3 - Multi Family	2.58	0.0002	0.0099
Water Heater Temperature Set Back (Lowered)	1.12	0.0001	0.0001
Shower Timer	19.38	0.0002	0.0734
Total Kit Savings	128.67	0.0120	0.4762

Source: Navigant Analysis

4. NET IMPACT EVALUATION

SAG determined⁷ that the NTG values for this program should be deemed prospectively and used to calculate verified net savings. Table 4-1 shows the deemed NTG values and the PY8 verified net savings.

Table 4-1. PY8 Verified Net Impact Savings Estimates by Measure Type

	Energy Savings (MWh)	PeakDemand Savings (MW)	Demand Savings (MW)
CFLs			
Ex Ante Gross Savings	470.23	0.046	N/A
Verified Gross Realization Rate	100%	100%	N/A
Verified Gross Savings	469.25	0.046	0.731
NTG	0.83	0.83	0.83
Verified Net Savings	389.48	0.038	0.607
Kitchen Aerators			
Ex Ante Gross Savings	289.21	0.036	N/A
Verified Gross Realization Rate	99%	99%	N/A
Verified Gross Savings	285.77	0.036	1.614
NTG	1.04	1.04	1.04
Verified Net Savings	297.20	0.037	1.678
Bathroom Aerators			
Ex Ante Gross Savings	60.40	0.043	N/A
Verified Gross Realization Rate	101%	90%	N/A
Verified Gross Savings	60.98	0.039	1.785
NTG	1.04	1.04	1.04
Verified Net Savings	63.42	0.041	1.856
Showerheads			
Ex Ante Gross Savings	702.40	0.039	N/A
Verified Gross Realization Rate	91%	95%	N/A
Verified Gross Savings	641.56	0.037	1.296
NTG	1.05	1.05	1.05
Verified Net Savings	673.64	0.039	1.361
Water Heater Setback			
Ex Ante Gross Savings	7.27	0.001	N/A
Verified Gross Realization Rate	207%	207%	N/A
Verified Gross Savings	15.07	0.002	0.002
NTG	1.00	1.00	1.00
Verified Net Savings	15.07	0.002	0.002
Shower Timers			
Ex Ante Gross Savings	261.13	0.003	NA
Verified Gross Realization Rate	100%	1,017%	NA
Verified Gross Savings	261.19	0.027	1.047
NTG	1.00	1.00	1.00
Verified Net Savings	261.19	0.027	1.047
Total			
Ex Ante Gross Savings	1,790.6	0.168	N/A
Verified Gross Realization Rate	97%	111%	N/A
Verified Gross Savings	1,733.8	0.186	6.47
NTG			
Verified Net Savings	1,700.0	0.183	4.92

Source: Evaluation Team analysis.

⁷ Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx IL SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

5. PROCESS EVALUATION

A limited process evaluation was conducted for the EEE program in PY8. This section includes changes made to the program in PY8 as well as changes planned for PY9.

5.1 Program Changes since PY7

Because the utilities and RAP invested significant time and resources into re-designing the program in PY7 and participation targets were met, there were very few changes made to the program in PY8. The minor changes made to the program included a slight change in participation targets and the counting of energy and demand savings from shower timers. Participation targets were lowered slightly in PY8 compared to PY7: 13,256 joint kits compared to 13,725 joint kits, respectively. There were no changes made to the number or make/model of the measures included in the energy savings kits. Ex ante energy and demand savings for the shower timers were counted this year (for the first time) due to the research Navigant conducted on this measure in the PY7 evaluation.

5.2 Participant Feedback

According to respondents from RAP's teacher and parent surveys, this program performed well in PY8. RAP sent an educator evaluation survey to every teacher who participated in PY8. The evaluation team analyzed the raw results from these questions and found that around 160 teachers in the ComEd service territory (36 percent of participating teachers) responded to the survey. About 97 percent of respondents said they would participate in the program again, and 96 percent said they would recommend this program to other colleagues. Ninety-eight percent indicated the materials were clearly written and well-organized and that the products in the energy savings kit were easy to use.

Teachers reported the curriculum/lesson plans, energy savings kits, and the student guides as the best program elements. Additionally, the majority of teachers (about 65 percent) reported the self-installation aspect of the energy savings kits was the best program element for students. When asked to provide possible changes to the program, the majority of teachers had no response or responded "none". Those who did respond with a change noted that some of the materials were too difficult for their students' current reading or math levels and that it was difficult to complete all the program material within the time constraints of the academic year.

Sixty-one parents in the ComEd service territory responded to the parent comment card included in the energy savings kit box (less than one percent of participating parents). All but one respondent said they would continue to use the contents in the kit and 93 percent said the materials were easy for their child to use.

6. FINDINGS AND RECOMMENDATIONS

The following provides insight into key program findings and recommendations. The program performed well in PY8, exceeding energy savings and participation targets for the year with high marks for customer satisfaction.

Program Participation

Finding 1. The program distributed 13,474 joint kits to schools in the ComEd service area, exceeding the original participation target of 13,256 joint kits.

Finding 2. The return rate of the student survey forms for the program overall was 44 percent, exceeding the target of 40 percent. The return rate is statistically significant to calculate the custom inputs that are allowed when determining unit savings for each measure.

Verified Gross Program Savings and Realization Rate

Finding 3. Navigant's review of the ex-ante calculations for the EEE program resulted in verified gross savings of 1,733.8 MWh and demand savings of 0.186 MW. The verified gross realization rate for energy savings is 97 percent. The verified gross realization rate for peak demand savings is 111 percent.

Process Evaluation

Finding 4. The program is performing well. Comments about the program from parents and teachers are generally uniformly positive. Of the 160 teachers in the ComEd service territory who responded to the educator evaluation questions asked by RAP (36 percent of participating teachers), 97 percent of them said they would participate in the program again.

Tracking System Review

Finding 5. The implementer used the total survey population (including those reporting gas hot water heating) in the in-service rate calculation for showerhead and aerator measures.

Recommendation 1. The implementer should include only those participants who reported electric hot water heating for the showerhead and aerator measures.

Finding 6. The implementer counted a penalty for those participants who reported increasing their hot water heating temperature.

Recommendation 2. The implementer should not count a penalty for participants who report increasing their hot water heating temperature.

Verified Net Savings

Finding 7. The ComEd PY8 EEE program achieved verified net savings of 1,700.0 MWh and demand savings of 0.183 MW.