



**ComEd**

# **National Theatre for Children's Middle School Kits Program Evaluation Report**

**FINAL**

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

**Presented to  
Commonwealth Edison Company**

January 26, 2017

***Prepared by:***

**Christy Zook  
Navigant Consulting**

**Chelsea Lamar  
Navigant Consulting**

[www.navigant.com](http://www.navigant.com)

**Submitted to:**

ComEd  
Three Lincoln Centre  
Oakbrook Terrace, IL 60181

**Submitted by:**

Navigant  
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

Patricia Plympton, Associate Director  
202.253.9356  
Patricia.Plympton@Navigant.com

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for ComEd based upon information provided by ComEd and from other sources. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Navigant nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

## TABLE OF CONTENTS

<b>E. Executive Summary</b> .....	<b>1</b>
E.1. Program Savings.....	1
E.2. Program Savings by Measure .....	1
E.3. Impact Estimate Parameters for Future Use .....	2
E.4. Program Volumetric Detail.....	3
E.5. Results Summary .....	4
E.6. Findings and Recommendations .....	4
<b>1. Introduction</b> .....	<b>6</b>
1.1 Program Description.....	6
1.2 Evaluation Objectives.....	6
<b>2. Evaluation Approach</b> .....	<b>7</b>
2.1 Overview of Data Collection Activities.....	7
2.2 Verified Savings Parameters.....	7
2.2.1 Verified Gross Program Savings Analysis Approach .....	7
2.2.2 Verified Net Program Savings Analysis Approach .....	8
2.3 Process Evaluation.....	8
<b>3. Gross Impact Evaluation</b> .....	<b>9</b>
3.1 Tracking System Review.....	9
3.2 Program Volumetric Findings .....	9
3.3 Gross Program Impact Parameter Estimates .....	11
3.3.1 CFLs, Showerheads and Aerators .....	11
3.3.2 Water Temperature Gauge Card.....	12
3.3.3 7-Plug Power Strip.....	13
3.4 Verified Gross Program Impact Results.....	14
<b>4. Net Impact Evaluation</b> .....	<b>16</b>
<b>5. Process Evaluation</b> .....	<b>18</b>
5.1 Program Performance .....	18
5.2 Program Incentives .....	18
5.3 Participant Satisfaction.....	18
5.4 Program Changes Planned for PY9.....	19
<b>6. Findings and Recommendations</b> .....	<b>20</b>
<b>7. Appendix</b> .....	<b>21</b>
7.1 Super Savers Hot Water Heater Temperature Setback Questions .....	21

## List of Figures and Tables

### Figures

Figure 3-1. Number of Measures Distributed by Type .....	10
Figure 3-2. Verified Gross MWh by Measure Type.....	11

### Tables

Table E-1. PY8 Total Program Electric Savings .....	1
Table E-2. PY8 Program Results by Measure .....	2
Table E-3. Impact Estimate Parameters for Future Use .....	2
Table E-4. PY8 Volumetric Findings Detail .....	3
Table E-5. PY8 Results Summary .....	4
Table 2-1. Primary Data Collection Activities.....	7
Table 2-2. Additional Resources .....	7
Table 2-3. Verified Savings Parameter Data Sources .....	8
Table 3-1. PY8 Volumetric Findings Detail .....	10
Table 3-2. ISR Values for Smart Strips.....	14
Table 3-3. PY8 Verified Gross Impact Savings Estimates by Measure Type.....	15
Table 4-1. PY8 Verified Net Impact Savings Estimates by Measure Type.....	17

## E. EXECUTIVE SUMMARY

This report presents a summary of the findings and results from the impact and process evaluation of the PY8<sup>1</sup> National Theatre for Children’s (NTC) Middle School Kits program. The NTC Middle School Kits program (NTC Schools) program focused on schools with sixth, seventh, and eighth grades throughout the ComEd service territory to deliver a multiplatform, behavior-driven, in-school program. The program featured live, educational theatre performances to the entire school rather than one grade at a time. After students see the performance, they are sent home with workbooks to complete. In addition to homework assignments, the workbooks contained an offer of a free energy efficiency kit shipped to their home. Parents requested to receive a kit and stated whether they had a gas or electric water heater. Based on the parents’ response, NTC delivered one of two types of kits. Homes with gas water heaters received a kit with different measures than those with electric water heaters. This is the first year ComEd offered the program to residential customers.

### E.1. Program Savings

Table E-1 summarizes the electricity savings from the NTC Schools 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	1,366	NA	NA
Verified Gross Savings	1,332	2.861	0.210
Verified Net Savings	1,247	2.871	0.201

*Source: ComEd tracking data and Navigant team analysis.*

### E.2. Program Savings by Measure

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

<sup>1</sup> The PY8 program year began June 1, 2015 and ended May 31, 2016.

**Table E-2. PY8 Program Results by Measure**

Measure	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)
Kitchen Faucet Aerator	84.4	N/A	84.4	0.020	100%	1.04†	87.8	0.021
Bathroom Faucet Aerator	11.0	N/A	11.0	0.017	100%	1.04†	11.4	0.018
Low-flow Showerhead	161.5	N/A	161.3	0.017	100%	1.05†	169.3	0.018
Water Temp. Gauge Card	83.4	N/A	83.4	0.010	100%	0.93†	77.5	0.009
13 W CFLs	347.5	N/A	347.5	0.034	100%	0.83†	288.4	0.028
7-plug Smart Strip	678.8	N/A	644.8	0.113	95%	0.95†	612.6	0.107
<b>Total‡</b>	<b>1,366.5</b>	<b>N/A</b>	<b>1,332.3</b>	<b>0.210</b>	<b>97%</b>		<b>1,247.0</b>	<b>0.201</b>

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, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

‡ Totals may not sum exactly due to rounding.

### E.3. Impact Estimate Parameters for Future Use

The net-to-gross (NTG) values for electric savings were deemed by measure in this program year (PY8), based on the Illinois Stakeholder Advisory Group's consensus process from previous evaluation research for the Elementary Energy Education program.

**Table E-3. Impact Estimate Parameters for Future Use**

Parameter	Value	Data Source
NTG	1.00	Deemed†

† A deemed value. Source: ComEd\_NTG\_History\_and\_PY8\_Recommendation\_2016-02-26\_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.4. Program Volumetric Detail

The NTC Schools program distributed 7,612 total kits in PY8 and distributed 32,492 measures as shown in the following table.

**Table E-4. PY8 Volumetric Findings Detail**

Participation	Measures Distributed
Number of Electric Water Heat Kits Distributed	1,022
Number of Gas Water Heat Kits Distributed	6,590
Number of Total Kits Distributed	7,612
Number of Measures/Electric Kit	6
Number of Measures/Gas Kit	4
Number of Showerheads Distributed	1,022
Number of CFLS Distributed	21,814
Number of Bathroom Aerators Distributed	1,022
Number of Kitchen Aerators Distributed	1,022
Number of Water Temperature Gauge Cards Distributed	1,022
Number of 7-Plug Smart Strips Distributed	6,590
Number of Total Measures Distributed	32,492

*Source: ComEd tracking data and Navigant team analysis.*

## E.5. Results Summary

The following table summarizes the key metrics from PY8.

**Table E-5. PY8 Results Summary**

Participation	Units	PY8
Net Savings	MWh	1,247.0
Net Demand Reduction	MW	2.871
Net Peak Demand Reduction	MW	0.201
Gross Savings	MWh	1,332.3
Gross Demand Reduction	MW	2.861
Gross Peak Demand Reduction	MW	0.210
Program Realization Rate	%	97
CFLs Distributed	#	21,814
Showerheads Distributed	#	1,022
Faucet Aerators Distributed	#	1,022
Kitchen Aerators Distributed	#	1,022
Number of Water Temperature Gauge Cards Distributed	#	1,022
Number of 7-Plug Smart Strips Distributed	#	6,590
Total Kits Distributed	#	7,612

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, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

## E.6. Findings and Recommendations

The following provides insight into key program findings and recommendations.<sup>2</sup> 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 7,612 kits to households in the ComEd service area, essentially meeting the original participation target of 7,750 kits.

### Verified Gross Impacts and Realization Rate

**Finding 2.** Navigant’s review of the ex ante calculations for the NTC Schools program resulted in verified gross savings of 1,332 MWh, peak demand savings of 0.21 MW and demand savings of 2.86 MW. The verified gross realization rate for energy savings is 97 percent.

**Finding 3.** The implementer had not included an in-service rate in the unit savings calculations for hot water heater temperature gauge cards and power strips; Navigant believes an in-

<sup>2</sup> 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.



service rate should be applied to this measure, due to the nature of the program design as a kit distribution program.

**Recommendation 1.** The implementer should apply an in-service rate to calculate energy savings for these two measures. Regarding hot water heater temperature gauge cards, the implementer's customer survey questions need to include what the existing temperature the customer's hot water heater is set to and what temperature they reduced it to after reading the water heater temperature gauge card. Regarding power strips, the implementer's customer survey questions need to be adjusted by asking if the power strip is currently installed as well as asking customers how they are using the power strip.

#### Verified Net Impacts

**Finding 4.** The ComEd PY8 NTC Schools program achieved verified net savings of 1,274 MWh, 0.20 peak MW, and demand savings of 2.87 MW. The program met its net savings target of 1,220 MWh.

#### Process Evaluation.

**Finding 5.** The program is performing well. Comments about the program from parents and teachers are generally positive. Of the 403 teachers who responded to the teacher evaluation survey questions asked by NTC, almost 100 percent of them said they would like to see the program again in the future.

**Finding 6.** Of the 296 parents who completed the reply card included in the energy savings kit box (about four percent of participating parents), 98 percent of them found the installation instructions easy to understand and rated their level of satisfaction with the program with a four or five (on a five-point scale).

**Finding 7.** Neither the teacher evaluation survey nor the reply card asked how the program could be improved.

**Recommendation 2.** NTC may want to consider adding a question regarding suggestions to improve the program to the surveys in order to learn about areas of the program that could be improved. Learning about these issues and being able to address them in the following program year will help keep customer satisfaction in the program high.

## 1. INTRODUCTION

### 1.1 Program Description

The Plan Year 8 (PY8)<sup>3</sup> National Theatre for Children's (NTC) Middle School Kits (NTC Schools) program is implemented by NTC and is branded "The Resource Force". The program focused on schools with sixth, seventh and eighth grades throughout the ComEd service territory to deliver a multiplatform, behavior-driven, in-school program. The program featured live, educational theatre performances to the entire school rather than one grade at a time. After students see the performance, they are sent home with workbooks to complete. In addition to homework assignments, the workbooks contained an offer of a free energy efficiency kit that to be delivered to their home. Parents must request to receive a kit and state whether they have a gas or electric water heater and based on their response, NTC shipped them one of two types of kits. Homes with gas water heaters received a kit with different measures than those with electric water heaters. Schools that received a certain number of kit requests from their school's community and meet NTC's objective for that school received a \$250 check. Reply cards (RC) were included in each kit sent home to the parents and asked installation and satisfaction questions. Parents were encouraged to return the RCs and were incentivized with the chance to win \$1,000 from a one-time drawing of everyone who returned a RC. This was the first year ComEd offered the program to residential customers.

The NTC Schools program's primary focus was to produce electricity savings in the residential sector by motivating students and their families to take steps through reducing energy consumption for electric water heating and lighting in their home.

### 1.2 Evaluation Objectives

The objectives for the PY8 impact evaluation were to determine the program's verified gross and net savings and determine if the program met its energy and demand savings targets. The objective for the process evaluation was to recommend potential program enhancements based on program manager and implementation staff interviews.

---

<sup>3</sup> The PY8 program year began June 1, 2015 and ended May 31, 2016.

## 2. EVALUATION APPROACH

For the 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 version 4.0<sup>4</sup> 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.<sup>5</sup> 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	August – October 2016	Source of information for verified gross analysis
In Depth Interviews	Program Manager/Implementer Staff	2	2	October 2016	Included staff from ComEd, NTC, and WECC.

**Table 2-2. Additional Resources**

Reference Source	Author	Application	Gross Impacts	Process
Illinois Technical Reference Manual	Illinois Energy Efficiency Stakeholder Advisory Group (SAG)	Measure Impact Analysis	X	
Business Reply Cards	From NTC	Customer Satisfaction Analysis		X
Teacher Evaluation Responses	From NTC	Teacher Satisfaction 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 temperature gauge, and seven-plug smart strips. These measures account for all quantifiable PY8 electric savings.

#### 2.2.1 Verified Gross Program Savings Analysis Approach

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

The evaluation calculated unit savings by using the algorithms from the Illinois TRM version 4.0<sup>6</sup>, where applicable; 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 CFLs, showerheads, faucet aerators, water temperature gauge and power strips (for detailed description of engineering algorithms and inputs used,

<sup>4</sup> Source: <http://www.ilsag.info/technical-reference-manual.html>

<sup>5</sup> Illinois Stakeholder Advisory Group, [ilsag.info](http://ilsag.info)

<sup>6</sup> Source: <http://www.ilsag.info/technical-reference-manual.html>

see Section 3.3.) The following table presents the deemed input parameter source that Navigant used by measure.

**Table 2-3. Verified Savings Parameter Data Sources**

Gross Savings Input Parameters Deemed †	Deemed † 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 Temperature Gauge Card	Illinois TRM v4.0 – Section 5.4.6
7-Plug Smart Strip	Illinois TRM v4.0 – Section 5.2.1

† A deemed value. Source: ComEd\_NTG\_History\_and\_PY8\_Recommendation\_2016-02-26\_Final\_EMV\_Recommendations.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

### 2.2.2 Verified Net Program Savings Analysis Approach

The evaluation 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 PY8, the NTGR estimates used to calculate the net verified savings were based on past evaluation research and defined by SAG as documented in a spreadsheet.<sup>7</sup>

## 2.3 Process Evaluation

The PY8 process evaluation was based on interviews with program staff and the implementation contractor and the analysis of parent and teacher survey responses collected by NTC.

Navigant conducted interviews with ComEd program managers as well as with implementation staff in the fall of 2016. The interview discussed the program’s energy savings and participation, as well as changes planned for PY9.

<sup>7</sup> Source: ComEd\_NTG\_History\_and\_PY8\_Recommendation\_2016-02-26\_Final\_EMV\_Recommendations.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

### 3. GROSS IMPACT EVALUATION

Navigant's review of the ex ante calculations for the ComEd PY8 NTC Schools Kits program resulted in verified gross savings of 1,332 MWh, 0.21 peak MW, and demand savings of 2.86 MW. The verified gross realization rate for energy savings is 97 percent.

#### 3.1 Tracking System Review

NTC's tracking system and savings documentation for PY8 consisted of a spreadsheet containing the unit savings and number of kits distributed for the year. Additionally, NTC provided data containing the same information for each month of the program.

Key findings include:

1. Overall, Navigant received all applicable data needed in order to conduct the gross impact analysis. Navigant suggests that the implementer include the inputs used for the unit savings values with the spreadsheet containing quantities and unit savings.
2. The main difference between the ex ante and ex post savings for the power strip measure is that Navigant used an ISR for this measure. The TRM methodology does not contain an ISR value. However, the TRM measure does not specify to use the methodology for kit programs, thus Navigant believes an ISR is appropriate based on research.

#### 3.2 Program Volumetric Findings

The NTC Middle School Kits program distributed 7,612 kits in PY8. Table 3-1 shows the number of measures distributed and Figure 3-1 shows the same information, graphically.

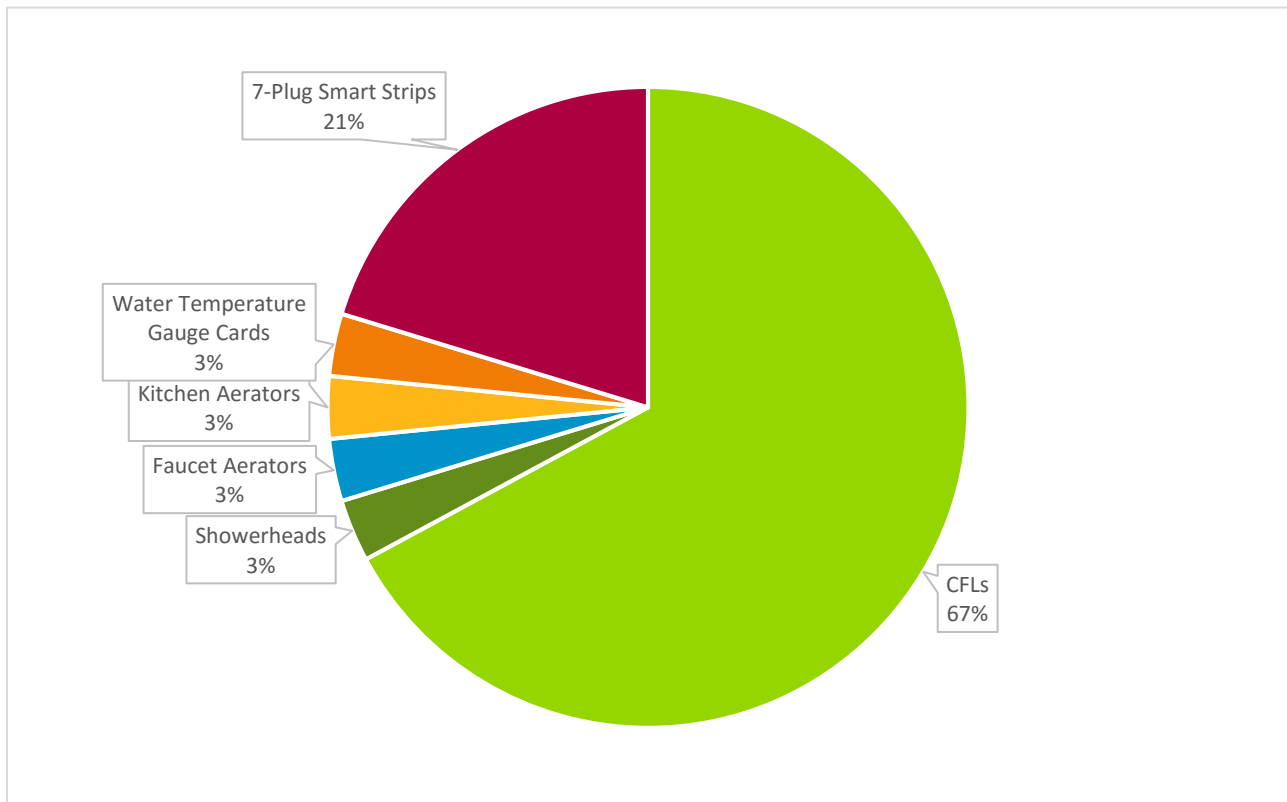
Figure 3-2 shows the verified gross energy savings by measure type.

Table 3-1. PY8 Volumetric Findings Detail

Participation	Measures Distributed
Number of Electric Water Heat Kits Distributed	1,022
Number of Gas Water Heat Kits Distributed	6,590
Number of Total Kits Distributed	7,612
Number of Measures/Electric Kit	6
Number of Measures/Gas Kit	4
Number of Showerheads Distributed	1,022
Number of CFLS Distributed	21,814
Number of Bathroom Aerators Distributed	1,022
Number of Kitchen Aerators Distributed	1,022
Number of Water Temperature Gauge Cards Distributed	1,022
Number of 7-Plug Smart Strips Distributed	6,590
Number of Total Measures Distributed	32,492

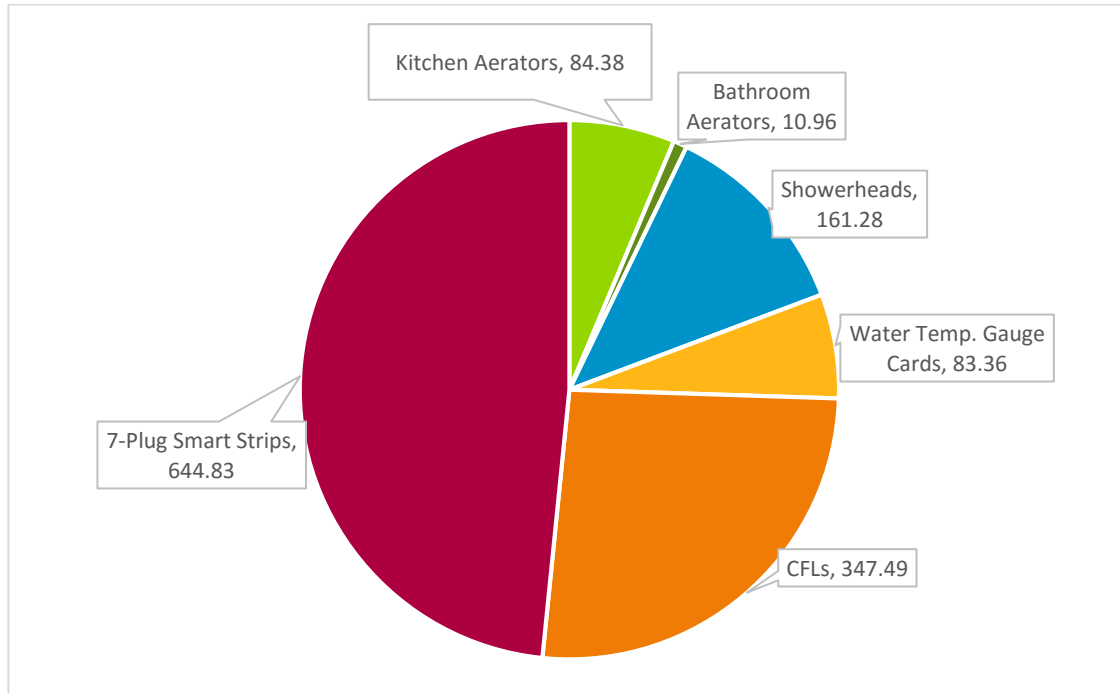
Source: ComEd tracking data and Navigant team analysis.

Figure 3-1. Number of Measures Distributed by Type



Source: Evaluation Analysis

Figure 3-2. Verified Gross MWh by Measure Type



Source: Evaluation Analysis

### 3.3 Gross Program Impact Parameter Estimates

As described in Section 2, energy and demand savings were estimated using the Illinois TRM v4.0. The Illinois TRM deems most input parameters for showerheads, faucet aerators, CFLs, and smart strips. The formulas in the following sections were used to estimate energy and demand savings as specified in the TRM.

#### 3.3.1 CFLs, Showerheads and Aerators

Navigant used the measure level inputs deemed by the TRM and the in-service rates (ISRs) found in the Nicor Gas kit research to calculate energy savings for these measures. The realization rate for these measures is 100 percent. The equations for these measures are presented below.

##### Equation 1. CFL Savings Equation and Inputs, IL TRM v4.0 Section 5.5.1

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

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

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.

**Equation 2. 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 3. 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

**3.3.2 Water Temperature Gauge Card**

Navigant used the measure level inputs deemed by the TRM without an in-service rate (ISR) to calculate the energy savings for the water heater temperature gauge card. The TRM does not specify an in-service rate for the water temperature setback measure, although the TRM specifies the measure is applicable to kit programs. The TRM does define the measure baseline condition as a “hot water tank with the thermostat reduced to no lower than 120 degrees” and the efficient condition as a “hot water tank with a thermostat setting that is higher than 120 degrees, typically systems with settings of 130 degrees or



higher”. The implementation contractor did not collect information to verify that the participants meet either the baseline condition criteria or the efficient condition criteria specified by the TRM. Because the TRM does specify that kit programs are applicable under the water heater temperature setback measure, Navigant is using the default TRM savings for PY8. Navigant notes if the program claims savings for this measure in future years, the program should collect data to verify the participants are meeting the baseline condition criteria and the efficient condition criteria outlined by the TRM. Appendix Section 7.1 includes an example from the SuperSavers program for the questions on the student survey that pertain to hot water heater temperature setback cards. Additionally, there is an errata for TRM v5.0 which specifies to use an in-service rate for this measure. The equation for this measure is presented below.

**Equation 4. Water Heater Temperature Gauge Card Savings Equation and Inputs, IL TRM v4.0 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.
- Tpre = Actual hot water setpoint prior to adjustment
- Tpost = 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

**3.3.3 7-Plug Power Strip**

Navigant applied a 95 percent ISR rate for this measure, based on participant postcard responses. Navigant notes that the participant postcard asks not only if the participant will install in the strip, but if they plan to install in the future. In the future, if the implementer plans to use participants’ postcards to determine the ISR for this measure, the question should ask only about current (not future) behavior. The implementer had not included any in-service rate for this measure. Navigant believes an in-service rate should be applied to this measure, due to the nature of the program design as a kit distribution program. In addition, through a literature review we found a wide range of ISR values for this measure (see Table 3-2 below). Navigant recommends conducting additional ISR research in Illinois for this measure. The equation for this measure is presented below.

**Equation 5. 7-Plug Smart Strip Savings Equation and Inputs, IL TRM v4.0 Section 5.2.1**

$$\text{Verified Gross Annual kWh Savings} = 103 \text{ kWh}$$

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

Table 3-2. ISR Values for Smart Strips

Utility	ISR	Date	Program Notes
IL TRM v5	0.7	February 2016	Two direct install programs
Public Service Company of New Mexico (PNM)	0.29	April 2016	Direct install program
Mid-Atlantic TRM	0.83	June 2015	Direct install program
Consolidated Edison Company of New York: Multifamily Electric and Gas Programs	0.33	September 2014	Direct install program
PPL Electric Utilities, Pennsylvania	0.8	November 2014	Kit program

Source: Navigant analysis

### 3.4 Verified Gross Program Impact Results

The resulting total program verified gross savings is 1,332 MWh, 0.21 peak MW, and demand savings of 2.86 MW as shown in the following table. The table presents savings at the measure group level.

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

	Sample Size	Gross Energy Savings (MWh)	Gross Peak Demand Savings (MW)	Gross Demand Savings (MW)
<b>CFLs</b>				
Ex Ante Gross Savings		347.49	NA	NA
Verified Gross Realization Rate	Census	1.00		
Verified Gross Savings		347.49	0.03	0.48
<b>Kitchen Aerators</b>				
Ex Ante Gross Savings		84.38	NA	NA
Verified Gross Realization Rate	Census	1.00		
Verified Gross Savings		84.38	0.02	0.90
<b>Bathroom Aerators</b>				
Ex Ante Gross Savings	Census	10.96	NA	NA
Verified Gross Realization Rate		1.00		
Verified Gross Savings		10.96	0.02	0.78
<b>Showerheads</b>				
Ex Ante Gross Savings		161.51	NA	NA
Verified Gross Realization Rate	Census	1.00		
Verified Gross Savings		161.28	0.02	0.61
<b>Hot Water Gauge</b>				
Ex Ante Gross Savings		83.36	NA	NA
Verified Gross Realization Rate	Census	0.01		
Verified Gross Savings		83.36	0.01	0.01
<b>7-Plug Power Strip</b>				
Ex Ante Gross Savings		678.77	NA	NA
Verified Gross Realization Rate	Census	0.95		
Verified Gross Savings		644.8	0.11	0.09
<b>Total</b>				
Ex Ante Gross Savings		1,366.47	NA	NA
Verified Gross Realization Rate	Census	0.97		
Verified Gross Savings		1,332.31	0.21	2.86

Source: Evaluation Team analysis.

#### 4. NET IMPACT EVALUATION

SAG determined<sup>8</sup> that the NTG values for this program should be deemed prospectively and used to calculate verified net savings. The following table shows the deemed NTG values and the PY8 verified net savings.

---

<sup>8</sup>Source: ComEd\_NTG\_History\_and\_PY8\_Recommendation\_2016-02-26\_Final\_EMV\_Recommendations.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

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

	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)	Demand Savings (MW)
<b>CFLs</b>				
Ex Ante Gross Savings	347.49		NA	NA
Verified Gross Realization Rate	1.00			
Verified Gross Savings	347.49		0.03	0.48
NTG	0.83		0.83	0.83
Verified Net Savings	288.42		0.03	0.40
<b>Kitchen Aerators</b>				
Ex Ante Gross Savings	84.38		NA	NA
Verified Gross Realization Rate	1.00			
Verified Gross Savings	84.38		0.02	0.90
NTG	1.04		1.04	1.04
Verified Net Savings	87.76		0.02	0.94
<b>Bathroom Aerators</b>				
Ex Ante Gross Savings	10.96		NA	NA
Verified Gross Realization Rate	1.00			
Verified Gross Savings	10.96		0.02	0.78
NTG	1.04		1.04	1.04
Verified Net Savings	11.40		0.02	0.81
<b>Showerheads</b>				
Ex Ante Gross Savings	161.51		NA	NA
Verified Gross Realization Rate	1.00			
Verified Gross Savings	161.28		0.02	0.61
NTG	1.05		1.05	1.05
Verified Net Savings	169.35		0.02	0.64
<b>Hot Water Gauge</b>				
Ex Ante Gross Savings	83.36		NA	NA
Verified Gross Realization Rate	1.00			
Verified Gross Savings	83.36		0.01	0.01
NTG	0.93		0.93	0.93
Verified Net Savings	77.52		0.01	0.01
<b>7-Plug Power Strip</b>				
Ex Ante Gross Savings	678.77		NA	NA
Verified Gross Realization Rate	0.95			
Verified Gross Savings	644.8		0.11	0.09
NTG	0.95		0.95	0.95
Verified Net Savings	612.6		0.1	0.85
<b>Total</b>				
Ex Ante Gross Savings	1366.47		NA	NA
Verified Gross Realization Rate	0.97			
Verified Gross Savings	1,332.3		0.21	2.86
NTG				
Verified Net Savings	1,247.0		0.20	2.87

Source: Evaluation Team analysis.

## 5. PROCESS EVALUATION

The PY8 process evaluation was based on interviews with program staff and the implementation contractor and the analysis of parent and teacher survey responses collected by NTC. The objective was to learn how the program performed in PY8 and changes planned for PY9.

### 5.1 Program Performance

In PY8, the program virtually met the energy savings and participation targets. The energy savings target was 1,220 net MWh and the participation target was 7,750 kits in PY8. The program achieved 1,266 ex ante net MWh and distributed 7,612 kits (6,590 natural gas water heating kits and 1,022 electric water heating kits). NTC had a goal to distribute a certain number of kits to each school that was based on the overall population of schools participating in the program. NTC was able to go to fewer schools than anticipated because they experienced higher participation and kit distribution than they initially projected. NTC attributed the higher than expected participation per school in PY8 to their experience with schools. Even though this was the first year ComEd offered this program to its residential customers, NTC has been implementing programs like this one for a number of years and has been able to resolve any issues in marketing and lines of communication from past experience.

### 5.2 Program Incentives

The program offered two types of incentives in PY8: one was offered to the schools, and one was offered to the parents who returned their reply cards (RCs). Schools were offered a monetary incentive of \$250 if NTC could verify that the school received a certain number of kit requests from their school's community. Each school was given a target number of kit requests, and if they met that target, they received the incentive.

The RCs were included in each kit that was shipped out to households. Parents were incentivized to return the RCs to NTC by being entered into a one-time drawing of all the returned RCs for \$1,000.

### 5.3 Participant Satisfaction

According to the respondents from NTC's teacher and parent surveys, the program performed well in PY8. NTC asked teachers that attended the live performance in their school to fill out an online evaluation survey. The evaluation team analyzed the raw results from these questions and found that 403 teachers responded to the survey. Almost 100 percent (all but two) of the respondents said they would like to see the program again in the future. The survey also included questions asking teachers to rate their experience on a scale of one to seven regarding certain program aspects. Teachers gave an average score of 6.5 and higher (out of seven) on the overall education value of the program, the ability of the live theatre performance to increase student's capacity for retaining the message, and the actors' professional and courteous manner. The average score teachers gave the program's ability to stimulate classroom discussion was a 6.4 while the average score they gave the value of the printed learning materials was 5.9.

A total of 296 parents completed the RC included in the energy savings kit box (about four percent of participating parents). Ninety-eight percent of the parents found the installation instructions easy to understand and rated their level of satisfaction with the program with a four or five (on a five-point scale).

Neither the teacher evaluation survey nor the RCs asked how the program could be improved. NTC may want to consider adding this type of question to the surveys in order to learn about areas of the program that could be improved. Learning about these issues and being able to address them in the next program year will help keep customer satisfaction in the program high.

#### 5.4 Program Changes Planned for PY9

Because the program performed so well in PY8, there are no major changes planned for PY9. There are only minor changes planned for marketing materials

## 6. FINDINGS AND RECOMMENDATIONS

This section summarizes the key impact and process findings and recommendations. The program performed well in PY8, virtually meeting energy savings and participation targets for the year with high marks for customer satisfaction.

### Program Participation

**Finding 1.** The program distributed 7,612 kits to households in the ComEd service area, essentially meeting the original participation target of 7,750 kits.

### Verified Gross Impacts and Realization Rate

**Finding 2.** Navigant's review of the ex ante calculations for the NTC Schools program resulted in verified gross savings of 1,332 MWh, peak demand savings of 0.21 MW and demand savings of 2.86 MW. The verified gross realization rate for energy savings is 97 percent.

**Finding 3.** The implementer had not included an in-service rate in the unit savings calculations for hot water heater temperature gauge cards and power strips; Navigant believes an in-service rate should be applied to this measure, due to the nature of the program design as a kit distribution program.

**Recommendation 1.** The implementer should apply an in-service rate to calculate energy savings for these two measures. Regarding hot water heater temperature gauge cards, the implementer's customer survey questions need to include what the existing temperature the customer's hot water heater is set to and what temperature they reduced it to after reading the water heater temperature gauge card. Regarding power strips, the implementer's customer survey questions need to be adjusted by asking if the power strip is currently installed as well as asking customers how they are using the power strip.

### Verified Net Impacts

**Finding 4.** The ComEd PY8 NTC Schools program achieved verified net savings of 1,274 MWh, 0.20 peak MW, and demand savings of 2.87 MW. The program met its net savings target of 1,220 MWh.

### Process Evaluation.

**Finding 5.** The program is performing well. Comments about the program from parents and teachers are generally positive. Of the 403 teachers who responded to the teacher evaluation survey questions asked by NTC, almost 100 percent of them said they would like to see the program again in the future.

**Finding 6.** Of the 296 parents who completed the reply card included in the energy savings kit box (about four percent of participating parents), 98 percent of them found the installation instructions easy to understand and rated their level of satisfaction with the program with a four or five (on a five-point scale).

**Finding 7.** Neither the teacher evaluation survey nor the reply card asked how the program could be improved.

**Recommendation 2.** NTC may want to consider adding a question regarding suggestions to improve the program to the surveys in order to learn about areas of the program that could be improved. Learning about these issues and being able to address them in the following program year will help keep customer satisfaction in the program high.

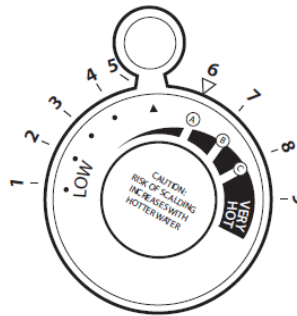
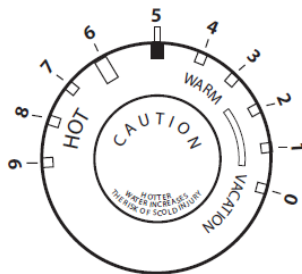
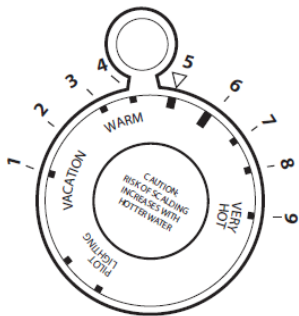


7. APPENDIX

7.1 Super Savers Hot Water Heater Temperature Setback Questions

1. Did your family lower the settings on your water heater?
  - a. Yes, lowered it
  - b. No, did not adjust
  - c. Yes, raised it

If you answered “yes - lowered it” to question 1, find the water heater dial that most closely matches yours at home and answer question 2 and 3 below. If you have a digital thermostat on your water heater, use the Digital Readout table on the right.



DIGITAL READOUT

9.	155 - 160 F
8.	150 - 154 F
7.	145 - 149 F
6.	140 - 144 F
5.	135 - 139 F
4.	130 - 134 F
3.	125 - 129 F
2.	120 - 124 F
1.	115 - 119 F
0.	Lower than 115 F

2. The old setting was at this number:
 

a. 9	f. 4
b. 8	g. 3
c. 7	h. 2
d. 6	i. 1
e. 5	j. 0
3. The new setting was at this number:
 

a. 9	f. 4
b. 8	g. 3
c. 7	h. 2
d. 6	i. 1
e. 5	j. 0