NAVIGANT

# ComEd Middle School Take Home Kits Impact Evaluation Report

## Energy Efficiency / Demand Response Plan: Program Year 2018 (CY2018) (01/01/2018-12/31/2018)

**Presented to**
**ComEd**

**FINAL**

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# ComEd Middle School Take Home Kits Impact Evaluation Report

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# 1. Introduction

This report presents the results of the impact evaluation of ComEd's CY2018 National Theatre for Children (NTC) Middle School Take Home Kit (Middle School Kits) Program. It presents a summary of the energy and demand impacts for the total program and is broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. CY2018 covers January 1, 2018 through December 31, 2018.

# 2. Program Description

The Middle School Kits Program targets sixth, seventh, and eighth grade teachers and school staff, students and their families throughout the ComEd service territory to deliver a multiplatform, behavior-driven, in-school program. The program features live, educational theatre performances by National Theater for Children (NTC) to the entire school rather than one grade at a time. After students see the performance, they are sent home with workbooks to fill out.

In addition to homework assignments, the workbooks contain an offer of a free energy efficiency kit that will be shipped to their home. Parents must request a kit and state whether they have a gas or electric water heater and based on their response, NTC will ship them one of two types of kits. Homes with gas water heaters are delivered a kit with different measures than those with electric water heaters.

The Middle School Kits Program's primary focus is 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.

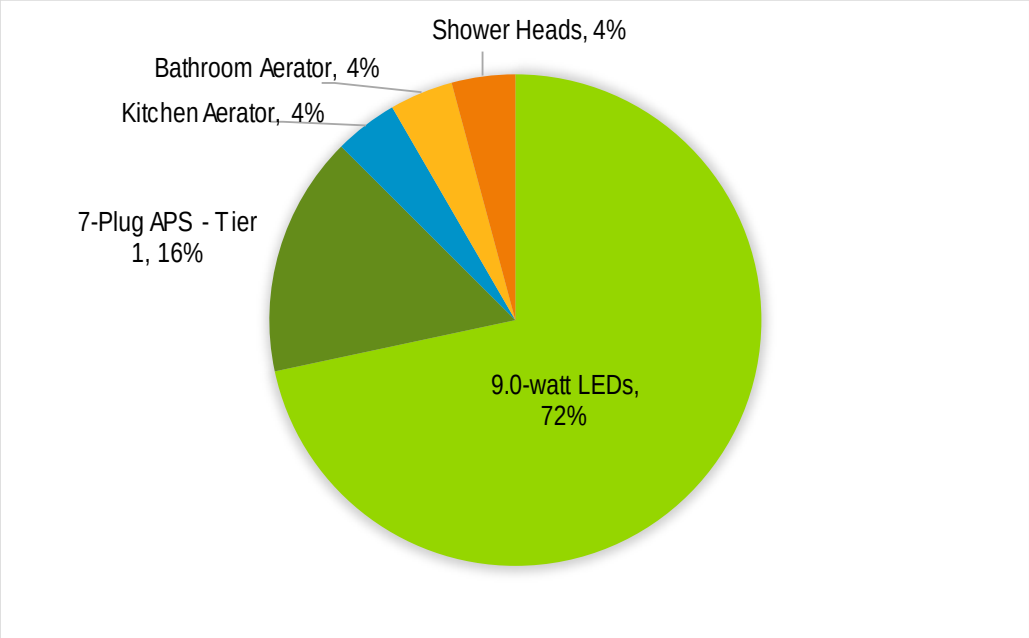
The program had 7,568 participants in CY2018 and distributed 37,840 measures as shown in the following table and graph.

**Table 2-1. CY2018 Volumetric Findings Detail**

| Participation | Electric Kits | Gas Kits | Total Kits |
|---|---|---|---|
| Number of Measures per Kit | 5 | 5 | 5 |
| Number of Total Kits Distributed | 1,579 | 5,989 | 7,568 |
| Number of Kitchen Aerator | 1,579 | 0 | 1,579 |
| Number of Bathroom Aerator | 1,579 | 0 | 1,579 |
| Number of Shower Heads | 1,579 | 0 | 1,579 |
| Number of 9.0-watt LEDs | 3,158 | 23,956 | 27,114 |
| Number 7-Plug APS - Tier 1 | 0 | 5,989 | 5,989 |
| Number of Total Measures Distributed | 7,895 | 29,945 | 37,840 |

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

**Figure 2-1. Number of Measures Distributed by Type**




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

## 3. Program Savings Detail

Table 3-1 summarizes the incremental energy and demand savings the Middle School Kits Program achieved in CY2018. ComEd did not claim any gas savings in CY2018. The ex ante and verified savings in Table 3-1 also include carryover savings from PY9 as a separate line item.

NTC calculated gross natural gas savings for the program, but this was done in error. Measures distributed in the electric kits (aerators, showerheads, and LEDs) should not be expected to generate natural gas savings since they were distributed only to participants who indicated they have an electric water heater. Participants who indicated they have a natural gas water heater did not receive any natural gas saving measures and received only LED lamps and an advanced power strip (APS).

**Table 3-1. CY2018 Total Annual Incremental Electric Savings**

| Savings Category | Energy Savings (kWh) | Demand Savings (kW)† | Summer Peak Demand Savings (kW) |
|---|---|---|---|
| **Electricity** | | | |
| Ex Ante Gross Savings | 1,367,995 | NR | 186 |
| Program Gross Realization Rate | 1.00 | NA | 0.96 |
| Verified Gross Savings | 1,368,039 | 4,279 | 179 |
| Program Net-to-Gross (NTG) Ratio | 1.00 | 1.00 | 1.00 |
| PY9 Verified Net Carryover Savings | 115,098 | 158 | 11 |
| Total Verified Net Savings Including Carryover | 1,483,137 | 4,437 | 190 |
| **Converted from Gas*‡** | | | |
| Ex Ante Gross Savings | NA | NA | NA |
| Program Gross Realization Rate | NA | NA | NA |
| Verified Gross Savings | NA | NA | NA |
| Program Net-to-Gross (NTG) Ratio | NA | NA | NA |
| Verified Net Savings | NA | NA | NA |
| **Total Electric Plus Gas** | | | |
| Ex Ante Gross Savings | 1,367,995 | NR | 186 |
| Program Gross Realization Rate | 1.00 | NA | 0.96 |
| Verified Gross Savings | 1,368,039 | 4,279 | 179 |
| Program Net-to-Gross (NTG) Ratio | 1.00 | 1.00 | 1.00 |
| PY9 Verified Net Carryover Savings | 115,098 | 158 | 11 |
| Total Verified Net Savings Including Carryover | 1,483,137 | 4,437 | 190 |

Note: NR = Not Reported by ComED
* Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).
† Gross demand savings were not reported (NR) by the implementation contractor. Realization rates for NR savings are not applicable (NA).
‡ Gas savings were not claimed by ComEd, and are not applicable (NA) for this program.
Note: The coincident Summer Peak period is defined as 1:00-5:00 PM Central Prevailing Time on non-holiday weekdays, June through August. The demand savings are defined as difference in kW in the baseline and post installation period for the measures installed in year 2018.
*Source: ComEd tracking data and Navigant team analysis.*

## 4. Cumulative Persisting Annual Savings

The measure-specific and total verified gross savings for the Middle School Kits Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following tables and figure. The CY2018 total CPAS across all measures is 1,483,137 kWh. ComEd did not claim any converted gas savings for the Middle School Kits Program in CY2018.

The Navigant team's evaluated savings are nearly identical to those used in the ex ante analysis. The implementation contractor (IC) adopted the recommendations presented by the Navigant team within the Wave 1 interim results memo[1] and there were no significant changes to savings parameters between the Wave 1 analysis and the final report. The savings for this program were verified using Illinois Technical Reference Manual (TRM) v6.0.

[1] ComEd NTC Middle School Kits CY2018 Data Review Memo. December 13, 2018.

The ex ante savings did not include an estimate for carryover savings from light bulbs distributed in PY9 but were installed in CY2018. The Navigant team included an estimate for PY9 carryover into CY2018 in the CPAS.

The evaluation team applied the Energy Independence and Security Act (EISA) baseline for LED lamps starting in 2021. The EISA baseline shift only applies to LED omnidirectional bulbs. Beginning in 2021, the LED baseline shifts from 43 watts to 20 watts for LED lamps included in the kits.

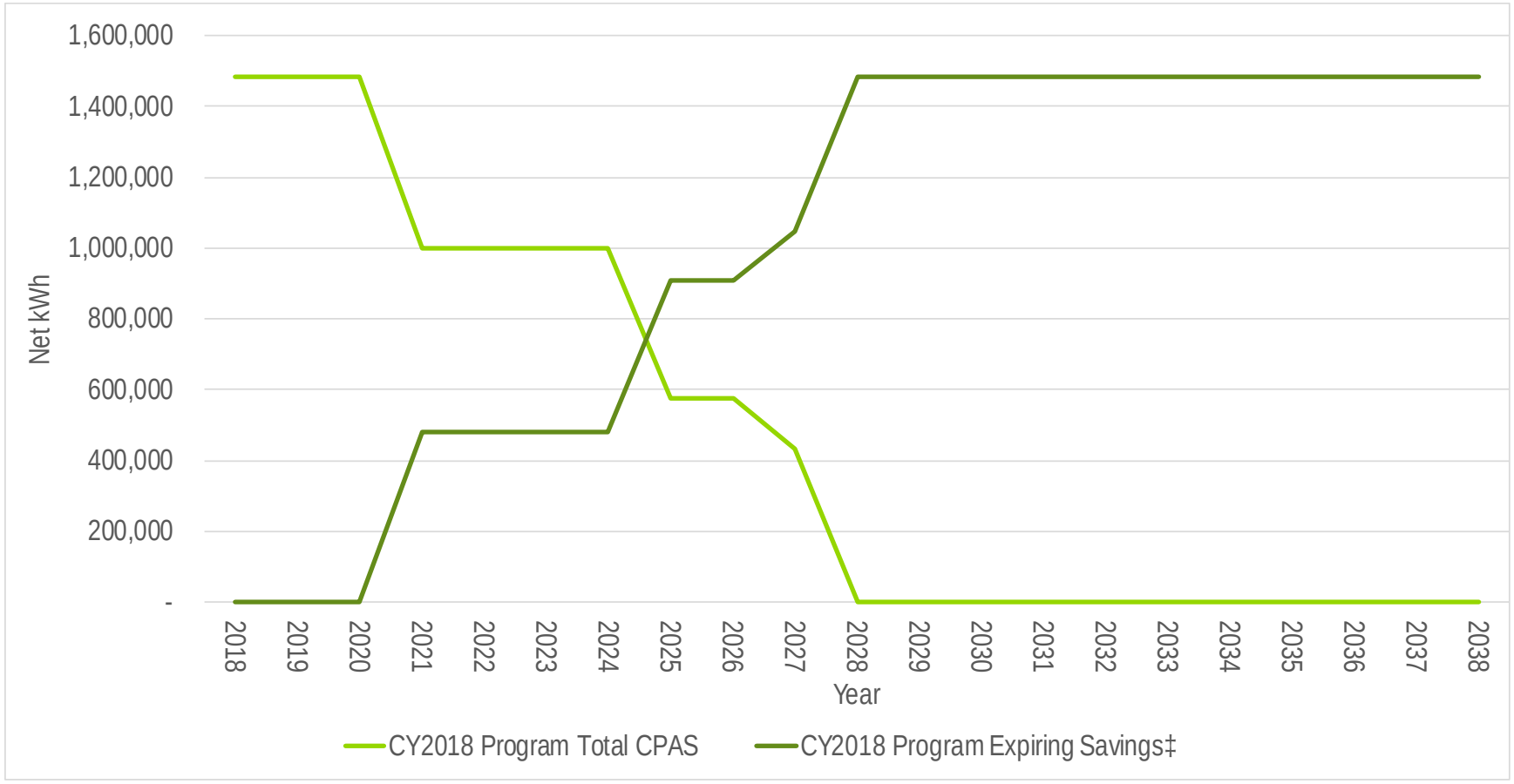
## Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric

| End Use Type | Research Category | EUL | CY2018 Verified Gross Savings | NTG* | Lifetime Net Savings† | Verified Net kWh Savings 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hot Water | Kitchen Aerator (1.5 GPM) | 9.0 | 122,638 | 1.00 | 1,103,745 | 122,638 | 122,638 | 122,638 | 122,638 | 122,638 | 122,638 | 122,638 | 122,638 | 122,638 |
| Hot Water | Bathroom Aerator (1.0 GPM) | 9.0 | 18,852 | 1.00 | 169,665 | 18,852 | 18,852 | 18,852 | 18,852 | 18,852 | 18,852 | 18,852 | 18,852 | 18,852 |
| Hot Water | Low-flow Showerhead (1.5 GPM) | 10.0 | 258,044 | 1.00 | 2,580,444 | 258,044 | 258,044 | 258,044 | 258,044 | 258,044 | 258,044 | 258,044 | 258,044 | 258,044 |
| Lighting | 9.0 watt LED - Electric Kit | 10.0 | 63,228 | 1.00 | 332,879 | 63,228 | 63,228 | 63,228 | 20,456 | 20,456 | 20,456 | 20,456 | 20,456 | 20,456 |
| Lighting | 9.0 watt LED - Gas Kit | 10.0 | 479,638 | 1.00 | 2,525,155 | 479,638 | 479,638 | 479,638 | 155,177 | 155,177 | 155,177 | 155,177 | 155,177 | 155,177 |
| Consumer Electronics | 7-plug Advanced Power Strip – Tier 1 | 7.0 | 425,638 | 1.00 | 2,979,468 | 425,638 | 425,638 | 425,638 | 425,638 | 425,638 | 425,638 | 425,638 | | |
| Carryover | PY9 Carryover | 3.0 | 115,098 | 1.00 | 345,294 | 115,098 | 115,098 | 115,098 | | | | | | |
| CY2018 Program Total Electric CPAS | | | 1,483,137 | | 10,036,649 | 1,483,137 | 1,483,137 | 1,483,137 | 1,000,806 | 1,000,806 | 1,000,806 | 1,000,806 | 575,168 | 575,168 |
| CY2018 Program Expiring Electric Savings‡ | | | | | | | | | 482,331 | 482,331 | 482,331 | 482,331 | 907,970 | 907,970 |

| End Use Type | Research Category | 2027 | 2028 | 2029 | 2030 | 2031 | 2032 | 2033 | 2034 | 2035 | 2036 | 2037 | 2038 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hot Water | Kitchen Aerator (1.5 GPM) | | | | | | | | | | | | |
| Hot Water | Bathroom Aerator (1.0 GPM) | | | | | | | | | | | | |
| Hot Water | Low-flow Showerhead (1.5 GPM) | 258,044 | | | | | | | | | | | |
| Lighting | 9.0 watt LED - Electric Kit | 20,456 | | | | | | | | | | | |
| Lighting | 9.0 watt LED - Gas Kit | 155,177 | | | | | | | | | | | |
| Consumer Electronics | 7-plug Advanced Power Strip – Tier 1 | | | | | | | | | | | | |
| Carryover | PY9 Carryover | | | | | | | | | | | | |
| CY2018 Program Total Electric CPAS | | 433,678 | | | | | | | | | | | |
| CY2018 Program Expiring Electric Savings‡ | | 1,049,460 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 | 1,483,137 |

Note: The green highlighted cell shows program total first year electric savings.
* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.
† Lifetime savings are the sum of CPAS savings through the EUL.
‡ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.
*Source: Navigant analysis*

**Figure 4-1. Cumulative Persisting Annual Savings**




‡ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.

*Source: Navigant analysis*

## 5. PROGRAM SAVINGS BY MEASURE

The Navigant team's analysis of the ComEd CY2018 Middle School Kits Program resulted in a verified gross energy and peak demand savings of 1,483,137 kWh and 190 kW, respectively. The verified gross realization rates for energy and peak demand savings were 108% and 103%, respectively. Verified net energy and peak demand savings were 1,483,137 kWh and 190 kW, respectively, which exceeded the original CY2018 net energy savings target of 1,267,000 kWh[2]. The verified savings detailed in this section include PY9 Carryover savings.

The program includes 5 measures as shown in the following tables. The LED lamps and 7-Plug APS contributed the most savings at 40% and 31%, respectively. A summary of the program savings by measure is shown in the following tables. NTC did not calculate demand savings so Table 5-2 shows that ex ante values were not reported (NR) for demand, and the realization rate was not applicable (NA).

Realization rate differences for energy and peak demand savings at the measure level are entirely due to rounding differences. For example, the demand savings for LEDs reported in the ex ante analysis is 0.002 kW per lamp, while the evaluation used 0.0017 kW per lamp, consistent with the Wave 1 memo analysis.

**Table 5-1. CY2018 Energy Savings by Measure – Electric**

| End Use Type | Research Category | Ex Ante Gross Savings (kWh) | Verified Gross Realization Rate | Verified Gross Savings (kWh) | NTG * | Verified Net Savings (kWh) | Effective Useful Life |
|---|---|---|---|---|---|---|---|
| Hot Water | Kitchen Aerator (1.5 GPM) | 122,641 | 1.00 | 122,638 | 1.00 | 122,638 | 9.0 |
| Hot Water | Bathroom Aerator (1.0 GPM) | 18,853 | 1.00 | 18,852 | 1.00 | 18,852 | 9.0 |
| Hot Water | Low-flow Showerhead (1.5 GPM) | 258,040 | 1.00 | 258,044 | 1.00 | 258,044 | 10.0 |
| Lighting | 9.0 watt LED - Electric Kit | 63,223 | 1.00 | 63,228 | 1.00 | 63,228 | 10.0 |
| Lighting | 9.0 watt LED - Gas Kit | 479,599 | 1.00 | 479,638 | 1.00 | 479,638 | 10.0 |
| Consumer Electronics | 7-plug Advanced Power Strip – Tier 1 | 425,638 | 1.00 | 425,638 | 1.00 | 425,638 | 7.0 |
| Carryover | PY9 Carryover | NR | NA | 115,098 | 1.00 | 115,098 | 3.0 |
| | Total | 1,367,995 | 1.08 | 1,483,137 | 1.00 | 1,483,137 | |

Note: NR = Not Reported by ComEd
* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.
*Source: ComEd tracking data and Navigant team analysis.*

[2] ComEd 2018 – 2021 Energy Efficiency and Demand Response Plan. June 30, 2017.

**Table 5-2. CY2018 Demand Savings by Measure**

| End Use Type | Research Category | Ex Ante Gross Demand Reduction (kW)† | Verified Gross Realization Rate‡ | Verified Gross Demand Reduction (kW) | NTG * | Verified Net Demand Reduction (kW) |
|---|---|---|---|---|---|---|
| Hot Water | Kitchen Aerator (1.5 GPM) | NR | NA | 1,387 | 1.00 | 1,387 |
| Hot Water | Bathroom Aerator (1.0 GPM) | NR | NA | 1,133 | 1.00 | 1,133 |
| Hot Water | Low-flow Showerhead (1.5 GPM) | NR | NA | 1,032 | 1.00 | 1,032 |
| Lighting | 9.0 watt LED - Electric Kit | NR | NA | 78 | 1.00 | 78 |
| Lighting | 9.0 watt LED - Gas Kit | NR | NA | 590 | 1.00 | 590 |
| Consumer Electronics | 7-plug Advanced Power Strip – Tier 1 | NR | NA | 60 | 1.00 | 60 |
| Carryover | PY9 Carryover | NR | NA | 158 | 1.00 | 158 |
| | Total | NR | NA | 4,437 | 1.00 | 4,437 |

Note: NR = Not Reported by ComEd
* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.
† Gross demand savings were not reported (NR) by the implementation contractor.
‡ Realization rates for NR savings are not applicable (NA).
*Source: ComEd tracking data and Navigant team analysis.*

**Table 5-3. CY2018 Summer Peak Demand Savings by Measure**

| End Use Type | Research Category | Ex Ante Gross Peak Demand Reduction (kW) | Verified Gross Realization Rate | Verified Gross Peak Demand Reduction (kW) | NTG* | Verified Net Peak Demand Reduction (kW) |
|---|---|---|---|---|---|---|
| Hot Water | Kitchen Aerator (1.5 GPM) | 30 | 1.02 | 31 | 1.00 | 31 |
| Hot Water | Bathroom Aerator (1.0 GPM) | 25 | 0.99 | 25 | 1.00 | 25 |
| Hot Water | Low-flow Showerhead (1.5 GPM) | 28 | 1.01 | 29 | 1.00 | 29 |
| Lighting | 9.0 watt LED - Electric Kit | 6 | 0.87 | 6 | 1.00 | 6 |
| Lighting | 9.0 watt LED - Gas Kit | 48 | 0.87 | 42 | 1.00 | 42 |
| Consumer Electronics | 7-plug Advanced Power Strip – Tier 1 | 48 | 1.00 | 48 | 1.00 | 48 |
| Carryover | PY9 Carryover | NR | NA | 11 | 1.00 | 11 |
| | Total | 186 | 1.03 | 190 | 1.00 | 190 |

Note: NR = Not Reported by ComED
* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.
*Source: ComEd tracking data and Navigant team analysis.*

# 6. Impact Analysis Findings and Recommendations

## 6.1 Impact Parameter Estimates

The Navigant team calculated verified gross energy and demand savings using the algorithms in the Illinois Technical Reference Manual (IL TRM), version 6.0 and IL TRM version 6.0 Errata. The input parameters used in the calculations were also taken from the appropriate measure section in the TRM, or from ComEd specific data. A summary of the custom versus deemed parameters used is shown in the following table.

**Table 6-1. Savings Parameters**

| Measure | Custom Input Parameters | Deemed Input Parameters | Deemed* Input Data Source |
|---|---|---|---|
| Kitchen Aerators | %SF, % MF, %ElectricDHW | Household, ISR, %SF, %MF, Hours, GPM_base, GPM_low, L_base, L_low, KFPH, EPG_electric, CF, NTG† | IL TRM v6.0 – Section 5.4.4 |
| Bathroom Aerator | %SF, % MF, %ElectricDHW | Household, ISR, Hours, GPM_base, GPM_low, L_base, L_low, KFPH, EPG_electric, CF, NTG† | IL TRM v6.0 – Section 5.4.4 |
| Low-flow Showerhead | %SF, % MF, %ElectricDHW | Household, ISR, Hours, GPM_base, GPM_low, L_base, L_low, days/yr, SPCD, SPH, EPG, CF, NTG† | IL TRM v6.0 – Section 5.4.5 |
| 9W LEDs | WattsEE, %SF, %MF | ISR, Wattbase, Hours, WHFe, WHFd, CF, Leakage, NTG† | IL TRM v6.0 – Section 5.5.8 and IL TRM v6.0 Errata |
| 7-Plus APS – Tier 1 | NA | kWh, ISR, Hours, CF | IL TRM v6.0 – Section 5.2.1 |

* State of Illinois Technical Reference Manual version 6.0 from http://www.ilsag.info/technical-reference-manual.html.
† A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html.

The evaluation used three custom inputs in the CY2018 verified savings calculations. The first custom input was the wattage of the LED bulbs distributed in the kits (9.0 watts). The second was the percent of customers who have electric hot water heaters. All customers who received an electric kit indicated they have an electric hot water heater, so the Navigant team used a custom input of 1.0 for the *%ElectricDHW* variable. The third custom input across all the measures in the program was the split between single family and multifamily homes (67% and 33%, respectively). The evaluation team calculated the split for the ex post analysis using a weighted average based on the ComEd Elementary Energy Education (EEE) kits student survey responses and verified savings from the three previous program years (PY7 through PY9). Equation 1 and Equation 2 show the formulas, and Table 6-2 shows the input parameters used in the weighted average calculation.

**Equation 1. Weighted Average %SF**

$$\%SF_{WA} = \sum_{PY7,PY8,PY9} (\%SF_i * \%Energy_i)$$

**Equation 2. Weighted Average %MF**

$$\%MF_{WA} = 1 - \%SF_{WA}$$

Where:
$\%SF_{WA} = Weighted\ average\ percent\ SF$
$\%SF_i = Percent\ single\ family\ in\ year\ i, from$ Table 6-2
$\%Energy_i = Percent\ of\ energy\ savings\ in\ year\ i, from$ Table 6-2
$\%MF_{WA} = Weighted\ average\ percent\ MF$

**Table 6-2. Single Family - Multifamily Split Summary**

| Program Year | Percent Single Family | Percent Multifamily | Ex Ante Gross Savings | Percent Energy Savings |
|---|---|---|---|---|
| PY7 | 73% | 27% | 1,944,113 | 20% |
| PY8 | 71% | 29% | 1,790,600 | 18% |
| PY9 | 64% | 36% | 6,079,289 | 62% |
| Weighted Average | 67% | 33% | | |

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

## 6.2 CY2019 Carryover Estimate

Calculation of the Calendar Year 2019 (CY2019) carryover estimate relies upon the IL TRM v6.0, IL TRM v7.0, and the PY9 and CY2018 reports. At this time all of these data sources are available and thus it is possible to estimate the gross and net carryover energy savings that the evaluation team recommends for CY2019. The energy and demand savings from these PY9 and CY2018 late installed bulbs are calculated based on the following parameters:

- Delta Watts – Verified savings estimate from the year of installation (source: IL TRM v7.0, CY2018 program data).
- HOU and Peak CF – Verified savings estimate from the year of installation (source: IL TRM v7.0).
- Energy and Demand IE – Verified savings estimate from the year of installation (source: IL TRM v7.0.)
- Installation Rate - Verified savings estimate from the year of purchase (source: IL TRM v6.0). The Navigant team used the installation rates for each year for Direct Mail Kits specified in IL TRM v6.0.
- NTGR – Evaluation research from the year of purchase (source: PY9 and CY2018 Reports).

Table 6-3 shows that in CY2019, 7,911 bulbs, purchased during either PY9 or CY2018 are expected to be installed within ComEd service territory. The table provides both the gross and net energy and demand savings from these bulbs. The total net energy savings is estimated to be 289,604 kWh and 19.65 summer peak kW, which will be counted in CY2019 as Middle School Take Home Kits program carryover savings.

**Table 6-3. CY2019 Verified Savings Carryover Estimate**

| CY2019 Verified Savings Carryover Estimate | PY9 Bulbs | CY2018 Bulbs | CY2019 Carryover |
|---|---|---|---|
| Carryover Bulbs Installed During CY2019 | 4,115 | 3,796 | 7,911 |
| Average Delta Watts | 30.0 | 34.0 | 31.9 |
| Average Installation Rate | 1.00 | 1.00 | 1.00 |
| Average Annual Hours of Use | 1,089 | 1,089 | 1,089 |
| Energy Interactive Effects | 1.05 | 1.05 | 1.05 |
| Demand Interactive Effects | 1.10 | 1.10 | 1.10 |
| Summer Peak Load Coicidence Factor | 0.07 | 0.07 | 0.07 |
| Carryover Gross Energy Savings (kWh) | 141,549 | 148,055 | 289,604 |
| Carryover Gross Demand Savings (kW) | 135.26 | 141.56 | 276.82 |
| Carryover Gross Summer Peak Demand Savings (kW) | 9.60 | 10.05 | 19.65 |
| Net-to-Gross Ratio | 1.00 | 1.00 | 1.00 |
| Carryover Net Energy Savings (kWh) | 141,549 | 148,055 | 289,604 |
| Carryover Net Demand Savings (kW) | 135.26 | 141.56 | 276.82 |
| Carryover Net Summer Peak Demand Savings (kW) | 9.60 | 10.05 | 19.65 |
| Effective Useful Life | 2.0 | 9.0 | 5.4 |

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

## 6.3 Other Impact Findings and Recommendations

The evaluation team has developed several recommendations based on findings from the CY2018 evaluation, as follows:

**Finding 1.** The ex ante savings claimed for the Middle School Take Home Kits Program did not include carryover savings from PY9.

**Recommendation 1.** The evaluation team recommends tracking carryover savings on an ongoing basis and including carryover savings estimates in the ex ante energy and demand savings.

**Finding 2.** The IC used the appropriate weighted average single family and multifamily split for the household characteristics parameters in the hot water measure savings calculations. The Navigant team recommended a 67% Single Family 33% multifamily split in the wave 1 memo.

**Finding 3.** The IC used the appropriate weighted average single family and multifamily split for the *WHFe* and *WHFd* input parameters for the 9W LED lamp measure.

**Finding 4.** The IC used the appropriate in-service rate (ISR) of 0.66 and *Watts_base* (43 watts) from IL TRM v6.0 in the calculation of LED energy and peak demand savings.

**Finding 5.** The IC used the correct algorithms and input parameters from the IL TRM v6.0 to determine the peak demand savings for all measures included in the kits.

**Recommendation 2.** The Navigant team recommends that the ex ante savings continue to use the weighted average single family and multifamily split, ISR, Watts_base and peak demand algorithms and input parameters from the IL TRM, absent any program changes.

**Finding 6.** The IC did not calculate demand savings (non-peak) for any of the measures included in the kits.

**Recommendation 3.** The Navigant team recommends the IC determine demand savings utilizing the algorithms and input parameters from the IL TRM. Non-peak demand savings are calculated using the same formulas but exclude the *CF* variable from the equations.

## 7. Appendix 1. Impact Analysis Methodology

The evaluation team utilized the appropriate input parameters and equations found in the IL TRM v6.0. The evaluation team used the deemed input parameters from all measures except for three variables; WattsEE, %SF, and %MF. A detailed summary of the input parameters used by the evaluation team and the IC is found in Appendix 2.

## 8. Appendix 2. Impact Analysis Detail

The tables below show the inputs and assumptions that were used by the evaluation team and the implementation contractor in the ex ante and the verified calculations for each measure.

**Table 8-1. Kitchen Aerator – Custom and Deemed Values Comparison**

| Navigant Value | ComEd Value | Variable | Source | Deemed/ Custom |
|---|---|---|---|---|
| 1.00 | 1.00 | %ElectricDHW | Actual | 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 |
| 4.50 | 4.50 | L_base | IL TRM 5.4.4 | Deemed |
| 4.50 | 4.50 | L_low | IL TRM 5.4.4 | Deemed |
| 365.25 | 365.25 | days/year | IL TRM 5.4.4 | Deemed |
| 2.56 | 2.56 | Household SF | IL TRM 5.4.4 | Deemed |
| 2.10 | 2.10 | Household MF | IL TRM 5.4.4 | Deemed |
| 0.75 | 0.75 | DF | IL TRM 5.4.4 | Deemed |
| 1.00 | 1.00 | KFPH | IL TRM 5.4.4 | Deemed |
| 0.10 | 0.10 | EPG_electric | IL TRM 5.4.4 | Deemed |
| 0.60 | 0.60 | ISR | IL TRM 5.4.4 | Deemed |
| 0.67 | 0.67 | %SF | EEE Kit Survey Data | Custom |
| 0.33 | 0.33 | %MF | EEE Kit Survey Data | Custom |
| 94.00 | 94.00 | Hours - SF | IL TRM 5.4.4 | Deemed |
| 77.00 | 77.00 | House - MF | IL TRM 5.4.4 | Deemed |
| 0.02 | 0.02 | CF | IL TRM 5.4.4 | Deemed |

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

**Table 8-2. Bathroom Aerator – Custom and Deemed Values Comparison**

| Navigant Value | ComEd Value | Variable | Source | Deemed/ Custom |
|---|---|---|---|---|
| 1.00 | 1.00 | %ElectricDHW | Actual | 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 |
| 1.60 | 1.60 | L_base | IL TRM 5.4.4 | Deemed |
| 1.60 | 1.60 | L_low | IL TRM 5.4.4 | Deemed |
| 365.25 | 365.25 | days/year | IL TRM 5.4.4 | Deemed |
| 2.00 | 2.00 | Household SF | IL TRM 5.4.4 | Deemed |
| 2.56 | 2.56 | Household MF | IL TRM 5.4.4 | Deemed |
| 2.10 | 2.10 | DF | IL TRM 5.4.4 | Deemed |
| 2.83 | 2.83 | BFPH - SF | IL TRM 5.4.4 | Deemed |
| 1.50 | 1.50 | BFPH - MF | IL TRM 5.4.4 | Deemed |
| 0.08 | 0.08 | EPG_electric | IL TRM 5.4.4 | Deemed |
| 0.63 | 0.63 | ISR | IL TRM 5.4.4 | Deemed |
| 0.67 | 0.67 | %SF | EEE Kit Survey Data | Custom |
| 0.33 | 0.33 | %MF | EEE Kit Survey Data | Custom |
| 14.00 | 14.00 | Hours - SF | IL TRM 5.4.4 | Deemed |
| 22.00 | 22.00 | Hours - MF | IL TRM 5.4.4 | Deemed |
| 0.02 | 0.02 | CF | IL TRM 5.4.4 | Deemed |

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

**Table 8-3. Showerhead – Custom and Deemed Values Comparison**

| Navigant Value | ComEd Value | Variable | Source | Deemed/ Custom |
|---|---|---|---|---|
| 1.00 | 1.00 | %ElectricDHW | IL TRM 5.4.5 | Actual |
| 2.35 | 2.35 | GPM_base | IL TRM 5.4.5 | Deemed |
| 1.50 | 1.50 | GPM_low | IL TRM 5.4.5 | Deemed |
| 7.80 | 7.80 | L_base | IL TRM 5.4.5 | Deemed |
| 7.80 | 7.80 | L_low | IL TRM 5.4.5 | Deemed |
| 365.25 | 365.25 | days/year | IL TRM 5.4.5 | Deemed |
| 2.56 | 2.56 | Household SF | IL TRM 5.4.5 | Deemed |
| 2.10 | 2.10 | Household MF | IL TRM 5.4.5 | Deemed |
| 0.60 | 0.60 | 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 |
| 0.12 | 0.12 | EPG_electric | IL TRM 5.4.5 | Deemed |
| 0.65 | 0.65 | ISR | IL TRM 5.4.5 | Deemed |
| 0.67 | 0.67 | %SF | EEE Kit Survey Data | Custom |
| 0.33 | 0.33 | %MF | EEE Kit Survey Data | Custom |
| 266.00 | 266.00 | Hours - SF | IL TRM 5.4.5 | Deemed |
| 218.00 | 218.00 | Hours - MF | IL TRM 5.4.5 | Deemed |
| 0.03 | 0.03 | CF | IL TRM 5.4.5 | Deemed |

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

**Table 8-4. LED Bulbs – Custom and Deemed Values Comparison**

| Navigant Value | ComEd Value | Variable | Source | Deemed/ Custom |
|---|---|---|---|---|
| 43.00 | 43.00 | WattsBase | IL TRM 5.5.8 | Actual (use table in IL TRM 5.5.8 |
| 9.00 | 9.00 | WattsEE | Specifications | Custom |
| 847.00 | 847.00 | Hours | IL TRM 5.5.8 | Deemed |
| 1.06 | 1.06 | WHFe - SF | IL TRM 5.5.9 | Deemed |
| 1.04 | 1.04 | WHFe - MF | IL TRM 5.5.10 | Deemed |
| 0.00 | 0.00 | Leakage | IL TRM 5.5.11 | Deemed |
| 0.66 | 0.66 | ISR | IL TRM 5.5.11 | Deemed |
| 0.67 | 0.67 | %SF | EEE Kit Survey Data | Custom |
| 0.33 | 0.33 | %MF | EEE Kit Survey Data | Custom |
| 1.11 | 1.11 | WHFd - SF | IL TRM 5.5.11 | Deemed |
| 1.07 | 1.07 | WHFd - MF | IL TRM 5.5.11 | Deemed |
| 0.07 | 0.07 | CF | IL TRM 5.5.11 | Deemed |

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

**Table 8-5. 7-Plug APS– Custom and Deemed Values Comparison**

| Navigant Value | ComEd Value | Variable | Source | Deemed/ Custom |
|---|---|---|---|---|
| 103.00 | 103.00 | kWh | IL TRM 5.2.1 | Deemed |
| 0.69 | 0.69 | ISR | IL TRM 5.2.1 | Deemed |
| 7129 | 7129 | Hours | IL TRM 5.2.1 | Deemed |
| 0.80 | 0.80 | CF | IL TRM 5.2.1 | Deemed |

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

# 9. Appendix 3. Total Resource Cost Detail

Table 9-1, below, shows the Total Resource Cost (TRC) table. It includes only the cost-effectiveness analysis inputs available at the time of finalizing this impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to evaluation later.

### Table 9-1. Total Resource Cost Savings Summary

| End Use Type | Research Category | Units | Quantity | Effective Useful Life | Verified Gross Savings (kWh) | Verified Gross Peak Demand Reduction (kW) | Gross Heating Penalty (Therms) | NTG | Verified Net Savings (kWh) | Verified Net Peak Demand Reduction (kW) | Net Heating Penalty (Therms) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Hot Water | Kitchen Aerator (1.5 GPM) | Each | 1,579 | 9.0 | 122,638 | 31 | 0 | 1.00 | 122,638 | 31 | 0 |
| Hot Water | Bathroom Aerator (1.0 GPM) | Each | 1,579 | 9.0 | 18,852 | 25 | 0 | 1.00 | 18,852 | 25 | 0 |
| Hot Water | Low-flow Showerhead (1.5 GPM) | Each | 1,579 | 10.0 | 258,044 | 29 | 0 | 1.00 | 258,044 | 29 | 0 |
| Lighting | 9.0 watt LED - Electric Kit | Lamp | 3,158 | 10.0* | 63,228 | 6 | (1,434) | 1.00 | 63,228 | 6 | (1,434) |
| Lighting | 9.0 watt LED - Gas Kit | Lamp | 23,956 | 10.0* | 479,638 | 42 | (10,875) | 1.00 | 479,638 | 42 | (10,875) |
| Consumer Electronics | 7-plug Advanced Power Strip – Tier 1 | Each | 5,989 | 7.0 | 425,638 | 48 | 0 | 1.00 | 425,638 | 48 | 0 |
| Carryover | PY9 Carryover | | | 3.0 | 115,098 | 11 | (2,611) | 1.00 | 115,098 | 11 | (2,611) |

Note: NR = Not Reported by ComEd.
* The CY2018 contribution to CPAS for these measures varies over time. See the CPAS tables in Section 4.
*Source: ComEd tracking data and Navigant team analysis.*