



# **MULTI-FAMILY ENERGY SAVINGS PROGRAM**

**FINAL**

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

**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 PY7 Multi-Family Energy Savings Program (Multi-Family or MESP). The Multi-Family Program is jointly implemented by Commonwealth Edison Company (ComEd) and Nicor Gas Company, and ComEd and Peoples Gas (PGL) and North Shore Gas (NSG) companies. The evaluation program year is electric program year 7 (EPY7 or simply PY7 in this report) and gas program year 4 (GPY4).<sup>1</sup> This evaluation report includes total ComEd electric savings impact from all of the jointly implemented programs.

The ComEd Multi-Family Program was redesigned in PY7 and no longer includes common area business account projects. Common area measures have been moved to the Smart Ideas for Your Business (SIFYB) program.<sup>2</sup> The PY7 program measures included tenant space direct install measures such as water efficiency aerators and showerheads, programmable thermostats, pipe insulation and lighting measures. The ComEd and Nicor Gas joint program is implemented by CLEAResult, and the ComEd, PGL and NSG program is implemented by Franklin Energy Services, LLC (Franklin Energy).

### E.1 Program Savings

Table E-1 summarizes the electricity savings from the Multi-Family Program. The program achieved verified net energy savings of 3,963 megawatt-hours (MWh), verified net demand reduction of 5.84 megawatts (MW) and verified net summer coincidence peak demand reduction of 0.44 MW.

**Table E-1. PY7 Total Program Electric Savings**

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	4,032	6.02	0.45
Verified Gross Savings	4,065	6.02	0.45
Verified Net Savings	3,963	5.84	0.44

*Source: ComEd tracking data and Navigant team analysis. MW values are rounded to 2 digits.*

Table E-2 summarizes the breakdown of the electricity savings by utility. The ComEd, PGL and NSG joint program achieved verified net energy savings of 3,134 MWh, verified net demand reduction of 3.93 MW and verified net summer coincidence peak demand reduction of 0.34 MW. The ComEd and Nicor Gas joint program achieved verified net energy savings of 829 MWh, verified net demand reduction of 1.91 MW and verified net summer coincidence peak demand reduction of 0.09 MW.

<sup>1</sup> The EPY7/GPY4 program year began June 1, 2014, and ended May 31, 2015.

<sup>2</sup> Multi-family common area measures installed in PY7 were evaluated by Navigant under a separate ComEd Smart Ideas For Your Business program.

**Table E-2. PY7 Total Program Electric Savings by Utility**

Utility Savings	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)*
<b>Savings from ComEd/PGL/NSG</b>			
Ex Ante Gross Savings	3,183	4.03	0.35
Verified Gross Savings	3,204	4.03	0.35
Verified Net Savings	3,134	3.93	0.34
<b>Savings from ComEd/Nicor Gas</b>			
Ex Ante Gross Savings	848	1.99	0.10
Verified Gross Savings	861	1.99	0.10
Verified Net Savings	829	1.91	0.09
<b>ComEd PY7 Program Total</b>			
Ex Ante Gross Savings	4,032	6.02	0.45
Verified Gross Savings	4,065	6.02	0.45
Verified Net Savings	3,963	5.84	0.44

Source: ComEd tracking data and Navigant team analysis.

\* MW values are rounded to 2 digits.

## E.2 Program Savings by Measure

Table E-3 summarizes the PY7 Multi-Family Program savings by measure.

**Table E-3. PY7 Program Results by Measure**

Measure Category	Ex Ante Gross Savings (MWh)	Verified Gross Savings (MWh)	Verified Gross Demand Reduction (MW)	Verified Gross Peak Demand Reduction (MW)	Verified Gross MWh Realization Rate	NTGR	Verified Net Savings (MWh)	Verified Demand Reduction (MW)	Net Verified Net Peak Demand Reduction (MW)
CFL Lighting	3,509	3,504	3.86	0.39	100%	0.98†	3,434	3.78	0.38
Bathroom Aerators	12	12	0.54	0.01	100%	0.94†	11	0.51	0.01
Kitchen Aerators	46	57	0.73	0.02	122%	1.00†	57	0.73	0.02
Showerheads	221	221	0.89	0.02	100%	0.92†	203	0.82	0.02
Pipe Insulation	31	31	<0.01	<0.01	100%	0.95*	28	<0.01	<0.01
Thermostats	213	241	0.00	0.00	113%	0.95*	229	0.00	0.00
Total	4,032	4,065	6.02	0.45	101%		3,963	5.84	0.44

Source: ComEd tracking data and Navigant team analysis.

† A deemed value. Source: ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx, which is found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

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

The evaluation did not have any additional research on parameters used in impact calculations or for deeming in future versions of the Illinois TRM.

### ***E.4 Program Volumetric Detail***

As shown in the following Table E-4, the Multi-Family Program had 17,887 participants (tenants or projects) in PY7 and distributed 129,250 measures. Lighting measures contributed 95 percent of the measure count and non-lighting measures (including hot water measures such as showerheads, faucet aerators, pipe insulation and thermostats) contributed 5 percent of the measure count. Lighting only projects constituted 77 percent of the projects in PY7, non-lighting only projects were 5 percent. Projects with both lighting and non-lighting measures constituted 18 percent of the project count in PY7.<sup>3</sup>

**Table E-4. PY7 Volumetric Findings Detail**

Participation	Lighting	Non-Lighting	Total
Participants (Tenant Units or Projects)	17,036*	4,066**	17,887***
Direct Install Measures	122,660	6,590	129,250
Average Program Measures/Project	7.2	1.6	7.2

Source: ComEd tracking data and Navigant team analysis.

\* There are 13,821 lighting only projects. The 17,036 projects shown include 3,215 duplicate projects with both lighting and non-lighting measures.

\*\* There are 851 non-lighting only projects. The 4,066 projects shown include 3,215 duplicate projects with both lighting and non-lighting measures.

\*\*\* Overall 17,887 unique projects: excludes 3,215 duplicate projects with both lighting and non-lighting measures.

### ***E.5 Results Summary***

The following table summarizes the key metrics from PY7.

<sup>3</sup> If evaluation assumes that a project with more lighting savings is categorized as lighting project, and vice versa, then the program had 92 percent of the project count from lighting and 8 percent from non-lighting.

**Table E-5. PY7 Results Summary**

	Units	PY7
Net Savings	MWh	3,963
Net Demand Reduction	MW	5.84
Net Peak Demand Reduction	MW	0.44
Gross Savings	MWh	4,065
Gross Demand Reduction	MW	6.02
Gross Peak Demand Reduction	MW	0.45
Program Realization Rate	%	101%
Program NTG Ratio*	#	Lighting=0.98 Bathroom Aerators=0.94 Kitchen Aerators=1.00 Showerheads=0.92 Pipe Insulation=0.95 Thermostats=0.95
Lighting Measures Installed	#	122,660
Non-Lighting Measures Installed	#	6,590
Participants (Tenant Units or Projects)	#	17,887
Customers Touched (Property Accounts)	#	1,191

Source: ComEd tracking data and Navigant team analysis.

\*A deemed value. Source: ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx, which is found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

## E.6. Findings and Recommendations

Key findings and recommendations are included below.

### Verified Gross Impacts and Realization Rate

**Finding 1.** The PY7 Multi-Family Program achieved verified gross energy savings of 4,065 MWh, verified gross demand reduction of 6.02 MW and verified gross summer coincidence peak demand reduction of 0.45 MW. This produced a verified gross realization rate of 101 percent on energy savings and 100 percent on demand savings. The program is accurately tracking gross savings for most measures, with updates recommended for some measures. Using the approved version of the Illinois TRM (v3.0), the evaluation team corrected the savings input assumptions for kitchen aerators, programmable thermostats (including thermostats with gas fan savings), and CFLs with two different per unit savings values in the tracking system.

**Recommendation 1.** Although evaluation adjustments to savings input assumptions were minor, the program implementation contractor (IC) should review the approved or effective version of the Illinois TRM and update the program tracking default unit savings values.



### Peak Demand Reduction

**Finding 2.** The program tracking data included fewer entries of the estimated measure default summer coincidence peak demand savings. The evaluation team estimated coincidence summer peak and non-peak demand savings using the Illinois TRM (v3.0). The evaluation team also estimated winter coincidence peak demand savings for PJM reporting using secondary research (see winter peak demand estimates and discussion in the Appendix 7.2).

### Verified Net Impacts & NTGR

**Finding 3.** The evaluation used deemed net-to-gross (NTG) estimates approved through the Illinois Stakeholder Advisory Group (IL SAG) consensus process to calculate verified net savings for the program. The NTG values were lighting (0.98), water measures (0.92), and programmable thermostat (0.90). The results were verified net savings of 3,963 MWh, verified net demand reduction of 5.84 MW and verified net summer coincidence peak demand reduction of 0.44 MW. The ComEd/PGL/NSG joint program achieved verified net energy savings of 3,134 MWh, verified net demand reduction of 3.93 MW and verified net summer coincidence peak demand reduction of 0.34 MW. The ComEd/Nicor Gas joint program achieved verified net energy savings of 829 MWh, verified net demand reduction of 1.91 MW and verified net summer coincidence peak demand reduction of 0.09 MW. Overall, the PY7 program met 72 percent of its 5,512 MWh energy savings planning estimate through direct installation activities in dwelling units.<sup>4</sup>

### Program Volumetric Findings

**Finding 4.** The PY7 Multi-Family Program had 17,887 participants (dwelling units or projects) and implemented 129,250 direct install measures (including 122,660 CFL bulbs and 6,590 non-lighting measures), which amounts to an average of 7.2 measures installed per project. The lighting measures were close to 95 percent of the measure count and 92 percent of the projects in PY7.<sup>5</sup> Non-lighting measures (including hot water measures and thermostats) contributed 5 percent of the measure count and 8 percent of the projects in PY7. The PY7 program involved approximately 1,191 property accounts. Overall, the PY7 program met 64 percent of planned participation through direct installation activities in dwelling units (planned approximately 28,000 dwelling units).

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<sup>4</sup> ComEd PY678 Residential Program Evolution.pdf (file received from ComEd on 2015-04-02)

<sup>5</sup> If evaluation assumes that a project with more lighting savings is categorized as lighting project, and vice versa, then the program had 92 percent of the project count from lighting and 8 percent from non-lighting. There were actually 77 percent from lighting only projects, 5 percent from non-lighting only projects, and 18 percent of project with both lighting and non-lighting measures.

## 1 Introduction

### 1.1 Program Description

This report presents a summary of the findings and results from the impact and process evaluation of the PY7 Multi-Family Energy Savings Program (Multi-Family or MESP). The program is jointly implemented by Commonwealth Edison Company (ComEd) and Nicor Gas Company, and ComEd and Peoples Gas (PG) and North Shore Gas (NSG) companies. The evaluation program year is electric program year 7 (EPY7 or simply PY7 in this report) and gas program year 4 (GPY4).<sup>6</sup> This evaluation report includes total ComEd electric savings impact from all of the jointly implemented programs.

The ComEd Multi-Family Program was redesigned in PY7 and no longer includes common area business account projects. Common area measures have been moved to the Smart Ideas for Your Business (SIFYB) program.<sup>7</sup> The PY7 program measures included tenant space direct install measures such as water efficiency aerators and showerheads, programmable thermostats, pipe insulations and lighting measures. The evaluation team relied solely on the Illinois Statewide Technical Reference Manual (TRM)<sup>8</sup> for deemed gross savings verification for each program measure. The verified net impact evaluation approach applied the net-to-gross (NTG) ratios deemed through the Illinois State Advisory Group (IL SAG) consensus process.<sup>9</sup> The PY7 ComEd/Nicor Gas joint program was implemented by CLEAResult, and the ComEd/PGL/NSG program was implemented by Franklin Energy Services, LLC (Franklin Energy or FES).

### 1.2 Evaluation Objectives

The evaluation team identified the key researchable questions listed in the following sections.

#### 1.2.1 Impact Questions

1. What are the program's verified gross savings?
2. What are the program's verified net savings?
3. What updates are recommended for the Illinois Technical Reference Manual (TRM)?

#### 1.2.2 Process Questions

The PY7 process evaluation activities for the Multi-Family Program involved interviews with program staff and the implementation contractor staff and review of program materials and tracking system inputs to verify information about marketing and outreach strategies made in PY7 that impacted customer participation and satisfaction.

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<sup>6</sup> The EPY7/GPY4 program year began June 1, 2014, and ended May 31, 2015.

<sup>7</sup> Multi-family common area measures installed in PY7 were evaluated as part of the Small Business Energy Savings (SBES) Program evaluation.

<sup>8</sup> Illinois Statewide Technical Reference Manual for Energy Efficiency Version 3.0, available at: <http://www.ilsag.info/technical-reference-manual.html>

<sup>9</sup> ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx, found on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

## 2 Evaluation Approach

The evaluation team reviewed the program tracking data and performed gross and net impact calculations to inform verified energy and demand savings for PY7. Navigant evaluated the gross savings by (1) reviewing the tracking system, (2) comparing the use of measure algorithms in the tracking database to their use in the Illinois TRM v3.0 to ensure that they are appropriately applied, and (3) cross-checked totals.

### 2.1 Overview of Data Collection Activities

The core data collection activities included review of the program’s tracking data and verification of direct install measures savings against the Illinois TRM v3.0. The full set of data collection activities is shown in the following table.

**Table 2-1. Primary Data Collection Activities**

What	Who	Target Completes PY7	When	Comments
Review Program Tracking Database	Participants	All	June-August 2015	Source of information for verified gross analysis
Review Program Measures in IL TRM	Illinois Statewide Technical Reference Manual for Energy Efficiency Version 3.0	All	June-September 2015	Source of information for verified gross analysis
Program Material Review	Program Documents	All	April- June 2015	
In Depth Interviews	Program Management	2	March-May 2015	Includes interviews with staff from ComEd, Nicor Gas, Franklin Energy

### 2.2 Verified Savings Parameters

#### 2.2.1 Verified Gross Program Savings Analysis Approach

Navigant estimated verified unit savings for each program measure using deemed impact algorithm sources found in the Illinois TRM v3.0. Verified unit savings values reflect evaluation adjustments to ex-ante unit savings values based on Navigant’s measure review. The tracking data for the PY7 Multi-Family Program evaluation came from ComEd’s Frontier tracking system, uploaded on the ComEd SharePoint site for evaluators, and extracted by Navigant on August 9, 2015. Navigant reviewed the program tracking system and procedures to verify that the program accurately reported measure counts. The verified gross savings are the product of verified unit savings values (energy and demand savings) and verified measure quantities.

### 2.2.2 Verified Net Program Savings Analysis Approach

Verified net energy and demand (coincident peak and overall) savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). In PY7, the NTGR estimates used to calculate the net verified savings were based on past evaluation research and deemed through the Illinois Stakeholder Advisory Group (IL SAG) consensus process.

Table 2-2 presents the key parameters and the references used in the verified gross and net savings calculations.

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

Verified Gross and Net Input Parameter	Value	Data Source	Deemed <sup>†</sup> or Evaluated
NTGR – Direct Install CFLs	0.98	IL SAG Spreadsheet†	Deemed
NTGR – Showerhead	0.92	IL SAG Spreadsheet†	Deemed
NTGR – Thermostats*	0.95	IL SAG Spreadsheet†	Deemed
NTGR – Bathroom Aerator	0.94	IL SAG Spreadsheet†	Deemed
NTGR – Kitchen Aerator	1.00	IL SAG Spreadsheet†	Deemed
NTGR – Pipe Insulation	0.95	IL SAG Spreadsheet†	Deemed
Verified Energy Gross Realization Rate**	101%	Program Tracking Data Review	Evaluated
Verified Peak Demand Gross Realization Rate	100%	Program Tracking Data Review	Evaluated
All lighting measures delta watts	Vary	Illinois TRM v3.0, Section 5.5	Deemed
Direct Install CFL In-Service Rate	0.969	Illinois TRM v3.0, Section 5.5.1	Deemed
Showerhead In-Service Rate	0.95	Illinois TRM v3.0, Section 5.4.5	Deemed
Bathroom Faucet Aerator In-Service Rate	0.95	Illinois TRM v3.0, Section 5.4.4	Deemed
Kitchen Faucet Aerator In-Service Rate	0.91	Illinois TRM v3.0, Section 5.4.4	Deemed
Pipe Insulation Inputs	Vary	Illinois TRM v3.0, Sections 5.4.1	Deemed

Source: Navigant analysis of ComEd tracking data

\* Includes direct install programmable and reprogrammed thermostats (include thermostats with gas heat fan savings).

\*\*Note: Gross Realization Rate is 100% for all measures peak and non-peak demand savings

† Source: ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx, which is found on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

### 2.3 Process Evaluation

Process research related to the PY7 evaluation involved interviews with program staff and the implementation contractor staff, and review of program materials and tracking system inputs, and to verify information about marketing and outreach strategies made in PY7 that impacted customer participation and satisfaction. No customer or trade ally research was conducted for the 2015 evaluation.

### 3 Gross Impact Evaluation

The PY7 Multi-Family Program achieved verified gross savings of 4,065 MWh, verified demand reduction of 6.02 MW, and verified peak demand reduction of 0.45 MW. The program’s verified gross realization rate was 101 percent for energy and 100 percent for demand. The high realization rate was due mainly to evaluation adjustments to some input assumptions used to calculate ex-ante measure savings.

#### 3.1 Tracking System Review

Navigant downloaded the final data for the Multi-Family Program impact evaluation on August 9, 2015 from the ComEd evaluation SharePoint site. Navigant reviewed the tracking data to verify the completeness and accuracy of the tracking system data and to identify any issues that would affect the impact evaluation of the program. Navigant verified that the program tracking system was accurately recording measure counts, but some measures need an update of the default unit energy savings input assumptions.

Key findings from the tracking system review include the following:

- i. **Kitchen Aerators:** the ex-ante tracking data unit energy savings was 84.3 kWh. Using the TRM v3.0, Navigant corrected the ex-ante savings input assumptions and used 102.7 kWh as the verified unit energy savings value.
- ii. **Programmable/Reprogrammable Thermostats:** the ex-ante tracking data unit energy savings for was 856.5 kWh. Using the TRM v3.0, Navigant corrected the ex-ante savings input assumptions and used 837.1 kWh as the verified unit energy savings value.
- iii. **Programmable/Reprogrammable Thermostats – Gas Fan Savings:** the ex-ante tracking data estimated energy savings was 26.9 kWh or 29.3 kWh. Evaluation adjustments used 37.3 kWh as the verified unit energy savings value.
- iv. **CFL Lighting:** the ex-ante tracking data unit savings for some CFL bulbs had two values. For example, 14W CFL had 27.41 kWh or 27.94 kWh savings. Evaluation adjustments used 27.41 as the verified unit energy savings value.
- v. **Bathroom aerators and showerheads:** evaluation adjustments verified the ex-ante input assumptions and applied minor adjustments to the significant digits.
- vi. Navigant found that although the tracking system includes sufficient information to track program performance, the tracking system may need additional data or further review. The tracking system does not track program demand reduction. Furthermore, the tracking system appears to have multiple names or descriptions for some type of measures. For example, 23W (100W) CFL IU as versus CFL - 23W – IU description. The 100W baseline description may be confusing because the 23W CFL does not have a 100W baseline but 72W in PY7, according to the Energy Independence and Security Act of 2007 (EISA). The tracking system should include default demand savings calculation and standardized measure descriptions where possible.

### 3.2 Program Volumetric Findings

As shown in Table 3-1, the Multi-Family Program had 17,887 participants (tenants or projects) in PY7 and distributed 129,250 measures. Lighting measures contributed 95 percent of the measure count and non-lighting measures (including hot water measures such as showerheads, faucet aerators, pipe insulation and thermostats) contributed 5 percent of the measure count. Lighting only projects constituted 77 percent of the projects in PY7, non-lighting only projects were 5 percent. Projects with both lighting and non-lighting measures constituted 18 percent of the project count in PY7.<sup>10</sup> The PY7 program included approximately 1,191 property accounts.

**Table 3-1. PY7 Volumetric Findings Detail**

Participation	Lighting	Non-Lighting	Total
Participants (Tenant Units or Projects)	17,036*	4,066**	17,887***
Direct Install Measures	122,660	6,590	129,250
Average Program Measures/Project	7.2	1.6	7.2
Property Accounts			1,191

Source: ComEd tracking data and Navigant team analysis.

\* There are 13,821 lighting only projects. The 17,036 projects shown include 3,215 duplicate projects with both lighting and non-lighting measures.

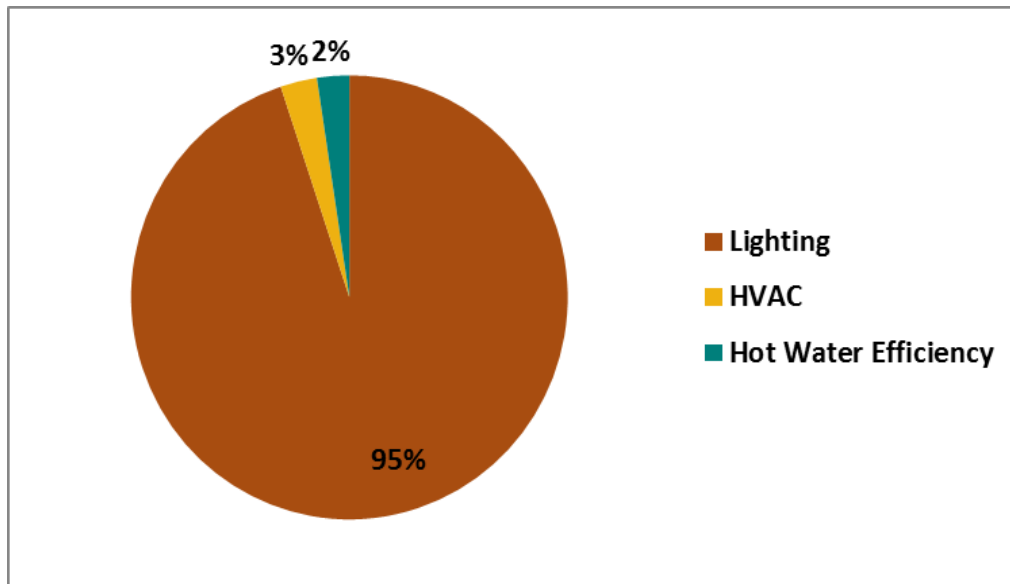
\*\* There are 851 non-lighting only projects. The 4,066 projects shown include 3,215 duplicate projects with both lighting and non-lighting measures.

\*\*\* Overall 17,887 unique projects: excludes 3,215 duplicate projects with both lighting and non-lighting measures.

Figure 3-1 disaggregates the measure mix by end-use type. Overall, lighting measures contributed 95 percent of the measure quantity in PY7, and non-lighting measures (including hot water efficiency measures and thermostats) contributed the remaining 5 percent.

<sup>10</sup> If evaluation assumes that a project with more lighting savings is categorized as lighting project, and vice versa, then the program had 92 percent of the project count from lighting and 8 percent from non-lighting.

**Figure 3-1. Number of Measures Installed by End-use Type**



Source: Navigant analysis of ComEd tracking data

Table 3-2 below provides additional measure details. As indicated above, ex-ante and verified measure counts were the same.

**Table 3-2. PY7 MESP Measure Count**

Measure	Unit	Install Type	Ex-Ante Measure Count	Verified Measure Count
CFL 9W	Each	In-unit	4,223	4,223
CFL 9W (Globe)	Each	In-unit	26,286	26,286
CFL 9W (Candelabra)	Each	In-unit	5,881	5,881
CFL 14W	Each	In-unit	75,200	75,200
CFL 14W (Globe)	Each	In-unit	2,022	2,022
CFL 14W (Flood)	Each	In-unit	1,278	1,278
CFL 19W	Each	In-unit	5,067	5,067
CFL 23W	Each	In-unit	2,703	2,703
Bathroom Aerators	Each	In-unit	473	473
Kitchen Aerators	Each	In-unit	551	551
Showerheads	Each	In-unit	615	615
Pipe Insulation	Each	In-unit	1,437	1,437
Programmable/Reprog. T-Stats	Each	In-unit	138	138
Prog/Reprog. T-Stats - Gas Fan Savings	Each	In-unit	3,376	3,376
<b>Total</b>			<b>129,250</b>	<b>129,250</b>

Source: Navigant analysis of ComEd tracking data

### 3.3 Gross Program Impact Parameter Estimates

As described in Section 2, Navigant estimated verified unit savings for each program measure using impact algorithm sources found in the Illinois TRM v3.0. Table 3-3 presents the key parameters and the references used in the verified gross and net savings calculations (energy and coincident peak demand).

**Table 3-3. PY7 MESP Ex-Ante and Verified Gross Savings Parameters**

Measure	Ex-Ante Gross Savings (kWh/unit)	Verified Gross Savings (kWh/unit)	Verified Gross Savings (kW/unit)	Method*	Source (Illinois TRM v3.0)
CFL 9W	18.91 or 19.27	18.91	0.002	Deemed	
CFL 9W (Globe)	26.46	26.46	0.004	Deemed	
CFL 9W (Candelabra)	41.49	41.49	0.004	Deemed	
CFL 14W	27.41 or 27.94	27.41	0.003	Deemed	
CFL 14W (Globe)	39.26 or 39.36	39.26	0.006	Deemed	Sections 5.5.1 & 5.5.2
CFL 14W (Flood)	43.53	43.48	0.005	Deemed	
CFL 19W	32.14 or 32.76	32.14	0.003	Deemed	
CFL 23W	46.32 or 47.21	46.32	0.005	Deemed	
Bathroom Aerators	25.03	25.03	0.025	Deemed	Sections 5.4.4
Kitchen Aerators	84.30	102.72	0.029	Deemed	
Showerheads	359.70	359.09	0.040	Deemed	Sections 5.4.5
Programmable/Reprogrammed Thermostat (IU)	856.50	837.07	0.000	Deemed	Sections 5.3.11
Reprogrammed Thermostat - Gas Heat Fan Savings (IU)	26.90 or 29.30	37.26	0.000	Deemed	
DHW Pipe Insulation	21.19	21.19	0.002	Deemed	Sections 5.4.1

Source: Navigant analysis of ComEd tracking data

\* Deemed values are from Illinois TRM v3.0, available at <http://www.ilsag.info/technical-reference-manual.html>.

### 3.4 Verified Gross Program Impact Results

The PY7 Multi-Family Program achieved verified gross savings of 4,032 MWh, 6.02 demand reduction and 0.45 MW coincidence peak demand, as shown in Table 3-4. The table presents savings at the measure group level including groups where the estimate is not statistically significant at the 90/10 level. The



program achieved a 101 percent gross realization rate on electricity savings and a 100 percent gross realization rate on demand reduction.<sup>11</sup>

**Table 3-4. PY7 Verified Gross Impact Savings Estimates by Measure Type**

Measure Category	Ex Ante Gross Savings (MWh)	Ex Ante Gross Demand Reduction (MW)	Ex Ante Gross Peak Demand Reduction (MW)	Verified Gross MWh RR	Verified Gross Savings (MWh)	Verified Gross Demand Reduction (MW)	Verified Gross Peak MW RR	Verified Gross Peak Demand Reduction (MW)	Sample (90/10 Sig?)
CFL Lighting	3,509	3.86	0.39	100%	3,504	3.86	100%	0.39	
Bathroom Aerators	12	0.54	0.01	100%	12	0.54	100%	0.01	
Kitchen Aerators	46	0.73	0.02	122%	57	0.73	100%	0.02	
Showerheads	221	0.89	0.02	100%	221	0.89	100%	0.02	NAT
Pipe Insulation	31	<0.01	<0.01	100%	31	<0.01	100%	<0.01	
Thermostats	213	0.00	0.00	113%	241	0.00	100%	0.00	
<b>Total</b>	<b>4,032</b>	<b>6.02</b>	<b>0.45</b>	<b>101%</b>	<b>4,065</b>	<b>6.02</b>	<b>100%</b>	<b>0.45</b>	

Source: ComEd tracking data and Navigant team analysis.

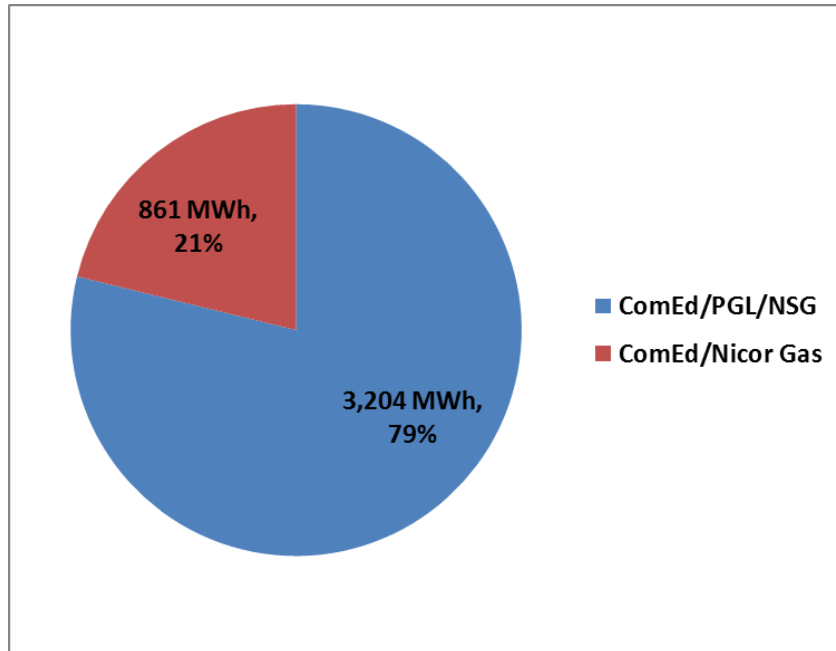
† A deemed value. Source: ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx, which is found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

NAT† indicates that the Illinois TRM v3.0 determines the gross savings.

Figure 3-2 provides the disaggregation of the PY7 Multi-Family Program verified gross savings by utility. Gross savings from the ComEd, PGL and NSG joint program were 79 percent of PY7 verified gross savings and the ComEd and Nicor Gas joint program were 21 percent of PY7 verified gross savings.

<sup>11</sup> The verified gross realization rate is the ratio of verified gross savings to ex-ante gross savings from the program tracking system.

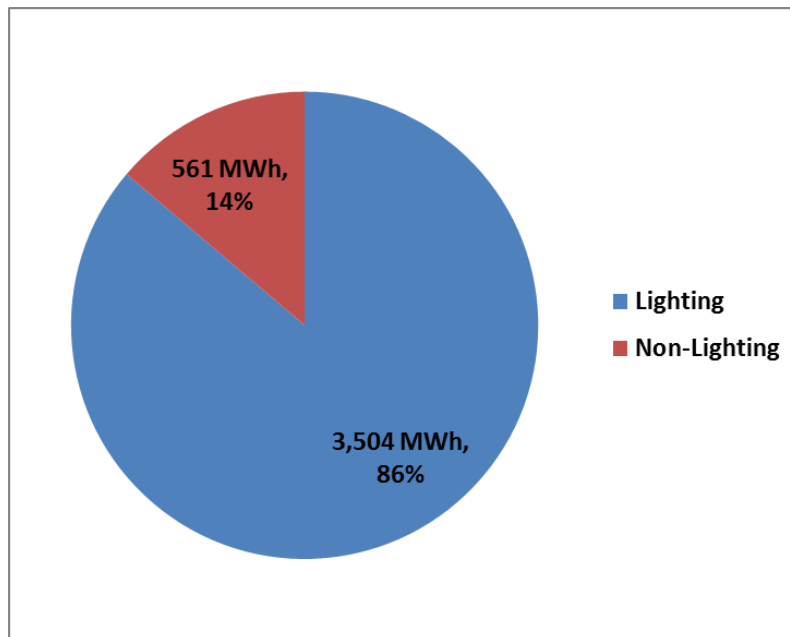
**Figure 3-2. PY7 MESP Verified Gross Savings by Utility**



Source: Navigant analysis of ComEd tracking data

Figure 3-2 provides the disaggregation of the PY7 Multi-Family Program verified gross savings by end-use type. Gross savings from lighting measures were 86 percent of PY7 verified gross savings and from non-lighting measures were 14 percent of PY7 verified gross savings.

**Figure 3-3. PY7 MESP Verified Gross Savings by End-use**



Source: Navigant analysis of ComEd tracking data

## 4 Net Impact Evaluation

Based on the Illinois Stakeholder Advisory Group (IL SAG) consensus process, NTG values for this program are deemed prospectively and used to calculate verified net savings.<sup>12</sup> Table 4-1 shows deemed NTG values from the IL SAG consensus process.

**Table 4-1. PY7 Verified Net Impact Parameters**

End-use	NTGR	Source
Lighting (incl. direct install CFL lighting measures)	0.98	IL SAG
Bathroom Aerator	0.94	
Kitchen Aerator	1.00	IL SAG
Showerhead	0.92	IL SAG
Pipe Insulation	0.95	IL SAG
Programmable Thermostats (incl. thermostats with gas fan savings)	0.95	IL SAG

Source: "ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx," available on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

The PY7 Multi-Family Program evaluation calculated verified net savings of 3,963 MWh, verified net demand reduction of 5.84 MW, and verified net peak demand reduction of 0.44 MW. The ComEd/PGL/NSG joint program realized net energy savings of 3,134 MWh, representing 79 percent of the total net savings, and the ComEd/Nicor Gas joint program realized net energy savings of 829 MWh, which is 21 percent of the total net savings.

Table 4-2 below presents the program net savings at the measure group level, including groups where the NTGR estimate is not statistically significant at the 90/10 confidence level. The PY7 evaluation did not include new free-ridership or spillover research.

<sup>12</sup> Source: ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx, found on the IL SAG website: <http://ilsag.info/net-to-gross-framework.html>

**Table 4-2. PY7 Verified Net Impact Savings Estimates by Measure Type**

Measure Category	Ex Ante Gross Savings (MWh)	Verified Gross Savings (MWh)	Verified Gross Demand (MW)	Verified Gross Peak Demand (MW)	Verified Gross MWh RR	NTGR	Verified Net Savings (MWh)	Verified Net Demand (MW)	Verified Net Peak Demand (MW)
CFL Lighting	3,509	3,504	3.86	0.39	100%	0.98†	3,434	3.78	0.38
Bathroom Aerators	12	12	0.54	0.01	100%	0.94†	11	0.51	0.01
Kitchen Aerators	46	57	0.73	0.02	122%	1.00†	57	0.73	0.02
Showerheads	221	221	0.89	0.02	100%	0.92†	203	0.82	0.02
Pipe Insulation	31	31	<0.01	<0.01	100%	0.95*	28	<0.01	<0.01
Thermostats	213	241	0.00	0.00	113%	0.95*	229	0.00	0.00
<b>Total</b>	<b>4,032</b>	<b>4,065</b>	<b>6.02</b>	<b>0.45</b>	<b>101%</b>		<b>3,963</b>	<b>5.84</b>	<b>0.44</b>

Source: ComEd tracking data and Navigant team analysis.

† A deemed value. Source: ComEd\_NTG\_History\_and\_PY7\_Recommendation\_2014-02-28\_Final\_EMV\_Recommendations.xlsx, which is found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>

## 5 Process Evaluation

Navigant conducted a limited process review in PY7. Process research was through interviews with program staff and the implementation contractor staff, and a review of program materials to verify information about program measures and the program tracking system.

Navigant conducted interviews with the ComEd Multi-Family Program staff in May, 2015 and followed up with interviews with the implementation contractor staff for the ComEd-Nicor program (CLEAResult) and ComEd-Peoples Gas-North Shore Gas program (Franklin Energy). We also reviewed the program tracking system input fields, and briefly reviewed the program eligibility requirements and facility assessment procedures as outlined on the program website.

Navigant's findings included:

- From interviews with the program staff and IC staff, the Multi-Family Program's administration and implementation activities appear to be functioning adequately and require minimal simplification at this time.
- ComEd's website provides information on how tenants interested in the multi-family energy savings opportunities can engage with their landlords to get enrolled in the program. The website also provides information for how multi-family property owners and managers can enroll in the program to receive rebates for their property's common area improvements.

## 6 Findings and Recommendations

This section summarizes the key impact and process findings and recommendations. These findings and recommendations are expanded from those in the executive summary.

### Verified Gross Impacts and Realization Rate

**Finding 1.** The PY7 Multi-Family Program achieved verified gross energy savings of 4,065 MWh, verified gross demand reduction of 6.02 MW and verified gross summer coincidence peak demand reduction of 0.45 MW. This produced a verified gross realization rate of 101 percent on energy savings and 100 percent on demand savings. The program is accurately tracking gross savings for most measures, with updates recommended for some measures. Using the approved version of the Illinois TRM (v3.0), the evaluation team corrected the savings input assumptions for kitchen aerators, programmable thermostats (including thermostats with gas fan savings), and CFLs with two different per unit savings values in the tracking system.

**Recommendation 1.** Although evaluation adjustments to savings input assumptions were minor, the program implementation contractor (IC) should review the approved or effective version of the Illinois TRM and update the program tracking default unit savings values.

### Peak Demand Reduction

**Finding 2.** The program tracking data included fewer entries of the estimated measure default summer coincidence peak demand savings. The evaluation team estimated coincidence summer peak and non-peak demand savings using the Illinois TRM (v3.0). The evaluation team also estimated winter coincidence peak demand savings for PJM reporting using secondary research (see winter peak demand estimates and discussion in the Appendix 7.2).

### Verified Net Impacts & NTGR

**Finding 3.** The evaluation used deemed net-to-gross (NTG) estimates approved through the Illinois Stakeholder Advisory Group (IL SAG) consensus process to calculate verified net savings for the program. The NTG values were lighting (0.98), water measures (0.92), and programmable thermostat (0.90). The results were verified net savings of 3,963 MWh, verified net demand reduction of 5.84 MW and verified net summer coincidence peak demand reduction of 0.44 MW. The ComEd/PGL/NSG joint program achieved verified net energy savings of 3,134 MWh, verified net demand reduction of 3.93 MW and verified net summer coincidence peak demand reduction of 0.34 MW. The ComEd/Nicor Gas joint program achieved verified net energy savings of 829 MWh, verified net demand reduction of 1.91 MW and verified net summer coincidence peak demand reduction of 0.09 MW. Overall, the PY7 program met 72 percent of its 5,512 MWh energy savings planning estimate through direct installation activities in dwelling units.<sup>13</sup>

### Program Volumetric Findings

**Finding 4.** The PY7 Multi-Family Program had 17,887 participants (dwelling units or projects) and implemented 129,250 direct install measures (including 122,660 CFL bulbs and 6,590

<sup>13</sup> ComEd PY678 Residential Program Evolution.pdf (file received from ComEd on 2015-04-02)

non-lighting measures), which amounts to an average of 7.2 measures installed per project. The lighting measures were close to 95 percent of the measure count and 92 percent of the projects in PY7.<sup>14</sup> Non-lighting measures (including hot water measures and thermostats) contributed 5 percent of the measure count and 8 percent of the projects in PY7. The PY7 program involved approximately 1,191 property accounts. Overall, the PY7 program met 64 percent of planned participation through direct installation activities in dwelling units (planned approximately 28,000 dwelling units).

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<sup>14</sup> If evaluation assumes that a project with more lighting savings is categorized as lighting project, and vice versa, then the program had 92 percent of the project count from lighting and 8 percent from non-lighting. There were actually 77 percent from lighting only projects, 5 percent from non-lighting only projects, and 18 percent of project with both lighting and non-lighting measures.

## 7 Appendix

### 7.1 Evaluation Research Impact Approaches and Findings

#### Evaluation Research Gross Impact Parameter Estimates

As described in Section 2, gross energy and demand savings for lighting measures are estimated using the following formula as specified in the TRM:

**Verified Gross Annual kWh Savings** = Program bulbs \* Delta Watts/1000 \* HOU \* IEe\* ISR

**Verified Gross Annual kW Savings** = Program bulbs \* Delta Watts/1000 \* ISR

**Verified Gross Annual Peak kW Savings** = Gross Annual kW Savings \* Peak Load CF \* IEd \* ISR

#### Where:

- Delta Watts = Difference between the Baseline Wattage and CFL Wattage
- HOU = Annual Hours of Use
- ISR = Installation Rate
- Peak Load CF = Peak Load Coincidence factor is calculated as the percentage of program bulbs turned on during peak hours (Central Time Zone weekdays from 1 to 5 p.m. for summer and between 6am-8am and 5pm-7pm for winter).
- IEe = Energy Interactive Effects
- IEd = Demand Interactive Effects



## 7.2 PJM Data and Findings

Multi-Family Energy Savings Program (MESP)  
Program Year 7 (PY7) – June 1, 2014 – May 31, 2015

### Ex-Post Gross Peak Demand (MW) Savings

The PJM summer ex-post gross coincident peak demand savings was 0.45 MW.  
The PJM winter ex-post gross coincident peak demand savings was 0.46 MW.

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

- (a) PY7 program bulbs and hot water measures installed
- (b) Non-coincident kW reduction
- (c) kW of baseline equipment and replacement equipment
- (d) Summer PJM coincidence factor (CF) defined by weekday's 1-5pm Central Prevailing Time Zone, between June 1 and August 31, and non-holidays
- (e) Winter PJM coincidence factor (CF) defined by weekdays between 6am-8am and 5pm-7pm Central Prevailing Time Zone, between January 1 and February 28, and non-holidays
- (f) Demand interactive effect
- (g) kW of baseline equipment during Performance Hours
- (h) kW of replacement equipment during Performance Hours
- (i) Installation Rate

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

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

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

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

ComEd's coincident peak demand savings for both baseline and post retrofit conditions are defined as the average demand kW savings for the 1 PM CPT to 5 PM CPT non-holiday weekday time period for summer, and 6 AM CPT to 8 AM CPT and 5 PM CPT to 7 PM CPT non-holiday weekday time period for winter.<sup>15</sup> If this energy savings measure is determined to have weather dependency then the summer peak kW savings are based on the zonal weighted temperature humidity index (WTHI) standard, and the winter peak kW savings are based on the zonal wind speed-adjusted temperature (WWP) standards posted by PJM (there is also PJM Zonal Winter Weather Standards similar to summer WTHI).<sup>16</sup> The zonal WTHI and WWP are the mean of the zonal WTHI values or WWP values on the days in which PJM peak load occurred in the past sixteen years (1998-2014). This mean ComEd WTHI value is 81.6 demand savings for summer is the difference in kW between the baseline and post retrofit conditions. Similarly,

<sup>15</sup> The Winter Weather Standard is the dry bulb temperature adjusted (by 0.5 °F) for wind speed above 10 mph. The measurements were for Hour Ending 19:00 on RTO peak days."

<sup>16</sup> This is in accordance with the PJM manual 18, PJM Capacity Market, effective October 16, 2015.



the ComEd WWP value is 14.5 demand savings for winter is the difference in kW between the baseline and post retrofit conditions.

The IL TRM does not list winter peak coincidence factors and winter peak savings. ComEd did not track winter peak savings in PY7. Based on the IL TRM summer coincidence factors, Navigant estimated 0.45 MW summer peak coincidence demand savings for PY7. Navigant used secondary research winter coincidence factors to estimate 0.46 MW winter peak coincidence demand savings for the PY7 Multi-Family Program.<sup>17</sup>

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<sup>17</sup> Winter peak coincidence factor for residential lighting were taken from Navigant/Itron study (ComEd Residential Lighting Winter Peak CF Recommendations\_2015\_02\_19.pdf). Winter peak coincidence factors for non-lighting residential measures were sourced from the Efficiency Maine Multifamily TRM (EMT-TRM\_MEP\_v2016\_1.pdf).