

Multi-Family Home Energy Savings Program PY5 Evaluation Report

Final

Energy Efficiency / Demand Response Plan:
Plan Year 5
(6/1/2012-5/31/2013)

Presented to
Commonwealth Edison Company

March 6, 2014

Prepared by:

Josh Arnold
Navigant Consulting, Inc.

Charles Ampong
Navigant Consulting, Inc.



www.Navigant.com



Submitted to:

ComEd
Three Lincoln Centre
Oakbrook Terrace, IL 60181

Submitted by:

Navigant Consulting, Inc.
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606
Phone 312.583.5700
Fax 312.583.5701

Contact:

Randy Gunn, Managing Director
312.583.5714
Randy.Gunn@Navigant.Com

Jeff Erickson, Director
608.497.2322
Jeff.Erickson@Navigant.Com

Acknowledgements

This report includes contributions from Rob Neumann, Kevin Grabner, Julianne Meurice, Jennifer Barnes, Laura Agapay-Read and Mary Thony in addition to those individuals listed above.

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

E.	Executive Summary	1
	E.1. Program Savings	2
	E.2. Program Savings by Measure Type	2
	E.3. Impact Estimate Parameters	4
	E.4. Impact Estimate Parameters For Future Use	4
	E.5. Participation Information.....	4
	E.6. Conclusions and Recommendations	5
1.	Introduction	6
	1.1 Program Description.....	6
	1.2 Evaluation Objectives	7
	1.2.1 Impact Questions	7
	1.2.2 Process Questions	7
2.	Evaluation Approach.....	8
	2.1 Overview of Data Collection Activities.....	8
	2.2 Verified Savings Parameters.....	8
	2.3 Verified Gross Program Savings Analysis Approach	9
	2.4 Verified Net Program Savings Analysis Approach.....	9
	2.5 Process Evaluation	10
3.	Gross Impact Evaluation	11
	3.1 Tracking System Review	11
	3.2 Program Volumetric Findings.....	11
	3.3 Gross Program Impact Parameter Estimates.....	12
	3.4 Development of the Verified Gross Realization Rate	13
	3.5 Verified Gross Program Impact Results.....	15
4.	Net Impact Evaluation	17
	4.1 Program Planned v. Actual Accomplishments	19
5.	Process Evaluation	21
6.	Conclusions and Recommendations	22
7.	Appendix	24
	7.1 Glossary	24
	7.2 Detailed Impact Research Findings and Approaches	28
	7.2.1 Net Program Impact Results	28
	7.3 Detailed Process Results.....	28
	7.4 TRM Recommendations.....	29

List of Figures and Tables

Tables

Table E-1. EPY5 Multi-Family Program Savings.....	2
Table E-2. EPY5 Multi-Family Program Results by Measure Type	3
Table E-3. EPY5 Multi-Family Program Results by Measure	3
Table E-4. EPY5 Multi-Family Program Primary Participation Detail.....	5
Table 2-1. Core Data Collection Activities	8
Table 2-2. Verified Gross and Net Savings Parameter Data Sources.....	9
Table 3-1. EPY5 Multi-Family Program Primary Participation Detail	11
Table 3-2. EPY5 Multi-Family Program Ex-Ante and Verified Measure Count	12
Table 3-3. EPY5 Multi-Family Program Ex-Ante and Verified Gross Savings Parameters	13
Table 3-4. EPY5 Multi-Family Program Verified Gross Savings Results by Measure	14
Table 3-5. EPY5 Multi-Family Program Ex-Ante and Verified Gross Savings Realization Rates	15
Table 3-6. EPY5 Multi-Family Program Verified Gross Impact Savings Estimates by End-Use	16
Table 4-1. EPY5 Multi-Family Program Verified Net Impact Savings by Measure End-Use	18
Table 4-2. EPY5 Multi-Family Program Ex-Ante Gross, Verified Gross and Verified Net Savings by Measure.....	19
Table 4-3. EPY5 Multi-Family Program Planned v. Actual Results.....	20
Table 4-4. EPY5 Multi-Family Program Yearly Comparison.....	20

E. Executive Summary

This report presents a summary of the findings and results from the Impact Evaluation of the EPY5 ComEd Multi-Family Home Energy Savings (MFHES) program.¹ The MFHES program is in the second year of jointly implemented program delivery with Nicor Gas Company and with Peoples Gas and North Shore Gas, which is ComEd electric program year 5 (EPY5) and gas program year 2 (GPY2).² The MFHES program achieves electric energy and demand savings for ComEd customers and natural gas energy savings for customers of Nicor Gas, Peoples Gas and North Shore Gas. This evaluation report includes total ComEd electric impacts from all of the jointly implemented programs. Separate evaluation reports include the natural gas impacts from the ComEd/Nicor Gas and the ComEd/Peoples Gas and North Shore Gas programs.

The MFHES program is designed to secure energy savings through direct installation of low-cost efficiency measures, such as CFLs, water efficient showerheads and faucet aerators in residential dwelling units of eligible multifamily residences. During EPY5/GPY2, the MFHES program expanded its scope to offer direct installation measures in common areas (i.e. hallways or exterior locations) of eligible multifamily properties. The program added assisted living, senior housing and public housing market segments to eligible properties.

In March 2013,³ the program started planning a new design and delivery strategy to target whole-building savings called the Multifamily Comprehensive Energy Efficiency Program (MCEEP). Such whole-building measures included upgrades or improvements to central plant and HVAC systems and controls, central lighting systems and building shell improvements, among others. Honeywell Smart Grid Solutions (Honeywell) implemented the ComEd/Nicor Gas program from the beginning of the program year until March 2013. With the transition to MCEEP, Franklin Energy Services, LLC (Franklin Energy) became the primary implementation contractor for the ComEd/Nicor Gas program. Franklin Energy is also the implementation contractor for the ComEd/Peoples Gas and North Shore Gas programs.

¹ In EPY6/GPY3, the ComEd, Peoples Gas and North Shore Gas program expanded its scope and changed its name to the Multi-Family Comprehensive Energy Efficiency Program. For purposes of this evaluation report, all of the EPY5/GPY2 ComEd programs are referred to as the Multi-Family Home Energy Savings program.

² The EPY5/GPY2 program year began June 1, 2012 and ended May 31, 2013.

³ In practice, the Multi-Family program continued to implement similar measures during the program transition as new MCEEP program components were under development until the end of the EPY5/GPY2 program year. This evaluation report includes results for the total EPY5/GPY2 program year without distinguishing between MFHES and MCEEP.

E.1. Program Savings

Table E-1 summarizes electricity and demand savings from the EPY5 ComEd Multi-Family program.

Table E-1. EPY5 Multi-Family Program Savings

Savings Category †	Energy Savings (MWh)	Demand Savings (MW)	Coincident Peak Demand Savings (MW)
Ex-Ante Gross Savings	13,692	1.46	0.15
Verified Gross Savings	13,706	1.46	0.15
Verified Net Savings	11,285	1.20	0.12

Source: Navigant analysis of EPY5 Multifamily program tracking data (8/27/2013 Frontier data extract).

† See the Glossary in the Appendix for definitions.

E.2. Program Savings by Measure Type

Table E-2 below summarizes EPY5 Multi-Family program savings by measure type (lighting measures and non-lighting measures). The program achieved verified net savings of 9,864 MWh from lighting measures (including CFLs in residential units and common areas) and 1,421 MWh from water efficiency measures (including showerheads, kitchen and bathroom faucet aerators).⁴ Verified net demand savings were 1.20 MW and verified net coincident peak demand savings were 0.12 MW. Details by measure are included in Section 3 and Section 4 of the report.

⁴ The program installed 9 vending miser measures during the EPY5/GPY2 program year. These savings accounted for verified gross savings of 14,516 kWh and verified net savings of 13,500 kWh. For purposes of this evaluation report, electricity savings from vending misers are included with water efficiency measures as “non-lighting measures.”

Table E-2. EPY5 Multi-Family Program Results by Measure Type

Savings Category	Lighting Measures	Non-Lighting Measures	Total
Ex-Ante Gross Savings (MWh)	12,174	1,518	13,692
Ex-Ante Gross Demand Savings (MW)	1.33	0.13	1.46
Verified Gross Realization Rate ‡	100%	101%	100%
Verified Gross Savings (MWh)	12,178	1,528	13,706
Verified Gross Demand Savings (MW)	1.33	0.13	1.46
Net to Gross Ratio (NTGR)	0.81†	0.93†	0.82 ‡
Verified Net Savings (MWh)	9,864	1,421	11,285
Verified Net Demand Savings (MW)	1.08	0.12	1.20
Verified Net Coincident Peak Demand Savings (MW)	0.11	0.01	0.12

Source: Navigant analysis of EPY5 Multifamily program tracking data (8/27/2013 Frontier data extract).

† NTG is a deemed value. Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as agreed to through a consensus process in March-August 2013. ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the Illinois SAG web site at <http://ilsag.info>.

‡ Results based on evaluation research findings.

Table E-3 summarizes EPY5 Multi-Family program ex-ante gross, verified gross and verified net results by measure. Verified gross demand savings were 1.46 MW and verified gross coincident peak demand was 0.15 MW. Verified net demand savings were 1.20 MW and verified coincident net peak demand was 0.12 MW for this program. Verified gross and net demand savings by measure-type are included in Section 3 and Section 4 of this report.

Table E-3. EPY5 Multi-Family Program Results by Measure

Equipment End-Use Type	Ex-Ante Gross Savings (kWh)	Verified Gross Savings (kWh)	Verified Gross Realization Rate‡	Net-to-Gross Ratio†	Verified Net Savings (kWh)
9W CFL	42,573	42,573	100%	0.81	34,484
14W CFL	6,948,734	6,945,991	100%	0.81	5,626,252
19W CFL	501,222	506,117	101%	0.81	409,955
23W CFL	135,752	135,806	100%	0.81	110,003
9W Globe CFL	3,294,879	3,298,140	100%	0.81	2,671,493
14W Globe CFL	129,154	126,692	98%	0.81	102,620
9W incl. Globe CFL (common area)	102,662	102,606	100%	0.81	83,111
14W CFL (common area)	857,128	855,330	100%	0.81	692,817
19W CFL (common area)	158,008	160,506	102%	0.81	130,009

Equipment End-Use Type	Ex-Ante Gross Savings (kWh)	Verified Gross Savings (kWh)	Verified Gross Realization Rate‡	Net-to-Gross Ratio†	Verified Net Savings (kWh)
23W CFL (common area)	3,821	3,820	100%	0.81	3,094
Showerheads (IU)	1,240,186	1,249,666	101%	0.93	1,162,189
Kitchen Aerators (IU)	119,052	108,750	91%	0.93	101,138
Bath Aerators (IU)	142,897	154,277	108%	0.93	143,477
Kitchen Aerator (CA)	167	180	108%	0.93	168
Bathroom Aerator (CA)	1,063	1,083	102%	0.93	1,007
Vending Misers	14,490	14,516	100%	0.93	13,500
TOTAL	13,691,786	13,706,052	100%	0.82	11,285,319

Source: Navigant analysis of EPY5 Multifamily program tracking data (8/27/2013 Frontier data extract).

† NTG is a deemed value. Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as agreed to through a consensus process in March-August 2013. ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the Illinois SAG web site at <http://ilsag.info>.

‡ Program level NTGR is verified net savings/verified gross savings.

‡ Based on evaluation research findings.

E.3. Impact Estimate Parameters

Navigant estimated verified per unit savings for each program measure using impact algorithm sources found in the Illinois TRM for deemed measures, and evaluation research for non-deemed measures. The key parameters and data sources used in the analysis are shown in Table 2-2.

E.4. Impact Estimate Parameters For Future Use

Navigant conducted evaluation research into two measures that may assist the Illinois TRM Technical Advisory Committee annual updating process: 1) a thermostatically initiated shower restriction valve on a showerhead for residential applications in Illinois and 2) hot water and steam pipe insulation measures in building common areas. Information about hot water and steam pipe insulation measures was supplied by the program’s implementation contractor. Additional details are included in a separate research memorandum in the Appendix and referenced in Section 7.2 .

E.5. Participation Information

In EPY5, the program installed 265,174 CFL measures in 39,429 residential dwelling units. The program installed 7,121 water efficiency measures and 9 vending misers. Compared to EPY4/GPY1, the EPY5/GPY2 program achieved greater electricity savings while installing a similar number of measures at fewer residential dwelling units. Program participation totals are shown in Table E-4.

Table E-4. EPY5 Multi-Family Program Primary Participation Detail

Measure Type	Verified Quantities
Participants (residential dwelling units)	39,429
CFLs	265,174
Water Efficiency Measures	7,121
Vending Misers	9
Total Measures	272,304

Source: Navigant analysis of EPY5 Multifamily program tracking data (8/27/2013 Frontier data extract).

E.6. Conclusions and Recommendations

Overall, the program tracking system is accurately recording measure counts and, with some minor exceptions as detailed in this report, measure savings based on the Illinois TRM, contributing to a verified gross realization rates of 100 percent. Compared to EPY4, the EPY5 program achieved greater electricity savings while installing a similar number of measures at fewer residential dwelling units. In EPY5, measure-level Net-to-Gross Ratios (NTGR) used to calculate verified net savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG)⁵ based on EPY3 evaluation research.

Verified Gross Realization Rates

Finding 1. The program is accurately tracking measure counts. Appropriate quality control and quality assurance procedures are in place. With minor exceptions as identified in the report, the program tracking system is accurately recording measure savings estimates based on deemed or partially deemed values from the Illinois TRM. The EPY5 program verified gross realization rate was 100 percent.

Savings Estimates

Finding 2. Ex-ante measure savings values for CFLs and common area kitchen and bathroom aerators vary somewhat from verified measure savings values calculated by Navigant using IL-TRM algorithms.

Recommendation 2. The implementation contractor should update ex-ante measure savings values for CFLs and common area kitchen and bathroom aerators, as indicated in this report.

⁵ Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013. [http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/ComEd%20PY5-PY6%20Proposal%20Comparisons%20with%20SAG.xls), which is to be found here: <http://ilsag.info/net-to-gross-framework.html>.

1. Introduction

1.1 Program Description

This report presents a summary of the findings and results from the Impact Evaluation of the EPY5 ComEd Multi-Family Home Energy Savings (MFHES) program.⁶ The MFHES program is in the second year of jointly implemented program delivery with Nicor Gas Company and with Peoples Gas and North Shore Gas, which is ComEd electric program year 5 (EPY5) and gas program year 2 (GPY2).⁷ The MFHES program achieves electric energy and demand savings for ComEd customers and natural gas energy savings for customers of Nicor Gas, Peoples Gas and North Shore Gas. This evaluation report includes total ComEd electric impacts from all of the jointly implemented programs. Separate evaluation reports include the natural gas impacts of the ComEd/Nicor Gas and the ComEd/Peoples Gas and North Shore Gas programs.

The MFHES program secures energy savings through direct installation of low-cost efficiency measures, such as CFLs, water efficient showerheads and faucet aerators in residential dwelling units of eligible multifamily residences. The program installs additional natural gas efficiency measures, such as water heater temperature setbacks, programmable thermostats, hot water pipe wrap insulation and steam pipe insulation measures. During EPY5/GPY2, the MFHES program expanded its scope to offer direct installation measures in common areas of eligible multifamily properties. Eligible buildings may have individual meters or master-metered systems. A secondary objective of the program is to identify energy saving opportunities in the common areas of multifamily buildings through a brief visual inspection of common area lighting and/or central plant locations to channel customers to other programs offered by the utilities. Primary target markets for the program include property management firms, trade and professional organizations, building owners and contractors who service multifamily buildings.

In March 2013, the ComEd/Nicor Gas program transitioned to a new design and delivery structure, called the Multifamily Comprehensive Energy Efficiency Program (MCEEP).⁸ The MCEEP provides direct install measures in residential dwelling units and common areas, as before. In addition, the new program offers technical services and financial incentives to install whole-building energy efficient measures at eligible multifamily properties. Such whole-building measures may include upgrades or improvements to central plant and HVAC systems and controls, central lighting systems and building shell improvements, among others. These measures may be installed by contractors or by a participant's own maintenance staff. Honeywell Smart Grid Solutions (Honeywell) implemented the program from the beginning of the program year until March 2013. With the transition to

⁶ In EPY6/GPY3, the ComEd, Peoples Gas and North Shore Gas program expanded its scope and changed its name to the Multi-Family Comprehensive Energy Efficiency Program. For purposes of this evaluation report, all of the ComEd EPY5/GPY2 programs are referred to as the Multi-Family Home Energy Savings program.

⁷ The EPY5/GPY2 program year began June 1, 2012 and ended May 31, 2013.

⁸ In practice, the Multi-Family program continued to implement similar measures during the program transition as new MCEEP program components were under development until the end of the EPY5/GPY2 program year. This evaluation report includes results for the total EPY5/GPY2 program year without distinguishing between MFHES and MCEEP.

MCEEP, Franklin Energy Services, LLC (Franklin Energy) became the primary implementation contractor for the ComEd/Nicor Gas program. Franklin Energy is also the implementation contractor for the ComEd/Peoples Gas and North Shore Gas programs.

1.2 Evaluation Objectives

Navigant conducted a limited verified gross impact evaluation in EPY5/GPY2 because all of the MFHES program's savings were deemed based on the Illinois TRM and Navigant reviewed the savings calculations for this program in the EPY4/GPY1 program year. Navigant's previous evaluation of the jointly implemented multifamily program included a detailed review of the programs' tracking system.⁹

Navigant identified the following key researchable questions for EPY5/GPY2:

1.2.1 Impact Questions

1. What is the MFHES program's verified net and gross savings?
2. Are TRM algorithms appropriately applied and are the programs' tracking system correctly calculating and tracking deemed measure values?
3. What are the energy savings associated with new program measures, such as Showerstart™ devices or electric savings from programmable thermostats installed in residential dwelling units?¹⁰

1.2.2 Process Questions

Process research related to the EPY5 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

The program evaluation plan for EPY5/GPY2 included a review or development of a program logic model and program theory for the new program component implemented in EPY5/GPY2,¹¹ as well as a review of multifamily program best practices. Navigant's multifamily program best practices research is presently underway. This evaluation research will be delivered in a separate memorandum.

⁹ Navigant, *EPY4-GPY1 ComEd, Nicor Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL* (June 5, 2013).

¹⁰ Navigant's research memorandum on Showerstart™ devices was delivered on September 6, 2013 and is included in Section 7.2.1.2. Navigant is in the process of researching potential electric savings associated with programmable thermostats installed in residential dwelling units. Evaluation research will be delivered in a separate memorandum.

¹¹ ComEd developed a program logic model and program theory for the new ComEd-Nicor Gas MCEEP program component implemented in EPY5/GPY2.

2. Evaluation Approach

Navigant conducted a verified gross impact evaluation in EPY5 through an engineering review of per unit savings parameters and the program tracking system and data. Navigant interviewed utility program staff, consultants, and implementation contractors to verify information about the program and review the tracking system. In EPY5, the Net-to-Gross Ratio (NTGR) estimates used to calculate the Net Verified Savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG)¹² based on EPY3 evaluation research. Navigant applied the deemed NTGR to obtain verified net savings.

2.1 Overview of Data Collection Activities

The core data collection activity was reviewing the programs’ tracking system to verify that all fields are appropriately populated, as shown in the Table 2-1.

Table 2-1. Core Data Collection Activities

N	What	Who	Target Completes	Completes Achieved	When	Comments
<i>Impact Assessment</i>						
1	Measure Savings Review	Program Tracking System	All	all	July-August 2013	Source of information for verified gross analysis
<i>Process Assessment</i>						
2	Interviews	Program Managers/Implementer Staff	4	4	July 2013	Includes interviews with staff from ComEd, Nicor Gas and Franklin Energy

Source: Navigant

2.2 Verified Savings Parameters

Navigant estimated verified per unit savings for each program measure using impact algorithm sources found in the Illinois TRM for deemed measures, and evaluation research for non-deemed measures. Navigant reported verified program savings by estimating savings for each program measure using impact algorithm sources found in the IL TRM. Table 2-2 below presents the sources for parameters that were used in verified gross savings analysis indicating which were examined through EPY5 evaluation research and which were deemed.

¹² Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013. [http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls](http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August%205-6,%202013%20Meeting/ComEd%20PY5-PY6%20Proposal%20Comparisons%20with%20SAG.xls).

Table 2-2. Verified Gross and Net Savings Parameter Data Sources

Parameter	Data Source	Deemed or Evaluated?
NTGR	Illinois Stakeholder Advisory Group Process †	Deemed
Realization Rate	Evaluation research	Evaluated
Number of measures installed	Program tracking system	Evaluated
CFLs (standard)	Illinois TRM, version 1.0, sections 5.5.1‡	Deemed
CFLs (specialty)	Illinois TRM, version 1.0, sections 5.5.2‡	Deemed
Direct Install Showerhead	Illinois TRM, version 1.0, section 5.4.5.‡	Deemed
Direct Install Bathroom and Kitchen Aerator	Illinois TRM, version 1.0, section 5.4.4.‡	Deemed
Common Area Showerhead	Illinois TRM, version 1.0, section 4.3.3.‡	Deemed
Common Area Bathroom and Kitchen Aerator	Illinois TRM, version 1.0, section 4.3.2.‡	Deemed
Vending Miser	Illinois TRM, version 1.0, section 4.6.5.‡	Deemed

† Source: NTGR is a deemed value. Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as agreed to through a consensus process in March-August 2013. ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the Illinois SAG web site at <http://ilsag.info>.

‡ Source: State of Illinois Technical Reference Manual. Final as of September 14, 2012, effective June 1, 2012. http://ilsagfiles.org/SAG_files/Technical Reference Manual/Illinois Statewide_TRM_Version_1.0.pdf

2.3 Verified Gross Program Savings Analysis Approach

Navigant reviewed the program’s tracking systems and procedures to verify that the program accurately reported measure counts. The majority of program savings were derived based on deemed values and algorithms from the State of Illinois Energy Efficiency Technical Reference Manual (Illinois TRM v1.0).¹³ For ComEd, the Illinois TRM provides algorithms to base per unit savings for direct install measures. Verified per unit savings reflect evaluation adjustments to per unit savings values based on Navigant measure review. The verified gross savings are the product of verified per unit savings and verified measure quantities.

2.4 Verified Net Program Savings Analysis Approach

Verified net energy savings were calculated by multiplying the Verified Gross Savings estimates by a deemed Net-to-Gross Ratio (NTGR). In EPY5, the NTGR estimates used to calculate the Net Verified Savings were deemed by the Illinois Stakeholder Advisory Group (SAG)¹⁴ based on EPY3 evaluation research.

¹³ State of Illinois Technical Reference Manual. Final as of September 14, 2012, effective June 1, 2012. http://ilsagfiles.org/SAG_files/Technical Reference Manual/Illinois Statewide_TRM_Version_1.0.pdf

¹⁴ Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013.

2.4.1.1 Free-Ridership

The EPY5 free-ridership estimates used to calculate the NTGR were deemed by the Illinois Stakeholder Advisory Group (SAG) based on EPY3 evaluation research. The program evaluation plan did not include new free-ridership research during the EPY5 program year.

2.4.1.2 Spillover

The EPY5 spillover estimates used to calculate the NTGR were deemed by the Illinois Stakeholder Advisory Group (SAG) based on EPY3 evaluation research. The program evaluation plan did not include new spillover research during the EPY5 program year.

2.5 Process Evaluation

Process research related to the EPY5/GPY2 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

3. Gross Impact Evaluation

Navigant determined that the EPY5 Multi-Family program achieved verified gross savings of 13,706 MWh, verified gross demand savings of 1.46 MW and verified gross peak demand savings of 0.15 MW. The program’s verified gross realization rate was 100 percent.

3.1 Tracking System Review

For this evaluation, Navigant verified that the program tracking system (using the Frontier database) continued to capture relevant data required to track the program’s actions for reporting and evaluation activities. Navigant found that the programs had implemented quality assurance and quality control procedures to minimize the likelihood of data entry errors and that the programs continued to maintain or improve upon these procedures.

Over the course of the EPY5 program year, Navigant and the program implementation contractor maintained close contact regarding program tracking system updates to follow up from previous program evaluation recommendations. The implementation contractor granted Navigant direct access to the Bensight Data Management platform, enabling Navigant to obtain real-time information. Navigant verified that the program tracking system was accurately recording measure counts. Except for a minor adjustment for common area faucet aerator measure savings values, Navigant verified that measure savings values were accurately recorded in the tracking system. Navigant’s previous evaluation of the jointly implemented multifamily programs included a detailed review of the programs’ tracking system.¹⁵

3.2 Program Volumetric Findings

As shown in Table 3-1, the EPY5 Multi-Family program installed 272,304 measures in 39,429 residential dwelling units. The program installed 7,121 water efficiency measures and 9 vending misers. As planned, CFL measure quantities towered above those of non-lighting measures, accounting for 97% of program measures installed.

Table 3-1. EPY5 Multi-Family Program Primary Participation Detail

Measure Type	Verified Quantities
Participants (residential dwelling units)	39,429
CFL measures	265,174
Water Efficiency Measures	7,121
Vending Misers	9
Total Measures	272,304

Source: Navigant analysis of EPY5 Multifamily program tracking data (August 27, 2013 data extract).

¹⁵ Navigant, EPY4-GPY1 ComEd, Peoples Gas and North Shore Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL (June 4, 2013). Navigant, EPY4-GPY1 ComEd, Nicor Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL (June 5, 2013).

As indicated in Table 3-2 below, ex-ante and verified measure counts were the same.

Table 3-2. EPY5 Multi-Family Program Ex-Ante and Verified Measure Count

Measure	Ex-Ante Measure Count	Verified Measure Count
9W CFL	1,453	1,453
14W CFL	159,741	159,741
19W CFL	9,561	9,561
23W CFL	2,932	2,932
9W Globe CFL	85,139	85,139
14W Globe CFL	2,204	2,204
9W incl. Globe CFL (common area)	552	552
14W CFL (common area)	3,101	3,101
19W CFL (common area)	478	478
23W CFL (common area)	13	13
Showerheads (IU)	2,365	2,365
Kitchen Aerators (IU)	2,176	2,176
Bath Aerators (IU)	2,573	2,573
Kitchen Aerator (CA)	1	1
Bathroom Aerator (CA)	6	6
Vending Misers	9	9
Total Measures	272,304	272,304

Source: Navigant analysis of EPY5 Multifamily program tracking data (August 27, 2013 data extract).

3.3 Gross Program Impact Parameter Estimates

As described in Section 2, Navigant calculated verified gross energy savings (kWh or kW) using Illinois TRM methodology and algorithms for deemed measures. For most measures, Navigant found minor differences between ex-ante measure savings values and the verified measure savings values. However, these differences were very small, resulting in a minor evaluation adjustment of less than a fraction of one percent of gross savings and accounting for the entire difference between the program’s ex-ante gross savings and the program’s verified gross savings. Navigant found that the ex-ante measure savings values for kitchen and bathroom aerators installed in common areas should be updated in the program tracking system. Navigant included ex-ante and verified gross measure savings values in Table 3-3 below.

Table 3-3. EPY5 Multi-Family Program 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 (IL-TRM)
9W CFL	29.30	29.30	0.003	Deemed	v1.0, sections 5.5.1 & 5.5.2
14W CFL	43.50	43.48	0.005	Deemed	
19W CFL	52.90	52.94	0.006	Deemed	
23W CFL	46.30	46.32	0.005	Deemed	
9W incl. Globe CFL	38.70	38.74	0.005	Deemed	
14W Globe CFL	58.60	57.48	0.006	Deemed	
9W incl. Globe CFL (common area)	185.90	185.88	0.024	Deemed	
14W CFL (common area)	275.80	275.82	0.036	Deemed	
19W CFL (common area)	335.80	335.79	0.044	Deemed	
23W CFL (common area)	293.80	293.81	0.038	Deemed	
Showerheads (IU)	528.40	528.40	0.041	Deemed	v1.0, section 5.4.5
Kitchen Aerators (IU)	50.00	50.00	0.007	Deemed	v1.0, section 5.4.4
Bath Aerators (IU)	60.10	60.10	0.008	Deemed	
Showerheads (CA)	436.13	436.13	0.054	Deemed	v1.0, section 4.3.3
Kitchen Aerator (CA)	50.00	90.23	0.029	Deemed	v1.0, section 4.3.2
Bathroom Aerator (CA)	60.10	90.23	0.029	Deemed	v1.0, section 4.3.2
Vending Misers	1,612.90	1,612.90	-	Deemed	v1.0, section 4.6.5

Source: Navigant analysis of EPY5 Multifamily program tracking data (August 27, 2013 data extract).
 ‡ State of Illinois Technical Reference Manual. Final as of September 14, 2012, effective June 1, 2012.
http://ilsagfiles.org/SAG_files/Technical Reference Manual/Illinois Statewide_TRM_Version_1.0.pdf

3.4 Development of the Verified Gross Realization Rate

The verified gross realization rate is the ratio of verified gross savings to ex-ante gross savings from the program tracking system. Navigant calculated verified gross energy savings (kWh or kW) using Illinois TRM methodology and algorithms. Navigant applied verified measure quantities found in the program tracking system as found in Table 3-2 to verified unit measure savings values as displayed in Table 3-3 to calculate verified gross savings. Verified gross savings results by measures are included in Table 3-4 below.

Table 3-4. EPY5 Multi-Family Program Verified Gross Savings Results by Measure

Equipment End-Use Type	Verified Gross Savings (kWh/unit)	Verified Measure Count (unit)	Verified Gross Savings (kWh)
9W CFL	29.30	1,453	42,573
14W CFL	43.48	159,741	6,945,991
19W CFL	52.94	9,561	506,117
23W CFL	46.32	2,932	135,806
9W Globe CFL	38.74	85,139	3,298,140
14W Globe CFL	57.48	2,204	126,692
9W incl. Globe CFL (common area)	185.88	552	102,606
14W CFL (common area)	275.82	3,101	855,330
19W CFL (common area)	335.79	478	160,506
23W CFL (common area)	293.81	13	3,820
Showerheads (IU)	528.40	2,365	1,249,666
Kitchen Aerators (IU)	50.00	2,176	108,750
Bath Aerators (IU)	60.10	2,573	154,277
Kitchen Aerator (CA)	436.13	1	180
Bathroom Aerator (CA)	90.23	6	1,083
Vending Misers	1,612.90	9	14,516
TOTAL	n/a	272,304	13,706,052

Source: Navigant analysis of EPY5 Multifamily program tracking data (August 27, 2013 data extract).

As shown in Table 3-5 below, EPY5 evaluation verified gross energy savings were nearly equal to ex-ante gross energy savings reported in the program tracking system, resulting in a realization rate of 100 percent.¹⁶

¹⁶ Realization rate = verified gross / ex-ante gross from the tracking system. The value of 100 percent is rounded.

Table 3-5. EPY5 Multi-Family Program Ex-Ante and Verified Gross Savings Realization Rates

Equipment End-Use Type	Ex-Ante Gross Savings (kWh)	Verified Gross Savings (kWh)	Verified Gross Realization Rate‡
9W CFL	42,573	42,573	100%
14W CFL	6,948,734	6,945,991	100%
19W CFL	501,222	506,117	101%
23W CFL	135,752	135,806	100%
9W Globe CFL	3,294,879	3,298,140	100%
14W Globe CFL	129,154	126,692	98%
9W incl. Globe CFL (common area)	102,662	102,606	100%
14W CFL (common area)	857,128	855,330	100%
19W CFL (common area)	158,008	160,506	102%
23W CFL (common area)	3,821	3,820	100%
Showerheads (IU)	1,240,186	1,249,666	101%
Kitchen Aerators (IU)	119,052	108,750	91%
Bath Aerators (IU)	142,897	154,277	108%
Kitchen Aerator (CA)	167	180	108%
Bathroom Aerator (CA)	1,063	1,083	102%
Vending Misers	14,490	14,516	100%
TOTAL	13,691,786	13,706,052	100%

Source: Navigant analysis of program tracking system extract (August 27, 2013 extract)

3.5 Verified Gross Program Impact Results

The ComEd EPY5 Multi-Family Home Energy Savings Program reported ex-ante gross energy savings of 13,692 MWh. Evaluation adjustments described in the sections above resulted in evaluation verified gross energy savings of 13,706 MWh, verified gross demand savings of 1.46 MW and verified gross peak demand savings of 0.15 MW. Ex-Ante and Verified Gross Savings by Equipment End-Use Type are shown in Table 3-6 below.

Table 3-6. EPY5 Multi-Family Program Verified Gross Impact Savings Estimates by End-Use

	Sample	Gross Energy Savings (MWh)	Gross Demand Savings (MW)	Gross Peak Demand Savings (MW)	90/10 Significance?
CFL Measures					
Ex-Ante Gross Savings	NA†	12,174	1.33	0.13	NA†
Verified Gross Realization Rate‡		100%	100%	100%	
Verified Gross Savings		12,178	1.33	0.13	
Water Efficiency Measures					
Ex-Ante Gross Savings	NA†	1,518	0.13	0.02	NA†
Verified Gross Realization Rate‡		101%	101%	101%	
Verified Gross Savings		1,528	0.13	0.02	
Total Program					
Ex-Ante Gross Savings	NA†	13,692	1.46	0.15	NA†
Verified Gross Realization Rate‡		100%	100%	100%	
Verified Gross Savings		13,706	1.46	0.15	

Source: Navigant analysis of EPY5 Multifamily program tracking data (August 27, 2013 data extract).

†NA when the TRM determines the gross savings.

‡ Based on evaluation research findings.

4. Net Impact Evaluation

In EPY5, Navigant calculated verified net savings of 11,285 MWh, verified net demand savings of 1.20 MW and verified net peak demand savings of 0.12 MW for the ComEd Multi-Family program. The Net-to-Gross Ratio for CFL measures was 0.81 and the Net-to-Gross Ratio for water efficiency measures was 0.93. The method used to calculate the verified net savings was deemed by the Illinois Stakeholder Advisory Group¹⁷ based on EPY3 evaluation research. As noted in Section 2.4, the EPY5 evaluation plan did not include new free-ridership or spillover research.

Navigant calculated verified net savings of 11,285 MWh for the EPY5 ComEd Multi-Family program, as shown in Table 4-1 below. As indicated in the table below, measure savings are derived from the Illinois TRM and engineering analysis of program population-level data, so sample size and statistical significance are not applicable. The table presents savings at the measure group level including groups where the NTGR estimate is not statistically significant at the 90/10 level.

¹⁷ Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013.
http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

Table 4-1. EPY5 Multi-Family Program Verified Net Impact Savings by Measure End-Use

	Net Energy Savings (MWh)	Net Demand Savings (MW)	Net Peak Demand Savings (MW)
CFL Measures			
Ex-Ante Gross Savings	12,174	1.33	0.13
Verified Gross Realization Rate‡	100%	100%	100%
Verified Gross Savings	12,178	1.33	0.13
Net-to-Gross Ratio (NTGR) †	0.81	0.81	0.81
Verified Net Savings	9,864	1.08	0.110
Water Efficiency Measures			
Ex-Ante Gross Savings	1,518	0.13	.001
Verified Gross Realization Rate‡	101%	100%	100%
Verified Gross Savings	1,528	0.13	0.01
Net-to-Gross Ratio (NTGR) †	0.93	0.93	0.93
Verified Net Savings	1,421	0.12	0.01
EPY5 Multi-Family Program Total			
Ex-Ante Gross Savings	13,692	1.46	0.14
Verified Gross Realization Rate‡	100%	100%	100%
Verified Gross Savings	13,706	1.46	0.14
Net-to-Gross Ratio (NTGR)	0.82	0.82	0.82
Verified Net Savings	11,285	1.20	0.12

Source: Navigant analysis of EPY5 Multifamily program tracking data (August 27, 2013 data extract).

Note: Analysis was not based on a sample so statistical significance is not reported.

† NTG is a deemed value. Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as agreed to through a consensus process in March-August 2013. ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the Illinois SAG web site at <http://ilsag.info>.

‡ Based on evaluation research findings.

Table 4-2 below includes ComEd EPY5 Multi-Family program ex-ante gross savings, verified gross savings and verified net savings by program measure.

Table 4-2. EPY5 Multi-Family Program Ex-Ante Gross, Verified Gross and Verified Net Savings by Measure

Equipment End-Use Type	Ex-Ante Gross Savings (kWh)	Verified Gross Savings (kWh)	Verified Gross Realization Rate [‡]	Net-to-Gross Ratio [†]	Verified Net Savings (kWh)
9W CFL	42,573	42,573	100%	0.81	34,484
14W CFL	6,948,734	6,945,991	100%	0.81	5,626,252
19W CFL	501,222	506,117	101%	0.81	409,955
23W CFL	135,752	135,806	100%	0.81	110,003
9W Globe CFL	3,294,879	3,298,140	100%	0.81	2,671,493
14W Globe CFL	129,154	126,692	98%	0.81	102,620
9W incl. Globe CFL (common area)	102,662	102,606	100%	0.81	83,111
14W CFL (common area)	857,128	855,330	100%	0.81	692,817
19W CFL (common area)	158,008	160,506	102%	0.81	130,009
23W CFL (common area)	3,821	3,820	100%	0.81	3,094
Showerheads (IU)	1,240,186	1,249,666	101%	0.93	1,162,189
Kitchen Aerators (IU)	119,052	108,750	91%	0.93	101,138
Bath Aerators (IU)	142,897	154,277	108%	0.93	143,477
Kitchen Aerator (CA)	167	180	108%	0.93	168
Bathroom Aerator (CA)	1,063	1,083	102%	0.93	1,007
Vending Misers	14,490	14,516	100%	0.93	13,500
TOTAL	13,691,786	13,706,052	100%	0.82	11,285,319

Source: Navigant analysis of EPY5 Multifamily program tracking data (August 27, 2013 data extract).

[‡] Based on evaluation research findings.

[†] NTG is a deemed value. Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as agreed to through a consensus process in March-August 2013. ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the Illinois SAG web site at <http://ilsag.info>.

4.1 Program Planned v. Actual Accomplishments

The EPY5 Multi-Family program achieved energy savings very close to planning levels (94%) despite seeing lower residential dwelling unit participation than planned (39%).

Table 4-3. EPY5 Multi-Family Program Planned v. Actual Results

Detail	EPY5 Planned	EPY5 Actual	Planned v. Actual
Participants (residential dwelling units)	100,000	39,429	39%
Verified Net Savings (MWh)	12,000	11,285	94%

Source: 2013 PGL NSG ComEd Multifamily Ops Manual_v7 2_4_5_2013_ACCEPTED_CHANGES.1; Nicor Gas Rider 30 EEP Program Portfolio Operating Plan, 1/24/2013; Navigant analysis of EPY5/GPY2 Multifamily program tracking data (August 27, 2013 data extract)

Table 4-4 below includes a comparison of EPY5/GPY2 program detail against EPY4/GPY1 program detail. Compared to EPY4/GPY1, the EPY5/GPY2 program achieved greater electricity savings while installing a similar number of measures at fewer residential dwelling units.

Table 4-4. EPY5 Multi-Family Program Yearly Comparison

Detail	EPY4/GPY1	EPY5/GPY2	Year over Year Difference
Participants (residential dwelling units)	50,198	39,429	79% (-21%)
Total Measures	259,235	272,304	105% (+5%)
Verified Net Savings (MWh)	9,456	11,285	119% (+19%)

Source: Navigant analysis of EPY5/GPY2 Multifamily program tracking data (August 27, 2013 data extract); Navigant EPY4-GPY1 ComEd, Peoples Gas and North Shore Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL (June 4, 2013); Navigant, EPY4-GPY1 ComEd, Nicor Gas Multi-Family Home Energy Savings Program Evaluation Report FINAL (June 5, 2013).

5. Process Evaluation

Process research related to the EPY5/GPY2 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

6. Conclusions and Recommendations

Overall, the program tracking system is accurately recording measure counts and, with some minor exceptions as detailed in this report, measure savings based on the Illinois TRM, contributing to a verified gross realization rates of 100 percent.¹⁸ Compared to EPY4, the EPY5 program achieved greater electricity savings while installing a similar number of measures at fewer residential dwelling units. In EPY5, measure-level Net-to-Gross Ratios (NTGR) used to calculate verified net savings were deemed through a consensus process by the Illinois Stakeholder Advisory Group (SAG)¹⁹ based on EPY3 evaluation research.

Verified Gross Realization Rates²⁰

Finding 1. The program is accurately tracking measure counts. Appropriate quality control and quality assurance procedures are in place. With minor exceptions as identified in the report, the program tracking system is accurately recording measure savings estimates based on deemed or partially deemed values from the Illinois TRM. The EPY5 program verified gross realization rate was 100 percent.

Measure Savings Estimates

Finding 2. Ex-ante measure savings values for CFLs and common area kitchen and bathroom aerators vary somewhat from verified measure savings values calculated by Navigant using IL-TRM algorithms.

Recommendation 2. The implementation contractor should update ex-ante measure savings values for CFLs and common area kitchen and bathroom aerators, as indicated in this report.

Finding 3. Navigant's research indicates that installing a thermostatically initiated shower restriction valve (i.e. Showerstart™ device) on a showerhead can potentially save an additional 84 kWh/year in multifamily homes, although additional research is required. Navigant should conduct additional research into energy savings associated with this measure as installed, including end-user preferences and possible interaction effects to verify measure savings.

Future Evaluation Risk

Finding 4. The EPY5 program achieved a 100 percent²¹ verified gross realization rate. Based on EPY5 program evaluation findings, evaluation risk associated with the direct installation portion of the program is relatively limited. The EPY6 program is expanding its scope to include additional measures that have not been evaluated under the Multi-Family program, which carries some risk associated with new design and delivery mechanisms. However, this

¹⁸ The value of 100 percent is rounded.

¹⁹ Document provided by ComEd to the SAG summarizing the SAG-approved NTGR for ComEd for EPY5-EPY6 as negotiated in March-August 2013. Distributed in the SAG meeting on August 5-6, 2013. http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ComEd PY5-PY6 Proposal Comparisons with SAG.xls

²⁰ Finding and Recommendations numbered 1 and 2 appear in the Executive Summary.

²¹ The value of 100 percent is rounded.

risk is somewhat mitigated by the fact that most of the measures associated with the EPY6 program have been evaluated as part of other ComEd programs, including the including the Business Standard program and the Business Custom program. The related realization rates and NTG ratios are available to calibrate ex ante savings to assure realistic projections.

7. Appendix

7.1 Glossary

High Level Concepts

Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 through May 31, 2009, EPY2 is June 1, 2009 through May 31, 2010, etc.
- GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 through May 31, 2012, GPY2 is June 1, 2012 through May 31, 2013.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY5/GPY2 the Illinois TRM was in effect and was the source of most deemed parameters. Some of ComEd's deemed parameters were defined in its filing with the ICC but the TRM takes precedence when parameters were in both documents.

Application: When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retrocommissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

Application: When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retrocommissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used for this concept)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times research NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ “Energy” and “Demand” may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.

† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.

§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the “Terms to be Used in Reports” column).

Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

Deemed Value – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a deemed measure shall use the superscript “D” (e.g., delta watts^D, HOU-Residential^D).

Non-Deemed Value – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript “E” for “evaluated” (e.g., delta watts^E, HOU-Residential^E).

Default Value – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript “DV” as in X^{DV} (meaning “Default Value”).

Adjusted Value – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript “AV” as in X^{AV}

Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012²².

Evaluation: Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification, measure level research, and program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

Synonym: **Evaluation, Measurement and Verification (EM&V)**

Measure Level Research: An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

Program Level Research: An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be

²² IL-TRM_Policy_Document_10-31-12_Final.docx

specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

Savings Verification: An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

Measure Type: Measures are categorized into two subcategories: custom and prescriptive.

Custom: Custom measures are not covered by the TRM and a Program Administrator’s savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator’s business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

Prescriptive: The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

Fully Deemed: Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

Partially Deemed: Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

Customized basis: Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

7.2 Detailed Impact Research Findings and Approaches

As discussed in Section 3.3, Navigant conducted evaluation research to validate engineering assumptions for parameter values not specified in the IL TRM including two measure categories: 1) a thermostatically initiated shower restriction valve on a showerhead for residential applications in Illinois and 2) hot water and steam pipe insulation measures in building common areas. Information about hot water and steam pipe insulation measures was supplied by the program's implementation contractor.²³ Please see the research memorandum included at the end of this Appendix for additional details.²⁴

7.2.1 Net Program Impact Results

In EPY5, measure-level Net-to-Gross Ratios (NTGR) used to calculate verified net savings were deemed through a negotiation process by the Illinois Stakeholder Advisory Group (SAG)²⁵ based on EPY3 evaluation research. As noted in Section 2.4, the EPY5 evaluation plan did not include new free-ridership or spillover research.

7.3 Detailed Process Results

Process research related to the EPY5 evaluation report was limited to interviews with program staff and the implementation contractor staff to verify information about the Multi-Family program's measures, tracking system and quality assurance /quality control procedures.

²³ Integrys_Master_Measure_Document 010213.xlsx (see spreadsheet Tab 31: MF Common Area Pipe Wrap).

²⁴ Navigant's evaluation research for this measure was distributed to interested parties in a separate memorandum dated September 6, 2013. Navigant revised the research memorandum for the final evaluation report.

²⁵ http://ilsagfiles.org/SAG_files/Meeting_Materials/2013/August 5-6, 2013 Meeting/ ComEd PY5-PY6 Proposal Comparisons with SAG.xls, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework-1.html>.

7.4 TRM Recommendations

Navigant conducted evaluation research into two measures that may assist the Illinois TRM Technical Advisory Committee annual updating process.

As described in Section 3.3, Navigant conducted evaluation research to validate engineering assumptions for parameter values not specified in the IL TRM including two measure categories: 1) a thermostatically initiated shower restriction valve on a showerhead for residential applications in Illinois and 2) hot water and steam pipe insulation measures in building common areas. Information about hot water and steam pipe insulation measures was supplied by the program's implementation contractor.²⁶ Navigant has included this evaluation research in a separate research memorandum to interested parties in Illinois.²⁷ A copy of this memorandum follows.

²⁶ Integrys_Master_Measure_Document 010213.xlsx (see spreadsheet Tab 31: MF Common Area Pipe Wrap).

²⁷ Navigant's evaluation research for this measure was distributed to interested parties in a separate memorandum dated September 6, 2013. Navigant revised the research memorandum for the final evaluation report.