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C&I New Construction Service Evaluation Report

FINAL
Energy Efficiency / Demand Response Plan:
Electric Plan Year 8 and Gas Plan Year 5 (EPY8/GPY5)
(6/1/2015-5/31/2016)

Presented to
Commonwealth Edison Company, Nicor Gas Company, Peoples Gas, and North Shore Gas

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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 Commonwealth Edison (ComEd) Commercial and Industrial (C&I) New Construction Service, which is in its eighth electric program year and fifth gas program year (EPY8/GPY5) [1]. The program is a part of ComEd's energy efficiency business program. Seventhwave implements the program for Commonwealth Edison (ComEd), Nicor Gas, Peoples Gas, and North Shore Gas.

Until mid-EPY7/GPY4, the New Construction Service was jointly offered by ComEd and Nicor Gas. Nicor Gas stopped accepting new gas projects under the joint allocation approach in December 2014 and shifted to a "dollars per therm" payment model for projects in the pipeline. Nicor Gas began accepting new projects again under the therm-buying approach in March 2016. Additionally, beginning in EPY8/GPY5, Peoples Gas and North Shore Gas also began coordinating with the program under the new program model. North Shore Gas did not complete projects in EPY8/GPY5 and, while one project was completed in the Peoples Gas service territory, the final designs included no gas savings or associated gas incentive. Therefore, no savings are reported for either North Shore Gas or Peoples Gas.

E.1. Program Savings

Table E-1 summarizes the EPY8/GPY5 gross and net electricity and natural gas savings from the New Construction Service by utility. Unless noted, the results presented in this report include interactive effects. No savings are reported for Peoples Gas or North Shore Gas Companies.

Table E-1. EPY8/GPY5 Total Program Electric and Gas Savings

Utility	Metric	Ex Ante Gross Savings	Gross Realization Rate	Evaluation- Adjusted Gross Savings	NTGR‡	Verified Net Savings
ComEd	MWh	48,165	90%	43,303	0.80	34,642
	MWh without interactive effects	48,900	90%	44,129	0.80	35,303
	Total MW	10.54	90%	9.47	0.80	7.58
	Total MW without interactive effects	10.54	93%	9.80	0.80	7.84
	Summer Peak MW	10.54	81%	8.59	0.80	6.87
	Winter Peak MW	10.54	52%	5.44	0.80	4.35
Nicor Gas	Therms	1,066,608	90%	955,407	0.92	878,974
	Therms removing interactive effects	1,213,841	93%	1,131,763	0.92	1,041,222

Source: ComEd tracking data and Navigant team analysis.
‡ Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html. Deemed NTGRs for Nicor Gas are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Values_2015-03-01.pdf.

[1] The EPY8/GPY5 program year began June 1, 2015 and ended May 31, 2016. The New Construction Service has been in operation for seven years, as it began in EPY2.

E.2. Impact Estimate Parameters

In the course of estimating EPY8/GPY5 verified gross and net savings, the evaluation team relied on a variety of parameters. Net-to-gross values and TRM parameters were deemed for this program and the others were adjusted based on our evaluation research. The key parameters used in our calculations and the source from which they were drawn are shown in Table E-2.

Table E-2. Impact Estimate Parameters

Parameter	Data Source	Deemed or Evaluated
Program Model Inputs	Program supplied building models and savings calculation spreadsheets†	Evaluated
Evaluated Model Inputs	Desk review of project documentation	Evaluated
Evaluated Model Inputs	Illinois TRM Version 4.0	Deemed
Evaluation Model Results	eQuest/DOE2.2, TRACE700, OpenStudio	Evaluated
Realization Rate	Program Savings and evaluated savings	Evaluated
NTG – Gas and Electric	SAG agreement‡	Deemed

† The program continues to use the System Track spreadsheet for calculate savings for simple project calculations, such as HVAC
‡ Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html. Deemed NTGRs for Nicor Gas are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Values_2015-03-01.pdf.

E.3. Program Volumetric Detail

As shown in Table E-3, the program completed 76 projects in EPY8/GPY5, consisting of 49 ComEd-only projects with claimed electric savings and 25 projects which had claimed savings for both ComEd and Nicor Gas, and 2 projects which claimed gas savings only for Nicor Gas[2].

Table E-3. EPY8/GPY5 Volumetric Findings Detail

Participation	Count of Projects
ComEd Only (claimed electric savings only)	49
ComEd and Nicor Gas (claimed electric and gas savings)	25
ComEd and Nicor Gas (claimed gas savings only)	2
ComEd and Peoples Gas	0
ComEd and North Shore Gas	0
Total	76

Source: ComEd tracking data and Navigant team analysis.

E.5. Results Summary

The following table summarizes the key results from the EPY8/GPY5 evaluation.

[2] All project counts are based on projects with claimed savings with interactive effects.

Table E-4. EPY8/GPY5 Results Summary

Parameter	MWh	MW			Therms†
		Total	Summer Peak	Winter Peak	
Verified Net Savings with interactive effects	34,642	7.58	6.87	4.35	878,974
Verified Net Savings removing interactive effects	35,303	7.84	--	--	1,041,222
Adjusted Gross Savings with interactive effects	43,303	9.47	8.59	5.44	955,407
Adjusted Gross Savings removing interactive effects	44,129	9.80	--	--	1,131,763
Realization Rate	90%	90%	81%	52%	90%
Realization Rate removing interactive effects	90%	93%	--	--	93%
NTG Ratio‡	0.80	0.80	0.80	0.80	0.92
Total Building Area Served (Sq. ft.)	16,921,231				
Actual Projects Completed	76				
Applications received in EPY8/GPY5	57				
Total Projects in the Pipeline	140				

Source: ComEd tracking data and Navigant team analysis.
‡ A deemed value. Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html. Deemed NTGRs for Nicor Gas are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Values_2015-03-01.pdf.
† All gas savings are associated with joint ComEd and Nicor Gas projects.

E.6. Findings and Recommendations

The following provides insight into key program findings and recommendations.[3]

Finding 2. For two projects, the evaluation team adjusted baseline conditions to match code compliance conditions, where the program's ex ante model was claiming savings based on expected conditions. For example, one project's ex ante model claims fan energy savings generated by building an open parking garage, as opposed to an enclosed parking garage, which would require ventilation. After it was shown that the program influenced the project's decision to switch from an enclosed parking garage to an open parking garage, the savings associated with reduced ventilation were included in the savings estimate.

Recommendation 2. We recommend the program provide documentation which details program influence when the program claims savings based on a horizontal baseline shift (i.e., moving from minimum code compliance standard to another minimum standard). Since a horizontal baseline shift will require us to deviate from ASHRAE 90.1 Appendix G in calculating savings, the documentation provided should clearly describe the program's influence so the program can claim all appropriate savings.

Finding 3. The evaluation team found inconsistencies in a few projects related to savings from electronically commutated motors (ECMs) in walk-in coolers. In three cases, the program was claiming savings for ECMs in walk-in coolers. However, ECMs were required for these types of walk-in coolers based on federal EISA-2007 standards. Per EISA-2007, walk-in coolers under 3,000 sq. ft. with single phase motors under 1 HP are required to be EC motors.

Recommendation 3. The evaluation team recommends the program ensures federal standards are appropriately incorporated into ex ante savings estimates.

[3] This is a subset of our findings and recommendations. Numbering on the findings and recommendations in this section are the same as those found in the Findings and Recommendations section of the evaluation report for ease of reference between each section.

Finding 4. For several projects, baseline ventilation requirements were not adjusted based on reductions in CFM in exhaust fans. For example, in one project (#527), the evaluation team reduced baseline ventilation by one-third, based on a reduction of 25 CFM for each 75 CFM fan.

Recommendation 4. The program's estimation of baseline ventilation should account for the variation in CFM for continuously ventilated bathrooms compared to intermittently ventilated bathrooms. While ASHRAE 62.1 requires minimum airflows and not maximum airflows, based on a review of C403.2.5, the installed HVAC system must be capable of reducing to the minimum required ventilation levels.

Finding 7. Repeat participation and targeted outreach have helped the program show owners and designers the merits of early participation, but many participants still engage with the program in later design phases. Consider the fact that one-third of the repeat participants interviewed engaged with the program in the 'design development' phase.

Recommendation 7. The program should continue to conduct outreach and marketing to the design community, including architects and MEP engineers, as well as developers, focusing on the benefits of early participation. The program should continue to remind participants of the benefits of early participation at the conclusion of each project. Through early participation, the program can help incorporate specific energy savings measures into design plans and budgets which otherwise might not be considered until later stages of design, when plans and budgets are less adjustable. In addition, the program can reduce potential value-engineering through program incentives and estimates of projected savings from program-provided building energy models.

1. INTRODUCTION

1.1 Program Description

The ComEd New Construction Service aims to capture immediate and long-term energy efficiency opportunities that are available during the design and construction of new buildings, additions and renovations in commercial and industrial (C&I) buildings. The ComEd program has been operating since June 1, 2009 (EPY2). Nicor Gas joined the program to offer natural gas rebates in June 2011 (GPY1). In December 2014, Nicor Gas stopped accepting new gas projects under the joint allocation approach and shifted to a "dollars per therm" payment model. They began accepting new projects again under the therm-buying approach in March 2016. Beginning in EPY8/GPY5, Peoples Gas and North Shore Gas also began coordinating with the program by purchasing therm savings associated with the projects in each of the gas company's respective service territories. North Shore Gas did not complete projects in EPY8/GPY5 and, while one project was completed in Peoples Gas service territory, the final designs included no gas savings or associated gas incentive. Seventhwave implements the program on behalf of ComEd, Nicor Gas, Peoples Gas, and North Shore Gas by reaching out to design professionals and customers at the beginning of the design process. The implementation team provides technical assistance in building designs that reduces energy use beyond what is required by existing building codes and standards.

1.2 Evaluation Objectives

As described in the research plan, the evaluation of the New Construction Service for EPY8/GPY5 sought to answer several questions related to the program's impacts and its implementation processes. These questions, broken into appropriate categories, are listed below.

1.2.1 Impact Questions

1. What are the researched gross energy and demand impacts?
2. What are the verified net impacts from the program using SAG-approved NTGRs?
3. Did the program meet its energy and demand savings goals? If not, why not?
4. What are the free ridership and spillover values to be used prospectively in future program years?

1.2.2 Process Questions

1. What design or implementation changes, including changes to the gas portion of the program, occurred in EPY8/GPY5, and how has this, if at all, changed the way the program is offered?
2. What challenges did the program face over the course of the program year and how did the program respond to them?

2. EVALUATION APPROACH

This evaluation of the New Construction Service covers the seventh year of program operation for ComEd and the fifth year for Nicor Gas. In an effort to recognize the singular nature of the program, the evaluation team synthesized process findings from each fuel type into a single set of findings. The impact evaluation is fuel-specific: the electric impact evaluation includes a sample of 25 EPY8/GPY5 projects with electric savings, while the gas impact evaluation includes a sample of 11 projects within a gas utility's service territory with gas savings. ComEd-only projects are those which do not fall within any gas utility's service territory, or do not claim gas savings.

2.1 Overview of Data Collection Activities

Table 2-1 summarizes the primary data sources that the evaluation team used to answer impact and process questions for both the electric and gas evaluations.

Table 2-1. Primary Data Collection Activities

What	Who	Target Completes	Completes Achieved	When
In-Depth Interviews	Program Manager/Implementer Staff	1	†	June 2016
Desk Review	Participants	25	25	June – July 2016
In-Depth Interviews	Participants	30	20‡	May – September 2016

† Instead of conducting a single program manager interview, the evaluation team incorporated this task into the ongoing monthly update meetings between the evaluation team and program management.
‡ The evaluation team completed 23 interviews covering 20 projects. For three projects, the evaluation team conducted two separate interviews

Table 2-2. Additional Resources

Reference Source	Author	Application	Gross Impacts	Process
Program tracking database	Program implementer	Impact and Process Evaluations	X	X
Project narratives and correspondences	Program implementer	Impact and Process Evaluations		X
Building plans	Program implementer	Impact Evaluation	X	
Program marketing and outreach materials and events	Program implementer	Process Evaluation		X
Illinois Technical Reference Manual, Version 4.0	Illinois Energy Efficiency Stakeholder Advisory Group	Impact Evaluation: Gross Savings Estimates	X	
International Energy Conservation Code 2009	International Code Council	Impact Evaluation: Baseline Determination	X	
International Energy Conservation Code 2012	International Code Council	Impact Evaluation: Baseline Determination	X	

2.2 Verified Savings Parameters

The evaluation team calculated verified gross and net savings (e.g., energy, demand, and coincident peak demand[4]) resulting from the EPY8/GPY5 New Construction Service by using participant-specific whole-building energy models developed for baseline and projected design scenarios. For each

[4] The evaluation team estimated both summer and winter peak demand using on PJM's peak periods.

participant, the design energy model estimates the annual whole building energy consumption of the proposed building based on architectural, building envelope, HVAC, lighting, and other parameters from the building design plans. The baseline energy model for a project estimates the counterfactual annual energy consumption the building would be expected to consume if it was built to meet the energy performance baseline standards. The estimated first year savings is the difference in annual electric and gas consumption between the two models. The energy performance baseline is the Illinois Energy Conservation Code for Commercial Buildings, which references and incorporates the applicable International Energy Conservation Code (IECC). This reference specifically allows for use of ASHRAE Standard 90.1 as an alternate compliance method. The program assumes the appropriate baseline based on the date that the project applied to the program. Projects that applied prior to January 1, 2013 used the IECC 2009 as the baseline; those that applied after used the IECC 2012.

Table 2-3 below presents the parameters that were used in the verified gross and net savings calculations and indicates which were calculated through evaluation activities and which were deemed.

Table 2-3. Verified Savings Parameter Data Sources

Gross Savings Input Parameters	Data Source	Deemed or Evaluated?
Program Model Inputs	Program supplied building models and Savings calculation spreadsheet‡	Evaluated
Evaluated Model Inputs	Desk review of project documentation	Evaluated
Evaluated Model Inputs	Illinois TRM Version 4.0	Deemed
Evaluation Model Results	eQuest/DOE2.2, TRACE700, OpenStudio	Evaluated
Realization Rate – All Projects	Program savings and evaluated savings	Evaluated
NTG – Electric and Gas†	SAG agreement†	Deemed

† Source: ComEd_NTG_History_and_PY8_Recommendation_2016-02-26_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html. Deemed NTGRs for Nicor Gas are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Values_2015-03-01.pdf.

‡ The program continues to use the system track spreadsheet for calculate savings for simple project calculations (e.g., HVAC)

2.2.1 Verified Gross Program Savings Analysis Approach

The engineering analysis used building energy models listed in Table 2-3. The analysis included:

1) Adjusting the model inputs in the executable files to match the as-built conditions identified in our review of the New Construction Service's project files and then rerunning the model.

2) Quantifying impacts by comparing two simulations representing the projected design scenario and the baseline scenario.

The baseline scenario in the model is dictated by the appropriate Illinois Energy Conservation Code for Commercial Buildings (this is to be distinguished from the IECC, the International Energy Conservation Code). A project's ex ante savings model is based on a baseline scenario which incorporates the building codes that were in effect at the time of the project's application. Although the applicable energy codes may change by the time a project obtains a building permit, the evaluation team believes that this is rare and the program's approach of using the application date to determine the applicable building code is reasonable and justified.

The evaluation team also calculated interactive effects, where applicable, for each fuel type. Interactive effects are the resulting changes to savings that occur when the installation of one measure has a positive or negative effect on the savings for the other fuel type. Interactive effects are calculated in the

model. Peak MWs are only shown with interactive effects because this is for PJM reporting. For utilities' goals tracking, we provide the savings without the penalties from interactive effects. The implementation team calculated savings for joint projects including interactive effects; however, the evaluation team also calculated savings both with and without interactive effects for reporting purposes. *Unless noted, the results in this report include interactive effects.*

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 EPY8/GPY5, the NTGR values used to calculate the net verified savings were based on past evaluation research and approved by the Stakeholder Advisory Group (SAG)[5].

During the course of the EPY8/GPY5 evaluation, the evaluation team researched program attribution to inform NTGRs for prospective application. Again, the evaluation team employed a "real-time" approach for researching free-ridership and spillover which was used in EPY7/GPY4, with a few modifications, discussed below. This overall methodology involves a review of project documentation followed by a post-reservation phase interview with the key decision makers on participant project teams. During the interviews, we collect quantitative data necessary to estimate project-level NTGRs according to the Illinois TRM v5.0. Section 7.1.2.1 in the Appendix of this report provides additional detail on this real-time NTG methodology. Below, we provide an overview of how we calculated free-ridership and spillover.

2.2.2.1 Free-Ridership

Using a self-report method, the evaluation team measured free-ridership by assessing three different free-rider scores based on participants' responses to interview questions in combination with a review of project-level documentation. Program Influence (PI), Program Components (PC) and No Program (NP). The PI score considers the relative influence of the program on the level of efficiency incorporated into the building design versus non-program influences. The PC element examines how much each component of the program influenced an individual projects' efficient design. The No Program score is based on responses to questions about whether the same efficient design features would have been included in the project in the absence of the program. Section 7.1.2.2 of the Appendix contains detailed descriptions of these three elements, including the battery of free-ridership questions.

2.2.2.2 Spillover

In prior years, the evaluation team also conducted post-verification interviews with participants once a project was complete, to collect additional free-rider data as well as participant spillover data. Because in previous evaluations the second interview consistently provided little new information, we recommended suspending the post-verification interview. Over the course of the program's life, the annual evaluations have found very little evidence of spillover. Therefore, the evaluation team did not interview program participants about spillover after project was completed. Instead, a general spillover study for the program, similar to that conducted in EPY6/GPY3, will be conducted in the future to capture evidence of any spillover that may exist.

2.3 Process Evaluation

Given the program's maturity and historically high participant satisfaction, the EPY8/GPY5 process evaluation was purposely limited to activities that provided information on participant characteristics, program implementation changes and program challenges.

[5] Source: ComEd_NTG_History_and_PY8_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html. Deemed NTGRs for Nicor Gas are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Values_2015-03-01.pdf.

2.3.1 Program Manager Interviews

In EPY8/GPY5, the evaluation team conducted program manager interviews on an ongoing basis though monthly meetings with program management, including both ComEd and Seventhwave. Through these meetings, the evaluation team was kept informed on EPY8/GPY5 program operations and challenges as well as any strategical implementation adjustments made during the program year. These meetings also allowed the evaluation team to ask clarifying questions about the program as they arose.

2.3.2 Program Participant In-Depth Interviews

The evaluation team collected and reviewed qualitative data from in-depth interviews with program participants to assess program processes and implementation from the participants' perspective. These interviews were conducted in conjunction with our net-to-gross research and, therefore, were completed only with participants that were in or beyond the program's reservation phase. Verbatim responses to the process questions covered in these interviews can be found in Section 7.2.

2.3.3 Review of Program Materials

The evaluation team reviewed program documentation, including project-specific documentation, to gain additional perspective on program processes and any updates in EPY8/GPY5.

3. GROSS IMPACT EVALUATION

Participants completed 76 projects through the New Construction Service in EPY8/GPY5, of which 25 were selected though a stratified sampling approach to be included in the engineering desk review. Total projects in the pipeline were 140. In many cases, the desk review independently confirmed the estimation of ex ante savings and no ex post adjustments were required. However, for other projects, we identified discrepancies in model inputs and ex ante savings calculations. The evaluation team calculated realization rates with and without interactive effects. The final realization rate was 90 percent for both MWh with interactive effects and MWh without interactive effects. For MW, the final realization rate was 90 percent with interactive effects and 93 percent for without interactive effects. For projects within a gas service territory, final realization rates were 90 percent for therms with interactive effects and 93 percent for therms without interactive effects.

3.1 Program Volumetric Findings

The evaluation team reviewed the New Construction Service program tracking data for projects completed in EPY8/GPY5. Table 3-1 presents the 76 completed projects, by savings type and utility. The New Construction Service completed more projects in EPY8/GPY5 than in EPY7/GPY4, when the program completed 57 projects. The number of projects completed with claimed gas savings increased from 21 projects in EPY7/GPY4 to 25 projects in EPY8/GPY5. All 25 of these projects were inside Nicor Gas's service territory.

Additionally, 53% of completed projects involved organizations or representatives who worked on projects which participated in the New Construction Service previously, compared to 37 percent in EPY7/GPY5. As anticipated, repeat participation has increased as the program reaches out to more design professionals representing a growing share of the building design market in the greater Chicago area. Repeat participants, familiar with the program's offerings, are also more likely to encourage project teams to sign up and work with the implementation team earlier in the design process, allowing for greater savings opportunities.

The program succeeded in its goal to serve larger projects, as both the total square footage of completed projects and the average square footage of completed projects increased as compared to EPY7/GPY4, by 36% and 2%, respectively. Projects completed in EPY8/GPY5 averaged 570 MWh savings per project, a 16% increase as compared to those completed in EPY7/GPY4, while also experiencing a seven percent increase in the average electric incentive per project. In terms of gas savings, the total claimed ex ante therms in EPY8/GPY5 increased 171% as compared to EPY7/GPY4, with a 160% increase in average therm savings. This dramatic increase in the average savings per project suggests that the new program model of "pay-for-therm" for gas savings is being implemented successfully and that program administration has experienced minimal transitional difficulties. Overall, these increases are indicative of the program's continued success in enrolling and effectively serving larger projects.

Table 3-1. EPY8/GPY5 Volumetric Findings Detail

Project Description	Count of Projects
ComEd Only (claimed electric savings only)	49
ComEd and Nicor Gas (claimed electric and gas savings)	25
ComEd and Nicor Gas (claimed gas savings only)	2
ComEd and Peoples Gas	0
ComEd and North Shore Gas	0
Total	76

Source: ComEd tracking data and Navigant team analysis.

3.2 Verified Gross Program Impact Results

Verified gross savings estimate for EPY8/GPY5 are shown by utility in Table 3-2. Table 7-1 in the Appendix shows ex ante gross savings and evaluation-adjusted gross savings by project, including individual project realization rates, for all sampled projects. The evaluation-adjusted gross savings estimates meet requirements for 10% precision at a 90% confidence level for MWh, total MW, and therms.[6] No savings are reported for Peoples Gas or North Shore Gas Companies.

Table 3-2. EPY8/GPY5 Verified Gross Impact Savings Results

Utility	Metric	Ex Ante Gross Savings	Gross Realization Rate	Relative Precision (90% confidence)	Evaluation-Adjusted Gross Savings	NTGR‡	Verified Net Savings
ComEd	MWh	48,165	90%	2.7%	43,303	0.80	34,642
	MWh removing interactive effects	48,900	90%	2.6%	44,129	0.80	35,303
	Total MW	10.54	90%	7.9%	9.47	0.80	7.58
	Total MW removing interactive effects	10.54	93%	8.1%	9.80	0.80	7.84
	Summer Peak MW	10.54	81%	10.6%	8.59	0.80	6.87
	Winter Peak MW	10.54	52%	17.8%	5.44	0.80	4.35
Nicor Gas	Therms	1,066,608	90%	3.0%	955,407	0.92	878,974
	Therms removing interactive effects	1,213,841	93%	4.9%	1,131,763	0.92	1,041,222

†Source: ComEd tracking data and Navigant team analysis
‡Source: ComEd_NTG_History_and_PY8_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

[6] Note that the results for summer and winter peak demand did not meet this threshold.

4. NET IMPACT EVALUATION

The NTGR values used to calculate verified net savings are deemed prospectively for this program. Table 4-1 shows the deemed NTGR values and the resulting EPY8/GPY5 verified net savings. The deemed NTGR value of 0.80 for electric savings and 0.92 for gas savings were agreed to by stakeholders in discussions in the SAG.

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

Utility	Metric	Evaluation- Adjusted Gross Savings	NTGR‡	Verified Net Savings
ComEd	MWh	43,303	0.80	34,642
	MWh removing interactive effects	44,129	0.80	35,303
	Total MW	9.47	0.80	7.58
	Total MW removing interactive effects	9.80	0.80	7.84
	Summer Peak MW	8.59	0.80	6.87
	Winter Peak MW	5.44	0.80	4.35
Nicor Gas	Therms	955,407	0.92	878,974
	Therms removing interactive effects	1,131,763	0.92	1,041,222

Source: Evaluation Team analysis

‡Source: ComEd_NTG_History_and_PY8_Recommendation_2014-02-28_Final_EMV_Recommendations.xlsx, which is to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html. Deemed NTGRs for Nicor Gas are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_Final_GPY5_Consensus_NTG_Values_2015-03-01.pdf.

5. PROCESS EVALUATION

For the process evaluation, the evaluation team conducted interviews with program implementers, administrators, and current program participants[7]. Until mid-EPY7, the New Construction Service was jointly offered by ComEd and Nicor Gas. Nicor Gas stopped accepting new gas projects under the joint allocation approach in December 2014 and shifted to a "dollars per therm" payment model for projects in the pipeline. Nicor Gas began accepting new projects again under the therm-buying approach in March 2016. Additionally, beginning in EPY8/GPY5, Peoples Gas and North Shore Gas also began coordinating with the program through the new "dollars per therm" model. North Shore Gas and Peoples Gas did not complete projects in EPY8/GPY5 with gas savings, primarily because of long lead times involved in new construction projects.

Overall, the New Construction Service continues to operate effectively and in accordance with the program model. Similar to previous program years, participants report a very high level of satisfaction with the program overall. Participants provided an average satisfaction rating of 9 out of 10 (n=23) and no participant provided a rating below 8 out of 10, on a scale from zero to 10, where zero corresponds to "not satisfied at all" and ten corresponds to "extremely satisfied". Below, we summarize the findings of our process evaluation. In Section 7.2, we provide several verbatim responses to process-related questions from participant interviews to illustrate and support these findings.

5.1 Program Participation

The New Construction Service completed 76 projects in EPY8/GPY5, as compared to 57 projects in EPY7/GPY4 and 59 projects in EPY6/GPY3. In addition to completing a higher number of projects, the program also served a higher total square footage as compared to last year (16,921,231 sq. ft. compared to 12,403,685 sq. ft. in EPY7/GPY4). The program continued to succeed in its aim of serving larger projects, as the average square footage of completed projects increased slightly from 217,609 sq. ft. per project in EPY7/GPY4 to 222,648 sq. ft. per project in EPY8/GPY5.

Of the 76 projects completed in EPY8/GPY5, just over 47% (36 out of 76) were repeat participants. The program has also succeeded in enrolling projects earlier in the design process. The same number of interviewed projects entered the New Construction Service in schematic design (n=8) as projects which were in design development. As would be expected, more repeat participants engaged with the program earlier on, with 67% of repeat participants engaging with the program early in the design process (at schematic design or before) as compared with 50% of first time participants. In addition, repeat participants achieved higher per-project electric savings and a higher weighted NTGR than first time participants.[8] This highlights the importance of repeat participation as a strategy for reaching program goals since when the program engages with a project earlier in the design phase there is a greater opportunity to influence the design process and offer greater and more comprehensive savings solutions.

The technical assistance component of the program continues to be highly regarded. Most respondents characterized their interaction with program technical staff as very positive. Many respondents found the program's whole building energy model an important design tool. Respondents who provided positive feedback cited the usefulness of third-party models in illustrating the projected energy and associated monetary savings of different design elements. When asked to rate the likelihood that third party data would have been available to support the team's design vision had the program not been available, respondents gave an average rating of 4 (on a 0 to 10 scale), but responses were mixed, ranging from zero to 9.

[7] In-depth interviews, which include both process and NTG sections, targeted program participants in the New Construction Service pipeline which are in or beyond the program's reservation phase

[8] Repeat participants achieved an average of 659 MWh of savings per project and a weighted NTGR of 0.68 compared to an average savings of 490 MWh per project and a weighted NTRG of 0.56 for first time participants. The NTG analysis is discussed in further in Section 7.1.2.

5.2 Coordination with the LEED process

Almost half of the projects interviewed (nine out of 20) indicated they are in the process of completing LEED certification at some level. Out of the nine projects, eight stated the New Construction Service helped them towards their goal of LEED certification in some way. The most common form of support the program provided was highlighting ways of meeting LEED design plans (11 respondents[9] representing eight projects). The program also helped participants achieve LEED certification though energy modeling support (seven respondents representing five projects) and highlighting ways the projects could achieve more LEED credits (four respondents representing four projects). However, the apparent lack of influence of the program's building energy model on LEED certification should be interpreted with caution. Similar to EPY7/GPY5, respondents mentioned that program-provided building energy models, at times, do not overlap with the specific building energy model requirements for LEED certification for their building type. While the program's energy model could not directly be used to satisfy LEED requirements in these situations, respondents noted the usefulness of having corroborating energy models.

5.3 Marketing and Outreach

Program outreach continued to be very well received and garner positive feedback. Almost all respondents reported overwhelmingly positive experiences with program staff. Similar to EPY7/GPY4, few respondents indicated they attended program-sponsored trainings in EPY8/GPY5. Given the high level of repeat participants, it is possible that respondents (or someone from their firm) attended trainings in previous years.

Most respondents were aware of the ComEd New Construction Service because of prior participation in the program by themselves or their employer, highlighting the importance of repeat participation as an important strategy for continuing to increase program participation in the future. The second most common source of program awareness was program outreach, and a few participants mentioned specific program-sponsored "lunch and learns" as a key source of program awareness. In addition, most participants indicated the continuation of "lunch and learns" and other specific marketing to the design community as integral to increasing participation moving forward. Specifically, multiple interviewees identified increasing awareness among mechanical electrical and plumbing (MEP) engineers as important to increasing the program's presence in larger or design-build projects. In addition, respondents recommended allowing for more informal interactions between project teams and program staff, in order to facilitate early involvement in the design process.

[9] For three projects, two respondents were interviewed. All three of those projects were LEED projects.

6. FINDINGS AND RECOMMENDATIONS

This section summarizes the key impact and process findings by topic and offers corresponding recommendations for each.

6.1 Verified Gross Impacts and Realization Rate

Finding 1. The evaluation team found several instances where a project's ex ante estimated baseline did not fully account for ASHRAE 90.1 or IECC requirements. For example, one project was adjusted to remove savings associated with supply air temperature reset, as it is a requirement of ASHRAE 90.1 Section 6.5.3.4. In another case, the savings associated with parking ramp ventilation controls were adjusted to account for the fact that ASHRAE requires parking ventilation controls to reduce flow to 50 percent.

Recommendation 1. The program should consistently apply the methodologies set forth in ASHRAE 90.1 and the IECC when calculating ex ante savings.

Finding 2. For two projects, the evaluation team adjusted baseline conditions to match code compliance conditions, where the program's ex ante model was claiming savings based on expected conditions. For example, one project's ex ante model claims fan energy savings generated by building an open parking garage as opposed to an enclosed parking garage which would require ventilation. After it was shown that the program influenced the decision to switch from an enclosed parking garage to an open parking garage, the savings associated with reduced ventilation were included in the savings estimate.

Recommendation 2. We recommend the program provide documentation which details specific program influence when the program claim's savings based on a horizontal baseline shift (i.e., moving from minimum code compliance standard to another minimum standard). Since a horizontal baseline shift may require us to deviate from ASHRAE 90.1 Appendix G in calculating savings, the documentation provided should clearly describe the programs influence so the program can claim all appropriate savings.

Finding 3. The evaluation team found inconsistencies in a few projects related to savings from ECMs in walk-in coolers. In three cases, the program was claiming savings for ECMs in walk-in coolers. However, ECMs were required for these types of walk-in coolers based on federal EISA-2007 standards. Per EISA-2007, walk-in coolers under 3,000 sq. ft. with single phase motors under 1 HP are required to be EC motors.

Recommendation 3. The evaluation team recommends the program ensures federal standards are appropriately incorporated into ex ante savings estimates.

Finding 4. For several projects, baseline ventilation requirements were not adjusted based on reductions in CFM in exhaust fans. For example, in one project (#527), the evaluation team reduced baseline ventilation by one-third, based on a reduction of 25 CFM for each 75 CFM fan.

Recommendation 4. The program's estimation of baseline ventilation should account for the variation in CFM for continuously ventilated bathrooms compared to intermittently ventilated bathrooms. While ASHRAE 62.1 requires minimum airflows and not maximum airflows, based on a review of C403.2.5, the installed HVAC system must be capable of reducing to the minimum required ventilation levels.

Finding 5. For several projects, numerical and definitional discrepancies were identified related to gas savings estimates. In one project, the calculation of ex ante natural gas savings from a heat exchanger used heat exchanger effectiveness similar to how savings calculations use heat exchanger efficiency, but because no heat is lost due to lower heat exchanger effectiveness, this overestimated gas savings. Based on our understanding of the system based on the plans, the heat exchanger is not recovering waste heat, but is a steam-to-hot water converter. The higher effectiveness will increase the amount of heat being removed per pound of steam. However, since the condensate is then sent back to the plant, the colder condensate will then result in additional heat required by the boiler to reheat and boil the condensate.

Recommendation 5. The program should strive to ensure that ex ante gas savings calculations are consistent with established calculation methodologies and rely on accurate underlying tracking data.

6.2 Process Evaluation

Finding 6. Claimed gas savings in the New Construction Service increased dramatically as compared to EPY7/GPY5. The increase in claimed gas savings points to early success under the new “pay for therms” program model.

Recommendation 6. The program should leverage the fuel-blind nature of program implementation to continue to increase program gas savings.

Finding 7. Repeat participation and targeted outreach have helped the program show owners and designers the merits of early participation, but many participants still engage with the program in later design phases. Consider the fact that one-third of the repeat participants interviewed, engaged with the program in the ‘design development’ phase.

Recommendation 7. The program should continue to conduct outreach and marketing to the design community, including architects and MEP engineers, as well as developers, focusing on the benefits of early participation. The program should continue to remind participants of the benefits of early participation at the conclusion of each project. Through early participation, the program can help incorporate specific energy savings measures into design plans and budgets which otherwise might not be considered until later stages of design, when plans and budgets are less adjustable. In addition, the program can reduce potential value-engineering through program incentives and estimates of projected savings from program-provided building energy models.

7. APPENDIX

7.1 Evaluation Research Impact Approaches and Findings

7.1.1 Evaluation Research Gross Impact Findings

Table 7-1 below shows the results of the engineering desk review. Ex ante and ex post electric and gas savings and the resulting realization rate are presented for each of the 25 projects included in the sample. In addition, where applicable, the table includes a narrative describing the reasons for any discrepancies between ex ante and ex-post savings. Realization rates below 100 percent indicate that energy savings were adjusted downwards while realization rates above 100 indicate energy savings were adjusted upwards. All energy savings include interactive effects.

Table 7-1: Researched Gross Savings for Sampled Projects

Project ID	Ex Ante		Ex Post		Realization Rate		Description
	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric (kWh) Savings RR	Gas (therm) Savings RR	
206	1,820,983	-	1,820,940	-	100%	N/A	No changes to the model.
321	3,165,183	134,568	3,098,503	115,264	98%	86%	The ex ante model was adjusted to account for small changes in the kitchen exhaust CFM levels, based on the as-build plans. This resulted in a small change to energy consumption. We have also included the savings associated with an open parking garage vs enclosed parking garage. It should be noted this is a horizontal baseline adjustment, and our approach will deviate from Appendix G. We strongly recommend that for projects like this that the program influence be documented to ensure credit can be given as appropriate.
360	2,192,689	-	1,069,848	-	49%	N/A	Baseline window area was modified to account for 40% maximum in IECC. Also the LPD was adjusted to remove savings for unlit areas (approximately 33% of tenant floors). We note the program has already incorporated recommendations related to the calculation of LPD and WWR moving forward, and that this project had completed an MIA prior to the May 2016 discussions.
542	2,901,388	22,781	2,901,388	22,781	100%	100%	No changes to the model.
673	3,087,272	-	3,084,055	(51,930)	100%	N/A	The wall insulation levels and door insulation levels were adjusted slightly based on the provided plans.
341	798,689	224,173	826,336	208,102	103%	93%	Only one change was made for this project. The supply air temperature reset savings were removed based on them being required based on 90.1-2010 Section 6.5.3.4.
465	403,521	-	273,984	-	68%	N/A	The LPD was adjusted to remove savings for unlit areas. We note the program has already incorporated recommendations related to the calculation of LPD moving forward, and that this project had completed an MIA prior to the May 2016 discussions.
467	525,263	82,488	406,538	82,484	77%	100%	Only one change was made to this project. The garage exhaust fan was assumed to operate at full flow continuously in the baseline condition and 33% flow continuously for the proposed case. Per ASHRAE 90.1-2010 Section 6.4.3.4.5 garage ventilation must be reduced to a minimum of 50%. Therefore, the baseline was reduced to 50% continuously. Also, the baseline model had the garage ventilation level set to 54,820 CFM, but this was reduced to 41,085 (consistent with the plans) for the WSHP model.
468	589,417	-	589,417	(90)	100%	N/A	No changes.

Project ID	Ex Ante		Ex Post		Realization Rate		Description
	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric (kWh) Savings RR	Gas (therm) Savings RR	
487	707,562	-	524,708	-	74%	N/A	Reduced the savings for the parking ramp ventilation controls. ASHRAE 90.1 requires parking ventilation controls to reduce flow to 50%. Also, remove in-unit lighting savings but reduce common space LPD to 0.42 to increase the savings for those spaces. We note the program has already incorporated recommendations related to the calculation of LPD moving forward, and that this project had completed an MIA prior to the May 2016 discussions.
500	612,803	-	572,065	-	93%	N/A	For this project, only the variable toilet exhaust measure was adjusted. However, it was adjusted with two counteracting adjustments. First, the total CFM was increased in the proposed case from the 8,800 CFM used in the ex ante analysis to 15,000 CFM based on the plans. Second, the baseline CFM was decreased to 10,200 CFM, based on a reduction in 25 CFM per bathroom exhaust (the difference in the required CFM for continuous vs. variable exhaust from 62.1). Based on a review of C403.2.2.5, the installed HVAC system must be capable of reducing to the minimum required ventilation levels. Based on this, our interpretation is that the ventilation levels for this measure must be adjusted based on the difference in required ventilations levels in ASHRAE 62.1.
527	809,076	-	690,588	-	85%	N/A	Reduced baseline bathroom ventilation by 1/3, based on reduction of 25 CFM for each 75 CFM exhaust fan. This reduced overall baseline ventilation by 15%. Based on a review of C403.2.2.5, the installed HVAC system must be capable of reducing to the minimum required ventilation levels. Based on this, our interpretation is that the ventilation levels for this measure must be adjusted based on the difference in required ventilations levels in ASHRAE 62.1.
560	77,350	3,002	77,350	3,002	100%	100%	No changes.
594	243,605	161,374	243,502	109,726	100%	68%	Although the ex ante calculations relied on information provided by the customer at the time, the evaluation team updated operating schedules due to additional information provided during a customer interview. Based on discussions with the customer, the heat exchanger for the water heat recovery operates approximately 67% of the time during production, about 40 minutes of every hour. Therefore, the ex ante model was adjusted to account for this downtime, when the system is being drained and the tempered water tanks are refilled.
595	829,938	243,449	792,847	243,449	96%	100%	The savings for the air compressor were reduced since the compressor was oil-free, which as a more efficient baseline. These are typically installed for food applications. Oil-free screw compressors do not have the load/unload characteristics of oil-injected compressors, since no oil-purge cycle is required. The part-load curve from airmaster is linear, down to a minimum of ~22%. However, we calculated the savings for the dryer based on this performance curve as well, and the purge CFM for a baseline heatless purge dryer with 15% purge. This increased the savings for the dryer by nearly 150%. Overall the compressor and dryer savings were reduced by 10%. Upon further consideration, we included the savings for the chiller, which were originally removed due to not meeting code efficiency requirements.
618	72,751	522	72,751	522	100%	100%	No changes.

Project ID	Ex Ante		Ex Post		Realization Rate		Description
	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric (kWh) Savings RR	Gas (therm) Savings RR	
501	3,609,766	-	3,381,085	(3,225)	94%	N/A	For this project, only one change was made. The efficient air compressor savings were recalculated based on the CFM data provided as well as typical performance curves, assuming a Load/No-Load compressor with 2 gal/cfm of storage for the baseline. The ex ante analysis assumed that the baseline compressors were larger compressors than the installed compressors.
505	637,588	113	637,588	113	100%	100%	No changes.
593	1,671,556	-	1,456,251	-	87%	N/A	Adjusted to account for penalties associated with 55% window area in final designs as compared to a 40% baseline.
621	741,127	-	508,420	-	69%	N/A	Based on a review, several changes were made to the model. First, the baseline lighting power density used in the ex ante analysis was 1.11 W/sf. However, this was reduced to 0.96 W/sf based on the space by space method. We agree that the building area (whole building) approach is acceptable. However, per section C405.5.2 of IECC-2012, the each building area (as defined by the types listed in the table) shall be treated as separate areas. We reclassified the areas listed based on the major building space category (office, warehouse, and manufacturing). Based on this, the resulting LPD for the building area method was 0.85 W/sf. However, by using the space-by-space method, we were able to increase the baseline to 0.96. The 0.96 W/sf is consistent with the supplied baseline W/sf indicated in the LEED documentation. Second, the savings for the DCV for the kitchen hood were removed. The installed kitchen hood controls are compliant with the requirements of 90.1-2010 Section 6.5.7.1.4 option B compliance). Finally, two changes were made to the savings for EC motors for the walk-in cooler evaporators section. Per EISA-2007, walk-in coolers under 3,000 SF, with single phase motors under 1 HP are required to be EC motors. Therefore, the savings for the EC motors were decreased by approximately 35%. However, this was offset by the addition of refrigeration savings due to the reduced heat gain to the space. Overall, the savings for this measure were decreased by approximately 20%.
630	410,761	-	173,043	-	42%	N/A	Three changes were made to this model. First, the baseline HVAC units were set to operate continuously, but the proposed units operate on-demand (intermittent operation). The baseline was changed to single speed intermittent operation. Second, the proposed VRF units had the fan type changed to 2-speed with 70% minimum speed based on provided plans. Finally, the baseline bathroom exhaust was adjusted to account for the lower CFM required for continuous ventilated bathroom exhaust fans. Based on a review of C403.2.2.5, the installed HVAC system must be capable of reducing to the minimum required ventilation levels. Based on this, our interpretation is that the ventilation levels for this measure must be adjusted based on the difference in required ventilations levels in ASHRAE 62.1.

Project ID	Ex Ante		Ex Post		Realization Rate		Description
	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric Savings (kWh/yr)	Gas Savings (therms/yr)	Electric (kWh) Savings RR	Gas (therm) Savings RR	
638	751,358	-	670,238	(3,487)	89%	N/A	The savings for the ECM motors for walk-in coolers was removed, since they are required by federal standards. In addition, the savings were originally removed for turning off unneeded lights overnight were removed, since it is required by C405.2.4. However, once documentation was provided which indicated influence from the program for the customer to change the lighting from dusk-to-dawn operation to being turned off, we revised the model to include these savings as eligible savings as a horizontal baseline adjustment, similar to project 321.
667	538,799	17,705	519,895	20,977	96%	118%	The baseline exterior lighting was slightly decreased due to rounding errors in the ex ante analysis. In addition, the unoccupied temperature setpoint for the destratification fan measure was adjusted to give 2F credit during both occupied and unoccupied times (instead of 2F during occupied and 6F during unoccupied). The gas savings were increased due to an apparent tracking error.
376	923,816	28,797	923,816	16,569	100%	58%	Only one change was made to this project. The ex ante analysis used heat exchanger effectiveness similar to efficiency. However, no heat is lost due to lower heat exchanger effectiveness. Based on the review of the documentation, we still do not see any energy savings associated with the installation of the heat exchanger with a higher effectiveness. Based on our understanding of the system based on the plans, the heat exchanger is not recovering waste heat, but is a steam-to-hot water converter. The higher effectiveness will increase the amount of heat being removed per pound of steam. However, since the condensate is then sent back to the plant, the colder condensate will then result in additional heat required by the boiler to reheat and boil the condensate. Please let us know if we are misunderstanding the system configuration.
663	442,415	-	339,436	531	77%	N/A	Disqualified ECM motors in walk-in units. Estimated retrofitted refrigerated cases savings based on the TRM savings, adjusted for the lighting and ECM motors, which are claimed elsewhere.
Total (Unweighted)	28,564,676	918,972	25,096,021	687,952	88%	75%	

7.1.2 Evaluation Research Net Impact Findings

7.1.2.1 Net-To-Gross Methodology

During the course of the EPY8/GPY5 evaluation, the evaluation team again employed a "real-time" approach for researching free-ridership and spillover which was used in EPY7/GPY4, with a few modifications. This overall methodology involves a review of project documentation followed by a post-reservation phase interview with key decision makers of participating project teams. The participant survey instrument asks about awareness of the measures identified and their inclination to pursue incorporation of those measures into design plans absent the program.

1) **Documentation Review.** The evaluation team began by reviewing the documentation on each sampled project provided by Seventhwave to identify potential points of influence. This component will include:
    a. Reviewing email correspondence for indications of program influence
    b. Reviewing building plans from throughout the project's participation to identify changes in efficiency throughout the construction process
    c. Discussing the project with Seventhwave to confirm areas where Seventhwave believes the program was influential, if needed
2) **Post-Reservation Interview.** Once a sampled project reaches the reservation stage, Seventhwave provides the evaluation team contact information for key decision makers and the team will conduct a post-reservation interview within 30 days or as soon as possible. We will also incorporate customized questions for each project linked to the points of influence identified in the documentation review. The in-depth-interview guide used in these interviews is provided in Appendix 7.3.

In prior years, the evaluation team also conducted post-verification interviews with participants once a project was complete, to collect additional free-rider data as well as participant spillover data. Because in previous evaluations the second interview consistently provided little new information, we recommended suspending the post-verification interview. Over the course of the program's life, the annual evaluations have found very little evidence of spillover. Therefore, the evaluation team omitted the post-completion project interview in the EPY8/GPY5 evaluation.

7.1.2.2 Net-To-Gross Algorithm

The net-to-gross analysis estimates the energy savings which each project would be expected to achieve in a counterfactual scenario in which the New Construction Service does not exist - that is, it identifies how much of the gross savings are attributable to program activities. Our analysis relied on data gathered through interviews with program participants in the reservation phase of the program or later. Interviewees were asked a battery of questions about how the program influenced the project's design and the expected efficiency of the project had the program not been available. Responses to our NTG questions are used to calculate three different scores, which, in turn, are used to triangulate project-specific NTGRs. We employed the C&I New Construction NTG approach of the Illinois TRM v5.0 protocol to combine these estimates into a project-specific NTGR. This approach is very similar to other commercial programs, but acknowledges that new construction energy efficiency programs are not expected to alter a project's timeline. Each of these free-rider scores, the corresponding interview questions used to calculate them, and the overall equation for determining our NTGR is provided below in Table 7-2.

As a threshold requirement, projects were screened based on when in the design process a project engaged with the New Construction Service. If a project enters the program in the construction

documents phase or in construction, there is no opportunity for the program to influence the level of energy efficiency incorporated in the design plans, and the project is a full free-rider (i.e. the net-to-gross ratio for the project is zero). Therefore, when an interviewee indicated that a project had engaged with the program in the construction documentation phase or later, the NTGR for that project was overridden to zero unless project documentation explicitly contradicted the interviewee's responses, in which case the NTGR is not overridden[10]. For all other projects, the NTGRs are calculated based on the method described in Table 7-2 below. Furthermore, the guide used for the in-depth interviews with participants is included in Appendix 7.3.

Table 7-2: Net-to-Gross Analysis Plan (Free Rider Question Score Map)

NTGR=1 – FR, where FR = (PI +PC+NP)/3)

Free Rider score	Questions	Algorithm Notes
Program Influence (PI score)	FR6a–b	These questions ask respondents to rate the relative importance of the program versus non-program influences by allocating a total of 100 points between the program (FR6a) and other factors (FR6b). Then, the PI score is calculated as one minus the program point divided by 100.
Program Components (PC score)	FR5a-mm	These questions ask respondents to rank the influence of multiple program and non-program factors on a scale of zero to ten, where zero corresponds to "no influence at all" and ten corresponds to "extremely influential". Then, the PC score is calculated as one minus the maximum program factor score divided by 10.
No-Program (NP score)	FR8	This question asks respondents to rank the likelihood the project would have included the same level of energy efficiency has the program not been available, on a scale from zero to ten, where zero corresponds to "not at all likely" and ten corresponds to "extremely likely". Then, the NP score is calculated by dividing this score by 10.

7.1.2.3 Researched Net-To-Gross Findings

To obtain the program-level NTGR, the project-level NTGR values were weighted by ex ante gross kWh savings and gross therm savings (for joint projects, using savings without interactive effects).[11] The results of our analysis are included in Table 7-3 below. For ease of comparison to the overall NTRG, each component free-rider score is presented as a difference from one. The NTGRs presented below are based upon the 23 interviews conducted in EPY8/GPY5 representing 20 projects[12].

Table 7-3: Researched Net-to-Gross Findings

Savings Type	PI Score (1-FR)	PC Score (1-FR)	NP Score (1-FR)	NTGR
kWh/kW	0.53	0.84	0.39	0.60
Therms	0.77	0.98	0.76	0.83

Source: Navigant team analysis, Data Collection Instrument

The variation across free-ridership scores is a likely a symptom of the inherent difficulty in estimating attribution in new construction programs, and highlights the benefits of including multiple variations of

[10] Only one respondents indicated engaging with the program in construction documentation, but based on project documentation this claim was deemed invalid

[11] Only one NTGR was calculated per project. Overall NTGR was calculated by weighting each project's NTGR by its relative contribution to total electric or Nicor Gas therm savings.

[12] For the three projects with two respondents, an average was taken of each respondents final NTGR to determine the project-specific NTGR

attribution questions in participant surveys. The decision-making process in new construction projects is complex, involving multiple market actors with varying degrees of influence coordinating over a period that could stretch years.

7.2 Verbatim Responses

Table 7-3 below presents illustrative verbatim responses to process-related questions asked during the in-depth interviews conducted by the evaluation team, categorized by theme.

Table 7-4: Participant Verbatim Responses to Process Questions

Theme	Response
Technical Assistance - Communication	"Quicker feedback loops I think would be more helpful. …[T]rying to make decisions based on input from the technical support staff ... it holds up the process a lot of times."
	"[T]here was a little bit of a delay in some cases when the energy model was being reviewed, but that was about it. I mean that was more having to do with the schedule or the project itself. But at the same time there were a lot of changes made to the model so it was understandable"
	"[A] lot of times in design build things move so quickly that in order to... get a drawing out there, to get a drawing or even a sketch out to Seventh Wave for them to do an analysis takes more time than the project team is willing to wait to make a decision or the owner is really willing to wait to make a decision."
Technical Assistance – Energy Modeling	"[I]t's really important in order to get the interaction between the systems...and then getting the annual energy costs as a result of running the models is helpful to the client [and] they wouldn't otherwise have that as a tool."
	"So typically we focus on the HVAC system in an energy model and lighting control is kind of an afterthought in those most of the time, so highlighting those parts of the energy model I think was beneficial."
	"[W]e get to see if we'd installed … the efficient measures we get to see our energy savings per year, how much of a percentage we can improve our energy use throughout the year. [I]t helped us you know internally decide if certain items are worth paying a premium for to get the payback"
	[T]he energy model …really kind of highlight[s] well you know there's a reason we're spending this extra you know first cost upfront because it's a better system and you're saving more energy"
Marketing	"[I]nstead of promoting this program to the owners, it would make sense to make architects and engineers more aware of this program I would say.
	"A lot of times it's just getting to the right people, so I think more direct contact with either the developers of buildings, owners of buildings or the architect.
	"I think educational seminars or lunch and learns, ...so that the program is known definitely the MEP engineers so that when they're engaged in schematic they can raise it as a design point in front of the owner. It's not always going to catch the architect's attention"
	"[L]unch and learns … to engineering firms so that they're more aware of it rather than having the owner have to be aware of it or the client"
LEED	[A] third party as well as ComEd [were] very, very helpful. I would say the extreme level of helpful in getting energy modeling accomplished."
LEED	[The program incentive is] like a bonus for pursuing the LEED in that this money can be seen as a way to offset some of those additional costs."

7.3 In-Depth Interview Guide – EPY8/GPY5

Post-Reservation Phase Interview
July 2016

Purpose

This in-depth interview guide will be used shortly after the project reaches the Reservation Phase. This interview asks questions about the participant's experience with the program so far, including the start of the project, the program's technical assistance, and its influence on the project's design and planned measures.

This interview will be used to attribute the effects of the New Construction Service on the projects under the purview of the respondent. It will also support the process analysis for this program. They will be performed by Navigant and Opinion Dynamics analytical staff via the telephone. We will call the primary contact person as provided by Seventhwave, but it may be necessary to expand our calls to include other individuals within the project if it appears that others were highly involved in the decision-making process. The numbered questions in this depth interview guide will definitely be asked, while non-numbered questions are prompts for the analyst to help ensure a complete response that adequately addresses the purpose of the numbered question. As such, not all questions in this guide will be asked as written.

Respondent name:	
Respondent phone number:	
Respondent title:	
Respondent type: (circle one:)	Developer/owner, A&E Design Professional, Other
Company name:	
Project (in sample)	
Utility	ComEd only ComEd/Gas Utility
Incentive Amount	
EE Equipment incented	
Interviewer:	
Date:	
Time Start:	

Introduction

Thank you for taking the time to talk with me today. The Opinion Dynamics [If joint participant, "and "Navigant"] evaluation team is currently conducting a study for ComEd [If joint participant, "and your gas utility"]. There are two aims of this interview: first, we'd like to get your perspective on the New Construction Service and find ways to improve it as much as possible; and second we'd like to understand the decision-making around the energy efficient design and equipment that went into the [PROJECT NAME] project. We'd like to get your insight by asking you some questions that should take about 30 minutes.

Role on Program Projects

Throughout this interview when I ask about the "program" or "New Construction Service" please consider your experience with the Seventhwave, ComEd, [If joint participant, "your gas utility"], or any combination of these as they relate to the [PROJECT NAME] project.

1. Please tell me about your involvement in the New Construction Service. Specifically:
   - How long have you been working with the program in relation to the [PROJECT NAME] project?
   - What is your role on the project and what are you responsible for?
   - Could you give me a brief overview of the [PROJECT NAME] project?

2. Are you involved now or were you involved in other projects that have participated in the New Construction Service?
   - Please give me a brief overview of those project(s).
3. We know there are several people involved in the project, but who is the main decision-maker for choices regarding the energy efficiency of the building design and equipment?
   - [IF NOT THE INTERVIEWEE, TAKE NAME AND CONTACT INFORMATION OF MAIN DECISION-MAKER.]
   - [IF NOT THE INTERVIEWEE, CONFIRM INTERVIEWEE HAS GOOD PERSPECTIVE ON THE DECISION-MAKING.] Although you are not the main decision maker, do you think you can still provide a lot of the rationale for choices regarding the energy efficiency of the building design and equipment?
   - [IF THE INTERVIEWEE LACKS GOOD PERSPECTIVE ON THE DECISION-MAKING, EXPLORE PROCESS QUESTIONS TO THE EXTENT POSSIBLE.]

Project Background

4. Program records show that the program is planning to offer [INSERT INCENTIVE AMOUNT] in incentives for the [INSERT PROJECT NAME] project. Does this sound about right?
5. Did the program assist you in developing an energy model?
   If yes, did the program provide energy modeling or calculations for the project before one existed for the project or did the program help refine an existing model or calculations?
   - (If necessary, "This would have been a computerized whole-building energy model Seventhwave used to represent the building energy consumption for a baseline design scenario and the energy efficient design scenario in order to highlight potential savings through system interactions.")
6. Is this project intended to be a LEED project? (If no, "Was it ever intended to be at an earlier point in the design?")
7. Were items cut from the project to control up-front project costs? (i.e., value engineering)?
   - (If no, follow up with, "Were design items ever cut due to budget shortfalls?")

Process Section

Now I would like to ask you about your experience with the New Construction Service.

Awareness and Participation

8. How did you first hear about the New Construction Service?

9. Why did you or your team decide to participate in the program?
   - [If necessary] Who on your team first decided to participate in the program?

Satisfaction

10. Overall, how satisfied are you with the program so far? Please use a scale where 0 is 'not satisfied at all' and 10 is 'extremely satisfied'.
    - [If <7, ask] Why are you not more satisfied with the program?

Program Processes

11. Have the program requirements been clearly explained to you?

12. Are there any ways you think the program can explain requirements or participation more clearly to participants in the future?

13. Do you think there are any requirements the program should adjust or change?
    - If so, which ones and how?

14. Did you fill out the program application for the project? If so, what do you think of it?
    - Do you have any suggestions for how to improve it?

15. How would you describe your experience with the technical assistance component of the program? [If necessary, "Technical assistance refers to the range of analysis, advice and support Seventhwave provided and may have included energy modeling; design assistance; technology and system recommendations; and an analysis of preliminary savings estimates and incentive levels."]
    - Do you have any suggestions for how to improve it?

[ASK IF ENERGY MODEL WAS DEVELOPED]

16. Could you describe the role the program's whole building energy modeling (simulation) played in your project?

17. Throughout your involvement with the program, has your communication with program staff been what you wanted? [Probe for timeliness and effectiveness of communication]

Alignment of Program Design with Participant New Construction Practices

18. At what point in your standard new construction design process do you consider participating in energy efficiency programs?

19. If you were to participate in the program again, do you think you or your project team would contact the program earlier in the design process? Why or why not?

20. Considering future projects, how could the program engage you or your peers in the new construction industry earlier during the project's pre-design phase?

21. Will you use Seventhwave for future projects? If not, why not?

NET-TO-GROSS (Attribution) SECTION

Free Ridership Factor (FR)

Now I'd like to ask a few questions about the design process that resulted in the energy efficient design or installations (e.g., HVAC, envelope, and lighting) that will be incented by the program. We need to understand how you (and your client) thought about energy efficiency and what influenced you (and your client) to incorporate energy efficient design or installations into this project.

FR1. So first could you give me an overview of how the energy efficient design or installations incented by the program were initiated? What were the main reasons they became or have stayed a part of this project?

FR1a. What were the roles of natural gas and electricity prices in the decision-making around energy efficient design or equipment if any?

FR1b. The program records show that the following types of measures are planned into the project and the program provided the following technical assistance. [READ MEASURES/ASSISTANCE] Is this correct? Were any other measures included or assistance provided?

FR2. Now could you give me an overview of the influence, if any, of the program on the energy efficiency components of the building design?

- What are the main ways the program has helped you bring energy efficiency into the project, if any?
- [If nothing specific described, then ask] Can you provide me with specific examples of the ways the program helped bring energy efficiency into the project?
- How would the energy efficiency of the project be different if it had not been submitted to the program?

FR3. Would you say you have worked with the program staff more around changes to design or changes to specific equipment? We know that design changes often mean equipment changes, but simple equipment changes do not tend to have extensive changes in design (if any).

[NOTE: we need to then ask the attribution questions in line with the answer to this question, i.e., a design change or equipment changes (by Measure #1, Measure #2).]

[ASK FR3a IF LEED PROJECT]

FR3a. Since the project is intended to meet LEED standards, we are interested in knowing how the program may have helped support or enhance the LEED goal. Please answer yes or no to the following questions.

i. Did the program help to refine an existing energy model?
ii. Did program staff provide technical assistance that highlighted ways to achieve LEED design plans?
iii. Did program incentives or technical assistance help the project to receive more energy and atmosphere credits than was originally planned?

[SKIP IF KNEW ABOUT THE PROGRAM FROM PREVIOUS PROJECT]

FR4a. When did you first learn about the New Construction Service and the incentives available for energy efficient installation and design? Was it during the…
1. pre-design?
2. schematic design?
3. design development?
4. construction documentation? (Total free rider, SKIP TO SO1)
5. construction phase? (Total free rider, SKIP TO SO1)
8. Don't know

FR4b. And in what phase is the project now?
1. pre-design?
2. schematic design?
3. design development?
4. construction documentation?
5. construction phase?
8. Don't know

FR4c. When do you anticipate construction will be complete for this building?

FR5. Next, I'm going to ask you to rate the influence of the program as well as other factors that might have influenced the decision to include the [*per FR3*: energy efficient design/Measure #1] that will be incented by the program. Please think of a scale from 0 to 10, where 0 means 'no influence at all' and 10 means 'extremely influential'. If something did not pertain to your project please let me know. [FOR FR8a-l, RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused]

(If needed: "How influential was/were _____ in the DECISION to include the energy efficient design/Measure #1 in the project(s)?)

Q	Question	Program Factor	Response
FR5a	[ASK IF PARTICIPANT ATTENDED TRAINING] Training sponsored by the program	Yes	
FR5b	The availability of financial incentives	Yes	
FR5c	Previous experience with this type of design/Measure #1	No	
FR5d	[ASK IF PRIOR/CONCURANT PARTICIPANT] Previous experience with the program	Yes	
FR5e	The program's technical assistance and building performance modeling	Yes	
FR5f	Recommendations from a program representative	Yes	
FR5g	Program information from program forms/website	Yes	
FR5h	Program outreach including Lunch & Learns, press releases, email or phone calls from Seventhwave	Yes	
FR5i	A recommendation from a design or consulting engineer	No	
FR5j	Corporate policy or guidelines	No	
FR5k	Standard practice in your business or industry?		
FR5l	The program's assistance in limiting value engineering	Yes	

FR5m. Were there any other factors we haven't discussed that were influential in the decision to [*per FR3*: use this design/install Measure #1]? If so, what were they?

[ASK IF FR5m = YES]

FR5mm. Using the same zero to 10 scale, how would you rate the influence of this factor on the decision to [*per FR3*: use this design/install Measure #1]? [RECORD 0 to 10; 98=Don't Know]

FR6a If you were given a TOTAL of 100 points that reflect the importance in your decision to implement the project, and you had to divide those 100 points between: 1) the program and 2) any other factors, how many points would you give to the importance of the PROGRAM? Points given to program:

FR6b And how many points would you give to other factors? [RECORD 0 to 100; 998=Don't Know; 999=Refused]

Interviewer Note: The allocated points for program factors and non-program factors should sum to 100.

CONSISTENCY CHECK ON PROGRAM IMPORTANCE SCORE

[ASK IF Program Factor Points > 70 AND ALL OF Program Factors in FR5 < 3, ELSE SKIP TO FR11]

FR7a You just gave <FR6a RESPONSE> points to the importance of the program. I would interpret that to mean that the program was quite important to your decision to complete this project. Earlier, when I asked about the importance of the individual elements of the program, I

recorded some answers that would imply they were not that important to you. Just to make sure I understand, would you explain why the program was not very important in your decision to complete the project?

[ASK IF Program Factor Points <30 AND ANY OF Program Factors in FR5 >7, ELSE SKIP TO FR8]

FR7b You just gave <FR6a RESPONSE> points to the importance of the program. I would interpret that to mean that the program was not very important to your decision to complete this project. Earlier, when I asked about the importance of individual elements of the program, I recorded some answers that would imply that they were very important to you. Just to make sure I understand, would you explain why the program was not very important in your decision to complete the project?

Now I want to ask you a few questions about how this project may have been different if the program had not existed.

FR8. Using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the program had not existed, what is the likelihood that the project would have included the same level of energy efficiency in the [*per FR3*: design/ Measure #1]? [RECORD 0 to 10; 98=Don't know]

[ASK IF SEVENTHWAVE DEVELOPED THE FIRST ENERGY MODEL FOR THE PROJECT]

FR9A. Using the same scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the program had not existed, what is the likelihood that an energy model would have been used as a design tool? [RECORD 0 to 10; 98=Don't know]

[ASK IF SEVENTHWAVE HELPED REFINE AN EXISTING ENERGY MODEL]

FR9B. Using the same scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if the program had not existed, what is the likelihood that the final energy model would have included the same level of energy efficiency as it did? [RECORD 0 to 10; 98=Don't know]

FR10. And using the same scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", what is the likelihood that independent, third party data supporting the design vision would have been available if the program had not been involved in this project? [RECORD 0 to 10; 98=Don't know; NOTE: This could include financial and energy data]

[For projects with multiple measures ask:]

FR11. Now I'd like to ask you about <Measure #2>. In terms of how the program or other factors influenced its selection or installation, would you say that this measure reflected the same or nearly the same decision-making as <Measure #1>?

1. Yes (Continue to FR13)
2. No

FR12. [If measure 1 and 2 are different fuels] Did the fuel type (electricity or natural gas) of <Measure #2> affect the decision-making at all?

1. Yes (Ask FR5 to FR10 for Measure #2)
   - [If so] How?
2. No (Ask FR5 to FR10 for Measure #2)

CONSISTENCY CHECK #2: INCENTIVE VS. NO PROGRAM SCORE

[FR8> 7 AND ANY Program Factors > 7, ELSE SKIP TO FR14]

FR13a When you answered the question(s) about the influence of the program factors with high ratings, I would interpret that to mean that the program was quite important to your decision to complete the project. Then, when you provided a high rating for how likely you would have been to include the same level of energy efficient design in the final project without the program, it sounds like the program was not very important in your decision.
I want to check to see if I am misunderstanding your answers or if the questions may have been unclear. Will you explain the role the program played in your decision to include the same level of energy efficient design?

FR13b Would you like for me to change your rating on the importance of the program factors to which you gave a high rating or change your rating on the likelihood you would include the same level of energy efficient design? We can also change both if you wish.
[Change ratings as necessary]

[FR8 < 3, AND ALL OF Program Factors < 3, ELSE SKIP TO FR15]

FR14a When you answered the questions about the influence of the program factors with low ratings, I would interpret that to mean that the program was not important to your decision. Then, when you provided a low rating for how likely you would have been to include the same level of energy efficient design in the final project without the program, it sounds like the program was very important in your decision.
I want to check to see if I am misunderstanding your answers or if the questions may have been unclear. Will you explain the role the program played in your decision to include the same level of energy efficient design?

FR14b Would you like for me to change your rating on the importance of the program factors to which you gave a high rating or change your rating on the likelihood you would include the same level of energy efficient design? We can also change both if you wish.
[Change ratings as necessary]

CORPORATE POLICY BATTERY [ASK IF FR5J>5, ELSE SKIP TO FR20]

FR15 Does your organization have a corporate environmental policy to reduce environmental emissions or energy use? Some examples would be to "buy green" or use sustainable approaches to business investments.

[ASK IF FR15=1, ELSE SKIP TO FR20]

FR16 What specific corporate policy influenced your decision to include <design element / measure #1> in the project?

FR17 Had that policy caused you to adopt <energy efficient design element or measure #1> in other projects before participating in the program?

[ASK IF FR17=1, ELSE SKIP TO FR20]

FR18 Did you receive an incentive for a previously including [design element / measure #1]?

1 Yes
2 No
8 (Don't know)
9 (Refused)

[ASK IF FR18=1]

FR19 To the best of your ability, please describe....
- a the amount of financial incentive received (IF NEEDED: for a previous installation of equipment)
- b the approximate timing
- c the name of the program that provided the incentive

STANDARD PRACTICE BATTERY [ASK IF FR5K>5, ELSE SKIP TO 8]

FR20 Approximately, how long has use of energy efficient equipment been standard practice in your industry?

FR21 Does your company ever deviate from the standard practice?
a. If so, please describe the conditions under which your company deviates from this standard practice.

FR22 How did this standard practice influence your decision to adopt the <energy efficient design element or measure #1> through the program?

FR23 Could you please rate the importance of the program versus this standard industry practice in influencing your decision to adopt <energy efficient design element or measure #1>? Would you say the program was...
- 1 Much more important
- 2 Somewhat more important
- 3 Equally important
- 4 Somewhat less important
- 5 Much less important

FR24 To what industry group or trade organization do you look to establish standard practice for your industry?

FR25 How do you and other firms in your industry receive information on updates in standard practice?

CLOSING SECTION

22. Is there anything else that you would like to let us know based on the topics we covered today, including any ways to improve the program if possible or how the program has affected your use of energy efficient measures or design in projects?

23. As part of this study, the evaluation team may seek to inspect the facilities and equipment for which the program incentives were received. Is there a site-level staff person you can refer me to who might be able to work with the evaluation site lead? This might be a facilities manager or a site engineer?

Name _____
Role _____
Contact Information _____

On behalf of ComEd (If joint project, “and your gas utility”), we thank you for your time today. If in reviewing my notes, I discover a point I need to clarify, is it all right if I follow-up with you by phone or email?

Time End _____