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Coordinated Utilities Public Sector New Construction Program Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Plan Year 9 (PY9) / Gas Plan Year 6 (GPY6) Bridge Period

June 2, 2017 – December 31, 2017

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

FINAL

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1. INTRODUCTION

This report presents the results of the impact evaluation of the coordinated utility Public Sector New Construction (PSNC) Program for the EPY9/GPY6 bridge period, June 2, 2017 through December 31, 2017. The report presents a summary of the electric and natural gas impacts for the overall program.

Note, a significant amount of data was missing from the project files, including estimates of demand savings. Additionally, for many projects, the project files did not contain the detailed information needed to recalculate the program-claimed savings and required the evaluation team to rely on assumptions and the best available information to estimate savings.

2. PROGRAM DESCRIPTION

The Public Sector New Construction Program provided incentives for new construction and major renovation of public sector buildings that exceed the Illinois Energy Conservation Code (IL ECC) at the time of the application. In the ComEd service territory, the program offered incentives for electric savings to ComEd customers and for gas savings to sites served by Nicor Gas, Peoples Gas, or North Shore Gas. Participants could receive either custom incentives for energy savings or prescriptive incentives for specific equipment installed. In addition to incentives, the program's implementer, the Smart Energy Design Assistance Center (SEDAC), offered technical assistance and trainings to help participants achieve higher savings.

This program was previously administered by the Illinois Department of Community and Economic Development (DCEO) until May 31, 2017 but continued to be implemented by the Smart Energy Design Assistance Center (SEDAC) through the end of 2017. Moving forward, all public-sector projects in the ComEd service territory will be served by the Coordinated Utility Commercial New Construction Program.

2.1 Bridge Period Program Activity

The program completed ten projects during the bridge period. Of these, nine received incentives related to electric savings and nine received gas-related incentives from Nicor Gas (7) or North Shore Gas (2). A total of eight projects received both electric and gas incentives. Please note that the two projects with savings claimed by North Shore Gas are evaluated in a separate report presented only to North Shore Gas.

Table 2-1. EPY9/GPY6 Volumetric Findings Detail

Participation	DCEO
Projects	10
Projects Receiving Electric Incentives	9
Projects Receiving Gas Incentives	9
Nicor Gas	7
North Shore Gas	2

Source: SEDAC tracking data.

3. Program Savings

Table 3-1 and Table 3-2 summarize the incremental electric and natural gas savings the PSNC Program achieved in the EPY9/GPY6 bridge period. Because the evaluation team reviewed all projects, there is no sampling error.

Table 3-1. EPY9 Bridge Total Annual Incremental Electric Savings

Savings Category	Energy Savings (MWh)	Demand Savings (MW)	Peak Demand Savings (MW)
Ex Ante Gross Savings	3,010	N/A	N/A
Program Gross Realization Rate	81%	N/A	N/A
Verified Gross Savings	2,451	N/A	N/A
Program Net-to-Gross Ratio (NTGR)	0.77	N/A	N/A
Verified Net Savings	1,887	N/A	N/A

Note that the reviewed project files did not contain demand savings estimates or details on many measures, requiring the evaluation team to rely on assumptions and the best available information to estimate savings.
Source: SEDAC tracking data and Navigant team analysis.

Table 3-2. GPY6 Bridge Total Annual Incremental Gas Savings

Savings Category	Nicor Gas
Ex Ante Gross Savings	121,050
Program Gross Realization Rate	96%
Verified Gross Savings	115,998
Program Net-to-Gross Ratio (NTGR)	0.67
Verified Net Savings	77,719

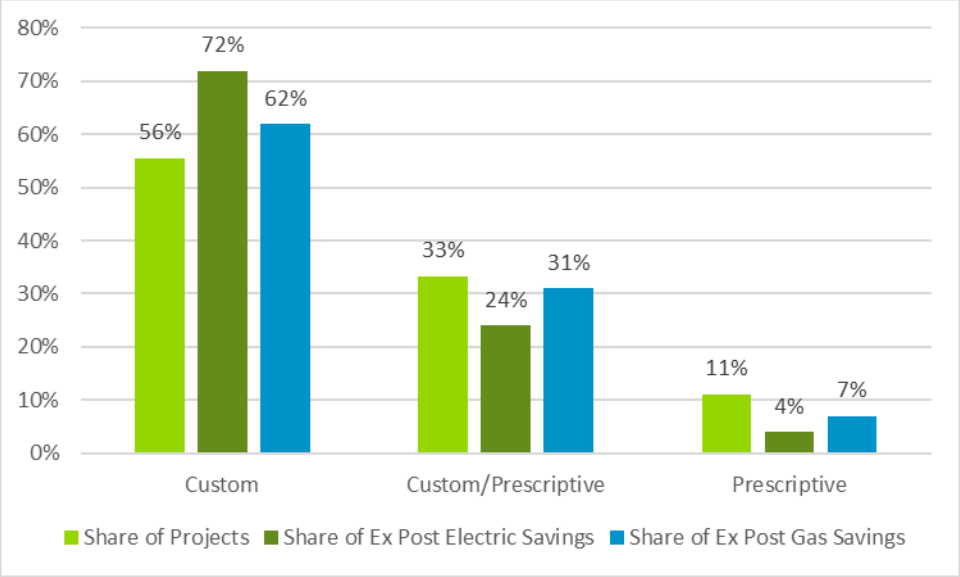
Source: SEDAC tracking data and Navigant team analysis.

4. Program Impact Analysis Findings and Recommendations

Participants in the PSNC Program could receive either custom incentives for energy savings or prescriptive incentives for specific equipment installed. Of the nine ComEd/Nicor Gas projects completed in the bridge period, five projects used the custom incentive path, one used the prescriptive path, and three used a combination of both paths,[1] As shown in Figure 4-1, custom path projects accounted for larger relative shares of both electric and gas savings compared to prescriptive and custom/prescriptive projects.

[1] Note, these counts do not include two North Shore Gas projects, both of which used the custom incentive path.

Figure 4-1. Breakout of Incentive Paths*



* Does not include North Shore Gas projects

4.1 Impact Parameter Estimates

Participants completed nine projects through the PSNC Program in EPY9/GPY6 bridge period.[2] Due to the limited number of projects, the evaluation team included all nine projects in the engineering desk review. In some cases, the desk review independently confirmed the estimation of ex ante savings and no ex post adjustments were required. However, for five projects, we identified discrepancies in model inputs and ex ante savings calculations. The evaluation team calculated realization rates with interactive effect penalties included. The final realization rate was 81% for kWh with interactive effects and 96% for therms with interactive effects (Nicor Gas projects only).

The evaluation team calculated verified gross and net savings for electricity and natural gas resulting from the EPY9/GPY6 bridge period PSNC Program by using either participant-specific whole-building energy models developed for baseline and projected design scenarios or a TRM prescriptive approach.

For each participant evaluated using the building model approach, 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 January 1, 2013 but before May 31, 2016 used the IECC 2012, and those that applied after June 1,

[2] Note that the values shown in this paragraph do not include the gas savings from two North Shore Gas projects. A total of 10 projects were completed in the bridge period, but one project did not have electric savings and only had gas savings claimed by North Shore Gas.

2016 use IECC 2015. This approach ensures that a consistent baseline is used for entire program years and that baselines are consistent with the TRM.

The projects calculated using the TRM approach included lighting, shell, and HVAC equipment installations. For these projects, no calculations were provided in the project documentation, nor were the specific inputs or building classification information used to develop the savings estimates included. Additionally, the evaluation team was unable to recreate the lighting savings using the default hours of operation values presented in the TRM. Therefore, it appears that the lighting savings were calculated using customer-specific hours of operation, rather than the default hours of operation from the TRM. However, based on the claimed savings values, we can impute what hours of use would be required. Using this approach, we verified that, for all projects reviewed, the hours of use assumptions were reasonable, and the lighting hours of use were not adjusted.

Table 4-1 summarizes the parameters and references used in verified gross and net savings calculation. The evaluation team calculated savings for each measure following algorithms defined by the Illinois TRM version 5.0.

Table 4-1. Verified Gross Savings Parameters

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 5.0*	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

* State of Illinois Technical Reference Manual version 5.0 from http://www.ilsag.info/technical-reference-manual.html.
† ComEd_NTG_History_and_PY9_Recommendations_2016-02-26_Final.xlsx and Nicor_Gas_GPY6_NTG_Values_2016-02-29_Final.xlsx, which are to be found on the IL SAG web site here: http://ilsag.info/net-to-gross-framework.html

4.2 Other Impact Findings and Recommendations

Finding 1. For many projects, the project files did not contain the detailed information needed to recalculate the program-claimed savings. This makes it more difficult to verify program-claimed savings and forces the evaluation team to rely on assumptions and the best available information to estimate savings.

Recommendation 1. All assumptions and calculations should be properly documented and included in the program's project files.

5. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

The engineering analysis used building energy models listed in Table 4-1. The analysis included:

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

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

3) Recalculating savings according to TRM assumptions and algorithms.

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.

Note that a significant amount of data was missing from the project files, including estimates of demand savings. Additionally, for many projects, the project files did not contain the detailed information needed to recalculate the program-claimed savings and required the evaluation team to rely on assumptions and the best available information to estimate savings.

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. *The results in this report include interactive effects.*

Verified net electric and natural gas savings were calculated by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). In EPY9/GPY6 Bridge Period, the NTGR values used to calculate the net verified savings were based on past evaluation research and approved by the Stakeholder Advisory Group (SAG)[3].

[3] PY9 Bridge Period deemed NTG ratios for ComEd, Nicor Gas, Peoples Gas and North Shore Gas are available on the IL SAG website here: http://ilsag.info/net-to-gross-framework.html.

6. Appendix 2. Impact Analysis Detail

Table 6-1 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 9 projects. 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% 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 6-1. Researched Gross Savings for All 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	
PS0005	30,491	10,306	20,272	NA*	66%	NA*	The savings for this project were reduced due to a reduction in the lighting savings. Most of this building is greenhouse space, which is not governed by code. Therefore, evaluation team recalculated the savings based on the difference in lighting Watts per lumen instead of new construction W/sf. This change reduced the overall project electric savings by 34%.
PS0007	255,910	11,603	255,910	11,603	100%	100%	No change
PS0008	125,472	18,289	125,472	18,289	100%	100%	No change
PS0010	1,270,155	61,431	697,096	61,431	55%	100%	Most of the savings for this project were due to the elimination of cooling tower energy usage due to the installation of an air-cooled chilling system. Based on a review of the results files, the assumed cooling tower energy usage appeared unreasonable. Therefore, the tower savings were estimated, which reduced the project electrical energy savings by 45%.
PS0011	252,631	6,520	252,631	6,520	100%	100%	No change

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	
PS0012	307,906	9,451	277,950	4,389	90%	46%	The savings for this project were updated to be consistent with the provided energy model extracts, which reduced the electric savings by 10% and the gas savings by 54%. The evaluation team reduced the gas savings because the U-values of the installed windows was lower than what was modeled which offset the increased savings from the roof and wall insulation. Similarly, the electric savings from increased efficiency of the cooling system were offset by the solar heat gain coefficient of the installed windows being worse than modeled.
PS0002	179,543	6,086	206,084	6,086	115%	100%	The savings for this project were increased by 15% due to changes in the calculation of savings related to the air conditioning equipment which were slighting offset by a reduction in lighting savings. It appears the AC equipment calculation was based on EER values rather than SEER or IEER. Additionally, the savings for lighting were reduced slightly due to a small change in lighting power density and hours of use.
PS0014	478,122	0	505,438	0	106%	N/A	The lighting savings for this project were increased. The code listed for the project was ASHRAE 90.1-2007. However, the lighting power density used was more conservative than ASHRAE 90.1-2007.
PS0003	109,892	7,670	109,892	7,670	100%	100%	No change

* Gas savings from this project were claimed by North Shore Gas and were evaluated and reported separately.

7. APPENDIX 3. TRC DETAIL

Table 7-1, below, the Total Resource Cost (TRC) variable table, only includes cost-effectiveness analysis inputs available at the time of finalizing this evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in this table and will be provided to evaluation later. Details on EULs in this table are subject to change and are not final.

Table 7-1. Total Resource Cost Savings Summary

Projects	Units	Quantity	Effective Useful Life	Ex Ante Gross kWh Savings	Ex Ante Gross Peak kW Savings	Ex Ante Gross Therms Savings	Verified Gross kWh Savings	Verified Gross Peak kW Savings	Verified Gross Therms Savings
ComEd	Project	9	17	3,010,122	NA	NA	2,450,745	NA	NA
Nicor Gas	Project	7	20	NA	NA	121,050	NA	NA	115,988
All	Project	9		3,010,122	-	121,050	2,450,745	0	115,998