



# Business Custom Incentive Program Impact Evaluation Report

Energy Efficiency Plan: Plan Year 6 (PY6)  
(6/1/2016-12/31/2017)

Presented to  
Nicor Gas Company

**FINAL**

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## 1. INTRODUCTION

This report presents the results of the impact evaluation of the Nicor Gas PY6 Business Custom Incentive Program (Custom Program). It presents a summary of the energy impacts for the total program and broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. PY6 covers June 1, 2016 through December 31, 2017.

## 2. PROGRAM DESCRIPTION

The Custom Program is targeted to commercial and industrial customers of Nicor Gas. It provides these customers with rebate incentives for the installation of cost-effective natural gas-related energy efficiency improvements that are not specified for a prescriptive rebate under the Nicor Gas Business Energy Efficiency Rebate Program. The Custom Program provides custom audits and engineering studies to assist customers in understanding their efficiency opportunities by quantifying the estimated project costs, energy savings, and forecasted incentives. The program targets large commercial and industrial customers with more complex facilities that will benefit most from a custom offering during new equipment purchases, facility modernization and industrial process improvements. The Custom Program was implemented in PY6 by CLEARResult.

Nicor Gas' Energy Efficiency Plan (EEP) for PY4 through PY6 transitioned to the energySMART brand for implementation. Integration of the energySMART brand seeks to deliver consistent and targeted messaging using market data, and encouraged cross-promotion between offerings to ensure that each customer interaction delivers a recognized and relevant call-to-action at any point on their energy efficiency application.<sup>1</sup> As an example of this strategy, the Custom Program offered the Strategic Energy Management (SEM) track. The SEM track presented participants the opportunity to optimize process operations and building efficiency by providing them with technical advice and financial incentives to perform low-cost tune-ups and adjustments. Evaluation results for the SEM component of the Custom Program was reported separately in the Nicor Gas and ComEd joint implementation of the Retro-Commissioning (RCx) and SEM Programs.<sup>2,3</sup> This evaluation report covers only the evaluation of the program savings realized from the custom measure component of the Custom Program.

The Custom Program staff work with both trade allies and decision-makers at facilities with natural gas use over 60,000 therms to identify and quantify efficiency opportunities at their facilities. Interested customers must first submit a letter of interest and a pre-approval application to the program. The initial application includes usage history and detailed calculations and specifications for the project. Program staff review the customer's initial reported savings and screen projects using an internal cost-benefit test. The Custom Program requires that a project's initial application be pre-approved prior to the start of the project. Prior to issuing an approval notice, pre-installation inspections are performed on almost all projects, especially for complex and high impact measures.

The program had 37 participants in PY6 and completed 39 projects as shown in the following table.

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<sup>1</sup> Nicor Gas Energy Efficiency Plan, June 2014 - May 2017 (Revised Plan Filed Pursuant to Order Docket No. 13-0549)

<sup>2</sup> ComEd Nicor SEM EPY8 GPY5 Evaluation Report 2016-10-01

<sup>3</sup> EPY8-GPY5 RCx Evaluation Report 2017-02-13 Final

**Table 2-1. PY6 Volumetric Summary**

Participation	Total
Participants*	37
Completed Projects†	39

Source: Nicor Gas tracking data and Navigant team analysis.

\* Participants are defined as unique company name-address combinations

† Installed Projects are defined as unique Vendor Project IDs

### 3. PROGRAM SAVINGS SUMMARY

Table 3-1 summarizes the energy savings of the Custom Program in PY6.

**Table 3-1. PY6 Annual Energy Savings Summary**

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
Business Custom	2,278,540	99%	2,264,572	0.73	1,653,137

Source: Nicor Gas tracking data and Navigant team analysis.

\* Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

† Net-to-Gross Ratio (NTGR) is the ratio of verified net savings to verified gross savings. The NTGR is a deemed value. Source: Nicor\_Gas\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

## 4. PROGRAM SAVINGS BY MEASURE

The Custom Program was divided into four strata for sampling and savings verification. Details on strata boundaries are discussed in Appendix 1 in Section 6.

**Table 4-1. PY6 Annual Energy Savings by Strata**

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTGR†	Verified Net Savings (Therms)
Certainty Strata	799,399	92%	734,534	0.73	536,210
Strata 1	465,308	105%	490,098	0.73	357,771
Strata 2	519,936	101%	522,843	0.73	381,675
Strata 3	493,897	105%	517,097	0.73	377,481
<b>Total</b>	<b>2,278,540</b>	<b>99%</b>	<b>2,264,572</b>	<b>0.73</b>	<b>1,653,137</b>

Source: Nicor Gas tracking data and Navigant team analysis.

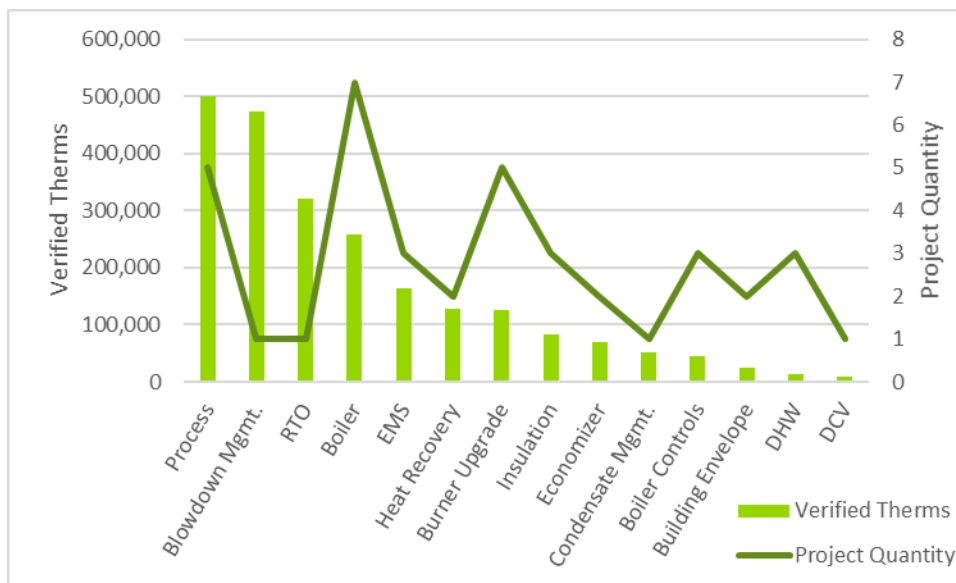
\* Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

† Net-to-Gross Ratio (NTGR) is the ratio of verified net savings to verified gross savings. The NTGR is a deemed value. Source: Nicor\_Gas\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

‡ Totals may not sum exactly due to rounding.

Figure 4-1 shows the verified savings by the various project types received by the Custom Program.

**Figure 4-1. Verified Savings by Project Type**



Source: Nicor Gas tracking data and Navigant team analysis.

## 5. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

### Impact Parameter Estimates

Table 5-1 shows that the unit therm savings for custom measures vary, and the overall realization rate for custom measures was 99 percent. The realization rate (RR) is the ratio of the verified savings to the ex ante savings. Following the table, we provide findings and recommendations, including discussion of measures from sampled projects with realization rates above or below 100 percent. Appendix 1 provides a description of the impact analysis methodology. Appendix 2 provides project level realization rates and a summary of adjustments to the verified savings.

**Table 5-1. Verified Gross Savings Parameters**

Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	Realization Rate	Data Source(s)
Custom Measures	Vary	Vary	Vary	99%	Project File Review, Monthly Billing Data, On-Site Measurement and Verification*

\* Project files and monthly billing data provided by Nicor Gas. On-site data collected by Navigant.

The following section provides insight into key program findings and recommendations.

Project 1010824 (RR = 114 percent) calculated the average production energy intensity (therms/production) by taking the average of monthly average values. This approach evenly weights the data points, regardless of monthly production. A more appropriate approach to calculate the average production energy intensity is to divide the sum of therms by the sum of the production, which assigns more weight to the months with more production.

**Recommendation 1.** Navigant recommends avoiding taking the average of other average values. These values should be estimated by dividing the sum of the numerators by the sum of the denominators (i.e., a weighted average).

Project 786554 (RR = 97 percent) involved the installation of heat recovery equipment in a manufacturing facility. The heating degree-day base temperature was estimated to be 65°F in the ex-ante calculation. However, the facility had a large amount of internal heat gain, in the form of high-temperature industrial ovens and molten metal baths, that made the 65°F base temperature assumption unreasonable. The facility’s gas usage was analyzed against heating degree-days of various base temperatures, to determine which base temperature yielded the highest coefficient of correlation (R<sup>2</sup>). This analysis produced a base temperature estimate of 51°F.

**Recommendation 2.** In projects that utilize heating degree-days, Navigant recommends calculating site-specific heating degree-day base temperatures if the usage data is available and of sufficient quality. This will more accurately account for the internal heat gains unique to that facility.

Project 843502 (RR = 114 percent) involved the installation of insulation on an industrial process tank. The ex-ante calculation determined the heat loss from the tank, but did not account for the heating system efficiency. Since the heating system efficiency is less than 100 percent, this underestimated the energy savings resulting from the project.



**Recommendation 3.** Navigant recommends incorporating the heating system efficiency in energy saving calculations.

Projects 1010824 (RR = 114 percent) and 1768198 (RR = 98 percent) were two separate phases of the same project. Phase 1 (Project 1010824) included some production data in 2015 and 2016 to estimate savings, while Phase 2 (Project 1768198) included some production data from 2016 and 2017. The Initial Phase 1 savings calculations did not incorporate all 2015 and 2016 production data. Navigant updated the Phase 1 savings calculations to include all production data from 2015 and 2016. The same update was made for Phase 2 (Project 1768198) for 2016 and 2017 data.

A similar case occurred for Project 758284 (RR = 105 percent). The initial savings calculation incorporated only facility production data from 2016, when production data from 2015 and 2016 was provided. Navigant updated the savings calculation to include 2015 and 2016 facility production data. Project 709869 (RR = 92 percent) was adjusted to include 2017 data.

**Recommendation 4.** Navigant recommends documenting justifications for excluding portions of historical usage and production data from engineering analyses.

Project 568954 (RR = 99 percent) involved upgrading air handling unit (AHU) schedules at several university buildings. The savings for different buildings were based on the AHU daily hours of use (HOU). The implementer provided hours of use calculations for all buildings involved in the project. However, not all the buildings' energy savings calculations matched the implementer's HOU calculations.

**Recommendation 5.** Navigant recommends that algorithm input values in energy savings calculations be consistent with project documentation. If several different values for the same input are available in the project documentation, provide justification for choosing one over the others.

Table 7-2 provides a summary of adjustments made to other sampled projects: Project 786729 (RR = 91 percent), Project 989846 (RR = 101 percent), Project 573428 (RR = 111 percent), and Project 306546 (RR = 92 percent).

No savings adjustments were made to the following sampled projects: Project 875969, Project 568975, Project 875929, or Project 795322.

## 6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

The PY6 evaluation involved retrospective adjustments to ex ante gross savings on custom measure variables of all projects installed in PY6. CLEAResult provided documentation of project applications and savings. Navigant verified project eligibility and savings based on engineering review, billing data review, and on-site measurement and verification (M&V) of a sample of program measures. Navigant designed the sample sizes to provide a 90/10 confidence and relative precision level for program-level gross savings verification. Navigant calculated PY6 verified net impact savings using the approved net-to-gross ratio (NTGR) deemed through Illinois Energy Efficiency Stakeholder Advisory Group (SAG) consensus.<sup>4</sup>

The evaluation team conducted site-specific research on a sample of projects to verify project savings. Two very large projects were designated as a Certainty Stratum (“C”) – projects whose size required that they be sampled. The remaining projects were randomly selected through a stratified sample design at the tracking record level using the population gross therm savings determined from program tracking data. Strata were defined by project size, based on gross energy savings boundaries that placed about one-third of program-level savings into each stratum. The details of strata boundaries are provided in Table 6-1. All four PY6 “parallel path” projects that received early feedback from evaluation at the implementer’s request were included in the sample of 15 projects selected.

**Table 6-1. Strata Boundary Detail for PY6 Custom Sample**

Strata	Description of Strata Boundary	Values of Strata Boundary (therms)
C*	Projects saving > 300,000 therms	≥ 320,961
1	Projects comprising the 67 <sup>th</sup> percentile (minus C strata)	320,961 > x ≥ 104,497
2	Projects between 33 <sup>rd</sup> and 67 <sup>th</sup> percentile (minus C strata)	104,497 > x ≥ 67,138
3	Projects below the 33 <sup>rd</sup> percentile (minus C strata)	< 67,138

\* “C” refers to certainty strata, which includes projects whose size required them to be sampled.  
Source: Navigant analysis

Table 6-2 shows a profile of the sample selection.

**Table 6-2. Profile of Gross Impact Sample for Custom Projects**

Program	Population Summary			Sample Summary		
	Sampling Strata	Number of Projects (N)	Ex Ante Gross Savings (Therms)	N	Ex Ante Gross Savings (Therms)	Sampled % of Population (% Therms)
Business Custom	C*	2	799,399	2	799,399	100%
	1	3	465,308	3	465,308	100%
	2	6	519,936	5	432,220	83%
	3	28	493,897	5	203,424	41%
<b>TOTAL</b>		<b>39</b>	<b>2,278,540</b>	<b>15</b>	<b>1,900,351</b>	<b>83%</b>

\* “C” refers to certainty strata, which includes projects whose size required them to be sampled.  
Source: Navigant analysis

<sup>4</sup> The Net-to-Gross Ratio (NTGR) used for calculating verified net savings is deemed prospectively through a consensus process managed by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). Deemed NTGRs are available at: <http://www.ilsag.info/net-to-gross-framework.html>

## Engineering Review of Project Files

For each selected project, an in-depth application review is performed to assess the engineering methods, parameters and assumptions used to generate all ex ante impact estimates. For each measure in the sampled project, engineers estimated ex post gross savings based on their review of documentation and engineering analysis.

To support this review, the implementation contractor provided project documentation in electronic format for each sampled project. Documentation included some or all scanned files of hardcopy application forms and supporting documentation from the applicant (invoices, measure specification sheets, and vendor proposals), pre and post inspection reports and photos, and calculation spreadsheets.

## On-Site Data Collection

On-site surveys were completed for a subset of four of the 15 customer applications sampled.

**Table 6-3. Gross Therm Realization Rates and Relative Precision at 90% Confidence Level**

Program	Strata	Relative Precision +or-%	Mean RR	Standard Error
Business Custom	C*	0.0%	92%	0.00
	1	0.0%	105%	0.00
	2	2.7%	101%	0.01
	3	4.7%	105%	0.02
Customer Total RR (90/10)		1.7%	99%	0.01

\* "C" refers to certainty strata, which includes projects whose size required them to be sampled.

## 7. APPENDIX 2. IMPACT ANALYSIS SUPPLEMENTAL INFORMATION

Table 7-1 provides a summary of the sample selection and M&V approach. Table 7-2 provides a summary of M&V results for the sample.

**Table 7-1. Profile of PY6 Custom Gross Impact Sample**

Project ID	Ex Ante Gross Savings (therms)	Strata	M&V Approach	Measure
PRJ-709869	476,458	C*	On-Site	Blowdown Management
PRJ-786729	322,941	C*	On-Site	RTO
PRJ-1010824	180,509	1	File Review	Process
PRJ-1768198	179,657	1	File Review	Process
PRJ-989846	105,142	1	File Review	Boiler
PRJ-875969	104,987	2	File Review	Process
PRJ-573428	104,602	2	On-Site	Boiler
PRJ-306546	82,539	2	File Review	Burner Upgrade
PRJ-786554	72,540	2	On-Site	Heat Recovery
PRJ-568954	67,552	2	File Review	EMS
PRJ-758284	56,065	3	File Review	Heat Recovery
PRJ-843502	46,998	3	File Review	Insulation
PRJ-568975	46,732	3	File Review	Economizer
PRJ-875929	30,474	3	File Review	Insulation
PRJ-795322	23,155	3	File Review	Economizer

Source: Evaluation analysis of programs data.

\* "C" refers to certainty strata, which includes projects whose size required them to be sampled.

**Table 7-2. PY6 Summary of Sample M&V Results**

Project ID	Measure Description	Gross Realization Rate	Summary of Adjustment
PRJ-709869*	Blowdown Management	92%	Updated the water quality values to include 2017 data
PRJ-786729*	RTO	91%	Corrected a VSD calculation error and removed the 100% load limit on VSD operation
PRJ-1010824*	Process	114%	Updated production data and removed the average of averages formulae
PRJ-1768198	Process	98%	Updated production data
PRJ-989846	Boiler	101%	Removed anomaly in usage data and updated weather data
PRJ-875969	Process	100%	OK
PRJ-573428	Boiler	111%	Updated the HDD base temperature, included additional usage history
PRJ-306546	Burner Upgrade	92%	Updated the average efficiency value
PRJ-786554	Heat Recovery	97%	Updated the HDD base temperature
PRJ-568954	EMS	99%	Updated hours of operation
PRJ-758284	Heat Recovery	105%	Updated the production data
PRJ-843502	Insulation	114%	Added heating system efficiency term and incorporated wind in exterior heat loss estimation
PRJ-568975*	Economizer	100%	OK
PRJ-875929	Insulation	100%	OK
PRJ-795322	Economizer	100%	OK

Source: Evaluation analysis of program data.

\* Parallel path project

### 8. APPENDIX 3. PROGRAM-SPECIFIC INPUTS FOR THE ILLINOIS TRC

Table 8-1, the Total Resource Cost (TRC) variable table, only includes cost-effectiveness analysis inputs available at the time of finalizing the PY6 Custom Program impact evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in the table and will be provided to evaluation later. Detail in the TRC table (e.g., EULs), other than final PY6 savings and program data, are subject to change and are not final.

**Table 8-1. PY6 Custom Program TRC Inputs**

Research Category (e.g., Measure)	Units	Quantity	Effective Useful Life (years)	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Blowdown Management*	Project	1	19	476,458	473,537	345,682
Boiler	Project	7	20	259,013	257,425	187,920
Boiler Controls	Project	3	17	44,303	44,031	32,143
Building Envelope	Project	2	20	25,720	25,562	18,660
Burner Upgrade	Project	5	21	125,642	124,872	91,156
Condensate Management	Project	1	20	52,354	52,033	37,984
DCV	Project	1	10	9,017	8,962	6,542
DHW	Project	3	20	13,032	12,952	9,455
Economizer	Project	2	15	69,887	69,459	50,705
EMS	Project	3	15	164,396	163,388	119,273
Heat Recovery*	Project	2	19	128,605	127,817	93,306
Insulation	Project	3	20	83,229	82,719	60,385
Process*	Project	5	19	503,943	500,854	365,623
RTO	Project	1	20	322,941	320,961	234,302
<b>Total</b>		<b>39</b>	<b>19</b>	<b>2,278,540</b>	<b>2,264,572</b>	<b>1,653,137</b>

Source: Nicor Gas tracking data and Navigant team analysis.

\* According to Illinois TRM version 7, Appendix B, each project/measure should have a custom EUL. To achieve this, the implementer will provide an ex ante EUL for the project/measure and the evaluator will assess it for reasonableness and revise as necessary. A custom EUL of 19 years was assigned to these measures by evaluation, using the Custom Program EUL value assigned for the GPY4 TRC calculation.