



Joint ComEd and Nicor Gas Company Strategic Energy Management Impact Evaluation Report

Energy Efficiency / Demand Response Plan:
Program Year 2018 (CY2018)
January 1, 2018 to December 31, 2018

Presented to
ComEd
Nicor Gas

DRAFT

March 11, 2019

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1. INTRODUCTION

This report presents the results of the impact evaluation of ComEd’s and Nicor Gas’ CY2018 Strategic Energy Management (SEM) Program. It presents a summary of the energy and demand impacts for the total program and broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. CY2018 spans January 1, 2018 through December 31, 2018.

2. PROGRAM DESCRIPTION

The SEM Program, managed by both ComEd and Nicor Gas, began as a pilot in EPY8/GPY5. The goal of the SEM Program is to apply a process of continuous energy management improvements that result in energy savings and demand reduction. The program seeks to educate participants to identify low-cost and no-cost measures, improve process efficiency, and reduce energy usage through behavioral changes. To encourage these savings, Nicor Gas provides an incentive of \$0.10 per therm saved. In the pilot year, ComEd provided a 10% bonus to rebates given on capital projects. Since that year, ComEd has offered an incentive of \$0.01 per kWh. While the utilities jointly manage the program, CLEAResult implements the day-to-day operation.

The program achieves energy savings through operational and maintenance (O&M) improvements, incremental increases in capital energy efficiency projects, additional capital projects that would not otherwise have been considered (e.g., process changes, consideration of energy efficiency in all capital efforts), and improved persistence for O&M and capital projects.

The SEM Program savings are calculated using site-specific models developed by CLEAResult that have built-in statistical regression analysis. The energy model uses two years of utility data prior to program participation. This data is associated with site information such as production and temperature to create baseline models that estimate a site’s baseline usage based on these variables.

After program participation begins, the model compares baseline energy usage to post-participation consumption, adjusted for temperature, production, and any differences attributed to SEM activities.

Cohort 3 supports customers who are in the first year of the SEM Program. Cohort 3 was comprised of 10 industrial participants in their first year of the program. These sites elected to establish an SEM practice within their organization to pursue energy savings. Most sites had a measurement period that started on November 1, 2017 and finished on October 31, 2018.

In addition to Cohort 3, the practitioner group was formed to support four participants in their second year of the program and four participants in their third year. This practitioner group was formed from sites that participated in the past and focused on maintaining changes and identifying new opportunities. The Practitioner Cohort measurement period lasted approximately 365 days and started in the second half of the year.

Table 2-1. CY2018 Volumetric Findings Detail

Participation Group	Customer Segment	Time Period
Cohort 3 (Year 1)	10 Industrial	November 1, 2017- October 31, 2018
Practitioner Cohort (Year 2)	1 Industrial 2 Universities 1 Hospital	Variable
Practitioner Cohort (Year 3)	4 Industrial	Variable

Source: ComEd and Nicor Gas tracking data and Navigant team analysis.

ComEd’s goals for the CY2018 SEM Program were four MWh for Cohort 3 and six MWh for the Practitioner Cohort. Nicor Gas’ goal for the CY2018 SEM Program was 965,804 Therms of energy savings.

3. PROGRAM SAVINGS DETAIL

Error! Reference source not found. and

Error! Reference source not found. summarize the incremental energy and demand savings the SEM Program achieved in CY2018. The program had 18 participating sites, as shown in the above table. The SEM program does not report demand savings since the calculators and implementer did not provide that to Navigant.

Error! Reference source not found.. **CY2018 Total Annual Incremental Electric Savings**

Savings Category	Energy Savings (kWh)	Demand Savings (kW)	Summer Peak Demand Savings (kW)
Electricity			
Ex Ante Gross Savings	14,250,668	NA	NA
Program Gross Realization Rate	1.04	NA	NA
Verified Gross Savings	14,878,411	NA	NA
Program Net-to-Gross Ratio (NTG)	0.95	NA	NA
Verified Net Savings	14,134,490	NA	NA
Converted from Gas*			
Ex Ante Gross Savings	NA	NA	NA
Program Gross Realization Rate	NA	NA	NA
Verified Gross Savings	NA	NA	NA
Program Net-to-Gross Ratio (NTG)	NA	NA	NA
Verified Net Savings	NA	NA	NA
Total Electric Plus Gas			
Ex Ante Gross Savings	14,250,668	NA	NA
Program Gross Realization Rate	1.04	NA	NA
Verified Gross Savings	14,878,411	NA	NA
Program Net-to-Gross Ratio (NTG)	0.95	NA	NA
Verified Net Savings	14,134,490	NA	NA

* Gas savings converted to kWh by multiplying therms * 29.31 (which is based on 100,000 Btu/therm and 3,412 Btu/kWh).

Note: The coincident Summer Peak period is defined as 1:00-5:00 PM Central Prevailing Time on non-holiday weekdays, June through August.

Source: ComEd tracking data and Navigant team analysis.

Error! Reference source not found.. CY2018 Total Annual Incremental Therm Savings – Nicor Gas

Savings Category	Energy Savings (Therms)
Natural Gas	
Ex Ante Gross Savings	366,059
Program Gross Realization Rate	1.09
Verified Gross Savings	399,106
Program Net-to-Gross Ratio (NTG)	1.00
Verified Net Savings	399,106

Source: ComEd and Nicor Gas tracking data and Navigant team analysis.

4. CUMULATIVE PERSISTING ANNUAL SAVINGS

The measure-specific and total ex ante gross savings for the SEM Program and the cumulative persisting annual savings (CPAS) for the measures installed in CY2018 are shown in the following table and figure. The total CPAS across all measures is 14,134,490 kWh. The program did not achieve gas savings eligible to be converted to electricity and counted toward ComEd’s goal.¹

¹ The evaluation will determine which gas savings will be counted toward goal while producing the portfolio-wide Summary Report.

Table 4-1. Cumulative Persisting Annual Savings (CPAS) – Electric

End Use Type	Research Category	EUL	CY2018 Verified Gross Savings	NTG*	Lifetime Net Savings†	Verified Net kWh Savings									
						2018	2019	2020	2021	2022	2023	2024	2025	2026	
Whole Building	SEM	5.0	14,878,411	0.95	70,672,452	14,134,490	14,134,490	14,134,490	14,134,490	14,134,490					
CY2018 Program Total Electric CPAS			14,878,411		70,672,452	14,134,490	14,134,490	14,134,490	14,134,490	14,134,490	-	-	-	-	
CY2018 Program Expiring Electric Savings‡							-	-	-	-	14,134,490	14,134,490	14,134,490	14,134,490	

Note: The green highlighted cell shows program total first year electric savings.

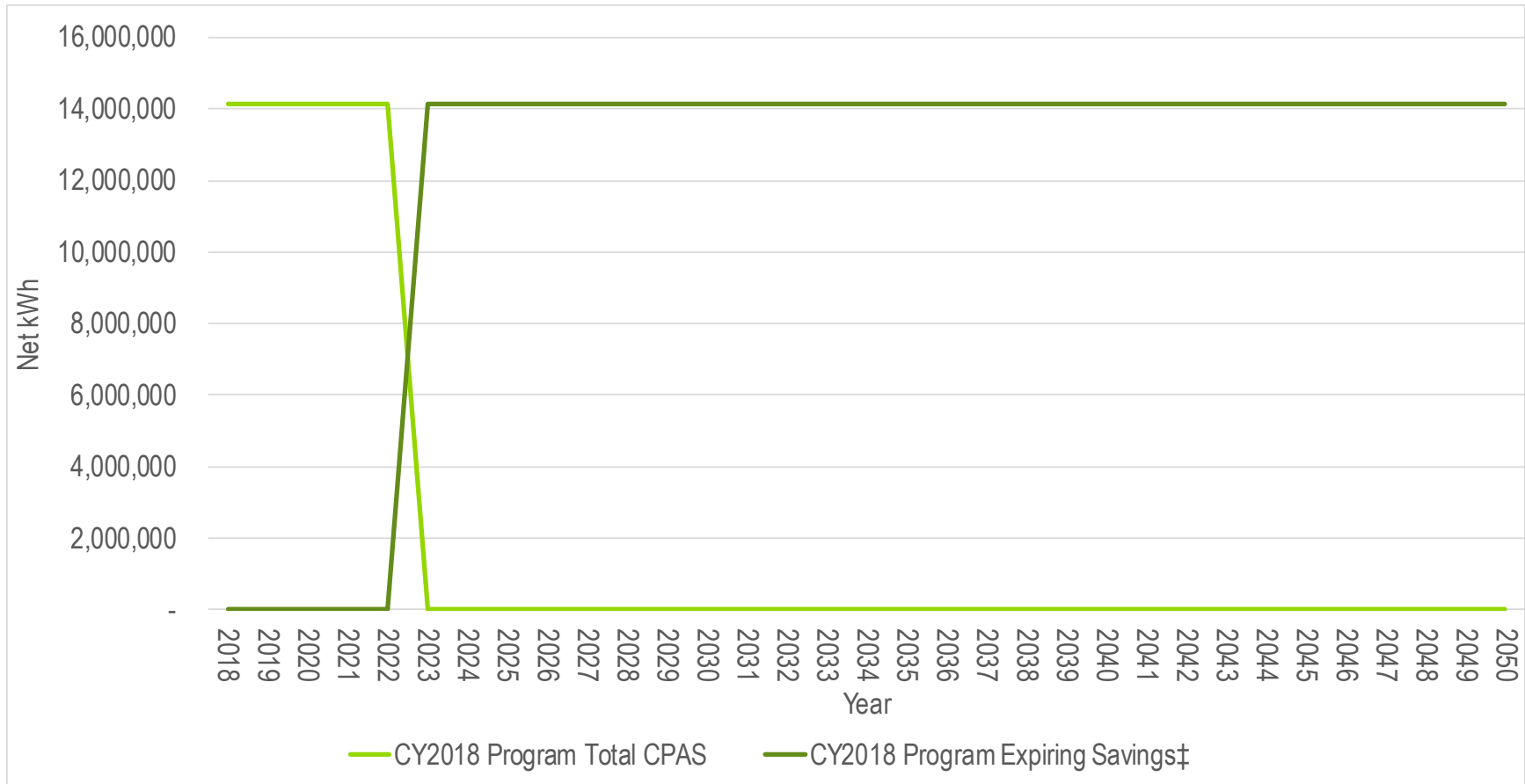
* A deemed value. Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>.

† Lifetime savings are the sum of CPAS savings through the EUL.

‡ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.

Source: Navigant analysis

Figure 4-1. Cumulative Persisting Annual Savings



‡ Expiring savings are equal to CPAS Yn-1 - CPAS Yn + Expiring Savings Yn-1.

Source: Navigant analysis

5. PROGRAM SAVINGS BY MEASURE

The SEM Program tracked and evaluated savings at the site level, rather than measure level. SEM site level detail can be found in Table 8-1.

6. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

6.1 Impact Parameter Estimates

As a behavioral-based model program, SEM Program does not have standard impact parameters that are used to determine program savings. The program savings are calculated using billing regression methodologies built into the program models that are customized for each site.

6.2 Other Impact Findings and Recommendations

High level details regarding site results are included in Table 8-1. Details regarding each site are shown below:

Site 1

This site implemented many energy saving measures throughout the year and achieved savings and this data point was removed. There was an unexplained decrease in savings for electricity usage during the last week of the measurement period (10/1/2018-10/7/2018). This data point was removed since it was the final data point in the post period and indicated a trend that was not consistent with any of the other post period data. Evaluation then annualized the cumulative savings.

Site 6

Data points between 4/23/2018 and 9/9/2018 showed negative savings directly related to non-SEM activities resulting from short-term malfunctions of its cogeneration operation. In all other time periods, evaluation found steady savings due to the implementation of energy saving measures. Evaluation removed the time period representing negative savings since it related to equipment malfunction.

Site 7

There was irregular production during the week of 5/21/2018. The savings during this period were twice any other savings period. Evaluation removed this data point to ensure that savings would not be overpredicted.

Site 13

The site showed steady savings before the summer months. During the summer months, there was unprecedented attendance that was inconsistent with the baseline model, resulting in a negative impact on site savings. Navigant ran a regression analysis during this post period to identify the impact of this additional attendance. Navigant was able to identify the impact of this event and removed it from the final annualized savings.

Site 17

Navigant removed three outlier measurement periods in the weekly model because they were significantly more than 110% of any baseline value. The outlier created negative savings that was attributed to a single change in production and not a lack of SEM activity.

Finding 1. All models with outliers in the baseline or measurement period excluded the data based on the site’s analysis.

Recommendation 1. Navigant recommends including all data points in the spreadsheet to allow for a secondary analysis. This allows Navigant to confirm the exclusion of any data.

Finding 2. Sites 7 and 17 had post variable values falling outside of accepted standards (more than 110% of maximum baseline or less than 90% of minimum baseline). In these cases, the model may not accurately represent what is occurring during these periods.

Recommendation 2. The implementer should continue to identify variable values that fall outside of accepted levels and account for them by testing their impact or removing them, as needed. Justification for removal of a data point should be clear and grounded in real-world effects, as much as possible, and not just model inconsistencies. Time periods with outliers in the baseline should be compared to the post condition to identify seasonal effects. If outliers require removal of data points, savings should be adjusted to represent 12 months of savings.

Finding 3. Sites 2, 3, 13, and 14 showed changes in their production and operation during the measurement period that made it difficult to accurately estimate savings.

Recommendation 3. The implementer should investigate potential solutions or ways to quantify the impact of these production changes. These changes could be accounted for using a post-period variable if it was shown to be statistically significant. If a variable does not sufficiently account for this change, the implementer could attempt to collect specific onsite information to directly calculate the impact of these changes.

Finding 4. Savings were both positive and negative for many sites. Negative savings was converted to zero as the implementer did not feel that the SEM Program caused the site to use additional energy.

Recommendation 4. The methods closely follow the guidance of the National Renewable Energy Laboratory’s (NREL) Uniform Methods Project (UMP) protocol for SEM, but the program should consider including the level of uncertainty as called out in the UMP.

7. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

7.1 Verified Gross Program Savings Analysis Approach

Verified gross savings from the CY2018 SEM Program were calculated using implementer provided engineering models that are grounded in site-specific data. These multi-regression models draw upon site data including energy usage, production, weather data and seasonality effects (including holidays or shutdowns). Navigant independently evaluated the electric and gas savings using separate energy models. The verified gross savings reported includes interactive effects. With few exceptions, the program design and calculation approach of the SEM Program does not allow Navigant to quantify and remove the interactive effects due to the installation of multiple measures within the same timeframe.

Navigant staff carefully reviewed the models using the following procedure:

- A site-specific analysis approach was implemented. Because this program contains primarily behavioral-based changes, the International Performance Measurement and Verification Protocol (IPMVP) Option C (billing/metered data regression) was the main approach to impact evaluation.
- The data collection focused on verifying and updating the assumptions that feed into the implementer’s energy model for each site. This data included: program tracking data and

supporting documentation (project specifications, invoices, etc.), utility billing and interval data, Navigant-calibrated building automation system trend logs and telephone conversations with onsite staff.

This data was used with other information collected from the site to identify operating characteristics of the site both pre- and post-program participation. If major changes occurred at the site during or after the SEM activities, Navigant adjusted the energy model to account for these changes. The changes that could affect the model savings include:

- Change in hours of operation
- Change in numbers of employees
- Change in production
- Other measures installed at the site that were implemented through other utility energy efficiency and demand response programs or outside of the ComEd or Nicor Gas programs.

7.2 Verified Net Program Savings Analysis Approach

Navigant calculated the verified net energy and demand savings by multiplying the verified gross savings estimates by a deemed net-to-gross (NTG) ratio. Table 7-1 shows the deemed NTG values for CY2018 (previously referred to as electric PY10 and gas PY7). The deemed NTG value of 0.95 for electric savings and 1.00 for gas savings were agreed to by stakeholders in discussions in the Stakeholder Advisory Group (SAG).²

Table 7-1. Deemed NTG Values for CY2018

Program Channel	CY2018 Deemed NTG Value
Electric	0.95
Natural Gas	1.00

Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01_Final.xlsx and Nicor_Gas_GPY7_NTG_Values_2017-03-01_Final.xlsx, which are to be found on the <http://www.ilsag.info/net-to-gross-framework.html>

8. APPENDIX 2. IMPACT ANALYSIS DETAIL

The program had electric and natural gas realization rates (RR) above 1.0 due to multiple sites including data that was unrelated to SEM activities. Table 8-1 summarizes the site-level incremental electric and gas savings the SEM Program achieved in CY2018. A site-level summary is included in Section 6.2. Sites with zero savings included projects that occurred late in CY2018 and showed no savings for this calendar year. Also, some sites with zero savings had difficulty creating accurate modeling due to operational changes. Many of these projects have been moved to the next calendar year. Also, several sites reported no ex ante electric or gas savings. Although activities were completed at these sites, the energy model was unable to detect energy savings occurring for a variety of reasons. For these sites, Navigant claimed zero savings to align with the implementer, but each site model was verified and checked.

² Source: ComEd_NTG_History_and_PY10_Recommendations_2017-03-01_Final.xlsx and Nicor_Gas_GPY7_NTG_Values_2017-03-01_Final.xlsx, which are to be found on the IL SAG web site here: http://www.ilsag.info/ntg_2016.html

Table 8-1. CY2018 Energy Savings by Site *

Site	Ex Ante Gross Savings (kWh)	Verified Gross kWh Realization Rate	Ex Post Gross Savings (kWh)	Ex Ante Gross Savings (Therms)	Verified Gross Therm Realization Rate	Ex Post Gross Savings (Therms)
Site 1	2,756,846	1.17	3,221,531	20,395	1.00	20,395
Site 2	0	0.00	0	0	0.00	0
Site 3	0	0.00	0	0	0.00	0
Site 4	0	0.00	0	0	0.00	0
Site 5	0	0.00	0	0	0.00	0
Site 6	1,700,200	1.00	1,700,200	69,866	1.40	98,103
Site 7	331,047	0.68	226,281	0	0.00	0
Site 8	0	0.00	0	0	0.00	0
Site 9	0	0.00	0	66,378	1.00	66,378
Site 10	0	0.00	0	0	0.00	0
Site 11	364,322	1.00	364,321	0	0.00	0
Site 12	60,290	1.00	60,290	16,546	1.00	16,546
Site 13	0	0.00	104,531	14,285	1.34	19,196
Site 14	0	0.00	0	0	0.00	0
Site 15	383,646	1.00	383,510	0	0.00	0
Site 16	168,305	1.00	168,305	105,495	1.00	105,496
Site 17	8,342,127	1.02	8,505,557	17,439	0.99	17,337
Site 18	143,885	1.00	143,885	55,655	1.00	55,655
Total	14,250,668	1.04	14,878,411	366,059	1.09	399,106

* Note: Sites with zero savings included projects that occurred late in CY2018 and showed no savings for this calendar year. Also, some sites with zero savings had difficulty creating accurate modeling due to operational changes. Many of these projects have been moved to the next calendar year.

Source: ComEd and Nicor Gas tracking data and Navigant team analysis.

For each site, Navigant reviewed and updated the engineering models provided by the implementer. Navigant staff generally followed the process below for this review:

Step 1: Navigant recreated the energy models to ensure they aligned with the provided data.

Step 2: Navigant confirmed the model saving calculations accounted for all capital projects.

Step 3: Navigant identified and accounted for any short-term effects that were occurring outside the SEM influence. Telephone interviews with the site staff confirmed these changes.

Step 4: Navigant made additional changes to the model as needed. Changes included excluding outlier data points or including additional variables.

9. APPENDIX 3. TOTAL RESOURCE COST DETAIL

Table 9-1, below, shows the Total Resource Cost (TRC) table. It includes only the cost-effectiveness analysis inputs available at the time of finalizing this impact 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.

Table 9-1. Total Resource Cost Savings Summary

Project	Units	Effective Useful Life	Ex Ante Gross Savings (kWh)	Verified Gross Savings (kWh)	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)
Site 1	Per Site	5	2,756,846	3,221,531	20,395	20,395
Site 2	Per Site	5	0	0	0	0
Site 3	Per Site	5	0	0	0	0
Site 4	Per Site	5	0	0	0	0
Site 5	Per Site	5	0	0	0	0
Site 6	Per Site	5	1,700,200	1,700,200	69,866	98,103
Site 7	Per Site	5	331,047	226,281	0	0
Site 8	Per Site	5	0	0	0	0
Site 9	Per Site	5	0	0	66,378	66,378
Site 10	Per Site	5	0	0	0	0
Site 11	Per Site	5	364,322	364,321	0	0
Site 12	Per Site	5	60,290	60,290	16,546	16,546
Site 13	Per Site	5	0	104,531	14,285	19,196
Site 14	Per Site	5	0	0	0	0
Site 15	Per Site	5	383,646	383,510	0	0
Site 16	Per Site	5	168,305	168,305	105,495	105,496
Site 17	Per Site	5	8,342,127	8,505,557	17,439	17,337
Site 18	Per Site	5	143,885	143,885	55,655	55,655

Source: ComEd and Nicor Gas tracking data and Navigant team analysis.