Guidehouse

Strategic Energy Management Impact Evaluation Report

Strategic Energy Management (SEM): Program Year 2019 (2019) (1/1/2019-12/31/2019)

Presented to
Peoples Gas and North Shore Company

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Prepared by:

Dustin Bailey
Guidehouse

David Bluestein
Guidehouse

Jean Rokke
Guidehouse

www.guidehouse.com

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Submitted to:

Peoples Gas
North Shore Gas
200 East Randolph Street
Chicago, IL 60601

Submitted by:

Guidehouse (which acquired Navigant in 2019)
150 N. Riverside Plaza, Suite 2100
Chicago, IL 60606

Contact:

Randy Gunn
Partner
312.583.5714
randy.gunn@guidehouse.com

Kevin Grabner
Associate Director
608.616.5805
kevin.grabner@guidehouse.com

Robert Neumann
Associate Director
312.583.2176
rob.neumann@guidehouse.com

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1. Introduction

This report presents the results of the impact evaluation of the Peoples Gas (PGL) and North Shore Gas (NSG) 2019 Strategic Energy Management (SEM) Program. It includes a summary of the gas impacts evaluated in 2019. The appendix provides the impact analysis methodology and details of the Total Resource Cost inputs. An appendix section also provides impact and process evaluation findings and recommendations for the joint programs based on interviews with the implementers and utility partners. Program year 2019 covers January 1, 2019 through December 31, 2019.

2. Program Description

ComEd and Nicor Gas started the SEM Program as a pilot in electric program year (EPY) 7 and gas program year (GPY) 4. In 2019, the program expanded to include Peoples Gas and North Shore Gas (PGL and NSG) and added two new implementation contractors, Cascade and Graphet. Cascade manages participants from the industrial refrigeration and wastewater treatment cohorts, and Graphet manages an industrial cohort. The three utilities manage the program while CLEAResult, Cascade, and Graphet implement and oversee the day-to-day operations of the SEM Program in the region. This report covers Peoples Gas and North Shore Gas impact and process evaluation efforts

The goal of the SEM Program is to apply a process of continuous energy management improvements that result in energy savings and gas use reductions. The program trains participants to identify low-cost and no-cost measures, improve process efficiency, and reduce energy usage and gas consumption through behavioral changes. PGL and NSG provide a $0.10 per therm saved incentive to all market segments participating in the SEM program.

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 program provides training and implementer support to identify O&M improvements. This training usually lasts for one year and occurs monthly or bi-monthly.

The SEM Program savings are calculated using site-specific models developed by the implementation contractors that have built-in statistical regression analysis. The energy models use 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 actual energy consumption to modeled energy consumption. The difference between the modeled energy consumption and actual billing data is the savings claimed by the SEM program. Both Table 2-1 and Table 2-2 provide the participation counts for 2019.

Table 2-1. 2019 Volumetric Findings Detail

Participation	Cascade	CLEAResult	Graphet
Participants	19	32	14
Total Measures	19	32	14

Source: SEM Program tracking data and Guidehouse team analysis

Table 2-2. 2019 Volumetric Findings Detail

Participation	ComEd	Peoples Gas North Shore Gas	Nicor Gas
Participants	54	13	29
Total Measures	54	13	29

Source: SEM Program tracking data and Guidehouse team analysis

3. Program Savings Detail

Table 3-1 summarizes the energy savings the PGL Strategic Energy Management program achieved in 2019.

Table 3-1. 2019 Annual Energy Savings Summary for PGL

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
PGL Strategic Energy Management	156,930	102%	160,264	1.00	160,264
PGL Total	**156,930**	**102%**	**160,264**	**1.00**	**160,264**

* Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
† Net-to-Gross (NTG) is the ratio of verified net savings to verified gross savings. The NTG is a deemed value. Source: PGL-NSG_NTG_History_and_2019_Recommendations_Faucet_Aerator_Showerhead_Correction_2019-04-12.xlsx, which is to be found on the Illinois SAG web site: https://www.ilsag.info/ntg_2019/
Source: Peoples Gas tracking data and Guidehouse team analysis.

Table 3-2 summarizes the energy savings the NSG Strategic Energy Management program achieved in 2019.

Table 3-2. 2019 Annual Energy Savings Summary for NSG

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
NSG Strategic Energy Management	165,787	100%	165,787	1.00	165,787
NSG Total	**165,787**	**100%**	**165,787**	**1.00**	**165,787**

* Realization Rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
Net-to-Gross (NTG) is the ratio of verified net savings to verified gross savings. The NTG is a deemed value. Source: PGL-NSG_NTG_History_and_2019_Recommendations_Faucet_Aerator_Showerhead_Correction_2019-04-12.xlsx, which is to be found on the Illinois SAG web site: https://www.ilsag.info/ntg_2019/
Source: North Shore Gas tracking data and Guidehouse team analysis.

4. Program Savings by Site

The SEM Program tracked and evaluated savings at the site level, rather than at the measure level. Table 4-1 summarizes the site-level incremental gas savings the SEM Program achieved in 2019.

Table 4-1. 2019 Energy Savings by Site

Site	Utility	Ex Ante Gross Savings (therms)	Verified Gross Therm Realization Rate	Verified Gross Savings (therms)
Site Q	North Shore Gas	90,857	100.0%	90,857
Site W	North Shore Gas	74,930	100.0%	74,930
Total	**North Shore Gas**	**165,787**	**100.0%**	**165,787**
Site R	Peoples Gas	45,171	100.0%	45,171
Site S	Peoples Gas	68,251	102.7%	70,086
Site T	Peoples Gas	43,508	103.4%	45,008
Total	**Peoples Gas**	**156,930**	**102.1%**	**160,264**

Source: ComEd and PGL and NSG tracking data and documentation files and Guidehouse team analysis.

5. Impact Analysis Findings and Recommendations

5.1 Impact Parameter Estimates

As a behavioral-based model program, the 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.

5.2 Site-Specific Impact Findings – PGL and NSG Only

Site Q NSG – No issues.

Site R PGL – Guidehouse found additional SEM savings using a newly created regression model but could not verify the savings due to a confusing baseline and post-period data provided by the implementer.

Site S PGL – Ex ante model contains only one regression variable. Guidehouse could not align the ex post regression model with the provided ex ante model. Baseline CSUM does not zero out.

Site T PGL – Guidehouse could not align the ex post regression model with the provided ex ante model. Baseline CSUM does not zero out.

Site W NSG – No issues.

6. Appendix 1. Impact Analysis Methodology

6.1 Verified Gross Program Savings Analysis Approach

Verified gross savings from the 2019 SEM Program were calculated using implementer provided statistical models that are grounded in site-specific data. These multi-variable regression models draw upon site data including energy usage, production, weather data and seasonality effects (including holidays or shutdowns). Guidehouse independently evaluated the electric and gas savings using separate energy models.

Guidehouse's review of the models was driven by the following procedure:

- **A site-specific analysis approach** – since 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, Guidehouse-calibrated building automation system trend logs and telephone conversations with onsite staff.

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

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

Step 2: Guidehouse confirmed the model saving calculations accounted for all capital projects. Savings from capital projects were subtracted from total measurement period savings.

Step 3: Guidehouse 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: Guidehouse made additional changes to the models as needed. Changes included excluding outlier data points or including additional variables. Outlier points that were above 110% or below 90% of baseline period variables were excluded if the residual was out of line with other residuals in the measurement period.

Guidehouse identified a number of changes that occurred at the site that had short-term or long-term effects on the statistical model. The changes that could affect the model savings include:

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

7. Appendix 2. Joint Program Findings

This section provides impact and process evaluation findings for the joint programs that are common across ComEd, Nicor Gas, and Peoples Gas and North Shore Gas, based on impact evaluation and process interviews with the implementers and utility partners.

7.1 Impact Evaluation Findings and Recommendations

Finding 1. SEM models varied across the three implementation contractors operating in 2019.

Supporting Evidence: Guidehouse reviewed a sample of 22 regression models provided by the implementation contractors for the impact evaluation effort and found significant differences in the information provided in the models, model layout, and model structure. For example, the majority of models included the original regression analysis used to calculate savings, but others did not. The latter situation made evaluation more difficult as Guidehouse had to puzzle through how exactly the IC arrived at their savings estimates, instead of reviewing the actual regression models.

Recommendation 1. Guidehouse recommends that the utilities work with the ICs implementing the SEM program to standardize the approach in modeling and provide similar regression analysis and reporting. Guidehouse found strengths with each ICs approach to SEM which should be incorporated and standardized by the others. For instance, Cascade provided very thorough and detailed opportunity registers with clear documentation on activities leading to SEM savings. CLEAResult provided accurate and detailed models, which included the actual data used in regression analysis, that were easy to follow and evaluate. Graphet clearly documented the post period measurement savings and clearly identified any gaps that impacted SEM savings. Sharing these approaches between ICs will improve the overall SEM program for customers and utilities.

Finding 2. One IC provided limited regression data that was not in the format used to create the original SEM models and calculate ex ante savings.

Supporting Evidence: There were a few models provided that only included raw interval data which was not formatted properly to align with the regression analysis detailed in the site-specific reports. For example, some sites provided raw AMI data with wet or dry bulb temperatures that had to be adjusted to outdoor temperatures, and daily data which had to be averaged to 5- or 7-day work weeks. Guidehouse had to adjust the data prior to regressing it to attempt to replicate the claimed SEM savings, but had difficulty arriving at the same result.

Recommendation 2. Guidehouse recommends all ICs provide robust regression models with clearly documented steps on how the AMI data was adjusted to calculate savings. This will allow the evaluator to replicate the regression analysis and document changes in savings results.

Finding 3. The ICs varied in the approach for identifying and removing savings from capital projects.

Supporting Evidence: Guidehouse found differences in how savings from capital projects were removed from SEM savings. One IC calculated the overall SEM savings and then removed the capital project savings in one lump sum, while others removed portions of the capital project savings at intervals within the SEM model itself. The latter approach showed inconsistencies as to when a capital project started, at times the project started prior to the post period[1] but still impacted SEM activities, as well as stopped before the end of the post period suggesting the capital project stopped having an impact on SEM results.

[1] Some SEM models had gaps between the end of the baseline period and the start of the post or measurement period. Savings from capital projects often began during this gap timeframe and continued into the post period. Guidehouse was unable to determine why capital project savings was treated this way and how to replicate it in the regression analysis. Again, did we ask the ICs?

Recommendation 3. Guidehouse recommends ICs treat capital savings consistently and remove capital savings as a lump sum after calculating savings for the post period.

Finding 4. Guidehouse found inconsistencies in regression analysis methods used by the ICs.
Supporting Evidence: Guidehouse reviewed the regression models provided by the three ICs and found two specific issues with the underlying modeling methods. Guidehouse's understanding of regression modeling, as required by SEM programs, is that the CSUM of a proper regression model should zero out at the end of the baseline period and should not include variables with T-stats of less than +/- 2.00. Some of the regression models used by the ICs did not follow these requirements, which led to slight variances in realization rates.
Recommendation 4. Guidehouse recommends the ICs standardize their regression modeling methods to ensure consistencies in SEM savings calculations.

7.2 Market Segment Outreach

Historically, SEM Program participants tended to be large manufacturing sites. In an effort to diversify the SEM program into new innovative segments, the utilities focused on seven different customer groups in 2019. When recruiting new participants for the program, the electric and gas utilities look to the larger users within a segment to maximize the potential energy savings for the program. Other recruiting criteria considers if the customers have the time available to participate in the training and onsite visits and if they have participated in the other programs the utilities have offered. Table 7-1 provides the various cohort segments, their associated utilities and incentives.

Table 7-1. Cohort Segments, Utilities and Incentives

Cohort	Electric Utility	Gas Utility	Incentive
Alumni	ComEd (Yr 3)	Nicor Gas (Yr 3)	$0.02/kWh; $0.10/therm
Commercial Real Estate	ComEd		$0.02/kWh;
Industrial	ComEd	PGL/NSG	$0.01/kWh; $0.10/therm
Industrial Refrigeration	ComEd		$0.01/kWh
K-12	ComEd	Nicor Gas	$0.02/kWh; $0.10/therm
MEGA		Nicor Gas	$0.10/therm
Wastewater Treatment	ComEd		$0.01/kWh

Source: Guidehouse analysis

Forming additional cohorts for the commercial real estate, industrial, industrial refrigeration, K-12, MEGA, and wastewater treatment segments in 2019 allowed the ICs to provide specific training and assistance to these targeted customers. Customers in these market segments, such as large industrial facilities, have sensitive processes and equipment so having training tailored to their needs built trust in the SEM program and encouraged participants to implement energy efficiency changes.

As the SEM Program progresses and saturates the larger customer market segments, utilities have begun to recruit participants with lower annual usage including large commercial sites. The migration to commercial customers requires the ICs to focus more on lighting, HVAC, building automation systems (BAS), and control measures for energy efficiency opportunities.

7.3 Incentives

In an effort to meet internal program objectives, ComEd worked with the IC CLEAResult to pilot Milestone incentives in 2019 and closely monitor the participants' energy data, energy charters, and executive sponsorship. Energy data was an incentivized component because the accuracy and timeliness of this customer-inputted data is a critical component to the energy model. The loss of Energy Champions can

hinder the progress of the program making it difficult for the participating site to continue in the program. Having the energy charter and energy sponsor as milestone markers provides the customer site the framework to continue in the program should an Energy Champion leave. Given the success of this pilot, ComEd will establish the Milestone Markers for all three ICs in CY2020.

7.4 Customer Support

Two new contractors were added to implement the joint programs in 2019, Cascade and Graphet. Cascade manages participants from the industrial refrigeration and wastewater treatment cohorts, and Graphet manages an industrial cohort.

7.4.1 Training

A key component of the SEM Program is the training provided to customers in the form of onsite workshops and cohort meetings. These trainings have two main categories – cohort encompassing or site specific. The cohort encompassing sessions addressed the main steps of SEM:

- SEM Introduction, what are the drivers and success factors for energy management
- Energy Modeling and Baseline, what is the purpose of an energy model and how is a baseline established
- Project Registers, prioritizing efficiency projects into short-term and long-term projects

The SEM Introduction trains customers on the important steps needed to develop an energy efficient culture at their facility. Changing the participant's culture to be aware of efficiency improvements is a core pillar of SEM. To facilitate this change, the ICs provide engagement workshops on how to empower all employees from the facility directors to the production line workers on how to make sustainable improvements.

7.4.2 Energy Model

The Energy Model is integral to the SEM Program, providing the customer insight on their day-to-day usage and how energy efficiency can help manage costs. The ICs used three different energy models in 2019:

- JMP – for alumni and MEGA industrial customers
- Energy Center – for the commercial customers in the alumni group, K-12 and commercial real estate
- Energy Sensei – for the industrial refrigeration and wastewater treatment cohort

Energy Sensei is a cloud-based customer facing energy management tool. The participant's energy model is uploaded into Sensei providing a dashboard of the energy model results and a way to visualize energy performance and usage. Providing customers a way to track projects through their implementation stages and a visualization of the impacts supports the customers' current energy efficiency efforts and encourages future projects.

The three ICs managed the customer energy models differently. One of the ICs entered all of the relevant information while others supported their customers who entered and managed the data. Guidehouse has observed that successful SEM programs encourage customers to have ownership of the energy model and the various inputs such as occupancy and production data, allowing the customer to see the efficiency changes and the impacts they have on usage.

An enhancement to the Energy Model the ICs would like is more timely interval data. Currently, the utilities are receiving this information on a monthly basis making it difficult for customers to see the effects of their efficiency changes in a timely manner. Receiving the interval data on a weekly basis would alleviate this issue.

8. Appendix 3. Total Resource Cost Detail

Table 8-1 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 the evaluation team later.

Table 8-1. Total Resource Cost Savings Summary

Site	Utility	EUL	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	NTG	Verified Net Savings (therms)
Site Q	North Shore Gas	5.0	90,857	90,857	1.00	90,857
Site W	North Shore Gas	5.0	74,930	74,930	1.00	74,930
Total	**North Shore Gas**	**5.0**	**165,787**	**165,787**	**1.00**	**165,787**
Site R	Peoples Gas	5.0	45,171	45,171	1.00	45,171
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Total	**Peoples Gas**	**5.0**	**156,930**	**160,264**	**1.00**	**160,264**

Source: ComEd and PGL and NSG tracking data and documentation files and Guidehouse team analysis.