



RetroCommissioning Program Impact Evaluation Report

Energy Efficiency Plan: Program Year 2023
(1/1/2023-12/31/2023)

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Peoples Gas and North Shore Gas

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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) 2023 RetroCommissioning program and a summary of the energy impacts for the total program as well as relevant measure and program structure details. The appendices present the impact analysis methodology, detailed engineering desk review results, and Illinois total resource cost (TRC) inputs. Program year 2023 covers January 1, 2023, through December 31, 2023.

The 2023 RetroCommissioning program is offered jointly to customers served by ComEd, Nicor Gas, PGL, and NSG. This report presents the results of the impact evaluation for PGL and NSG.

2. Program Description

The RetroCommissioning program has been part of ComEd's Energy Efficiency program portfolio since 2007. In 2010, ComEd began coordinating the program with the gas utilities that also serve ComEd customers. ComEd manages and funds the program, and the gas utilities have the option to share the program costs and savings with ComEd on a project-by-project basis. The overlapping gas territories include Nicor Gas, PGL, and NSG.

The RetroCommissioning program helps commercial and industrial customers improve the energy performance of their facilities through systematic analysis of existing building systems. Program-qualified energy efficiency service providers (EESPs) recruit participants, conduct energy studies, and recommend energy saving measures to implement. EESPs are required to verify implemented projects and measures before the project is considered complete. As the implementation contractor, Resource Innovations verifies, tracks, and reports savings for the coordinating utilities.

Generally, the program pays 100% for a detailed study, contingent on a participant's commitment to spend a defined amount of its own funds implementing study recommendations with a simple payback of 18 months or less. In 2023, the program consisted of two tracks: Monitoring-Based Commissioning (MBCx) and RetroCommissioning Flex (RCx).

- **MBCx** projects are supported by a multiyear agreement between the building owner and the EESP. This approach identifies, analyses, implements, and verifies multiple bundles of measures on a rolling basis with the EESP monitoring building automation system (BAS) data periodically using integrated, program-installed software to document ongoing savings. Measure savings are counted toward program goals in the calendar year and are submitted based on EESP monitoring since the prior submitted savings.
- **RCx** projects generally last 6-15 months and include a fully funded RCx Flex study covering the costs of engineering services and additional performance-based incentives. To receive the study, participants must agree to implement mutually agreed upon energy conservation measures (ECMs) with a simple payback of 1.5 years or less.

The PGL program had 12 participants in 2023 and completed 17 projects¹, as Table 2-1 shows.

Table 2-1. 2023 Volumetric Summary for PGL

Participation	Total
Participants *	12
Installed Projects †	17

* Participants are defined as unique Account Name.

† Installed projects are defined as unique Work Order ID.

Source: Peoples Gas tracking data and Guidehouse evaluation team analysis

The NSG program had one participant in 2023 and completed one project, as Table 2-2 shows.

Table 2-2. 2023 Volumetric Summary for NSG

Participation	Total
Participants *	1
Installed Projects †	1

* Participants are defined as unique Account Name.

† Installed projects are defined as unique Work Order ID.

Source: North Shore Gas tracking data and Guidehouse evaluation team analysis

¹ Program participants can submit multiple bundles at different times during the year. Each project bundle submitted in 2023 is counted as one project for impact evaluation sampling purposes.

3. Program Savings Detail

Table 3-1 summarizes the energy savings the PGL RetroCommissioning program achieved in 2023. Guidehouse separated the savings for “economically disadvantaged areas” (hereafter “DAC”) for eligible business customers to apply the Net-to-Gross (NTG) ratio per the Illinois Energy Efficiency Policy Manual.

Table 3-1. 2023 Annual Energy Savings Summary for PGL

Program Track	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
All Tracks	349,572	101%	352,998	0.98	345,938
All Tracks - DAC	11,613	84%	9,736	1.00	9,736
Total or Weighted Average	361,185	100%	362,734		355,674

Note: Guidehouse excluded two projects from the PGL 2023 tracking data (WO-4297215 and WO-4297880) from both the ex ante and verified savings as savings for both projects were already claimed and verified in 2022 (see Table B-2, projects 17-119 and 20-0066 in 2022 report).²

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

† A deemed value available on the Stakeholders Advisory Group (SAG) website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2023/>. The NTG ratio for eligible business customers in disadvantaged neighborhoods is set to 1.00 as per the “NTG Ratio for Disadvantaged Areas” policy.³

Source: Peoples Gas tracking data and Guidehouse evaluation team analysis

Table 3-2 summarizes the energy savings the NSG RetroCommissioning program achieved in 2023.

Table 3-2. 2023 Annual Energy Savings Summary for NSG

Program Track	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
All Tracks	4,558	113%	5,156	0.98	5,053
Total or Weighted Average	4,558	113%	5,156	0.98	5,053

* RR is the ratio of verified gross savings to ex ante gross savings based on evaluation research findings.

† A deemed value available on the SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2023/>.

Source: North Shore Gas tracking data and Guidehouse evaluation team analysis

4. Program Savings by Measure

The RetroCommissioning program does not claim savings by measure, so this report does not present measure-level savings. Evaluation-verified savings for the program are based on a random sample of projects and reported at the project level. 5.1 Appendix B provides more information about sampled project-level (bundle-level for MBCx) savings.

² https://www.ilsag.info/wp-content/uploads/PGL_NS-G-RetroCommissioning-2022-Impact-Evaluation-Report-2023-05-04-Final.pdf

³ Illinois Energy Efficiency Policy Manual Version 3.0, Section 7.4, available at <https://www.ilsag.info/policy/>

5. Impact Analysis Findings and Recommendations

5.1 Findings and Recommendations

Finding 1. The evaluation team noted that input parameters in some ex ante custom calculators (e.g., 19-0151, 20-0036) were based on setpoint values even when those parameters were monitored and trended, and actual values were available. The team also identified one project (22-0027) where hard-coded input parameters in the calculators did not match the trend data, and investigation phase data was not updated with additional pre- and post-implementation data collected during the verification phase.

Recommendation 1. Emphasize the priority of measured data for measure verification when available. Hard-coded values, if used, should indicate the source and include the corresponding source document as part of the project files. If additional/more recent trend data is collected, it should be used to update the estimated savings.

Finding 2. The evaluation team noticed multiple input errors in the project calculators (e.g., 20-0061, 21-0054, 22-0010, 20-0037, 20-0049, 19-0151, 22-0045). Some examples of the errors include incorrect motor horsepower, incorrect air handler schedule, incorrect fan power calculations, and incorrect/inconsistent boiler efficiency.

Recommendation 2. Enhance quality control procedures to reduce these errors.

Finding 3. For project 20-0036, the implemented mixed air temperature (MAT) setpoint and discharge air temperature (DAT) setpoint sequencing measures save cooling energy but also result in increased natural gas usage for certain air handling units. Through this project, the optimization sequence was implemented as a permanent change rather than a reset measure. As a result, although the implemented change reduced cooling load in the summer, it also resulted in increased heating loads in the winter as the change was not reset back to winter setpoints.

Recommendation 3. Provide training to highlight the difference between a reset and a change to ensure the appropriate optimization sequence is applied through the program.

Finding 4. For multiple projects (e.g., 19-0151, 22-0006, 22-0010), the evaluation team found that the equipment modified for program measures was no longer in service. Program requirements under the RetroCommissioning program offerings stipulate that equipment must be installed and operational. The evaluation team did not verify any savings associated with the equipment no longer in service.

Recommendation 4. If the program is aware that equipment within the scope of the project is scheduled for near-term replacement, any savings resulting from operational modifications on that equipment should not be claimed as they will not persist following replacement. No-cost changes/measures are still encouraged because they provide immediate benefit to the participant, even though they may not qualify as eligible savings through the program.

Finding 5. For project ID 21-0054, the calculator did not use the most appropriate weather station based on proximity. The evaluation team updated the reference weather station selected in the calculator.

Recommendation 5. Increase training on the availability of weather stations in the standard calculator template and ensure uniform use of proximal datasets. In 2024, additional weather stations will be included in the calculator, which will increase the alternatives available as “best reference” and the possibility of erroneous selections, making the increased training more valuable.

Finding 6. Through onsite inspections and phone interviews with building operators, the evaluation team noticed that some measures (e.g., 20-0037, 20-0036) were deemed too aggressive by the operating engineers and undone to meet occupant comfort or other system setpoints. Examples include rooftop unit scheduling, and MAT and DAT setpoint resets and optimization.

Recommendation 6. Time should be allowed post-implementation for facility operators to adjust to the measures for continued feasibility before the program finalizes the estimated project savings. If the recommended changes are identified to be too aggressive and compromise system operation or occupant comfort, the EESPs should readjust the measures before finalizing project savings. The additional time post-implementation will allow the EESPs to find compromised solutions for implemented measures rather than the facility operators undoing the measure entirely.

Appendix A. Impact Analysis Methodology

A.1 Ex Ante Estimates

EESPs estimated ex ante energy savings with custom algorithms, frequently using hourly weather data and time-series trend data applied in engineering relationships of energy, temperature, and mass transfer. Alternatively, when data supported the method, EESPs determined savings by regressions of utility-metered energy use versus outdoor temperature and other independent variables. When energy efficiency measures had a climate-related component, service providers used standard weather datasets (typical meteorological year 3, or TMY3)⁴ for proximal locations to estimate weather-normalized savings.

A.2 Evaluation Methods

The evaluation team used a stratified random sampling approach to select the gross impact sample. In 2023, the evaluation team reviewed 28 projects⁵ (38% of the total) and 499,866 therms (77% of the total claimed). The team sorted projects based on the level of ex ante kWh electric energy savings and the presence or absence of natural gas savings, then placed the projects into six strata. Within each stratum, the team selected a random sample of projects for analysis.

The evaluation team reviewed each sampled project and its measures individually to validate the savings, usually using the same methods as the ex ante estimate. Savings calculation reviews ensured the savings estimates were accurately modeled, used consistent inputs, and included reasonable assumptions, as required. In some cases, the team acquired additional trend data or interval meter data to verify savings with more data and data concurrent with expected savings (e.g., winter data for winter measures). In most cases, the impact evaluation involved analysis of time-series trends and measured data both pre- and post-implementation. In all cases, the evaluation team normalized savings estimates to TMY3 weather data to minimize the effects of atypical weather variation.

For a nested sample of projects (selected from projects sampled for engineering review), Guidehouse performed on-site inspections to determine whether implemented measures were still operating as described in project documentation (set points, affected equipment, hours of operation, etc.). For projects not selected for an on-site inspection, evaluators supplemented desk reviews with phone interviews with building operators and reviewed some BAS via remote connection or teleconferencing.

In cases where the evaluation team's verified inputs were inconsistent with EESP reported data, such as setpoints or operational hours, the team re-estimated savings with available data, additional data requested from the participant or EESP, or program guideline inputs.

⁴ TMY3 were produced by the National Renewable Energy Laboratory's Electric and Systems Center under the Solar Resource Characterization Project, which is funded and monitored by the U.S. Department of Energy's Energy Efficiency and Renewable Energy Office. Source data for all 239 TMY3 locations draw on data from 1991 through 2005.

⁵ The evaluation team reviewed 34 individual sample points because the team randomly selected multiple bundles for four projects in 2023.

Table A-1 provides a profile of the gross impact measurement and verification sample for the RetroCommissioning program compared to the population.

Table A-1. 2023 Profile of Gross Impact Sample for All Projects

Population Summary				Sample Summary		
Program	Sampling Strata	Number of Projects (N)	Ex Ante Gross Savings (therms)	n	Ex Ante Gross Savings (therms)	Sampled % of Population (% therms)
RetroCommissioning	Large	7	0	6	0	N/A
	Large – Gas	2	228,167	2	228,167	100%
	Medium	14	0	6	0	N/A
	Medium – Gas	8	146,814	6	130,911	89%
	Small	38	0	6	0	N/A
	Small – Gas	30	277,280	8	140,788	51%
Total or Weighted Average		99	652,261	34	499,866	77%

Note: The population and the sample summary represent all projects completed in 2023 as per the ComEd tracking data, corroborated with the Nicor Gas, PGL and NSG data. The table shows the gas sample disposition.

Source: Guidehouse evaluation team analysis

A.2.1 Savings Rollup

There are two basic statistical methods for combining individual gross RRs from the sample projects into an estimate of verified gross therms savings for the population when using stratified random sampling: separate and combined ratio estimation.⁶ In the case of a separate ratio estimator, a separate gross therms savings RR is calculated for each stratum and then combined. In the case of a combined ratio estimator, the evaluation completes a single gross therms savings RR calculation without first calculating separate gross RRs by stratum.

The evaluation team used the separate ratio estimation technique to estimate verified gross impacts for the program. The separate ratio estimation technique follows the steps outlined in the California Evaluation Framework,⁷ which identifies best practices in program evaluation. The team matched these steps to the stratified random sampling method used to create the sample for the component.

⁶ A full discussion and comparison of separate vs. combined ratio estimation can be found in *Sampling Techniques* (Cochran, 1977), pp. 164-169.

⁷ Tec Market Works, *The California Evaluation Framework*, prepared for the California Energy Commission, June 2004, available at <http://www.calmac.org>.

Appendix B. Impact Analysis Supplemental Information

Table B-1 provides the ex ante and verified gas saving for each stratum.

Table B-1. 2023 Gas Savings by Strata (All Projects)

Strata	Sample Size	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
Large	6	0	N/A	0	0.98	0
Large – Gas	2	228,167	107%	243,015	0.98	238,154
Medium	6	0	N/A	0	0.98	
Medium – Gas	6	130,911	111%	145,784	0.99	143,601
Small	6	0	N/A	1,156	0.98	1,133
Small – Gas	8	140,788	84%	118,030	0.98	115,669
Total or Weighted Average	34	499,866	102%	507,984	0.98	498,557

* RR is the ratio of verified gross savings to ex ante gross savings based on evaluation research findings.

† A deemed value available on the SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2023/>. The NTG ratio for eligible business customers in disadvantaged neighborhoods is set to 1.00 as per the “NTG Ratio for Disadvantaged Areas” policy.

Source: Guidehouse evaluation team analysis

Table B-2 and Table B-3 show the strata classification and ex ante and verified gas savings for all projects claimed by PGL and NSG in 2023, respectively.

Table B-2. 2023 Gas Savings by Project (PGL Projects Only)

Project ID	Bundle #	Strata	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
22-0010	Bundle #12	Large – Gas	169,694	107%	180,737	0.98	177,122
22-0010	Bundle #10	Medium – Gas	34,422	111%	38,333	0.98	37,566
22-0010	Bundle #11	Medium – Gas	27,641	111%	30,781	0.98	30,166
22-0010	Bundle #8	Small – Gas	25,124	84%	21,063	0.98	20,641
22-0021	Bundle #2	Small – Gas	23,505	84%	19,705	0.98	19,311
21-0047	Bundle #1	Small – Gas	20,124	84%	16,871	0.98	16,534
22-0005	Bundle #2	Medium – Gas	15,900	111%	17,706	0.98	17,352
22-0027	Bundle #1	Small – Gas	14,730	84%	12,349	0.98	12,102
20-0029	Bundle #1	Small – Gas	11,613	84%	9,736	1.00	9,736
21-0007	Bundle #1	Small – Gas	6,361	84%	5,333	0.98	5,226
21-0033	Bundle #1	Small – Gas	4,421	84%	3,706	0.98	3,632
22-0034	Bundle #2	Small – Gas	2,499	84%	2,095	0.98	2,053
17-119	Bundle #5	Small – Gas	2,410	84%	2,020	0.98	1,980
22-0027	Bundle #2	Small – Gas	1,998	84%	1,675	0.98	1,642
22-0028	Bundle #1	Small – Gas	573	84%	480	0.98	471
21-0037	Bundle #1	Small – Gas	167	84%	140	0.98	137
22-0034	Bundle #1	Medium – Gas	3	111%	3	0.98	3
Total or Weighted Average			361,185	100%	362,734		355,674

Note: Totals may not sum due to rounding.

* RR is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

† A deemed value available on the SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2023/>. The NTG ratio for eligible business customers in disadvantaged neighborhoods is set to 1.00 as per the “NTG Ratio for Disadvantaged Areas” policy.

Source: Guidehouse evaluation team analysis

Table B-3. 2023 Gas Savings by Project (NSG Projects Only)

Project ID	Bundle #	Strata	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
21-0054	Bundle #1	Small – Gas	4,558	113%	5,156	0.98	5,053
Total or Weighted Average			4,558	113%	5,156	0.98	5,053

* RR is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

† A deemed value available on the SAG website: <https://www.ilsaq.info/evaluator-ntg-recommendations-for-2023/>.

Source: Guidehouse evaluation team analysis

Table B-4 details the verified gas savings and RR of all sampled gas projects.

Table B-4. 2023 Gas Savings by Project (All Sampled Projects)

Project ID	Bundle #	Strata	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
22-0010	Bundle #12	Large - Gas	169,694	111%	188,549	0.98	184,778
20-0061	Bundle #2	Large - Gas	58,473	93%	54,466	0.98	53,377
19-0151	Bundle #1	Small - Gas	54,283	86%	46,414	0.98	45,486
22-0010	Bundle #10	Medium - Gas	34,422	111%	38,247	0.98	37,482
22-0010	Bundle #11	Medium - Gas	27,641	111%	30,757	0.98	30,142
22-0010	Bundle #8	Small - Gas	25,124	89%	22,332	0.98	21,886
22-0025	Bundle #1	Medium - Gas	22,425	100%	22,425	0.98	21,977
21-0052	Bundle #1	Medium - Gas	20,339	100%	20,339	1.00	20,339
21-0047	Bundle #1	Small - Gas	20,124	100%	20,124	0.98	19,722
20-0036	Bundle #8	Small - Gas	18,831	42%	7,963	0.98	7,804
22-0014	Bundle #1	Medium - Gas	17,746	100%	17,746	0.98	17,391
22-0027	Bundle #1	Small - Gas	14,730	88%	12,902	0.98	12,644
22-0045	Bundle #1	Medium - Gas	8,338	195%	16,270	1.00	16,270
21-0054	Bundle #1	Small - Gas	4,558	113%	5,156	0.98	5,053
17-119	Bundle #5	Small - Gas	2,410	100%	2,410	0.98	2,362
22-0013	Bundle #2	Small - Gas	728	100%	728	0.98	713
22-0001	Bundle #2	Small	0	N/A	1,156	0.98	1,133

Note: Participants can submit multiple bundles at different times during the year. Each project bundle submitted in 2023 was counted as one project for impact evaluation sampling purposes.

* RR is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.

† A deemed value. Available on the SAG website: <https://www.ilsaq.info/evaluator-ntg-recommendations-for-2023/>. The NTG ratio for eligible business customers in disadvantaged neighborhoods is set to 1.00 as per the "NTG Ratio for Disadvantaged Areas" policy.

Source: Guidehouse evaluation team analysis.

Appendix C. Program-Specific Inputs for the Illinois TRC

Table C-1 and Table C-2 show the TRC cost-effectiveness analysis inputs available at the time of producing this impact evaluation report. Currently, additional required cost data (e.g., measure costs, program-level incentive and non-incentive costs) are not included in these tables and will be provided to the evaluation team later. Guidehouse will include annual and lifetime water savings and greenhouse gas reductions in the end of year summary report.

Table C-1. 2023 Verified Cost-Effectiveness Inputs – PGL

Program Track	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Net Savings (therms)
All Tracks	All Tracks	Projects	16	8.6	349,572	352,998	345,938
All Tracks	All Tracks – DAC	Projects	1	8.6	11,613	9,736	9,736
Total or Weighted Average			17	8.6	361,185	362,734	355,674

Source: Peoples Gas tracking data and Guidehouse evaluation team analysis.

Table C-2. 2023 Verified Cost-Effectiveness Inputs – NSG

Program Track	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Net Savings (therms)
All Tracks	All Tracks	Projects	1	8.6	4,558	5,156	5,053
Total or Weighted Average			1	8.6	4,558	5,156	5,053

Source: North Shore Gas tracking data and Guidehouse evaluation team analysis.