

Coordinated RetroCommissioning Impact Evaluation Report

Energy Efficiency Plan: Program Year 2024
(1/1/2024-12/31/2024)

Prepared for:

Nicor Gas Company

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Introduction

This report presents the results of the impact evaluation of the Nicor Gas 2024 Coordinated RetroCommissioning 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. Program year 2024 covers January 1, 2024 through December 31, 2024.

The 2024 Coordinated RetroCommissioning program is offered jointly to customers served by ComEd, Nicor Gas, Peoples Gas, and North Shore Gas. This report presents results of the impact evaluation for Nicor Gas.

Program Description

The Coordinated 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, Peoples Gas, and North Shore Gas.

The Coordinated 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 CY2024, this component 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 they 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.

Nicor participated in the program with 17 participants in 2024 and completed 20 projects as shown in the following table.

Table 1. 2024 Volumetric Findings Detail

Participation	Direct Install
Private Sector	
Participants *	11
Installed Projects †	14
Public Sector	
Participants *	6
Installed Projects †	6
Program 2024 Total	
Participants *	17
Installed Projects †	20

* Participants are defined as unique Project Name

† Installed Projects are defined as unique project and bundle combination

Source: Nicor Gas tracking data and evaluation team analysis.

Program Savings Detail

Table 2 summarizes the energy savings the Coordinated RetroCommissioning Program achieved by path in 2024.

Table 2. 2024 Annual Energy Savings Summary

Program Category	Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG [†]	NPSO [‡]	Verified Net Savings (Therms)
Private, Non-Disadvantaged Communities	Direct Install	121,512	99%	120,580	0.98	N/A	118,169
Private, Disadvantaged Communities	Direct Install	6,488	98%	6,330	1.00	N/A	6,330
Public, Non-Disadvantaged Communities	Direct Install	24,667	98%	24,067	0.98	N/A	23,586
Public, Disadvantaged Communities	Direct Install	8,884	98%	8,668	1.00	N/A	8,668
Total		161,551	99%	159,646			156,753

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

† NTG, Net to Gross is the deemed value available on the SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2024/>. Based on SAG Policy, participants in disadvantaged communities (DAC) based on their census tract and with consumption under 35,000 Therms are assigned a NTG of 1.00.

‡ Market rate net savings are multiplied by a residential non-participant spillover (NPSO) factor of 1.048. Do not apply to RCx program.

Source: Evaluation team analysis.

Impact Analysis Findings and Recommendations

Finding 1. For project ID 23-0008 Bundle #4 and Bundle #5, the ex ante savings did not include the boiler efficiency in the calculations for natural gas savings. Guidehouse included the boiler efficiency of 83% in the verified savings for these measure bundles resulting in a gas savings realization rate greater than 1.00.

Recommendation 1. Enhance quality control procedures to reduce these errors and verify that equipment efficiency, where relevant, is included in the savings calculation.

Finding 2. For multiple projects, particularly those using legacy custom calculation templates, the evaluation team sometimes noted lack of clear documentation of assumptions and other relevant context in the workbook.

- **24-0021 Bundle #1.** The excel calculator for this project included a summary worksheet that listed each rooftop unit (RTU) impacted by the measure and a description of the changes implemented for each RTU to generate savings. The calculator also included within the calculation worksheet for each RTU (18 total), a table documenting equipment information and other calculation inputs along with their source. Guidehouse recommends this as a best practice.
- **23-0003 Bundle #2.** Both the ex ante and verified savings for this project were calculated using two calculation methodologies (one based on trend data and the other based on test data) that yielded slightly different savings estimates. The program claimed the less conservative savings result (based on test data) with no additional reasoning for choosing one over the other. The evaluation team verified the more conservative savings estimate based on the availability and review of the supporting trend data.
- **22-0021 Bundle #3.** The custom calculator for this project also included savings for a measure bundle that is expected to be submitted in the future. The documentation within the calculator however does not make this distinction or provide any context around the intent to claim those savings in a future measure bundle. To align with the reported savings, the evaluation team also verified savings corresponding to only the measures included in the ex ante savings estimate.

Recommendation 2. Guidehouse recommends the following best practices with regards to savings calculator organization and documentation: Include clear documentation of input and outputs within the custom calculators along with their source where relevant. If savings for an ECM are expected to be split into multiple bundles, they should be clearly labelled to avoid confusion and the possibility of double-counting. If savings for a particular piece of equipment or temperature range are being excluded from a measure bundle, it should be clearly indicated within the documentation along with an explanation for doing so (e.g., to allow more time to collect season-specific trend data). For projects where the ECM is affecting several pieces of equipment (e.g., multiple RTUs, air handling units, fans, boilers etc.) the savings for each impacted equipment should be clearly laid out and documented.

Finding 3. The evaluation team has observed an increase in the number of partial savings bundles accepted by the program. For example, separate measure bundles may be submitted for the same measure, one claiming only electric savings first, followed by the gas savings

bundle later in the year, once winter heating data becomes available. While Guidehouse does not object to this savings submission approach, it has the potential to present issues like double-counting unless the intention to claim the remaining savings from an implemented measure in future bundles is clearly stated within the project documentation. During our review, the evaluation team noted that some projects that followed this approach had clearly indicated that additional savings would be claimed once relevant data was available, but others were not as clear. To align with the reported savings, the evaluation team only verified savings corresponding to the measure components included in the ex ante savings estimate.

- **21-0020 Bundle #2.** The verification report clearly indicated that additional heating season savings (below 20°F outside air temperature) for ECM #2 would be considered as a future measure once winter operation data is available.
- **22-0021 Bundle #3.** This project excluded some temperature ranges from claimed savings without any explanation.
- **22-0010 Bundle #19.** The project documentation had no explanation for excluding gas savings resulting from measure implementation. On inquiry, the implementation team confirmed that the gas savings from this ECM will be claimed under Bundle #20 approved in 2025.

Recommendation 3. Require the EESPs to be very explicit in their project descriptions and calculation workbooks with regards to the scope of the measure bundle in instances where partial savings are being claimed. When the additional savings are claimed for the measure in a future bundle, the EESPs should again clearly document both the current bundle and any precursor submissions so that savings are not over or understated in either bundle.

Finding 4. For multiple projects, the ex ante custom calculations extrapolated limited BAS data from monitored temperature ranges to higher and lower temperatures to characterize savings for a full year. These extrapolations, while often robust, can be improved.

- **23-0008 Bundle #2.** The 22°F-24°F and 26°F-28°F bins had only one and two observations for preheat temperature in the baseline condition respectively. If those observations are exceptional, they can distort extrapolations. The evaluation team based the preheat temperature for these temperature bins on the observations for the adjacent bins (20°F-22°F and 24°F-26°F and 28°F-30°F, respectively) with more robust data.
- Extrapolations in some projects (e.g., 24-0010 and 22-0010) were based on the full range of available BAS data, spanning different modes of operation (mechanical cooling, free cooling, and heating). Different temperature setpoints are expected to apply in each operating mode so temperature estimations based on extrapolations spanning different modes of operation are likely to deviate from actual operation. In these cases, the evaluation team adjusted datapoints to flatline the estimate for parameters like supply air temperature.
- **23-0008 Bundle #5.** At the extremes of the extrapolations, the evaluation team noted some parameter value estimates to be unreasonable. For example, extrapolations estimated mixed air temperatures (MATs) at lower outside air temperatures (OATs) to be close to freezing (e.g., MAT for AHU-SURG-10-4 at the -8°F bin is estimated to be 32.8°F) while maintaining a constant intake of outside air in the system, which does not represent how these systems would be operated in real-life. The evaluation team assumed that the MAT observed at the lowest temperature bin (20°F for AHU-SURG-10-

3 and 18°F for AHU-SURG-10-4) in the trend data would be maintained even at lower OATs by reducing the intake of outside air in the system.

Recommendation 4. Enhance quality control procedures when using extrapolations and employ additional scrutiny on estimated parameters for reasonability and representation of actual in the field operation. Some recommended guidelines include:

- Each bin parameter should be based on at least 5 observations. Omit bins from extrapolations if BAS data is inadequate.
- Base extrapolations on data from the same operating mode, i.e. do not include bins above 50°F for heating mode extrapolations. Do not include bins below 70°F for cooling mode extrapolations.
- Review the results of extrapolations that produce parameter values outside of normal operation range for relevant equipment. Employ bounds on the extrapolations or justify abnormal parameters in the calculation documentation.

Finding 5. Starting CY2024, the evaluation team is using the TMYx 2007-2021¹ weather data representative of the location of the project being evaluated to derive normalized savings estimates. The evaluation team noted that ex ante savings estimates for some projects (e.g., 23-0025 and 15-106) especially for participants that enrolled in MBCx several years ago, are still using the older TMY3 weather dataset. The TMYx data also includes additional locations with better proximity to some project sites. Thus, a project (e.g., 23-0017 and 23-0008) in the Chicago loop area that once used Midway TMY3 weather data should now use the more representative Northerly Island TMYx weather data.

Recommendation 5. Implement quality control checks on both the edition of the Typical Meteorological Year weather data and the weather station used for savings estimation to ensure uniform use of proximal datasets. Employ increased scrutiny for projects that enrolled in the program several years ago.

Finding 6. Nicor Gas classified one project (22-0045) as a Disadvantaged communities (DAC) designated site in their ex ante net savings estimate. Guidehouse, classified three projects (22-0045, 22-0057 and 23-0020) as DAC designated sites based on the review of the location and energy consumption level.

Recommendation 6. Continue to track DAC designated sites in the tracking data and ensure all projects that meet the criteria for eligibility are classified as DAC designated sites.

¹https://climate.onebuilding.org/WMO_Region_4_North_and_Central_America/USA_United_States_of_America/index.html#IDIL_Illinois

Appendix A. Impact Analysis Methodology

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 data sets (typical meteorological year, or TMY)² for proximal locations to estimate weather-normalized savings.

Evaluation Methods

The evaluation team used a stratified random sampling approach to select the gross impact sample. In CY2024, the evaluation team reviewed 35 projects³ (34% of the total) and 345,409 therms (61% of the total claimed). The team sorted projects based on the level of ex ante kWh savings and presence or absence of therms savings and 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 trend and measured data both pre and post implementation. In all cases, the evaluation team normalized savings estimates to TMYx 2007-2021⁴ 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 onsite inspections to determine whether implemented measures were still operating as described in project documentation (setpoints, affected equipment, hours of operation, etc.). For projects not selected for an onsite inspection, evaluators supplemented desk reviews with phone interviews with building operators and reviewed 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, the program team, or program guideline inputs.

Table A-1 shows a profile of the sample selection.

² A TMY data set provides an annual data set at the hourly level that typify weather conditions for a certain location over a long period of time (e.g., 30 years)

³ The evaluation team reviewed 35 individual sample points because the team randomly selected multiple bundles for seven projects in CY2024.

⁴https://climate.onebuilding.org/WMO_Region_4_North_and_Central_America/USA_United_States_of_America/index.html#IDIL_Illinois-

Table A-1. 2024 Profile of Gross Impact Sample (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)
Coordinated RetroCommissioning	Large	6	-	6	-	N/A
	Large – Gas	3	149,317	3	149,317	100%
	Medium	12	-	6	-	N/A
	Medium – Gas	11	184,556	6	44,651	24%
	Small	35	-	7	-	N/A
	Small – Gas	35	236,671	7	151,441	64%
TOTAL		102	570,544	35	345,409	61%

Note: The population and the sample summary represent all projects completed in CY2024 as per the ComEd tracking data, collaborated with the Nicor Gas data. Here we shown the gas sample disposition.

Source: Evaluation team analysis.

Savings Rollup

There are two basic statistical methods for combining individual gross realization rates from the sample projects into an estimate of verified gross kWh savings for the population when using stratified random sampling: separate and combined ratio estimation.⁵ In the case of a separate ratio estimator, a separate gross kWh savings realization rate is calculated for each stratum and then combined. In the case of a combined ratio estimator, the evaluation completes a single gross kWh savings realization rate calculation without first calculating separate gross realization rates by stratum.

The evaluation team used the separate ratio estimation technique to estimate verified gross impacts for the RetroCommissioning component. The separate ratio estimation technique follows the steps outlined in the California Evaluation Framework,⁶ which identifies best practices in program evaluation. The team matched these steps to the stratified random sampling method it used to create the sample for the component.

⁵ A full discussion and comparison of separate versus combined ratio estimation can be found in *Sampling Techniques* (Cochran, 1977), pp. 164-169.

⁶ 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 Detailed Results

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

Table B-1. 2024 Gas Savings by Strata (All Projects)

Strata	Sample Size	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate*	Verified Gross Savings (Therms)
Large	6	0	N/A	0
Large - Gas	3	149,317	99%	147,429
Medium	7	0	N/A	0
Medium - Gas	6	44,651	104%	46,267
Small	6	0	N/A	0
Small - Gas	7	151,441	98%	147,760
Total	35	345,409	99%	341,456

This table includes gas savings from all projects evaluated in CY2024. This includes projects for customers served by ComEd, Nicor Gas, Peoples Gas, and North Shore Gas.

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

Source: Evaluation team analysis.

Table B-2 shows the strata classification and ex ante and verified gas savings for all projects claimed by Nicor Gas in 2024.

Table B-2. 2024 Gas Savings by Project (Nicor Gas Projects Only)

Project ID	Bundle #	Strata	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
22-0039	Bundle #1	Medium - Gas	10,394	104%	10,770	0.98	10,555
22-0040	Bundle #2	Small - Gas	711	98%	694	0.98	680
22-0046	Bundle #1	Small - Gas	470	98%	459	0.98	449
23-0001	Bundle #1	Small - Gas	25,423	98%	24,805	0.98	24,309
23-0001	Bundle #2	Small - Gas	29,173	98%	28,464	0.98	27,895
23-0001	Bundle #3	Medium - Gas	6,138	104%	6,360	0.98	6,233
23-0020	Bundle #1	Small - Gas	6,119	98%	5,970	1.00	5,970
23-0031	Bundle #1	Medium - Gas	4,391	104%	4,550	0.98	4,459
23-0031	Bundle #2	Medium - Gas	3,498	104%	3,625	0.98	3,552
23-0032	Bundle #1	Small - Gas	336	98%	328	0.98	321
23-0033	Bundle #1	Small - Gas	6,024	98%	5,878	0.98	5,760
23-0034	Bundle #1	Medium - Gas	8,995	104%	9,321	0.98	9,134
23-0043	Bundle #1	Small - Gas	12,224	98%	11,927	0.98	11,688
23-0044	Bundle #1	Small - Gas	3,736	98%	3,645	0.98	3,572
23-0045	Bundle #1	Small - Gas	2,213	98%	2,159	0.98	2,116
20-0036	Bundle #10	Small - Gas	4,224	98%	4,121	0.98	4,039
22-0044	Bundle #2	Small - Gas	855	98%	834	0.98	818

Project ID	Bundle #	Strata	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
22-0045	Bundle #3	Small - Gas	369	98%	360	1.00	360
22-0057	Bundle #1	Small - Gas	8,884	98%	8,668	1.00	8,668
24-0021	Bundle #1	Small - Gas	27,374	98%	26,709	0.98	26,174
Total			161,551	99%	159,646		156,753

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

† NTG, Net to Gross is the deemed value available on the SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2024/>. Based on SAG Policy, participants in disadvantaged communities (DAC) based on their census tract and with consumption under 35,000 Therms are assigned a NTG of 1.00.

Source: Evaluation team analysis.

Table B-3 details the verified gas savings and realization rates for all sampled gas projects.

Table B-3. 2024 Gas Savings by Project (All Sampled Projects)

Project ID	Bundle #	Strata	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate*	Verified Gross Savings (Therms)
22-0010	Bundle #17	Large - Gas	112,860	99%	111,695
23-0008	Bundle #2	Small - Gas	39,765	122%	48,497
23-0037	Bundle #1	Large - Gas	32,317	93%	30,125
23-0001	Bundle #2	Small - Gas	29,173	100%	29,173
24-0021	Bundle #1	Small - Gas	27,374	100%	27,374
23-0001	Bundle #1	Small - Gas	25,423	53%	13,445
23-0025	Bundle #1	Small - Gas	19,745	93%	18,299
18-119	Bundle #2	Medium - Gas	14,695	97%	14,306
22-0039	Bundle #1	Medium - Gas	10,394	100%	10,394
22-0021	Bundle #3	Small - Gas	8,857	100%	8,857
23-0017	Bundle #1	Medium - Gas	8,203	119%	9,777
23-0031	Bundle #1	Medium - Gas	4,391	100%	4,411
23-0008	Bundle #4	Large - Gas	4,140	135%	5,609
23-0031	Bundle #2	Medium - Gas	3,498	100%	3,498
23-0008	Bundle #5	Medium - Gas	3,470	112%	3,881
23-0025	Bundle #3	Small - Gas	1,104	192%	2,115

Note: Participants can submit multiple bundles at different times during the year. Each project bundle submitted in CY2024 was counted as one project for impact evaluation sampling purposes.

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

† NTG, Net to Gross is the deemed value available on the SAG website: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2024/>. Based on SAG Policy, participants in disadvantaged communities (DAC) based on their census tract and with consumption under 35,000 Therms are assigned a NTG of 1.00.

Source: Evaluation team analysis.

Appendix C. Program Specific Inputs for the Illinois TRC

Table C-1 shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing 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. Guidehouse will include annual and lifetime water savings and greenhouse gas reductions in the end of year summary report.

Table C-1. 2024 Verified Cost-Effectiveness Inputs

Program Category	Program Path	Savings Category	DAC Project	Units	Quantity	Effective Useful Life	Early Replacement Flag	Verified Gross Annual Water Savings (Gallons)	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Private	Direct Install	RCx Project	FALSE	Project	12	8.6	NO	N/A	121,512	120,580	118,169
Private	Direct Install	RCx Project	TRUE	Project	2	8.6	NO	N/A	6,448	6,330	6,330
Public	Direct Install	RCx Project	FALSE	Project	5	8.6	NO	N/A	24,667	24,067	23,586
Public	Direct Install	RCx Project	TRUE	Project	1	8.6	NO	N/A	8,884	8,668	8,668
Total or Weighted Average						8.6		N/A	161,551	159,646	156,753

Source: Evaluation team analysis.