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| Residential New Construction Program Impact Evaluation Report  Energy Efficiency Plan: Program Year 2023 (1/1/2023-12/31/2023) | | | | | | | | | | |
| Prepared for:  Nicor Gas  DRAFT  March 26, 2024 | | | | | | | | | | |
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# Introduction

This report presents the results of the impact evaluation of the Nicor Gas 2023 Residential New Construction (RNC) program. A summary of the energy impacts for the total program and relevant measure and program structure details. The appendix presents the impact analysis methodology and Illinois total resource cost (TRC) inputs. Program year 2023 covers January 1, 2023, through December 31, 2023.

# Program Description

The RNC program's objective is to obtain energy savings by increasing the energy efficiency of new construction single-family detached homes and townhomes. The program provides participating new home builders a financial incentive to either a) exceed state and local building code requirements regarding duct and air sealing, along with the installation of specific high-efficiency equipment, or b) install prescriptive high-efficiency equipment only.

The RNC program had 2,089 participants with 7,901 measures in 2023, as shown in Table 2‑1.

Table 2‑1. 2023 Volumetric Findings Detail

|  |  |  |
| --- | --- | --- |
| **Participation** | **Residential New Construction** | **Total** |
| Participants \* | 2,089 | 2,089 |
| Installed Measures † | 7,901 | 7,901 |

\* Participants are defined as the total number of unique vendor project IDs.

† Installed Measures is the total quantity of measures installed.

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

Table 2‑2 summarizes the installed measure quantities that are the basis for verified energy savings.

Table 2‑2. 2023 RNC Program Installed Measure Quantities

|  |  |  |  |
| --- | --- | --- | --- |
| **Program Category** | **Measure** | **Quantity Unit** | **Installed Quantity** |
| **Residential New Construction** | Advanced Thermostat | Unit | 2,023 |
| Air Sealing | Project | 1,068 |
| Duct Insulation and Sealing | Project | 1,068 |
| Gas High Efficiency Furnace >92% AFUE\* | Unit | 196 |
| Gas High Efficiency Furnace >95% AFUE\* | Unit | 1,893 |
| On Demand Water Heater | Unit | 750 |
| Storage Water Heater | Unit | 905 |
| Total |  |  | 7,903 |

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

# Program Savings Detail

Table 3‑1 summarizes the energy savings the RNC Program achieved in 2023.

Table 3‑1. 2023 RNC Program Annual Energy Savings Summary

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Program Path** | **Ex Ante**  **Gross Savings (Therms)** | **Verified Gross RR\*** | **Verified**  **Gross Savings (Therms)** | **NTG†** | **Residential**  **NPSO** ‡ | **Verified**  **Net Savings (Therms)** |
| Residential New Construction | 654,383 | 100% | 656,729 | 0.80/ 0.90‡ | 1.048 | 565,738 |
| **Total** | **654,383** | **100%** | **656,729** |  |  | **565,738** |

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

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

‡ The net savings was multiplied by a residential non-participant spillover factor of 1.048. The program did not have any disadvantaged community (DAC) designated sites.

Source: Guidehouse evaluation team analysis.

# Program Savings by Measure

The program includes seven measures as shown in Table 4‑1. The Advanced Thermostat and Gas High Efficiency Furnace measures contributed the most savings.

Table 4‑1. 2023 RNC Program Annual Energy Savings by Measure

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **End-Use** | **Savings Category** | **Ex Ante Gross Savings (Therms)** | **Verified Gross RR\*** | **Verified Gross Savings (Therms)** | **NTG†** | **Residential NPSO** ‡ | **Verified**  **Net**  **Savings (Therms)** |
| HVAC | Gas High Efficiency Furnace  >95% AFUE | 263,154 | 100% | 262,959 | 0.80 | 1.048 | 220,465 |
| HVAC | Advanced Thermostat | 144,442 | 100% | 144,442 | 0.90 | 1.048 | 136,238 |
| Shell | Air Sealing | 80,507 | 100% | 80,444 | 0.80 | 1.048 | 67,444 |
| HVAC | Duct Insulation and Sealing | 66,266 | 100% | 66,266 | 0.80 | 1.048 | 55,557 |
| Hot Water | On Demand Water Heater | 53,665 | 100% | 53,665 | 0.80 | 1.048 | 44,992 |
| Hot Water | Storage Water Heater | 27,068 | 110% | 29,672 | 0.80 | 1.048 | 24,877 |
| HVAC | Gas High Efficiency Furnace  >92% AFUE | 19,281 | 100% | 19,281 | 0.80 | 1.048 | 16,165 |
|  | **Total** | **654,383** | **100%** | **656,729** |  |  | **565,738** |

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

† Net-to-Gross. A deemed value. Available on the SAG (Stakeholder Advisory Group) web site: <https://www.ilsag.info/evaluator-ntg-recommendations-for-2023/>.

‡ Residential NPSO. Residential non-participant spillover factor

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

# Impact Analysis Findings and Recommendations

## Impact Parameter Estimates

Table 5‑1 shows the unit therms savings and realization rate findings by measure from Guidehouse’s review. The realization rate is the ratio of the verified savings to the ex ante savings. Table 51 are findings and recommendations, including discussion of the measure with a realization rate other than 100%. Appendix A describes the impact analysis methodology. Appendix B shows the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing this impact evaluation report.

Table 5‑1. 2023 RNC Program Verified Gross Savings Parameters

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Measure** | **Unit Basis** | **Ex Ante Gross (therms/unit)** | **Verified Gross (therms/unit)** | **Realization Rate** | **Data Source(s)** |
| Advanced Thermostat | Unit | 71.4 | 71.4 | 100% | Illinois TRM v11.0 (TRM)† – Section 5.3.16 |
| Air Sealing | Project | 75.4 | 75.3 | 100% | TRM v11.0 – Section 5.6.1; Illinois Energy Conservation Code‡ |
| Duct Insulation and Sealing | Project | 62.0 | 62.0 | 100% | TRM v11.0 – Section 5.3.4; Illinois Energy Conservation Code |
| Gas High Efficiency Furnace >92% AFUE | Unit | 98.4 | 98.4 | 100% | TRM v11.0 – Section 5.3.7 |
| Gas High Efficiency Furnace >95% AFUE | Unit | 139.0 | 138.9 | 100% | TRM v11.0 – Section 5.3.7 |
| On Demand Water Heater | Unit | 71.6 | 71.6 | 100% | TRM v11.0 – Sections 5.4.2 and 4.3.1 |
| Storage Water Heater | Unit | 29.9 | 32.7 | 110% | TRM v11.0 – Sections 5.4.2 and 4.3.1 |

\* Program Tracking Data (PTD) provided by Nicor Gas, extract dated February 07, 2024.

† Illinois Statewide Technical Reference Manual version 11.0 from http://www.ilsag.info/technical-reference-manual.html.

‡ Illinois Energy Conservation Code, July 1, 2018. <https://www.ilga.gov/commission/jcar/admincode/071/07100600ZZ9996AR.html>

## Findings and Recommendations

### Air Sealing and Duct Insulation

**Finding 1**. The conditioned volume data in the participation data for project 239321 is 3,411 ft3, which could be a typographical error. This very low value result in a verified savings and realization rate unusually low as compared to similar projects. Nicor Gas provided a supplemental data that provided this input for the air sealing measure savings verification.

Project 220397 has a zip code 60858, that does not correspond to any location in Illinois. To accurately quantify the savings, the evaluation team used the zip code 60585 associated with the address (according to the US Postal Services) in the participant report.

**Recommendation 1a.** Include the actual conditioned building volume data in the program participation report, and ensure the data contains the accurate conditioned volume data for each project.

**Recommendation 1b.** Ensure zip codes are listed correctly in the program participation database.

### Gas High Efficiency Furnace

**Finding 2**. Twenty-five gas high efficiency furnace installations had a realization rate other than 100%. Twenty-four of these measures have a realization rate less than 100%, and one has a realization rate greater than 100%. The evaluation team was unable to identify a cause for the discrepancies in the realization rate for the measures which could be relevant to the information in the participant report. The verified savings calculations are based on the Illinois Statewide Technical Reference Manual (IL-TRM) version 11.0 and Nicor Gas RNC program tracking data.

Table 5‑2. Gas High Efficiency Furnace Savings Discrepancies

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **VendorProjectID** | **EFLH** | **Input Capacity** | **AFUE\_eff** | **AFUE\_base** | **Verified Realization Rate** |
| 235281 | 976 | 98,000 | 95.0% | 80.0% | 54% |
| 237897 | 976 | 66,000 | 96.0% | 80.0% | 99% |
| 227466 | 976 | 80,000 | 96.0% | 80.0% | 200% |
| 237900, 237901, 237902, 237903, 237906 | 976 | 80,000 | 96.5% | 80.0% | 97% |

*Source: Nicor Gas tracking data and Guidehouse evaluation team analysis; Illinois Statewide Technical Reference Manual version*

*11.0.*

**Recommendation 2.** Perform quality control andconfirm the input values used in ex ante savings calculations for furnaces are accurate and consistent with the claimed savings and provide all the input values in the tracking data.

### Gas Storage Water Heaters

**Finding 3**. When Guidehouse calculated savings based on the tracking data inputs, the evaluation team identified 398 projects with furnace input capacity greater than 75,000 Btu/hr with a realization rate other than 100%, this includes Project IDs, 214881, 214884, 214901, 214911, 214921, 214922, and others. Guidehouse could not duplicate the baseline UEFs used in the ex ante savings calculation. The verified savings calculations are based on the Illinois Statewide Technical Reference Manual (IL-TRM) version 11.0 and Nicor Gas RNC program tracking data.

Eight projects with the project IDs 214559, 217959, 220292, 222035, 222875, 224186, 227449, and 229859 have negative verified savings and evaluation set the savings to zero with 0% realization rate due to no improvement in the uniform energy factor rating (UEF) of the equipment compared to the baseline values.

Six projects with the project IDs 214999, 218369, 219833, 224186, 227449, and 235584 have ex ante savings of zero in the participant report. The verified savings were set to zero with no savings realization rates.

Overall, the storage water heater measure had a gross realization rate of 110%.

**Recommendation 3a.** Improvequality control of the input values used in the ex ante savings calculation for storage water heater and ensure they are consistent with the savings reported in the participation data.

**Recommendation 3b.**  Review the UEF baseline with regards to the storage water heater capacity, gallons, and draw pattern and ensure the UEF improvement value results in verifiable ex ante savings in the participation data.

**Recommendation 3c.**  Review measures with zero ex ante savings and confirm if savings should be claimed in the final participation data.

##### Impact Analysis Methodology

Guidehouse followed algorithms outlined in the Illinois Technical Reference Manual (TRM) v11.0 to calculate verified gross savings for residential programs. The evaluation team verified that these algorithms and appropriate deemed input parameters were correctly applied and validated custom parameters that were used. Baseline assumptions were derived from the Illinois Energy Conservation Code[[1]](#footnote-2) or the TRM.

Guidehouse calculated verified net savings by multiplying verified gross savings by a net-to-gross (NTG) of 0.90 for advanced thermostats and 0.80 for all other measures, and a residential non-participant spillover multiplier of 1.048 as deemed by the Illinois Stakeholder Advisory Group (SAG) for 2023.

##### Program Specific Inputs for the Illinois TRC

Table B‑1 shows the Total Resource Cost (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 Table B1 ‑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 B‑1. 2023 RNC Program Verified Cost Effectiveness Inputs

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **End-Use** | **Savings Category** | **Units** | **Quantity** | **Effective Useful Life** | **Ex Ante Gross Savings (Therms)** | **Verified Gross Savings (Therms)** | **Verified Net Savings (Therms)** |
| HVAC | Advanced Thermostat | Each | 2,023 | 11 | 144,442 | 144,442 | 136,238 |
| Shell | Air Sealing | Project | 1,068 | 20 | 80,507 | 80,444 | 67,444 |
| HVAC | Duct Insulation and Sealing | Project | 1,068 | 20 | 66,266 | 66,266 | 55,557 |
| HVAC | Gas High Efficiency Furnace >92% AFUE | Each | 196 | 20 | 19,281 | 19,281 | 16,165 |
| HVAC | Gas High Efficiency Furnace >95% AFUE | Each | 1,893 | 20 | 263,154 | 262,959 | 220,465 |
| Hot Water | On Demand Water Heater | Each | 750 | 13 | 53,665 | 53,665 | 44,992 |
| Hot Water | Storage Water Heater | Each | 905 | 13 | 27,068 | 29,672 | 24,877 |
| **Total or Weighted Average** | |  | **7,903** | **17.1** | **654,383** | **656,729** | **565,738** |

Note: Totals may not sum due to rounding.

Note: The total for the Effective Useful Life is the weighted average.

*Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.*

The net savings were multiplied by a residential non-participant spillover factor of 1.048. The program did not have any disadvantaged community (DAC) designated sites.

1. Illinois Energy Conservation Code, July 1, 2018. https://www2.illinois.gov/cdb/business/codes/IllinoisAccessibilityCode/Documents/2018%20Illinois%20Specific%20Amendments%20with%20Modifications%20Shown.pdf [↑](#footnote-ref-2)