Guidehouse
Outwit Complexity

Income Eligible Multi-Family and Public Housing Programs Impact Evaluation Report

Energy Efficiency Plan: Program Year 2022 (1/1/2022-12/31/2022)

Prepared for:

Nicor Gas Company

FINAL

June 13, 2023

Prepared by:

Kyle Mckenna
EcoMetric Consulting

Himanshu Haridas
EcoMetric Consulting

Majesh Tom Mani
EcoMetric Consulting

Michael Frischmann
EcoMetric Consulting

Submitted to:

Nicor Gas Company
1844 Ferry Road
Naperville, IL 60563

Submitted by:

Guidehouse
150 N. Riverside Plaza, Suite 2100
Chicago, IL 60606

Contact:

Ed Balbis
Partner
561.644.9407
ebalbis@guidehouse.com

Stu Slote
Director
802.526.5113
stu.slote@guidehouse.com

Laura Agapay-Read
Associate Director
312.583.4178
laura.agapay.read@guidehouse.com

Charles Ampong
Associate Director
608.446.3172
charles.ampong@guidehouse.com

Table of Contents

List of Tables, Figures, and Equations

1. Introduction

This report presents the results of the impact evaluation of the Nicor Gas 2022 Income Eligible Multi-Family (MFIE) program. The MFIE program includes the Illinois Home Weatherization Assistance Program (IHWAP) and the Retrofits program. This report presents a summary of the energy impacts for the total program and is broken out by relevant measure and program structure details. The second section of the report presents impact results for the Public Housing Energy Savings (PHES) program. The appendices present the impact analysis methodology and Illinois total resource cost (TRC) inputs. Program year 2022 covers January 1, 2022 through December 31, 2022.

2. Income Eligible Multi-Family Retrofits and IHWAP

2.1 Program Description

The Nicor Gas MFIE program offers weatherization products and energy saving measures for income-eligible customers in multi-family (MF) dwellings within the Nicor Gas service territory. The 2022 IHWAP and Retrofits program paths included direct installation of water heating efficiency measures (faucet aerators, showerheads, shower timer, gas water heaters), advance thermostats, programmable thermostats, attic insulation, air sealing, floor insulation, and furnace and boiler tune-ups.

The program had 178 participants in 2022 and completed 4,484 projects as Table 2-1 shows.

Table 2-1. 2022 Volumetric Findings Detail

Participation	MF Retrofit	MF IHWAP	Total
Income Eligible Multi-Family			
Participants *	177	2	**179**
Installed Projects †	4483	2	**4,485**

* Participants are defined as unique site addresses from tracking data.
† Installed projects are defined as unique vendor project IDs from tracking data.
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. 2022 Installed Measure Quantities

Program Category	Program Path	Measure	Quantity Unit	Installed Quantity
Income Eligible Multi-Family	MF Retrofit	Air Sealing	Ln Ft	304,510
	MF Retrofit	Pipe Insulation CA	Ln Ft	17,555
	MF Retrofit	Attic Insulation	Sq Ft	822,830
	MF Retrofit	Hydronic Boilers	Unit	32

Program Category	Program Path	Measure	Quantity Unit	Installed Quantity
	MF Retrofit	Low Flow Showerhead (DI) IU	Unit	2,370
	MF Retrofit	Prog. T-Stat (DI) IU	Unit	504
	MF Retrofit	DHW Controller	Unit	174
	MF Retrofit	Boiler Tune Up	Unit	78
	MF Retrofit	Shower Timer	Unit	2,867
	MF Retrofit	Faucet Aerator - Kitchen (DI) IU	Unit	2,635
	MF Retrofit	AC Cover and Gap Sealer	Unit	909
	MF Retrofit	Steam Boilers	Unit	4
	MF Retrofit	Reprogram T-Stat (DI) IU	Unit	99
	MF Retrofit	Boiler Reset Controls	Unit	2,855
	MF Retrofit	Faucet Aerator - Bathroom (DI) IU	Unit	1,569
	MF Retrofit	Furnace	Unit	1,040
	MF Retrofit	Steam Traps	Unit	10
	MF Retrofit	Floor Insulation	Sq Ft	13,950
	MF Retrofit	DHW Tank Insulation	Ln Ft	196
	MF Retrofit	Air Sealing - Weatherstripping	Ln Ft	90
	MF Retrofit	Air Sealing - Door Sweep	Unit	81
	MF Retrofit	Advanced Thermostat	Unit	4
	MF Retrofit	Low Flow Showerhead (DI) CA	Unit	5
	MF Retrofit	Storage Water Heater	Unit	1
	MF Retrofit	Faucet Aerator - Bathroom (DI) CA	Unit	4
	MF Retrofit	Faucet Aerator - Kitchen (DI) CA	Unit	2
	MF Retrofit	Health & Safety Services	Unit	386,796
	MF Retrofit	Steam Traps - Test/Audit	Unit	367
	MF Retrofit	Unit Assessment	Unit	3,960
	MF IHWAP	Custom Project - MAU	Unit	1

Program Category	Program Path	Measure	Quantity Unit	Installed Quantity
	MF IHWAP	Attic Insulation	Sq Ft	13,079
	MF IHWAP	Custom Project - Air Sealing - Silicone Caulk	Unit	1
	MF IHWAP	Custom Project - Air Sealing - Weatherstripping	Unit	1
	MF IHWAP	Air Sealing - Door Sweep	Unit	30
	MF IHWAP	Custom Project - RTU	Unit	1
	MF IHWAP	Health & Safety Services	Unit	4

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

2.2 Program Savings Detail

Table 2-3 summarizes the energy savings the MFIE Program achieved by path in 2022.

Table 2-3. 2022 Annual Energy Savings Summary

Program Path	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
MF Retrofit	273,312	109%	298,752	1.00	298,752
MF IHWAP	2,247	94%	2,106	1.00	2,106
Total or Weighted Average	**275,560**	**109%**	**300,858**	**1.00**	**300,858**

Note: Totals may not sum due to rounding
* Realization rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
† Net-to-Gross (NTG): A deemed value. Available on the Stakeholder Advisory Group (SAG) website: **https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/**.
Source: Guidehouse evaluation team analysis.

2.3 Program Savings by Measure

The program includes 35 measures as Table 2-4 shows. The air sealing, pipe insulation, and attic insulation measures contributed the most savings.

Table 2-4. 2022 Annual Energy Savings by Measure

Program Management	Savings Category	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
MF Retrofit	Air Sealing	72,441	100%	72,745	1.00	72,745
MF Retrofit	Pipe Insulation CA	50,328	101%	50,898	1.00	50,898
MF Retrofit	Attic Insulation	38,116	109%	41,695	1.00	41,695
MF Retrofit	Hydronic Boilers	13,979	110%	15,371	1.00	15,371
MF Retrofit	Low Flow Showerhead (DI) IU	16,521	100%	16,521	1.00	16,521
MF Retrofit	Prog. T-Stat (DI) IU	16,077	73%	11,729	1.00	11,729
MF Retrofit	DHW Controller	8,903	123%	10,910	1.00	10,910
MF Retrofit	Boiler Tune Up	8,828	101%	8,895	1.00	8,895
MF Retrofit	Shower Timer	6,203	100%	6,200	1.00	6,200
MF Retrofit	Faucet Aerator - Kitchen (DI) IU	4,288	100%	4,296	1.00	4,296
MF Retrofit	AC Cover and Gap Sealer	4,074	100%	4,074	1.00	4,074
MF Retrofit	Steam Boilers	3,084	100%	3,084	1.00	3,084
MF Retrofit	Reprogram T-Stat (DI) IU	3,368	68%	2,287	1.00	2,287

Program Management	Savings Category	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
MF Retrofit	Boiler Reset Controls	958	226%	2,162	1.00	2,162
MF Retrofit	Faucet Aerator - Bathroom (DI) IU	1,544	100%	1,544	1.00	1,544
MF Retrofit	Furnace	4,473	28%	1,236	1.00	1,236
MF Retrofit	Steam Traps	1,580	75%	1,190	1.00	1,190
MF Retrofit	Floor Insulation	1,727	43%	751	1.00	751
MF Retrofit	DHW Tank Insulation	728	85%	619	1.00	619
MF Retrofit	Air Sealing - Weatherstripping	452	94%	426	1.00	426
MF Retrofit	Air Sealing - Door Sweep	377	90%	338	1.00	338
MF Retrofit	Advanced Thermostat	157	100%	157	1.00	157
MF Retrofit	Low Flow Showerhead (DI) CA	62	100%	62	1.00	62
MF Retrofit	Storage Water Heater	12	160%	19	1.00	19
MF Retrofit	Faucet Aerator - Bathroom (DI) CA	15	100%	15	1.00	15
MF Retrofit	Faucet Aerator - Kitchen (DI) CA	9	100%	9	1.00	9
MF Retrofit	Steam Traps - Test/Audit	15,008	277%	41,520	1.00	41,520
MF IHWAP	Custom Project - MAU	945	102%	962	1.00	962
MF IHWAP	Attic Insulation	612	74%	454	1.00	454
MF IHWAP	Custom Project - Air Sealing - Silicone Caulk	404	100%	404	1.00	404
MF IHWAP	Custom Project - Air Sealing - Weatherstripping	134	100%	134	1.00	134
MF IHWAP	Air Sealing - Door Sweep	125	100%	125	1.00	125
MF IHWAP	Custom Project - RTU	27	103%	28	1.00	28
	Total or Weighted Average	**275,560**	**109%**	**300,858**	**1.00**	**300,858**

* Realization rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
† Net-to-Gross (NTG): A deemed value. Available on the Stakeholder Advisory Group (SAG) website: **https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/**.
Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.

2.4 Impact Analysis Findings and Recommendations

The overall realization rate for the MFIE program was 109% for therms in CY2022.

2.4.1 Impact Parameter Estimates

Table 2-5 shows the unit therms savings and realization rate (RR) findings by measure from the Guidehouse review. The RR is the ratio of the verified savings to the ex ante savings. Following Table 2-5 are findings and recommendations, including discussion of all measures with RR above or below 100%. Appendix A provides a description of the impact analysis methodology. Appendix B provides the Total Resource Cost (TRC) cost-effectiveness analysis inputs available at the time of producing this impact evaluation report.

Table 2-5. Verified Gross Savings Parameters

Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	RR	Data Source(s)
Air Sealing	Ln Ft	0.24	0.24	100%	Illinois TRM, v10.0†, Section 5.6.1 and PTD*
Pipe Insulation CA	Ln Ft	Varies	Varies	101%	Illinois TRM, v10.0, Section 4.4.14 and PTD
Attic Insulation	Sq Ft	Varies	Varies	109%	Illinois TRM, v10.0, Section 5.6.5 and PTD
Hydronic Boilers	Unit	Varies	Varies	110%	Illinois TRM, v10.0, Section 4.4.10 and PTD
Low Flow Showerhead (DI) IU	Unit	6.97	6.97	100%	Illinois TRM, v10.0, Section 5.4.5 and PTD
Prog. T-Stat (DI) IU	Unit	Varies	Varies	73%	Illinois TRM, v10.0, Section 5.3.11 and PTD
DHW Controller	Unit	Varies	62.70	123%	Illinois TRM, v10.0, Section 4.3.8 and PTD
Boiler Tune Up	Unit	Varies	0.27	101%	Illinois TRM, v10.0, Section 4.4.2 and PTD
Shower Timer	Unit	2.16	2.16	100%	Illinois TRM, v10.0, Section 5.4.9 and PTD
Faucet Aerator - Kitchen (DI) IU	Unit	1.63	1.63	100%	Illinois TRM, v10.0, Section 5.4.4 and PTD
AC Cover and Gap Sealer	Unit	4.48	4.48	100%	Illinois TRM, v10.0, Section 4.4.38 and PTD
Steam Boilers	Unit	0.36	0.36	100%	Illinois TRM, v10.0, Section 4.4.10 and PTD
Reprog. T-Stat (DI) IU	Unit	Varies	Varies	68%	Illinois TRM, v10.0, Section 5.3.11 and PTD

Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	RR	Data Source(s)
Boiler Reset Controls	Unit	Varies	0.76	226%	Illinois TRM, v10.0, Section 4.4.4 and PTD
Faucet Aerator - Bathroom (DI) IU	Unit	0.98	0.98	100%	Illinois TRM, v10.0, Section 5.4.4 and PTD
Furnace	Unit	Varies	1.19	28%	Illinois TRM, v10.0, Section 5.3.7 and PTD
Steam Traps	Unit	157.98	118.97	75%	Illinois TRM, v10.0, Section 4.4.16 and PTD
Floor Insulation	Sq Ft	Varies	Varies	43%	Illinois TRM, v10.0, Section 5.6.3 and PTD
DHW Tank Insulation	Ln Ft	3.72	3.16	85%	Illinois TRM, v10.0, Section 4.4.14 and PTD
Air Sealing - Weatherstripping	Ln Ft	Varies	Varies	94%	Illinois TRM, v10.0, Section 5.6.1 and PTD
Air Sealing - Door Sweep	Unit	Varies	Varies	92%	Illinois TRM, v10.0, Section 5.6.1 and PTD
Advanced Thermostat	Unit	Varies	Varies	100%	Illinois TRM, v10.0, Section 5.3.16 and PTD
Low Flow Showerhead (DI) CA	Unit	12.33	12.33	100%	Illinois TRM, v10.0, Section 4.3.3 and PTD
Storage Water Heater	Unit	11.84	18.98	160%	Illinois TRM, v10.0, Section 4.3.1 and PTD
Faucet Aerator - Bathroom (DI) CA	Unit	3.86	3.86	100%	Illinois TRM, v10.0, Section 4.3.2 and PTD
Faucet Aerator - Kitchen (DI) CA	Unit	4.65	4.65	100%	Illinois TRM, v10.0, Section 4.3.2 and PTD
Steam Traps - Test/Audit	Unit	Varies	Varies	277%	Illinois TRM, v10.0, Section 4.4.16 and PTD
Custom Project - MAU	Unit	945.06	961.70	102%	Project File Review‡, Illinois TRM, v10.0, Section 4.4.27 and PTD
Custom Project - Air Sealing - Silicone Caulk	Unit	404.29	404.29	100%	Project File Review, Illinois TRM, v10.0, Section 5.6.1 and PTD
Custom Project - Air Sealing - Weatherstripping	Unit	133.52	133.52	100%	Project File Review, Illinois TRM, v10.0, Section 5.6.1 and PTD
Custom Project - RTU	Unit	27.36	28.22	103%	Project File Review, Illinois TRM, v10.0, Section 4.4 and PTD

* Program Tracking Data (PTD) provided by Nicor Gas, extract dated January 31, 2023.
† Illinois Statewide Technical Reference Manual (IL-TRM) version 10.0 from **https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/**.
‡ Project files and monthly billing data provided by Nicor Gas. Where conducted, on-site or telephone interview data collected by Guidehouse.
Source. Nicor Gas tracking data and Guidehouse team analysis.

2.4.2 Findings and Recommendations

The evaluation team developed findings and recommendations based on the 2022 evaluation. The findings and recommendations are organized by measure type in the following sections.

2.4.2.1 Climate Zones

Finding 1. The ex ante analysis had incorrectly selected the climate zone dependent variables for Air Sealing, Air Sealing – Weatherstripping and Air Sealing – Door Sweep measures. The evaluation team used the customer location to choose the proper climate zone for each participant.

- Air Sealing: For 64 measure instances, the ex ante analysis had selected the $\Delta therms_{sealing}$ / ft value based on an incorrect climate zone. Choosing the correct climate zone adjusted the measure-level savings by less than 1% for this measure.
- Air Sealing – Weatherstripping – DI: For three measure instances (MEA-2022.06.09-352939, MEA-2022.06.09-352940 and MEA-2022.11.23-443913), ex ante analysis had selected the $\Delta therms_{WX}$ value based on an incorrect climate zone. For climate zone 1, the value should be 0.63 as per IL-TRM (Section 5.6.1), but ex ante analysis had selected 0.61, resulting in an RR of 103% for these three measures.
- Air Sealing – Door Sweep – DI: For the measure instance (MEA-2022.11.23-443912), ex ante analysis had selected the $\Delta therms_{sweep}$ value based on an incorrect climate zone. For climate zone 1, the value should be 9.46 as per IL-TRM (Section 5.6.1), but ex ante analysis had selected 9.13, resulting in an RR of 104% for this measure.

Recommendation 1. Climate zone-dependent variables should be selected based on the project climate zone. Review the savings algorithm and the inputs being used in the savings calculation, and match with the algorithms from the Illinois Statewide Technical Reference Manual (IL-TRM)[1] v10.0.

2.4.2.2 Consistency with TRM

Finding 2. The evaluation team could not replicate the ex ante savings for the Boiler Tune Up, Programmable Thermostat, Re-Programmable Thermostat, Boiler Reset Controls, Furnace > 95% AFUE, Floor Insulation Above Crawlspace, Storage Water Heater >0.67 EF, Showerhead measures, Air Sealing – Weatherstripping, Air Sealing – Door Sweep. To determine the verified savings, the evaluation team used the measure information from the tracking data and the relevant algorithms from the IL-TRM.

[1] In this report, unless stated otherwise, IL-TRM refers to version 10.0 (v10.0)

- Boiler Tune Up – MF, IE: For one measure instance (MEA-2023.01.04-469242), the evaluation team leveraged the algorithms and assumptions from IL-TRM (Section 4.4.2), resulting in a 254% RR for this measure instance.
- Programmable Thermostat (DI) MF-IU: For 394 out of 504 instances, the evaluation team leveraged the algorithms and assumptions in IL-TRM (Section 5.3.11), resulting in an RR of 68%. These instances were all in climate zone 2, but there were other climate zone 2 instances with an RR of 100%.
- Re-Programmable Thermostat (DI) MF-IU: For 98 out of 99 instances the evaluation team leveraged the algorithms and assumptions in IL-TRM (Section 5.3.11), resulting in an RR of 68%.
- Boiler Reset Controls – MF, IE: For these three measure instances (MEA-2022.11.23-443910, MEA-2022.12.01-448260 and MEA-2022.12.01-448259) the evaluation team leveraged the algorithms and assumptions in IL-TRM (Section 4.4.4) resulting in RRs of 254%, 308% and 326%, respectively.
- Furnace, >95% AFUE – MF IU: For these three measure instances (MEA-2022.10.19-422203, MEA-2022.12.22-461039 and MEA-2022.12.28-461744), the evaluation team leveraged the algorithms and assumptions in IL-TRM (Section 5.3.7) resulting in an RRs of 17%, 45% and 45%, respectively
- Floor Insulation Above Crawlspace: For these five measure instances (MEA-2022.04.28-328049, MEA-2022.07.13-368008, MEA-2022.12.22-461042, MEA-2022.12.28-461745 and MEA-2023.01.04-469208), the evaluation team leveraged the algorithms and assumptions in IL-TRM (Section 5.6.3) resulting in different RRs from 10% to 79%.
- Storage Water Heater, >0.67 EF: For this measure installation (MEA-2022.09.29-408834), the evaluation team assumed the unit was a common area unit and followed the algorithm and default assumptions as per IL-TRM (Section 4.3.1), resulting in an RR of 160%.
- Air Sealing – Weatherstripping – DI: For six measure instances, the evaluation team leveraged the algorithms and assumptions found in IL-TRM (Section 5.6.1) resulting in RRs of 80% and 83%.
- Air Sealing - Door Sweep – DI: For seven measure instances, the evaluation team leveraged the algorithms and assumptions found in IL-TRM (Section 5.6.1), resulting in different RRs of 57%, 80% and 83%.

Recommendation 2. For measures which leverage the IL-TRM, ensure that the savings algorithm matches the appropriate measure in IL-TRM, leveraging equipment specific inputs when available, and IL-TRM default assumptions when necessary.

2.4.2.3 EUL

Finding 3. The measure life was reported incorrectly for Programmable Thermostat, Re-Programmable Thermostat, Steam Boiler and Steam Traps - Test/Audit measures in the tracking data. The evaluation team has considered the measure life per IL-TRM.

- Programmable Thermostat (DI) MF-IU: The measure life was reported as 8 years in the tracking data. The evaluation team used a 16-year measure life per IL-TRM (Section 5.3.11).
- Re-Programmable Thermostat (DI) MF-IU: The measure life was reported as 8 years in the tracking data. The evaluation team used a 2-year measure life per IL-TRM (Section 5.3.11).
- Steam Boilers: The measure life was reported as 16.5 years in the tracking data. The evaluation team used a 25-year measure life per IL-TRM (Section 4.4.10).
- Steam Traps - Test/Audit - MF, IE: The measure life was reported as 1 year in the tracking data for this measure installation. The evaluation team have considered the measure life as 6 years per IL-TRM (Section 4.4.16). As savings were reported for this measure, the measure life for steam trap replacement would be applicable.

Recommendation 3. Review the measure life entered in the tracking data and ensure it matches with IL-TRM.

2.4.2.4 Attic Insulation

Finding 4. The evaluation team added an R-value of 3 to both baseline and proposed conditions and considered the allocation factor of 57% based on feedback from Nicor Gas during Wave 1. However, the evaluation team was unable to replicate the ex ante savings based on the supplied data, resulting in RR that ranged from 54% to 147% for individual cases.

Recommendation 4. Ensure the savings algorithm and the inputs being used in the ex ante savings calculation match with the algorithms from IL-TRM (Section 5.6.5)

Finding 5. For one measure installation (MEA-2022.09.15-402927), the pre and post R value shown in the tracking data was the same. As there is no incremental increase in insulation levels, the evaluation team verified no savings for this instance.

Recommendation 5. Review the tracking data entries for situations where baseline and efficient cases are identical and consider adding quality assurance checks in the tracking system.

2.4.2.5 Hydronic Boilers, >85%

Finding 6. Out of eight measure installations, three measures had an RR of 100%. For the remaining five measures, the quantity column in the tracking data seems to list the actual capacities (kBtu/h) of the boilers. The evaluation team assumed 1,000 Btu/h as the capacity while doing the analysis. The evaluation team was unable to replicate the savings based on the supplied data, resulting in different RR of 200%, 210% and 251% for these five measures (MEA-2022.06.09-352784, MEA-2022.07.27-375214, MEA-2022.07.27-375215, MEA-2022.12.22-461038 and MEA-2023.01.04-469207).

Recommendation 6. Review the savings algorithm and the inputs being used in the savings calculation and ensure these match with the algorithms from IL-TRM (Section 4.4.10). Review the tracking data entries for this measure installation and ensure that future calculations for this measure include additional quality assurance checks in the tracking system.

Finding 7 For this measure instance (MEA-2022.11.03-432465), the input capacity was listed as 12,800 MBH in tracking data. Based on the information in the program tracking data, it appeared the listed input capacity was for one boiler. The IC provided supplemental documentation after the first round of comments on the draft report that showed the 12,800 MBH input capacity listed in the tracking data was the combined input capacity for 25 boilers. The actual quantity of the boilers was not reported in the tracking data. The evaluation was able to verify the savings only after the IC provided supplemental data resulting in an RR of 100% for this measure instance. The evaluation team relies on the tracking data to calculate the verified savings for all measure instances in this program.

> **Recommendation 7.** Ensure that the tracking data reports both the input capacity and the actual quantity of boilers moving forward. This helps in the instant evaluation calculation of the verified savings.

Finding 8. The values listed in the Capacity New Equipment data field in the program tracking data does not appear to be consistent when compared to the values in the Quantity column. The Quantity column appears to the installed unit capacity (in kBtu/h) instead of the number of installed equipment. Based on the units listed in the Quantity column, the evaluation team would expect the values to agree with the values in the Capacity New Equipment column.

> **Recommendation 8.** Ensure there is agreement between the Quantity and Capacity New Equipment columns in the program tracking data.

2.4.2.6 Pipe Insulation

Finding 9. For eight pipe insulation instances in the tracking data, the evaluation team was unable to replicate the ex ante savings based on the supplied data. . The evaluation team used an IL-TRM deemed value of 0.7 for hot water and steam pipe insulation measures, resulting in an RR of 105%.

> **Recommendation 9.** Review the savings algorithm and the inputs being used in the savings calculation and ensure these match with the algorithms from IL-TRM (Section 4.4.14). .

2.4.2.7 Shower Timer, MF

Finding 10. For 173 out of 2,722 instances, the ex ante calculations had rounded the EPG_gas value to 0.0063 therms/gal. As per IL-TRM (Section 5.4.9), the EPG_gas value should be 0.00625 therms/gal. This change resulted in an RR of 99% for these 173 measures.

> **Recommendation 10.** Review the savings algorithm and the inputs being used in the savings calculation and ensure these match with the algorithms from IL-TRM (Section 5.4.9).

2.4.2.8 Low Flow Aerator - Kitchen (DI) MF-IU

Finding 11. For 87 out of 2,631 measures, the EPG_gas value was selected as 0.0050 therms/gal in ex-ante calculations, which is for MF homes (unknown). As per IL-TRM (Section

5.4.4), for MF homes (kitchen), the EPG_gas value should be 0.0053 therms/gal. This change resulted in an RR of 106% for these 87 measures.

Recommendation 11. Review the savings algorithm and the inputs being used in the savings calculation and ensure these match with the algorithms from IL-TRM (Section 5.4.4).

2.4.2.9 Steam Trap - MF, IE

Finding 12. The evaluation team was unable to replicate the ex ante savings for the steam trap measure (MEA-2022.10.13-415572). The algorithm in Section 4.4.16 of IL-TRM requires the calculation of T_1 representing the temperature of saturated steam. T_1 relies on the average steam trap inlet absolute pressure in psia (P_1). The evaluation team calculated verified savings for this project assuming an average steam trap inlet gauge pressure of 2 psig for an MF space heating steam system. There is one measure installation (MEA-2022.10.13-415572), which resulted in an RR of 75%.

Recommendation 12. Track the assumptions used for average steam trap inlet and outlet absolute pressures to calculate the temperature of saturated steam (T_1) per Section 4.4.16 of IL-TRM. If the values are unknown, use a value of 16.696 for P_1, which results in a T_1 value of 665.86.

2.4.2.10 Custom Project – MAU

Finding 13. The heating effective full load hours (EFLH) for an MF mid-rise building in climate zone 2 was selected as 1,730 in ex ante calculations, which is the value for climate zone 1. As per IL-TRM (Section 4.4), the correct value for heating EFLH for an MF mid-rise building in climate zone 2 is 1,782. Ex-ante analysis has used the baseline heating system efficiency in the heat recovery ventilator (HRV) gas savings formula. The formula refers to IL-TRM (Section 4.4.27). As per IL-TRM, the actual efficiency of the heating system needs to be used. The evaluation team used the thermal efficiency of the proposed HRV unit as per the provided specification sheet. This resulted in an RR of 102% for this measure (MEA-2022.10.04-409453).

Recommendation 13. Review the savings algorithm and the inputs being used in the savings calculation and ensure these match with the algorithms from IL-TRM (Section 4.4.27).

2.4.2.11 DHW Storage Tank Insulation

Finding 14. There is one measure installation (MEA-2022.08.03-381467) that evaluation team was unable to replicate the savings, resulting in an RR of 85%. Based on the inputs provided in the program tracking data, the ex ante savings appear to use the savings algorithms for the Pipe Insulation (Section 4.4.14) measure in IL-TRM. Given the provided information in program tracking data, the evaluation team calculated the verified savings using provided algorithm inputs in the program tracking data and the same savings algorithms from IL-TRM (Section 4.4.14).

Recommendation 14. For tank insulation measure, update the savings algorithm and collect the relevant information pertaining to the measure algorithm listed in IL-TRM (Section 4.3.12). .

2.4.2.12 Custom Project – RTU

Finding 15. The heating EFLH for an MF mid-rise building in climate zone 2 was selected as 1,730 in ex ante calculations, which is the value for climate zone 1. As per IL-TRM (Section 4.4), the correct value for heating EFLH for an MF mid-rise building in climate zone 2 is 1,782. Ex-ante analysis had used the quantity of condenser fan in the cooling input (kW) calculations as one for the existing unit. As per the provided pictures, the quantity of condenser fans is two. The evaluation team updated the quantity to two. This resulted in an RR of 103% for this measure (MEA-2022.10.04-409452).

Recommendation 15. Review the savings algorithm and the inputs being used in the savings calculation and ensure these match with the algorithms from IL-TRM (Section 4.4) and the provided documentation.

2.4.2.13 Steam Traps - Test/Audit - MF, IE

Finding 16. Out of the three measure installations (MEA-2022.10.12-415515, MEA-2022.12.28-464518 and MEA-2022.12.28-464519), positive savings were reported for two measures (MEA-2022.12.28-464518 and MEA-2022.12.28-464519) in the tracking data. The evaluation team was unable to replicate the ex ante savings for these two measures. The algorithm in Section 4.4.16 of IL-TRM requires the calculation of T_1 representing the temperature of saturated steam. T_1 relies on the average steam trap inlet absolute pressure in psia (P_1). The evaluation team calculated verified savings for this project assuming an average steam trap inlet pressure of 2 psig for an MF space heating steam system. This resulted in RRs of 75% and 290% for the two measures.

Recommendation 16. Track the assumptions used for average steam trap inlet and outlet pressures in psia to calculate the temperature of saturated steam (T_1) per Section 4.4.16 of IL-TRM. If the values are unknown, use a value of 16.696 for P_1 which results in a T_1 value of 665.86. Review the tracking data entries so that any steam trap replacement measure installations are listed correctly under the Steam Trap - MF, IE measure name.

2.4.2.14 On-Demand DHW Controller

Finding 17. Out of the six measure installations, one measure (MEA-2022.09.15-402988) reported zero savings in the tracking data. The evaluation team verified the savings per IL-TRM (Section 4.3.8) for this measure. The RR for the remaining five measures is 100%.

Recommendation 17. Review the tracking data entries for this measure installation and ensure that future calculations for this measure include additional quality assurance checks in the tracking system.

3. Public Housing Energy Savings (PHES)

3.1 Program Description

The Public Housing Energy Savings (PHES) Program works with public housing authorities (PHAs) in ComEd, Nicor Gas, Peoples Gas (PGL), and North Shore Gas (NSG) territories to achieve electric and gas savings. The PHAs themselves are the program participants, though the residents of the properties are directly affected by the program through in-unit and common area upgrades. Gas savings opportunities included both heating and water heating equipment upgrades and envelope measures (attic insulation, air sealing, and room AC covers/gap sealer). The program also included gas saving direct install measures, such as low-flow faucet aerators, shower timers, and programmable thermostats.

The program had 14 participants in 2022 and completed 15 projects as Table 3-1 shows.

Table 3-1. 2022 Volumetric Findings Detail

Participation	Total
Participants #	14
Installed Projects †	15
Measure Types Installed	8
AC Cover and Gap Sealer (DI) - MF IU*	22
Air Sealing*	1
Attic Insulation*	1
Furnace, >95% AFUE - MF IU*	2
Hydronic Boilers, >85%*	1
Storage Water Heater, >0.67 EF*	2
Storage Water Heater, >88% TE*	1
Wall Insulation SF*	2

Participants are defined by the unique account number variable in the tracking data.
† Installed Projects are defined by unique Project IDs in the tracking data and measure type.
* Individual measures are defined by unique Measure IDs in the tracking data.
Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.

Table 3-2 summarizes the installed measure quantities that are the basis for verified energy savings.

Table 3-2. 2022 Installed Measure Quantities

Program Category	Measure	Quantity Unit	Installed Quantity
PHES	AC Cover and Gap Sealer (DI) - MF IU	Units	981
	Air Sealing	Linear Feet	4,304
	Attic Insulation	Square Feet	19,150
	Furnace, >95% AFUE - MF IU	Units	128
	Hydronic Boilers, >85%	Units	2
	Storage Water Heater, >0.67 EF	Units	27
	Storage Water Heater, >88% TE	Units	76
	Wall Insulation SF	Square Feet	9,300

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

3.2 Program Savings Detail

Table 3-3 summarizes the energy savings the Nicor Gas PHES Program achieved in 2022.

Table 3-3. 2022 Annual Energy Savings Summary

Program Path	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
PHES	35,564	89%	31,516	1.00	31,516
Total or Weighted Average	**35,564**	**89%**	**31,516**	**1.00**	**31,516**

* Realization rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
† Net-to Gross (NTG): A deemed value. Available on the Stakeholder Advisory Group (SAG) website: **https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/**.
Source: Guidehouse evaluation team analysis.

3.3 Program Savings by Measure

The PHES program includes 8 measures as Table 3-4 shows.

Table 3-4. 2022 Annual Energy Savings by Measure

Program Management	Savings Category	Ex Ante Gross Savings (therms)	Verified Gross RR*	Verified Gross Savings (therms)	NTG†	Verified Net Savings (therms)
PHES	AC Cover and Gap Sealer (DI) - MF IU	5,446	100%	5,446	1.00	5,446
PHES	Air Sealing	2,238	104%	2,324	1.00	2,324
PHES	Attic Insulation	649.41	99%	643.2	1.00	643
PHES	Furnace, >95% AFUE - MF IU	23,194	75%	17,498	1.00	17,498
PHES	Hydronic Boilers, >85%	1,894	208%	3,944	1.00	3,944
PHES	Storage Water Heater, >0.67 EF	438	102%	445	1.00	445
PHES	Storage Water Heater, >88% TE	567	126%	714	1.00	714
PHES	Wall Insulation SF	1,137	44%	500	1.00	500
	Total or Weighted Average	**35,564**	**89%**	**31,516**	**1.00**	**31,516**

* Realization rate (RR) is the ratio of verified gross savings to ex ante gross savings, based on evaluation research findings.
† Net-to-gross (NTG): A deemed value. Available on the Stakeholder Advisory Group (SAG) website: **https://www.ilsag.info/evaluator-ntg-recommendations-for-2022/**.
Source: Nicor Gas tracking data and Guidehouse evaluation team analysis.

3.4 Impact Analysis Findings and Recommendations

3.4.1 Impact Parameter Estimates

The evaluation team calculated verified gas savings by applying the impact algorithm sources found in the Illinois Statewide Technical Reference Manual v10.0 (TRM v10.0). The team leveraged program tracking data to inform savings assumptions — for example insulation R-values. For savings calculation inputs not in the tracking data, the evaluation team relied on default assumptions from the TRM v10.0.

Table 3-5 shows the unit therm savings and realization rate findings by measure from our review. The realization rate is the ratio of the verified savings to the ex ante savings. Following the table, we provide findings and recommendations, including discussion of all measures with realization rates above or below 100%. Appendix A provides a description of the impact analysis methodology. Table B-1 in Appendix B shows the TRC cost-effectiveness analysis inputs available at the time of producing this impact evaluation report.

Table 3-5. Verified Gross Savings Parameters

Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	Realization Rate	Data Source(s)
AC Cover and Gap Sealer (DI) - MF IU	Units	Varies	Varies	100%	Illinois TRM, v10.0, Section 4.4.38
Air Sealing	Linear Feet	0.52	0.54	104%	Illinois TRM, v10.0, Section 5.6.1
Attic Insulation	Square Feet	0.03	0.03	99%	Illinois TRM, v10.0, Section 5.6.5
Furnace, >95% AFUE - MF IU	Units	Varies	Varies	75%	Illinois TRM, v10.0, Section 5.3.7
Hydronic Boilers, >85%	Units	0.95	1.97	208%	Illinois TRM, v10.0, Section 4.4.10
Storage Water Heater, >0.67 EF	Units	Varies	Varies	102%	Illinois TRM, v10.0, Section 5.4.2
Storage Water Heater, >88% TE	Units	7.46	9.40	126%	Illinois TRM, v10.0, Section 5.4.2
Wall Insulation SF	Square Feet	0.12	0.05	44%	Illinois TRM, v10.0, Section 5.6.4

* Program Tracking Data (PTD) provided by Nicor Gas, extract dated January 31, 2023.
† State of Illinois Technical Reference Manual version 10.0 from **http://www.ilsag.info/technical-reference-manual.html**.
‡ Project files and monthly billing data provided by Nicor Gas. Where conducted, on-site or telephone interview data collected by Guidehouse.

3.4.2 PHES Findings and Recommendations

Finding 18. The *Unit of Measure* is not consistently noted in the tracking data, and it appears incorrect for some measures. For the two Wall Insulation projects, the tracking data listed the unit of measure as "Unit" and "LN Ft.", but it should be "Square Feet". Similarly, for the Hydronic Boilers measure, the unit should be "MBH Input", whereas the tracking data mentions "Unit". For Furnaces measure, ex post quantity is updated to be 1/10th of the ex ante quantity, otherwise the RR will be 1000%. While the evaluation team was able to determine the appropriate units for most measures, mislabeling of the units could lead to data entry errors in the future.

> **Recommendation 18.** Consider adding consistency checks or data validation points to the tracking data to ensure the unit of measure is consistent across all measure instances and identical to the required units in IL-TRM. Also make sure that the quantity aligns with the mentioned unit of measure.

Finding 19. The evaluation team could not recreate the ex ante savings calculations for the Hydronic Boiler, Wall Insulation, and Storage Water Heater measures. To determine the verified savings, the evaluation team used the measure information from the tracking data and the appropriate algorithms in IL-TRM.

- Hydronic Boiler: The evaluation team leveraged equations from Section 4.4.10, the capacity from the tracking data, (the quantity field), efficiency from the specifications. The specifications for the boiler did not match the tracking data, so the evaluation team

updated the verified savings to use the efficiency from the specifications. The realization rate for this measure was 208%, and this measure accounted for 10% of the verified savings.

- Wall Insulation: The evaluation team leveraged equations and default technical parameters from Section 5.6.4, and the area and efficient case R-value from the tracking data. The realization rate for this measure was 44%, and this measure accounted for 1% of the verified savings.
- Storage Water Heater, >0.67 EF: The evaluation team leveraged the equations and water use assumptions from Section 5.4.2, and the efficiencies from the specifications. The specifications for the water heaters mention that all are tankless models. This changes the baseline assumptions for the measures (Measure ID- MEA-2022.11.10-434942 and MEA-2022.12.22-461041). The efficiencies from the specifications did not match the tracking data, so the evaluation team updated the verified savings to use the efficiency from the specifications (Measure ID- MEA-2022.11.10-434942, MEA-2022.12.22-461041). The realization rate for this measure was 102%, and this measure accounted for 1% of the verified savings.
- Storage Water Heater, >88% TE: The evaluation team leveraged the equations and water use assumptions from Section 5.4.2, and the efficiencies from the specifications. The efficiencies from the specifications did not match the tracking data, so the evaluation team updated the verified savings to use the efficiency from the specifications (Measure ID- MEA-2022.12.22-461367). The realization rate for this measure was 126%, and this measure accounted for 2% of the verified savings.

Recommendation 19. For prescriptive measures which leverage the TRM, ensure that the calculations match the appropriate measure in IL-TRM, leveraging equipment specific inputs when available, and TRM default assumptions when necessary.

Finding 20. Climate zone dependent variables were not selected based on the project climate zone for some measures in the ex ante calculations. For Hydronic Boiler measure and furnace measures, the customer location was in climate zone 1 but the EFLH was selected for climate zone 2. For the Air Sealing measure, deemed savings value (Δthermssealing) for climate zone 2 was selected whereas the project location was in climate zone 1. The differences between climate zones can affect the verified measure savings by up to 5%, depending on the measure.

Recommendation 20. Ensure that the climate zone dependent inputs to savings algorithms are selected based on actual project location shown in the tracking data.

Finding 21. The information in the tracking data is not sufficient to verify the appropriate deemed values for the AC Cover and Gap Sealer measures. The therms/unit value is selected based on the floor level and height of rooms involved in the project. These data were missing from the tracking data.

Recommendation 21. Include all data and inputs necessary in the TRM measure entry within the tracking database to ensure all savings inputs can be reviewed internally and through evaluation.

Finding 22. The ex-ante savings for efficient furnaces revealed that the allocation factor was applied to one of the projects even though both were gas only customers. The allocation factor

was also not applied to a Storage water heater, >88% TE measure even though the customer was a joint customer. For other measures in the tracking data, the allocation factor was not shown in the tracking data.

> **Recommendation 22.** Consider adding the allocation factor to the tracking data so it is clear what factor is used for each measure. This will also allow for automated checks to be put in place to ensure the allocation factor is applied properly to each project.

Finding 23. The measure life was reported as 15 years for Storage Water Heater Measures. The evaluation team updated the measure life as 13 years per IL-TRM (Section 5.4.2).

> **Recommendation 23.** Review the measure life entered in the tracking data and ensure it aligns with corresponding sections of IL-TRM.

Finding 24. The ex-ante savings for efficient furnaces revealed that the calculation algorithm and EFLH value were considered from the commercial version of the measure (4.4.11) whereas the default heating capacity and AFUE values were considered from the residential version of the measure (5.3.7).

> **Recommendation 24.** Review the savings algorithm and the inputs being used in the savings calculation for PHES program furnace measure and ensure these matches with the algorithm from IL-TRM (Section 5.3.7).

Appendix A. Impact Analysis Methodology

A.1 Retrofits and IHWAP

The evaluation team determined verified gross savings for each program measure by:

1. Reviewing the savings algorithm inputs in the tracking data for agreement with IL TRM v10.0[2].
2. Validating that the savings algorithm was applied correctly.
3. Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

Engineering Review of Project Files

The evaluation team conducted an engineering desk file review for all custom projects (PID-2022.03.03-99947 and PID-2022.09.22-136061) installed in 2022, to verify project savings that were not based on measures specified in IL TRM. For the custom projects, an in-depth application review was performed by a Guidehouse engineer to assess the engineering methods, parameters and assumptions used to generate ex ante impact estimates. The evaluation team reviewed project documentation in application forms and supporting documentation from the applicant. **Error! Reference source not found.** shows the summary of the custom project engineering desk file reviews.

Table A-1. Summary of Custom Projects

Project ID	Measure ID	Measure Description	Ex Ante Gross Savings (therms)	Gross Realization Rate	Verified Gross Savings (therms)
PID-2022.03.03-99947	MEA-2022.10.04-409453	Custom Project - MAU	945	102%	962
	MEA-2022.10.04-409452	Custom Project - RTU	27	103%	28
PID-2022.09.22-136061	MEA-2022.12.20-457248	Custom Project - Air Sealing - Weatherstripping	134	100%	134
	MEA-2022.12.20-457247	Custom Project - Air Sealing - Silicone Caulk	404	100%	404

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

A.2 PHES

The evaluation team calculated gross verified savings for the PHES Program by applying savings algorithms from the Illinois TRM v10.0. The team determined verified gross savings for each program measure by:

[2] Available on the SAG web site: **http://www.ilsag.info/technical-reference-manual.html**

- Reviewing the savings algorithm inputs in the measure workbook for agreement with the TRM v10.0 and TRM v10.0 Errata.
- Validating savings algorithms were applied correctly.
- Prioritizing project-specific information to inform savings calculations where the TRM v10.0 advises to use actual values. For variables where project information did not include project-specific actual values, the evaluation team relied on defaults from the TRM v10.0 and TRM v10.0 Errata.
- Cross-checking per-unit savings values in the tracking data with the verified values in the measure workbook or in the evaluation team's calculations if the workbook did not agree with the TRM v10.0.
- Multiplying the verified per-unit savings value by the quantity reported in the tracking data.

The evaluation team calculated verified net gas savings by multiplying the verified gross savings estimates by a net-to-gross (NTG) ratio of 1.0. For 2022, the PHES Program's NTG estimate was defined by a consensus process through the Illinois SAG.

Appendix B. Program-Specific Inputs for the Illinois TRC

B.1 Retrofits and IHWAP

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 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 B-1. Verified Cost Effectiveness Inputs

Program Path	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Net Savings (therms)
MF Retrofit	Air Sealing	Ln Ft	304,510	20.0	72,441	72,745	72,745
	Pipe Insulation CA	Ln Ft	17,555	15.0	50,328	50,898	50,898
	Attic Insulation	Sq Ft	822,830	20.0	38,116	41,695	41,695
	Hydronic Boilers	Unit	32	25.0	13,979	15,371	15,371
	Low Flow Showerhead (DI) IU	Unit	2,370	10.0	16,521	16,521	16,521
	Prog. T-Stat (DI) IU	Unit	504	16.0	16,077	11,729	11,729
	DHW Controller	Unit	174	15.0	8,903	10,910	10,910
	Boiler Tune Up	Unit	78	3.0	8,828	8,895	8,895
	Shower Timer	Unit	2,867	2.0	6,203	6,200	6,200
	Faucet Aerator - Kitchen (DI) IU	Unit	2,635	10.0	4,288	4,296	4,296
	AC Cover and Gap Sealer	Unit	909	5.0	4,074	4,074	4,074
	Steam Boilers	Unit	4	25.0	3,084	3,084	3,084
	Reprog. T-Stat (DI) IU	Unit	99	2.0	3,368	2,287	2,287
	Boiler Reset Controls	Unit	2,855	16.0	958	2,162	2,162
	Faucet Aerator - Bathroom (DI) IU	Unit	1,569	10.0	1,544	1,544	1,544
	Furnace	Unit	1,040	20.0	4,473	1,236	1,236
	Steam Traps	Unit	10	6.0	1,580	1,190	1,190
	Floor Insulation	Sq Ft	13,950	20.0	1,727	751	751
	DHW Tank Insulation	Ln Ft	196	15.0	728	619	619
	Air Sealing - Weatherstripping	Ln Ft	90	20.0	452	426	426

Program Path	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Net Savings (therms)
	Air Sealing - Door Sweep	Unit	81	20.0	377	338	338
	Advanced Thermostat	Unit	4	11.0	157	157	157
	Low Flow Showerhead (DI) CA	Unit	5	10.0	62	62	62
	Storage Water Heater	Unit	1	15.0	12	19	19
	Faucet Aerator - Bathroom (DI) CA	Unit	4	10.0	15	15	15
	Faucet Aerator - Kitchen (DI) CA	Unit	2	10.0	9	9	9
	Steam Traps - Test/Audit	Unit	367	6.0	15,008	41,520	41,520
MF IHWAP	Custom Project - MAU	Unit	1	15.0	945	962	962
	Attic Insulation	Sq Ft	13,079	20.0	612	454	454
	Custom Project - Air Sealing - Silicone Caulk	Unit	1	15.0	404	404	404
	Custom Project - Air Sealing - Weatherstripping	Unit	1	15.0	134	134	134
	Air Sealing - Door Sweep	Unit	30	20.0	125	125	125
	Custom Project - RTU	Unit	1	15.0	27	28	28
Total or Weighted Average				**15.1**	**275,560**	**300,858**	**300,858**

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

B.2 PHES

Table B-2 shows the 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 B-2. Verified Cost Effectiveness Inputs

Program Path	Savings Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Net Savings (therms)
PHES	AC Cover and Gap Sealer (DI) - MF IU	Unit	981	5.0	5,446	5,446	5,446
PHES	Air Sealing	Linear Feet	4,304	20.0	2,238	2,324	2,324
PHES	Attic Insulation	Square Feet	19,150	20.0	649	643	643
PHES	Furnace, >95% AFUE - MF IU	Unit	128	20.0	23,194	17,498	17,498
PHES	Hydronic Boilers, >85%	Unit	2	25.0	1,894	3,944	3,944
PHES	Storage Water Heater, >0.67 EF	Unit	27	13.0	438	445	445
PHES	Storage Water Heater, >88% TE	Unit	76	13.0	567	714	714
PHES	Wall Insulation SF	Square Feet	9,300	20.0	1,137	500	500
Total or Weighted Average				**17.78**	**35,564**	**31,516**	**31,516**

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