



Income Qualified Single-Family Impact Evaluation Report

**Energy Efficiency Plan Year 2020
(1/1/2020-12/31/2020)**

Prepared for:

Nicor Gas

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1. Introduction

The Nicor Gas Income Qualified Single-Family Program offers free weatherization for income-qualified customers in the Nicor Gas service territory and other energy saving measures through multiple paths. This report presents the results of the impact evaluation for the measures installed through the Contractor Channel, Single Family Bloomington-Normal Program (BNP) with kits (BNP SF), Urban Efficiency Group (UEG SF) paths and the Kits Program (Kits), broken out by relevant measure and program structure details. A separate joint report presents energy savings for the measures installed through the State of Illinois' Home Weatherization Assistance Program (IHWAP) with joint savings with ComEd. The 2020 program year covers January 1, 2020 through December 31, 2020.

2. Program Description

The Income Qualified Single-Family Program had three implementation paths administered by Nicor Gas: (1) Contractor Channel, (2) BNP SF with kits and (3) UEG SF. These paths included direct installation of water heating efficiency measures (faucet aerators, showerheads, gas water heaters); advanced and programmable thermostats; air sealing, attic, duct, and rim insulation; and high efficiency boilers and furnaces). The BNP SF path also offered energy savings kits of water efficiency and air sealant measures (reported as "Kit BN" in the Nicor Gas program tracking data). This kit included domestic hot water pipe insulation, a shower valve, a low-flow showerhead, a low-flow kitchen and bathroom aerator, a shower timer, and air sealant materials (gaskets, foam tape, door sweeps and caulk).

Separately, the program provided an option of free energy savings kits of water efficiency or air sealant measures (reported as "Kit 2" and "Kit 4" in the Nicor Gas program tracking data). Kit 2 included low-flow showerheads (SH, 2 per kit), a kitchen aerator (KA), a shower timer (ST), and bathroom aerators (BA, 2 per kit). Kit 4 included 12 electrical switch/outlet gaskets, 1 door sweep, 30 linear feet of caulk, and 34 linear feet of weather stripping. The program provided one or two kits per customer depending on their request.

The program paths had 2,381 participants in 2020 and completed 2,763 projects as shown in Table 2-1.

Table 2-1. 2020 Volumetric Findings Detail

Participation	Contractor Channel	BNP SF	UEG SF	Kits	Total
Participants *	469	30	261	1,621	2,381
Installed Projects †	738	11	351	1,663	2,763
Advanced Thermostat	130	8	112	-	250
Gas High Efficiency Furnace	30	2	1	-	33
Programmable Thermostat	40	-	12	-	52
Gas High Efficiency Boiler	3	-	-	-	3
Residential Furnace Tune Up	38	-	15	-	53
Duct Insulation and Sealing (Projects)	242	-	107	-	349
Low Flow Showerhead	131	-	48	2,738	2,917
Low Flow Faucet Aerator - Bathroom	336	4	240	2,738	3,318
Low Flow Faucet Aerator - Kitchen	153	-	117	1,369	1,639
Hot Water Pipe Insulation (Projects)	237	6	161	-	404
Gas Water Heater	2	2	-	-	4
Shower Timer	-	-	-	1,369	1,369
Air Sealing (Projects, Kit 4)	320	6	143	2,810	3,279
Attic Insulation (Projects)	259	6	128	-	393
Rim Insulation (Projects)	91	5	47	-	143
Wall Insulation (Projects)	-	3	-	-	3
Kit BN‡	-	20	-	-	20

* Participants are defined as unique BuildingAccountNumbers

† Installed Projects are defined as unique VendorProjectIDs

‡ Kit BN included 3 linear feet (ln ft) of ½" DHW Pipe Insulation; 3 ln ft ¾" DHW Pipe Insulation; 1 Shower Valve; 1 Low Flow Showerhead; 1 Low Flow Bathroom Aerator; 1 Low Flow Kitchen Aerator; 1 Shower Timer; 12 Gaskets; 17' of Weatherstrip; 2 of 40" Door Sweep; and 30' of Rope Caulk.

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

3. Program Savings Detail

Table 3-1 through summarizes the energy savings the Income Qualified Single-Family Program achieved by path in 2020.

Table 3-1. 2020 Annual Energy Savings Summary

Program Path	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Contractor Channel	93,500	100%	93,510	1.00	93,510
BNP SF (+ Kits BNP)	2,137	100%	2,137	1.00	2,137
UEG SF	50,143	160%	80,115	1.00	80,115
Kits Channel	132,679	100%	132,671	1.00	132,671
Total or Weighted Average	278,459	111%	308,433	1.00	308,433

* 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 Illinois SAG web site: https://www.ilsag.info/ntg_2020.

Source: Guidehouse evaluation team analysis.

4. Program Savings by Measure

The four program paths included 16 measures and 3 kit offerings, as shown in the following four tables. The Contractor Channel (Table 4-1) and Kits (Table 4-4) had realization rates of 100%. The BNP SF (Table 4-2) and UEG SF channel (Table 4-3) had realization rates of 99% and 160%, respectively. The Contractor Channel and Kits contributed the most program savings.

Table 4-1. 2020 Annual Energy Savings by Measure – Contractor Channel

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
HVAC	Advanced Thermostat	8,410	100%	8,410	NA‡	8,410
HVAC	Duct Insulation and Sealing - Distribution Efficiency	4,545	100%	4,545	1.00	4,545
HVAC	Furnace Tune-Up‡	2,053	100%	2,054	1.00	2,054
HVAC	Gas High Efficiency Boiler – Time of Sale (TOS)	160	100%	160	1.00	160
HVAC	Gas High Efficiency Furnace - TOS	4,001	100%	4,001	1.00	4,001
HVAC	Programmable Thermostat	2,749	100%	2,749	1.00	2,749
Hot Water	Gas Water Heater - TOS	47	100%	47	1.00	47
Hot Water	Hot Water Pipe Insulation	2,056	100%	2,056	1.00	2,056
Hot Water	Low Flow Faucet Aerator - Bathroom	318	100%	318	1.00	318
Hot Water	Low Flow Faucet Aerator - Kitchen	1,221	100%	1,221	1.00	1,221
Hot Water	Low Flow Showerhead	1,166	100%	1,166	1.00	1,166
Shell	Air Sealing	22,560	100%	22,571	1.00	22,571
Shell	Attic Insulation	44,149	100%	44,149	1.00	44,149
Shell	Rim Insulation	63	100%	63	1.00	63
Total or Weighted Average		93,500	100%	93,510	1.00	93,510

* 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 Illinois SAG web site: https://www.ilsag.info/ntg_2020.

‡ The IL TRM v8.0 (<http://www.ilsag.info/technical-reference-manual.html>) algorithm for advanced thermostat savings is deemed to calculate net savings, so no NTG adjustment is applicable.

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

Table 4-2. 2020 Annual Energy Savings by Measure – BNP SF

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
HVAC	Advanced Thermostat	456	100%	456	NA‡	456
HVAC	Gas High Efficiency Furnace - TOS	70	100%	70	1.00	70
Hot Water	Gas Water Heater - TOS	64	100%	64	1.00	64
Hot Water	Hot Water Pipe Insulation	28	100%	28	1.00	28
Hot Water	Low Flow Faucet Aerator - Bathroom	2	100%	2	1.00	2
Shell	Air Sealing	246	100%	246	1.00	246
Shell	Attic Insulation	288	100%	288	1.00	288
Shell	Rim Insulation	58	100%	58	1.00	58
Shell	Wall Insulation	57	100%	57	1.00	57
Kits	Kits BNP	867	100%	867	1.00	867
Total or Weighted Average		2,137	100%	2,137	1.00	2,137

* 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 Illinois SAG web site: https://www.ilsag.info/ntg_2020.

‡ The IL TRM v8.0 (<http://www.ilsag.info/technical-reference-manual.html>) algorithm for advanced thermostat savings is deemed to calculate net savings, so no NTG adjustment is applicable.

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

Table 4-3. 2020 Annual Energy Savings by Measure – UEG SF

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
HVAC	Advanced Thermostat	7,365	100%	7,365	NA‡	7,365
HVAC	Gas High Efficiency Furnace	177	105%	186	1.00	186
HVAC	Programmable Thermostat	748	100%	748	1.00	748
HVAC	Residential Furnace Tune Up	794	113%	898	1.00	898
HVAC	Duct Insulation and Sealing‡	8,032	100%	8,033	1.00	8,033
Hot Water	Low Flow Showerhead	2,362	99%	2,339	1.00	2,339
Hot Water	Low Flow Faucet Aerator – Bathroom	209	99%	207	1.00	207
Hot Water	Low Flow Faucet Aerator – Kitchen	334	98%	326	1.00	326
Hot Water	Hot Water Pipe Insulation	426	100%	426	1.00	426
Shell	Air Sealing	13,675	109%	14,847	1.00	14,847
Shell	Attic Insulation	15,950	280%	44,668	1.00	44,668
Shell	Rim Insulation	72	102%	73	1.00	73
Total or Weighted Average		50,143	160%	80,115	1.00	80,115

* 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 Illinois SAG web site: https://www.ilsag.info/ntg_2020.

‡ The IL TRM v8.0 (<http://www.ilsag.info/technical-reference-manual.html>) algorithm for advanced thermostat savings is deemed to calculate net savings, so no NTG adjustment is applicable.

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

Table 4-4. 2020 Annual Energy Savings by Measure – Kits

End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
Hot Water	Kit 2	32,952	100%	32,947	1.00	32,947
Shell	Kit 4	99,727	100%	99,724	1.00	99,724
Total or Weighted Average		132,679	100%	132,671	1.00	132,671

* 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 Illinois SAG web site: https://www.ilsag.info/ntg_2020.

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

5. Impact Analysis Findings and Recommendations

5.1 Impact Parameter Estimates

Error! Reference source not found. 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 **Error! Reference source not found.**, we provide findings and recommendations, including discussion of all measures with realization rates other than 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 5-1. Verified Gross Savings Parameters – Contractor Channel

Measure	Unit Basis	Ex Ante Gross Average (therms/unit)	Verified Gross Average (therms/unit)	Measure Realization Rate	Data Source(s)*
Advanced Thermostat	Each	65	65	100%	Illinois TRM v8.0 (TRM)† – Section 5.3.16
Gas High Efficiency Furnace	Each	133	133	100%	TRM v8.0 – Section 5.3.07
Programmable Thermostat	Each	69	69	100%	TRM v8.0 – Section 5.3.11
Gas High Efficiency Boiler	Each	53	53	100%	TRM v8.0 – Section 5.3.06
Residential Furnace Tune Up	Each	54	54	100%	TRM v8.0 – Section 5.3.13
Duct Insulation and Sealing	Each	19	19	100%	TRM v8.0 – Section 5.3.04
Low Flow Showerhead	Each	3.04	3.04	100%	TRM v8.0 – Section 5.4.05
Low Flow Faucet Aerator	Each	3.14	3.14	100%	TRM v8.0 – Section 5.4.04
Hot Water Pipe Insulation	Linear Feet	0.88	0.88	100%	TRM v8.0 – Section 5.4.01
Gas Water Heater	Each	24	24	100%	TRM v8.0 – Section 5.4.02
Air Sealing	Project	71	71	100%	TRM v8.0 – Section 5.6.01
Attic Insulation	Square Feet	0.19	0.19	100%	TRM v8.0 – Section 5.6.05
Rim Insulation	Square Feet	0.04	0.04	100%	TRM v8.0 – Section 5.6.06

* Program Tracking Data (PTD) provided by Nicor Gas, extract dated January 28, 2021.

† State of Illinois Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

Table 5-2. Verified Gross Savings Parameters – BNP SF

Measure	Unit Basis	Ex Ante Gross Average (therms/unit)	Verified Gross Average (therms/unit)	Measure Realization Rate	Data Source(s)*
Advanced Thermostat	Each	57	57	100%	Illinois TRM v8.0 (TRM)† – Section 5.3.16
Gas High Efficiency Furnace	Each	35	35	100%	TRM v8.0 – Section 5.3.07
Low Flow Faucet Aerator - Bathroom	Each	0.53	0.53	100%	TRM v8.0 – Section 5.4.04
Hot Water Pipe Insulation	Linear Feet	0.87	0.87	100%	TRM v8.0 – Section 5.4.01
Gas Water Heater	Each	32	32	100%	TRM v8.0 – Section 5.4.02
Air Sealing	Project	41	41	100%	TRM v8.0 – Section 5.6.01
Wall Insulation	Square Feet	0.08	0.08	100%	TRM v8.0 – Section 5.6.04
Attic Insulation	Square Feet	0.07	0.07	100%	TRM v8.0 – Section 5.6.05
Rim Insulation	Square Feet	0.10	0.10	100%	TRM v8.0 – Section 5.6.06
Kits BN	Kit	43.35	43.35	100%	TRM v8.0, Program Calculator

* Program Tracking Data (PTD) provided by Nicor Gas, extract dated January 28, 2021.

† State of Illinois Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

Table 5-3. Verified Gross Savings Parameters – UEG SF

Measure	Unit Basis	Ex Ante Gross Average (therms/unit)	Verified Gross Average (therms/unit)	Measure Realization Rate	Data Source(s)*
Advanced Thermostat	Each	66	66	100%	Illinois TRM v8.0 (TRM)† – Section 5.3.16
Gas High Efficiency Furnace	Each	177	186	105%	TRM v8.0 – Section 5.3.07
Programmable Thermostat	Each	62	62	100%	TRM v8.0 – Section 5.3.11
Residential Furnace Tune Up	Each	53	60	113%	TRM v8.0 – Section 5.3.13
Duct Insulation and Sealing	Each	75	75	100%	TRM v8.0 – Section 5.3.04
Low Flow Showerhead	Each	8.88	8.79	99%	TRM v8.0 – Section 5.4.05
Low Flow Faucet Aerator	Each	1.52	1.50	99%	TRM v8.0 – Section 5.4.04
Hot Water Pipe Insulation	Linear Feet	0.26	0.26	98%	TRM v8.0 – Section 5.4.01
Gas Water Heater	Each	32	32	100%	TRM v8.0 – Section 5.4.02
Air Sealing	Project	96	104	109%	TRM v8.0 – Section 5.6.01
Attic Insulation	Square Feet	0.13	0.37	280%	TRM v8.0 – Section 5.6.05
Rim Insulation	Square Feet	0.11	0.12	102%	TRM v8.0 – Section 5.6.06

* Program Tracking Data (PTD) provided by Nicor Gas, extract dated January 28, 2021.

† State of Illinois Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>.

5.2 Findings and Recommendations

5.2.1 Contractor Channel Findings and Recommendations

Overall, the evaluation team determined that the implementer accurately calculated the energy savings for the Contractor Channel program component. The evaluation team developed four recommendations for consideration for 2021 program. Table 5-4 presents the measure-level realization rates and program savings percentages.

Table 5-4. Contractor Channel Measure Level Realization Rates

Measure ID	Realization Rate	Percentage of Verified Savings
Attic Insulation	100%	47%
Air Sealing	100%	24%
Advanced Thermostat	100%	9%
Duct Insulation and Sealing - Distribution Efficiency	100%	5%
Gas High Efficiency Furnace - TOS	100%	4%
Programmable Thermostat	100%	3%
Furnace Tune-Up	100%	2%
Hot Water Pipe Insulation	100%	2%
Low Flow Faucet Aerator - Kitchen	100%	1%
Low Flow Showerhead	100%	1%
Gas High Efficiency Boiler – Time of Sale (TOS)	100%	<1%
Gas Water Heater - TOS	100%	<1%
Low Flow Faucet Aerator - Bathroom	100%	<1%
Rim Insulation	100%	<1%

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

5.2.1.1 Hot Water Pipe Insulation

The evaluation team found one measure that reported a different R_{new} value in the tracking data than the value used to calculate ex ante savings. The evaluation team back-calculated the value that were used to calculate ex ante savings and used this value to verify savings, as seen in Table 5-5. The value of 6 was confirmed by the implementer on May 26, 2021.

Table 5-5. R_{new} Values used in Ex Ante Savings – Contractor Channel

Measure ID	InsulatedPipeHeatLoss (R_{new} from tracking data)	R_{new} Value Used for Ex Ante Savings
MEA-2019.11.19-120713	5	6

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

Additionally, the evaluation team found that the tracking data did not pass the length of the pipe insulation in a separate field to the quantity field. Previously, the evaluation team used the rounded value in the quantity field as the length of insulation. The implementer provided the evaluation team with supplemental data for specific measure's pipe lengths on May 26, 2021. They also noted that they will work to include a "Length" field in the 2021 tracking data.

Recommendation 1. Review the R_{new} values and Length inputs for hot water pipe insulation to ensure consistency between data tracking inputs and the ex ante savings calculation.

5.2.1.2 Low Flow Showerheads

Three measures (MEA-2019.07.17-88285, MEA-2019.11.19-120715, MEA-2019.12.14-131118) out of 284 have a 99% realization rate. This is due to the ex ante calculations using an In-Service Rate (ISR) of 0.98 instead of 0.97, as deemed by the Illinois Technical Reference Manual (TRM) v8.0.

Recommendation 2. Ensure the correct TRM deemed ISR values are used when calculating ex ante savings for showerheads.

5.2.1.3 Air Sealing

One measure, MEA-2020.11.05-177859, has a realization rate of 126%. The implementer calculated ex ante savings with an $ADJ_{AirSealingGasHeat}$ value of 0.72 and an $IE_{NetCorrection}$ value of 1.10. These values are applicable for projects which install both air sealing and attic insulation measures. However, this project only installed Air Sealing measures, and thus should be Calculated with an $ADJ_{AirSealingGasHeat}$ and $IE_{NetCorrection}$ value of 1.00.

Recommendation 3. An $ADJ_{AirSealingGasHeat}$ value of 0.72 and an $IE_{NetCorrection}$ value of 1.10 are correct for TRM v8.0 and TRM v9.0 only when both air sealing and attic insulation measures are installed, otherwise, savings should be calculated using a value of 1.00 for both variables.

5.2.1.4 Rim Insulation

There were 91 unique rim insulation measures installed through the contractor channel path in 2020. The measure-level realization rate is 100%. The evaluation team found that the value used for Area, passed through the quantity field in the tracking data, was rounded to a whole number. Ex ante savings were calculated using an Area value with 2 additional digits. This rounding discrepancy led to initial realization rates which varied from 93% to 133%. The implementer then provided the evaluation team supplemental data on May 26, 2021 with the unrounded Area values. The supplementary Area values were used to verify savings.

Recommendation 4. Ensure that the values for Area are passed as unrounded numbers in 2021.

5.2.2 BNP SF Recommendations and Findings

Overall, the evaluation team determined that the implementer accurately calculated the energy savings for the BNP SF program component. Table 5-6 presents the measure-level realization rates and program savings percentages.

Table 5-6. BNP SF Measure Level Realization Rates

Measure ID	Realization Rate	Percentage of Verified Savings
Kits BN	100%	41%
Advanced Thermostat	100%	21%
Attic Insulation	100%	13%
Air Sealing	100%	12%
Gas High Efficiency Furnace - TOS	100%	3%
Gas Water Heater - TOS	100%	3%
Rim Insulation	100%	3%
Wall Insulation	100%	3%
Hot Water Pipe Insulation	100%	1%
Low Flow Faucet Aerator - Bathroom	100%	<1%

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

5.2.2.1 Hot Water Pipe Insulation

The evaluation team found that the tracking data did not pass the length of the pipe insulation in a separate field to the quantity field. Previously, the evaluation team used the rounded value in the quantity field as the length of insulation. The implementer provided the evaluation team with supplemental data for specific measure's pipe lengths on May 26, 2021. They also noted that they will work to include a "Length" field in the 2021 tracking data.

Recommendation 5. Review the R_{new} values and Length inputs to ensure the values reported in the tracking data match the values used in ex ante savings calculations.

5.2.2.2 Kit BN

The realization rates for the kits incorporated in the BNP path is 100%. We observed that while the measure calculator incorporates the fuel split factor in the individual tabs for the hot water measures, it does not do so for the pipe insulation and weatherization measure tabs. This created confusion when we reviewed the summary tab and the gas factor column, which appears to show the fuel split for the hot water measures was not applied in the ex ante (we confirmed the 100% factor is correct not 84% as the adjustments were already applied in the hot water tabs).

Recommendation 6. For consistency, consider adding the fuel split factor to the pipe insulation and weatherization measure tabs.

5.2.3 UEG SF Findings and Recommendations

The evaluation team developed the following recommendations based on findings from the 2020 evaluation. These recommendations suggest ways to improve the measure-level realization rates. Table 5-7 presents the measure-level realization rates and program savings percentages.

Table 5-7. UEG SF Measure Level Realization Rates

Measure ID	Realization Rate	Percentage of Verified Savings
Attic Insulation	280%	56%
Air Sealing	109%	19%
Duct Insulation and Sealing	100%	10%
Advanced Thermostat	100%	9%
Low Flow Showerhead	99%	3%
Programmable Thermostat	100%	1%
Residential Furnace Tune Up	113%	1%
Hot Water Pipe Insulation	100%	1%
Gas High Efficiency Furnace	105%	<1%
Low Flow Faucet Aerator - Bathroom	99%	<1%
Low Flow Faucet Aerator - Kitchen	98%	<1%
Rim Insulation	113%	<1%

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

5.2.3.1 Gas High Efficiency Furnace

There is one furnace measure in the UEG path with a 105% realization rate. The evaluation team could not pinpoint the exact value that was leading to this discrepancy between ex ante and verified savings. Table 5-8 provides the variables used in the verified savings calculation, based on provided tracking data and TRM v8.0 deemed values.

Table 5-8. Gas High Efficiency Furnace Values – UEG SF

Measure ID	EFLH*	CAPInput*	AFUE(eff)*	AFUE(exist)*	Derating(eff) and Derating(base)
M-12557	976	95000	0.95	0.80	6.4%

*Data provided in Nicor Gas tracking data

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

Recommendation 7. When calculating ex ante savings for the 2021 program, ensure the values provided in the tracking data, and deemed values from the TRM are used, where appropriate.

5.2.3.2 Residential Furnace Tune Up

The evaluation team found two residential furnace tune up measures (M-09241 and M-13259) that had realization rates of 88% and 300%, respectively. The evaluation team requested confirmation on the improved efficiency of the furnace systems from the implementer (E_i in the TRM formula) and received a supplemental file from the implementer with these values for all furnace tune-up measures. Although this supplemental data provided 100% realization rates for most furnace tune-up measures, these two measures still have discrepancies. Table 5-9 provides the values used for calculating verified savings for these measures.

Table 5-9. Residential Furnace Tune Up – UEG SF

Measure ID	EFLH*	CAPInput*	E_i *	Eff_{before} *	Ex Ante therms	Verified therms	Realization Rate
M-09241	976	80000	0.03	0.80	39.79	35.28	88%
M-13259	976	80000	0.16	0.80	54.22	162.67	300%

*Data provided in Nicor Gas tracking data

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

Recommendation 8. When calculating ex ante savings for the 2021 program, ensure the values provided in the tracking data, and deemed values from the TRM are used , where appropriate.

5.2.3.3 Low Flow Showerheads

This measure has a 99% realization rate due to the ex ante calculations using an ISR of 0.98 instead of 0.97, as deemed by the TRM v8.0.

Recommendation 9. Ensure the correct TRM deemed ISR values are used when calculating ex ante savings for showerheads.

5.2.3.4 Low Flow Faucet Aerators

The GPM_{base} values reported in the tracking data vary slightly from the TRM v8.0 deemed values for both bathroom and kitchen aerator measures. This resulted in realization rates for bathroom and kitchen measures of 98% and 99%, respectively. Although custom input flow throttle and flow rates can be used in these calculations, the reported values of 1.535 and 1.64 gallons per minute are applied across all measures in the program and are not site-specific due to flow throttle measurements. The TRM deems these values to be 1.53 and 1.63 gallons per minute, respectively.

Recommendation 10. Use the TRM deemed values for GPM_{base} when calculating savings for bathroom and kitchen aerator measures if site specific flow measurements are not recorded.

5.2.3.5 Air Sealing

The evaluation team found that the implementer did not use the correct $IE_{NetCorrection}$ and $ADJ_{AirSealingGasHeat}$ when calculating savings for Air Sealing measures in homes where attic insulation was also installed. For income eligible projects which receive both air sealing and attic

insulation measures installed, the $IE_{NetCorrection}$ and $ADJ_{AirSealingGasHeat}$ values used should be 110% and 72%, respectively. Ex ante savings calculations used 100% for both variables.

Recommendation 11. Use the TRM deemed values for $IE_{NetCorrection}$ and $ADJ_{AirSealingGasHeat}$ when air sealing and attic insulations measures are both installed in a project.

5.2.3.6 Attic Insulation

The evaluation team found that many of the Attic Insulation measures reported an R-old value of zero. Per the TRM v8.0, the minimum R-old value is 3. The evaluation requested clarification for these values from the implementer and received a supplemental file, but there was no clarification on the R-old values used in ex ante savings calculations. The evaluation team used a value of 3 for R-old when verifying savings for measures with reported R-old values of zero.

The remaining Attic Insulation measures reported R-old values of 3, 6 and 8. However, the realization rates for these measures range from 189% to 325%. Table 5-10 shows the inputs used to verify savings. All inputs were provided in the tracking data.

Table 5-10. Attic Insulation Realization Rate Trends – UEG SF

R-Old	R-new	HDD	nHeat	ADJGasHeat	Verified RR
3	46	5113	0.72	0.72	325%
8	41	5113	0.72	0.72	200%
6	43	5113	0.72	0.72	225%
0*	49	5113	0.72	0.72	189%

*Value of 3 used to verify savings

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

Recommendation 12. Ensure the values provided in the tracking data were used to calculate ex ante savings.

Recommendation 13. Record the R-old value for each project. If an R-old value is not able to be recorded, use the TRM deemed value of 3 for R-old when calculating savings.

5.2.3.7 Rim Insulation

The verified savings were calculated using the values provided in the tracking data. The nHeat value provided in the tracking data is 0.72, the deemed value from the TRM. However, for projects where measures other than Rim Insulation was installed, the nHeat value provided is 0.80. When the evaluation team used 0.80 in the calculation, the realization rate for the measures is 100%. The evaluation team based verified savings on an nHeat of 0.72, which is the value deemed in TRM v8.0 and provided in the tracking data.

Table 5-11. Rim Insulation nHeat Values – UEG SF

nHeat for Rim Insulation Measures in the Tracking Data	nHeat used in the Ex Ante Savings	nHeat from TRM v8.0 used to Verified Savings
0.72	0.80	0.72

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

Additionally, there was one measure, M-02643, with a realization rate of 162%. The values used when verifying savings are derived from the Nicor Gas tracking data and the TRM, and shown in Table 5-12.

Table 5-12. Rim Insulation Measure Discrepancy – UEG SF

VendorProjectID	R _{old} *	R _{new} *	Area*	Framing Factor	nHeat for Rim Insulation Measures in the Tracking Data	nHeat used to Verify Savings
M-02643	5	15	11.7	0.05	0.72	0.72

*Data provided in Nicor Gas tracking data

Source: Nicor Gas tracking data and Guidehouse evaluation team analysis

Recommendation 14. Ensure the value for nHeat used in ex ante savings calculations matches the TRM deemed value or the tracking data input if custom-calculated for each project.

5.2.4 Kits Channel Findings and Recommendations

5.2.4.1 Kit 4 Findings

The ex ante savings for Kit 4 are currently calculated using deemed savings values from Section 5.6.1 of the TRM v8.0 for an average climate zone (CZ) calculated as a weighted average of CZ 1 Rockford (30%), CZ 2 Chicago (60%) and CZ 3 Springfield (10%). The verified savings are calculated using the same weighted average values. The tracking data includes climate zone information for a majority of the customers but others are blank. Guidehouse found that ex ante savings based on the weighted average of climate zones matched the savings from reported climate zones within less than one percent.

Appendix A. Impact Analysis Methodology

Guidehouse followed algorithms outlined in the Illinois Technical Reference Manual (TRM) v8.0¹ to calculate verified gross savings for the Income Qualified programs. The evaluation team verified that these algorithms and appropriate deemed input parameters were correctly applied and validated custom parameters that were used. Guidehouse calculated verified net savings by multiplying verified gross savings by a deemed NTG of 1.00.

¹ State of Illinois Technical Reference Manual version 8.0 from <http://www.ilsag.info/technical-reference-manual.html>

Appendix B. Program Specific Inputs for the Illinois TRC

Table B-1 through Table B-4 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 B-1. Verified Cost Effectiveness Inputs – Contractor Channel

End Use	Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
HVAC	Advanced Thermostat	Each	130	11.0	8,410	8,410	8,410
HVAC	Duct Insulation and Sealing - Distribution Efficiency	Each	242	20.0	4,545	4,545	4,545
HVAC	Furnace Tune-Up	Each	38	3.0	2,053	2,054	2,054
HVAC	Gas High Efficiency Boiler - TOS	Each	3	25.0	160	160	160
HVAC	Gas High Efficiency Furnace - TOS	Each	30	20.0	4,001	4,001	4,001
HVAC	Programmable Thermostat	Each	40	8.0	2,749	2,749	2,749
Hot Water	Gas Water Heater - TOS	Each	2	13.0	47	47	47
Hot Water	Hot Water Pipe Insulation	Linear Feet	2,338	15.0	2,056	2,056	2,056
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	336	10.0	318	318	318
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	153	10.0	1,221	1,221	1,221
Hot Water	Low Flow Showerhead	Each	384	10.0	1,166	1,166	1,166
Shell	Air Sealing	Projects	320	20.0	22,560	22,571	22,571
Shell	Attic Insulation	Square Feet	229,712	20.0	44,149	44,149	44,149
Shell	Rim Insulation	Square Feet	1,394	20.0	63	63	63
Total or Weighted Average				18.1	93,500	93,510	93,510

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

Table B-2. Verified Cost Effectiveness Inputs – BNP SF

End Use	Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
HVAC	Advanced Thermostat	Each	8	11.0	456	456	456
HVAC	Gas High Efficiency Furnace - TOS	Each	2	20.0	70	70	70
Hot Water	Hot Water Pipe Insulation	Linear Feet	32	15.0	28	28	28
Hot Water	Gas Water Heater - TOS	Each	2	13.0	64	64	64
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	4	10.0	2	2	2
Shell	Air Sealing	Projects	6	20.0	246	246	246
Shell	Attic Insulation	Square Feet	4,171	20.0	288	288	288
Shell	Rim Insulation	Square Feet	580	20.0	58	58	58
Shell	Wall Insulation	Square Feet	730	20.0	57	57	57
Kits	Kit BN	Each	20	17.2	867	867	867
Total or Weighted Average				16.7	2,137	2,137	2,137

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

Table B-3. Verified Cost Effectiveness Inputs – UEG SF

End Use	Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
HVAC	Advanced Thermostat	Each	112	11.0	7,365	7,365	7,365
HVAC	Gas High Efficiency Furnace	Each	1	20.0	177	186	186
HVAC	Programmable Thermostat	Each	12	8.0	748	748	748
HVAC	Residential Furnace Tune Up	Each	15	3.0	794	898	898
HVAC	Duct Insulation and Sealing	Each	107	20.0	8,032	8,033	8,033
Hot Water	Low Flow Showerhead	Each	266	10.0	2,362	2,339	2,339
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	240	10.0	209	207	207
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	117	10.0	334	326	326
Hot Water	Hot Water Pipe Insulation	Linear Feet	1,612	15.0	426	426	426
Shell	Air Sealing	Projects	143	20.0	13,675	14,847	14,847
Shell	Attic Insulation	Square Feet	121,293	20.0	15,950	44,668	44,668
Shell	Rim Insulation	Square Feet	630	20.0	72	73	73
Total or Weighted Average				18.5	50,143	80,115	80,115

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

Table B-4. Verified Cost Effectiveness Inputs – Kits

End Use	Research Category	Units	Quantity	Effective Useful Life	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
Hot Water	Kit 2 (2 SH, 2 BA, 1 KA, 1 ST)	Kit	1,369	10.0	32,952	32,947	32,947
Shell	Kit 4 (12 gasket, 1 sweep, 30 LF caulk, 34 LF wx)	Kit	2,810	20.0	99,727	99,724	99,724
Total or Weighted Average			4,179	17.5	132,679	132,671	132,671

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