



# Single Family Income Qualified Savings Evaluation Report

**Energy Efficiency Plan: Plan Year 2019 (CY2019)  
(1/1/2019-12/31/2019)**

**Presented to  
Nicor Gas**

**FINAL**

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## Single Family Income Qualified Program Savings Evaluation Report

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## 1. INTRODUCTION

This report presents the results of the impact evaluation of the Nicor Gas 2019 Single Family Income Qualified Program. It presents a summary of the energy impacts for the Nicor Gas only program and kits program, broken out by relevant measure and program structure details. A separate joint report presents energy savings for the single family State of Illinois' Home Weatherization Assistance Program (IHWAP) joint savings with ComEd. The appendix presents the impact analysis methodology. The 2019 program covers January 1, 2019 through December 31, 2019.

## 2. PROGRAM DESCRIPTION

The Nicor Gas Single Family Income Qualified Program offers free weatherization for income-qualified customers in the Nicor Gas service territory. The 2019 contractor channel included direct installation of water heating efficiency measures (faucet aerators, showerheads, gas water heaters); advanced and programmable thermostats; attic, wall, duct, and rim insulation; air leakage reduction; and high efficiency boilers and furnaces. The program also provided 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), kitchen aerators (KA), shower timers (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 programs had 3,391 participants in 2019 and completed 5,889 projects as shown in the following table.

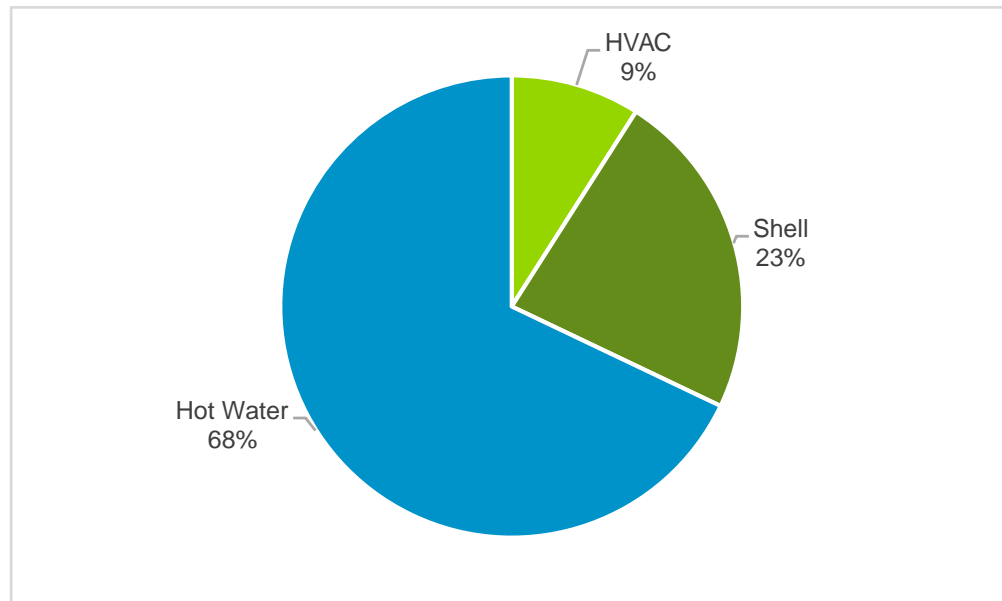
**Table 2-1. CY2019 Volumetric Findings Detail**

Participation	Contractor Channel	Kits Channel	Total
Participants*	716	2,675	3,391
Installed Projects†	2,633	3,256	5,889
Advanced Thermostat	219		219
Gas High Efficiency Furnace	28		28
Programmable Thermostat	24		24
Gas High Efficiency Boiler	5		5
Residential Furnace Tune Up	50		50
Duct Insulation and Sealing (Projects)	153		153
Low Flow Showerhead	379	5,112	5,491
Low Flow Faucet Aerator - Bathroom	412	5,112	5,524
Low Flow Faucet Aerator - Kitchen	190	2,556	2,746
Hot Water Pipe Insulation	2,584		2,584
Gas Water Heater	5		5
Shower Timer		2,556	2,556
Air Sealing (Projects, Kit 4)	215	700	915
Attic Insulation (Projects)	206		206
Rim Insulation (Projects)	96		96
Wall Insulation (Projects)	1		1

\* Participants are defined as unique utility IDs

† Installed Projects are defined as unique project IDs

Source: Nicor Gas tracking data and Guidehouse team analysis.

**Figure 2-1. Number of Projects Installed by Type**


Source: Nicor Gas tracking data and evaluation team analysis

### 3. PROGRAM SAVINGS DETAIL

Table 3-1 summarizes the gas savings the Income Qualified Single Family Program achieved in CY2019.

**Table 3-1. CY2019 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	64,796	108%	69,748	1.00	69,748
Kits Channel	86,366	100%	86,359	1.00	86,359
<b>Total</b>	<b>151,162</b>	<b>103%</b>	<b>156,107</b>	<b>1.00</b>	<b>156,107</b>

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

† Net-to-Gross (NTG) is the ratio of verified net savings to verified gross savings. The NTG is a deemed value. Source: Nicor\_Gas\_NTG\_History\_and\_2019\_Recommendations\_2018-10-01\_Final Aerator Showerhead Correction 2019-04-12.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

Source: Nicor Gas tracking data and Guidehouse team analysis.

## 4. PROGRAM SAVINGS BY MEASURE

The program includes 17 measures as shown in the following table. The Kit 2, Kit 4, and attic insulation measures contributed the most savings (see Figure 4-1).

**Table 4-1. 2019 Annual Energy Savings by Measure**

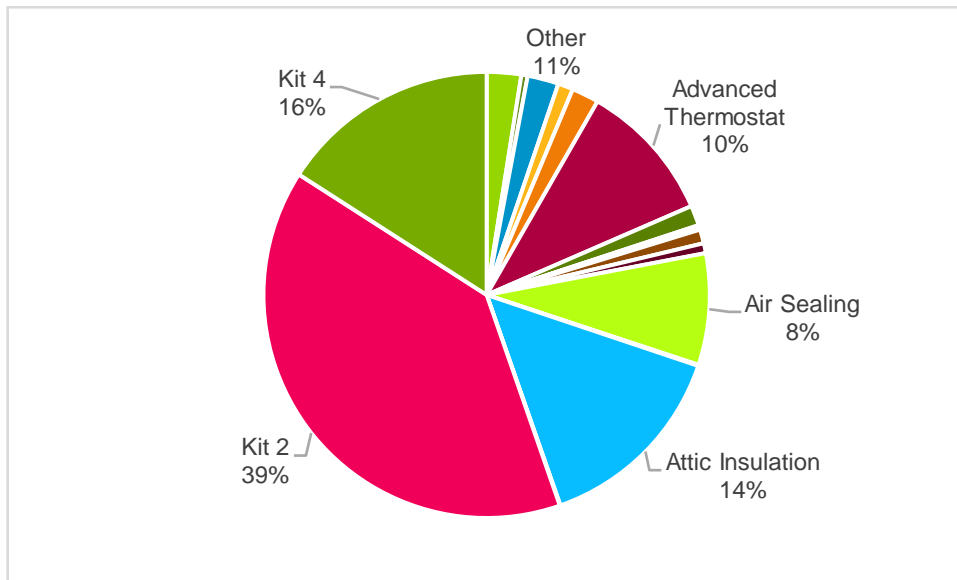
Program Path	End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross Realization Rate*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)	Effective Useful Life
Contractor Channel	HVAC	Duct Insulation and Sealing	3,890	1.00	3,894	1.00	3,894	20.0
	HVAC	Gas High Efficiency Boiler - TOS	711	1.00	711	1.00	711	25.0
	HVAC	Gas High Efficiency Furnace - TOS	3,529	1.00	3,529	1.00	3,529	20.0
	HVAC	Programmable Thermostat	1,715	1.00	1,715	1.00	1,715	8.0
	HVAC	Furnace Tune-Up	3,062	1.00	3,062	1.00	3,062	2.0
	HVAC	Advanced Thermostat	15,927	1.00	15,927	1.00	15,927	11.0
	Hot Water	HW Pipe Insulation	2,272	1.00	2,274	1.00	2,274	15.0
	Hot Water	Gas Water Heater - ER	88	1.00	88	1.00	88	13.0
	Hot Water	Gas Water Heater - TOS	31	1.00	31	1.00	31	13.0
	Hot Water	Low Flow Faucet Aerator - Bathroom	400	1.00	400	1.00	400	10.0
	Hot Water	Low Flow Faucet Aerator - Kitchen	1,566	1.00	1,572	1.00	1,572	10.0
	Hot Water	Low Flow Showerhead	1,121	1.00	1,121	1.00	1,121	10.0
	Shell	Air Sealing	10,893	1.16	12,620	1.00	12,620	20.0
	Shell	Wall Insulation	107	1.18	125	1.00	125	20.0
Shell	Attic Insulation	19,426	1.16	22,611	1.00	22,611	20.0	
Shell	Rim Insulation	57	1.17	67	1.00	67	20.0	
		<b>Sub-total</b>	<b>64,796</b>	<b>1.08</b>	<b>69,748</b>	<b>1.00</b>	<b>69,748</b>	<b>16.3</b>
Kits Channel	Hot Water	Kit 2	61,523	1.00	61,514	1.00	61,514	10.0
	Shell	Kit 4	24,843	1.00	24,845	1.00	24,845	20.0
		<b>Sub-total</b>	<b>86,366</b>	<b>1.00</b>	<b>86,359</b>	<b>1.00</b>	<b>86,359</b>	<b>12.9</b>
		<b>Total</b>	<b>151,162‡</b>	<b>1.03</b>	<b>156,107</b>	<b>1.00</b>	<b>156,107</b>	<b>14.4</b>

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

† Net-to-Gross (NTG) is the ratio of verified net savings to verified gross savings. The NTG is a deemed value. Source: Nicor\_Gas\_NTG\_History\_and\_2019\_Recommendations\_2018-10-01\_Final Aerator Showerhead Correction 2019-04-12.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

‡ Summed value higher due to rounding.

Source: Nicor Gas tracking data and Guidehouse team analysis.

**Figure 4-1. Verified Net Savings by Measure – Therms**

Source: Nicor Gas tracking data and Guidehouse team analysis.

## 5. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

### 5.1 Impact Parameter Estimates

Table 5-1 shows the unit therm savings and realization rate findings by measure type 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 percent. Appendix 1 provides a description of the impact analysis methodology.



**Table 5-1. Verified Gross Savings Parameters**

Program Path	Measure Type	Unit Basis	Ex Ante Gross (therms/unit)*	Verified Gross (therms/unit)	Realization Rate	Data Source(s)†
Contractor Channel	Residential Furnace Tune-Up	Each	Varies	Varies	100%	Illinois TRM, v7.0 (TRM) Section 5.3.13
Contractor Channel, Kits Channel	Air Sealing	Linear Feet	Varies	Varies	Varies, adjusted upward	TRM Section 5.6.01
Contractor Channel	Attic Insulation	Square Feet	Varies	Varies	116%	TRM Section 5.6.05
Contractor Channel, Kits Channel	Low Flow Showerhead	Each	Varies	Varies	100%	TRM Section 5.4.05
Contractor Channel, Kits Channel	Low Flow Faucet Aerator	Each	Varies	Varies	100%	TRM Section 5.4.04
Contractor Channel	Advanced Thermostat	Each	Varies	Varies	100%	TRM Section 5.3.16
Contractor Channel	Gas High Efficiency Furnace	Each	Varies	Varies	100%	TRM Section 5.3.07
Contractor Channel	Gas Water Heater	Each	Varies	Varies	100%	TRM Section 5.4.02
Contractor Channel	Duct Insulation	Each	Varies	Varies	100%	TRM Section 5.3.04
Contractor Channel	Hot Water Pipe Insulation	Linear Feet	Varies	Varies	100%	TRM Section 5.4.01
Contractor Channel	Gas High Efficiency Boiler	Each	Varies	Varies	100%	TRM Section 5.3.06
Contractor Channel	Programmable Thermostat	Each	Varies	Varies	100%	TRM Section 5.3.11
Contractor Channel	Wall Insulation	SQ FT	0.124	0.124	118%	TRM Section 5.6.04
Contractor Channel	Rim Insulation	Each	Varies	Varies	117%	TRM Section 5.6.06
Kits Channel	Shower Timer	Each	3.71	3.71	100%	TRM Section 5.4.09
Kits Channel	Kit 2 (2 SH, 2 BA, 1 KA, 1 ST)	Kit	24.07	24.07	100%	TRM Section 5.4.4 and TRM Section 5.4.5
Kits Channel	Kit 4 (12 gasket, 1 sweep, 30 LF caulk, 34 LF wx)	Kit	35.49	35.49	100%	TRM Section 5.6.01

\* Program Tracking Data (PTD) provided by Nicor Gas, extract dated February 2, 2020.

† State of Illinois Technical Reference Manual version 7.0 from <http://www.ilsag.info/technical-reference-manual.html>.

### 5.1.1 Contractor Channel Findings and Recommendations

#### 5.1.1.1 Low Flow Faucet Aerator - Kitchen

For measures that did not have assigned household types, the evaluation team assumed that the household type was single family. The tracking database included four records with kitchen aerator measures that did not have a household type; for these four, the implementer used TRM deemed values for mobile homes to calculate ex ante savings. However, the implementer calculated savings for these measures using a household factor 2.1 (multi-family) instead of the deemed single family value of 2.56. The household factor for mobile homes should align with the single family household type for the Single Family Income Qualified Program. This resulted in 121% realization rates for these projects and an overall measure realization rate of 100% listed below:

**Table 5-2. Kitchen Aerator Multifamily Measures**

Record ID
MEA-2019.04.30-75576
MEA-2019.04.25-73676
MEA-2019.04.30-75556

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

**Recommendation 1.** Guidehouse recommends using the single family household factor of 2.56 for all measures in this program that do not have custom values, as deemed by the TRM v7.0.

#### 5.1.1.2 Duct Insulation and Sealing Finding

Seventeen duct insulation measure savings were evaluated using the Modified Blower Door Subtraction Calculation Method. The tracking data provided by Nicor Gas reported a pre-installation efficiency value of 0.70 for these measures. This value aligns with the default nSystem, or pre-installation efficiency value, deemed by the IL TRM v7.0. The evaluation team found that ex ante savings were calculated using a nSystem value of 0.74. This led to a realization rate of 105% for these seventeen measures and a 100% realization rate for the overall duct insulation measure.

**Recommendation 2.** Guidehouse recommends using the nSystem value of 0.70 to evaluate savings for duct insulation measures when using the Modified Blower Door Subtraction Calculation Method, as deemed by the IL TRM v7.0.

#### 5.1.1.3 Residential Furnace Tune Up Finding

One project included a furnace tune up measure (MEA-2019.07.15-88274) with a reported input capacity of 99,999 Btuh in the tracking data. The implementer has indicated that this was an error in the tracking data and has provided the input capacity of 80,000 Btuh for the measure. The evaluation team verified this value using the furnace model. This model is a Trane TDD080R9V3F1, where the “080” indicates a nominal size of 80,000 Btuh.

**Recommendation 3.** Guidehouse recommends that Nicor Gas refer to equipment manufacturer and model number information when capacity is unknown.

#### **5.1.1.4 Shell End Use Furnace Efficiency**

The evaluation team calculated verified savings for measures in the Shell End Use using the existing heating system efficiency value and derating it by 15% for distribution losses, as deemed by the TRM v7.0. We performed this deration under the assumption that the existing heating system value provided had not been previously derated.

**Recommendation 4.** Guidehouse recommends using a furnace efficiency derated by distribution losses when evaluating savings for air sealing and insulation measures.

#### **5.1.2 Kits Channel Findings and Recommendations**

##### **5.1.2.1 Kit 4 Findings**

The ex ante savings for Kit 4 are currently calculated using deemed savings values from Section 5.6.1 of the IL TRM v7.0 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.

##### **5.1.2.2 Kit Distribution Quantity Finding**

During 2019, Nicor Gas had a total of 3,256 kits shipped to single family participants. A total of 2,556 kits were Kit 2 and 700 kits were Kit 4. Based on 2019 data, 11 percent of Kit 4 participants received two Kit 4 kits or shipments. The TRM does not prohibit the number of kits, or the individual measures, which can be distributed to customers. However, distributing more than one kit may have an impact on the rate at which customers install all of the kit measures.

**Recommendation 5.** The evaluation team recommends that additional installation rate research be conducted with Kit 4 participants to validate that the ISRs for weatherization measures in the TRM are appropriate for customers who receive two kits. Evaluation acknowledges that ISR research is planned for the 2020/2021 program implementation and evaluation period.

## **6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY**

Guidehouse followed algorithms outlined in the IL TRM v7.0 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 NTG of 1.00 which is deemed in the IL TRM v7.0.

## **7. APPENDIX 2. PROGRAM-SPECIFIC INPUTS FOR THE ILLINOIS TRC**

Table 7-1, the Total Resource Cost (TRC) variable table, includes only cost-effectiveness analysis inputs available at the time of finalizing the CY2019 Income Qualified Single Family Program evaluation report. Additional required cost data (e.g., measure costs, program level incentive and non-incentive costs) are not included in the tables and will be provided to the evaluation team later. Detail in the TRC tables (e.g., EULs), other than final 2019 savings and program data, are subject to change and are not final.

**Table 7-1. Total Resource Cost Savings Summary**

Program Path	End Use Type	Research Category	Units	Quantity	EUL (years)*	Ex Ante Savings (Therms)	Verified Gross Savings (Therms)	NTG (Therms)	Verified Net Savings (Therms)	
Contractor Channel	HVAC	Duct Insulation and Sealing	Each	224	20.0	3,890	3,894	1.00	3,894	
	HVAC	Gas High Efficiency Boiler - TOS	Each	5	25.0	711	711	1.00	711	
	HVAC	Gas High Efficiency Furnace - TOS	Each	28	20.0	3,529	3,529	1.00	3,529	
	HVAC	Programmable Thermostat	Each	24	8.0	1,715	1,715	1.00	1,715	
	HVAC	Furnace Tune-Up	Each	38	2.0	3,062	3,062	1.00	3,062	
	HVAC	Advanced Thermostat	Each	219	11.0	15,927	15,927	1.00	15,927	
	Hot Water	HW Pipe Insulation	Linear Feet	2,584	15.0	2,272	2,274	1.00	2,274	
	Hot Water	Gas Water Heater - ER	Each	2	13.0	88	88	1.00	88	
	Hot Water	Gas Water Heater - TOS	Each	3	13.0	31	31	1.00	31	
	Hot Water	Low Flow Faucet Aerator - Bathroom	Each	412	10.0	400	400	1.00	400	
	Hot Water	Low Flow Faucet Aerator - Kitchen	Each	190	10.0	1,566	1,572	1.00	1,572	
	Hot Water	Low Flow Showerhead	Each	379	10.0	1,121	1,121	1.00	1,121	
	Kits Channel	Shell	Air Sealing	Projects	215	20.0	10,893	12,620	1.00	12,620
		Shell	Wall Insulation	Square Feet	861	20.0	107	125	1.00	125
Shell		Attic Insulation	Square Feet	173,181	20.0	19,426	22,611	1.00	22,611	
Shell		Rim Insulation	Square Feet	1,471	20.0	57	67	1.00	67	
Hot Water		Kit 2 (2 SH, 2 BA, 1 KA, 1 ST)	Kit	2,556	10.0	61,523	61,514	1.00	61,514	
Shell		Kit 4 (12 gasket, 1 sweep, 30 LF caulk, 34 LF wx)	Kit	700	20.0	24,843	24,845	1.00	24,845	
<b>Total</b>				<b>183,092</b>	<b>14.4</b>	<b>151,162†</b>	<b>156,107</b>	<b>NA</b>	<b>156,107</b>	

\* The total of the EUL column is the weighted average measure life (WAML), and is calculated as the sum product of EUL and measure savings divided by total program savings.

† Early Replacement (ER) measures are flagged as YES, otherwise a NO is indicated in the column.

‡ Summed value higher due to rounding.

Source: Guidehouse analysis of tracking data.