



# Single Family Income Qualified Program Impact Evaluation Report

Energy Efficiency Plan: Program Year 2018  
(1/1/2018-12/31/2018)

Presented to  
Nicor Gas Company

Final

July 26, 2019

***Prepared by:***

Jennifer Ma  
Consultant  
312.583.6986  
jennifer.ma@navigant.com

Peter Vigilante  
Senior Consultant  
312.583.6987  
peter.vigilante@navigant.com

Chelsea Lamar  
Managing Consultant  
312.583.2673  
chelsea.lamar@navigant.com

[www.navigant.com](http://www.navigant.com)

**Submitted to:**

Nicor Gas Company  
1844 Ferry Road  
Naperville, IL 60563

**Submitted by:**

Navigant Consulting, Inc.  
150 North Riverside  
Suite 2100  
Chicago, IL 60606  
Phone 312.583.5700

**Contact:**

Randy Gunn  
Managing Director  
312.583.5714  
[randy.gunn@navigant.com](mailto:randy.gunn@navigant.com)

Kevin Grabner  
Associate Director  
608.497.2323  
[kevin.grabner@navigant.com](mailto:kevin.grabner@navigant.com)

Charles Ampong  
Managing Consultant  
608.497.2336  
[charles.ampong@navigant.com](mailto:charles.ampong@navigant.com)

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## 1. INTRODUCTION

This report presents the results of the impact evaluation of the Nicor Gas Single Family Income Qualified Program during program year 2018. The program is comprised of the Illinois Home Weatherization Assistance Program (IHWAP) and an energy-saving kits offering. It presents a summary of the energy impacts for the total programs and broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. The 2018 covers January 1, 2018 through December 31, 2018.

## 2. PROGRAM DESCRIPTION

Nicor Gas energySMART offers free weatherization for income-qualified customers in coordination with the Illinois Home Weatherization Assistance Program (IHWAP) in the Nicor Gas service territory. In 2018, IHWAP was jointly administered by ComEd, Peoples Gas and North Shore Gas (PGL/NSG), and Nicor Gas, with Resource Innovations operating as implementer of the program. The 2018 natural gas measures for IHWAP included water efficiency measures, advanced and programmable thermostats, attic, wall, floor, and basement sidewall insulation, air leakage reduction, high efficiency furnace, high efficiency boiler, and efficient gas water heater. The Nicor Gas Single Family Income Qualified Program also provided free energy savings kits which included low-flow showerheads (SH, 1 or 2 per kit), kitchen aerators (KA), shower timers (ST), and bathroom aerators (BA, 1 or 2 per kit).

This report focuses solely on the natural gas savings from the programs for Nicor Gas. Savings for other utilities are included in a separate evaluation report delivered to respective utilities.

The programs had 1,474 participants and completed projects as shown in the following table.

**Table 2-1. 2018 Volumetric Summary, by Program Path**

Participation	IHWAP	Kits	Total
Participants*	389	1,085	1,474
Installed Projects†	389	1,085	1,474

\* Participants are definite as unique addresses

† Installed Projects are defined as vendor project IDs

Source: Nicor Gas tracking data

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

**Table 2-2. 2018 Installed Measure Quantities**

Path	End Use Type	Measure	Quantity Unit	Installed Quantity	
IHWAP	Hot Water	Gas Water Heater - ER	Each	110	
	Hot Water	Gas Water Heater - TOS	Each	11	
	Hot Water	HW Pipe Insulation	Linear Feet	1,969	
	Hot Water	Low Flow Faucet Aerator - Bathroom	Each	307	
	Hot Water	Low Flow Faucet Aerator - Kitchen	Each	126	
	Hot Water	Low Flow Showerhead	Each	250	
	HVAC	Advanced Thermostat	Each	223	
	HVAC	Gas High Efficiency Boiler - ER	Each	6	
	HVAC	Gas High Efficiency Boiler - TOS	Each	5	
	HVAC	Gas High Efficiency Furnace - ER	Each	133	
	HVAC	Gas High Efficiency Furnace - TOS	Each	54	
	HVAC	Programmable Thermostat	Each	31	
	Shell	Air Sealing	Home	232	
	Shell	Attic Insulation	Square Feet	192,972	
	Shell	Basement Sidewall Insulation	Square Feet	39,612	
	Shell	Floor Insulation	Square Feet	9,376	
	Shell	Wall Insulation	Square Feet	46,737	
	Kits	Hot Water	Kit 1 (1 SH, 2 BA, 1 KA, 1 ST)	Each	74
		Hot Water	Kit 2 (2 SH, 2 BA, 1 KA, 1 ST)	Each	1,011

Source: Nicor Gas tracking data and Navigant team analysis.

### 3. PROGRAM SAVINGS SUMMARY

Table 3-1 summarizes the energy savings the Income Qualified programs achieved in 2018.

**Table 3-1. 2018 Annual Energy Savings Summary**

Program	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
IHWAP	83,750	103%	86,164	1.00	86,164
Kits	23,458	100%	23,458	1.00	23,458
<b>Total</b>	<b>107,208</b>	<b>102%</b>	<b>109,622</b>	<b>1.00</b>	<b>109,622</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 GPY7 NTG Values 2017-03-01 Final Faucet Aerator Correction 2019-03-20.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 Navigant team analysis.

## 4. PROGRAM SAVINGS BY MEASURE

The programs include 18 measures as shown in Table 4-1. The IHWAP measures that contributed the most savings were early retirement gas furnaces, air sealing, and advanced thermostat measures at 23, 18, and 17 percent of overall savings, respectively. The verified gross realization rate for the programs combined is 102 percent.

**Table 4-1. 2018 Annual Energy Savings by Measure**

Path	End Use Type	Research Category	Ex Ante Gross Savings (Therms)	Verified Gross RR*	Verified Gross Savings (Therms)	NTG†	Verified Net Savings (Therms)
IHWAP	Hot Water	Gas Water Heater - ER	3,432	100%	3,421	1.00	3,421
	Hot Water	Gas Water Heater - TOS	125	100%	125	1.00	125
	Hot Water	HW Pipe Insulation	1,913	100%	1,914	1.00	1,914
	Hot Water	Low Flow Faucet Aerator - Bathroom	183	100%	183	1.00	183
	Hot Water	Low Flow Faucet Aerator - Kitchen	623	100%	623	1.00	623
	Hot Water	Low Flow Showerhead	1,936	100%	1,936	1.00	1,936
	HVAC	Advanced Thermostat	13,899	103%	14,290	1.00	14,290
	HVAC	Gas High Efficiency Boiler - ER	1,039	100%	1,039	1.00	1,039
	HVAC	Gas High Efficiency Boiler - TOS	137	100%	137	1.00	137
	HVAC	Gas High Efficiency Furnace - ER	18,086	108%	19,494	1.00	19,494
	HVAC	Gas High Efficiency Furnace - TOS	6,542	111%	7,241	1.00	7,241
	HVAC	Programmable Thermostat	1,332	106%	1,409	1.00	1,409
	Shell	Air Sealing	16,025	99%	15,874	1.00	15,874
	Shell	Attic Insulation	7,144	100%	7,144	1.00	7,144
	Shell	Basement Sidewall Insulation	7,966	100%	7,966	1.00	7,966
	Shell	Floor Insulation	443	100%	443	1.00	443
Shell	Wall Insulation	2,926	100%	2,926	1.00	2,926	
		<b>Subtotal</b>	<b>83,750</b>	<b>103%</b>	<b>86,164</b>	<b>1.00</b>	<b>86,164</b>
Kits	Hot Water	Low Flow Faucet Aerator - Bathroom	998	100%	998	1.00	998
	Hot Water	Low Flow Faucet Aerator - Kitchen	3,830	100%	3,830	1.00	3,830
	Hot Water	Low Flow Showerhead	14,615	100%	14,615	1.00	14,615
	Hot Water	Shower Timer	4,015	100%	4,015	1.00	4,015
		<b>Subtotal</b>	<b>23,458</b>	<b>100%</b>	<b>23,458</b>	<b>1.00</b>	<b>23,458</b>
<b>Total</b>			<b>107,208</b>	<b>102%</b>	<b>109,622</b>	<b>1.00</b>	<b>109,622</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 GPY7 NTG Values 2017-03-01 Final Faucet Aerator Correction 2019-03-20.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 Navigant 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 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 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**

End Use Type	Measure	Unit Basis	Ex Ante Gross (therms/unit)	Verified Gross (therms/unit)	RR	Data Source(s)
Hot Water	Gas Water Heater - ER	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.4.02 and PTD†
Hot Water	Gas Water Heater - TOS	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.4.02 and PTD†
Hot Water	HW Pipe Insulation	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.4.01 and PTD†
Hot Water	Low Flow Faucet Aerator - Bathroom	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.4.04 and PTD†
Hot Water	Low Flow Faucet Aerator - Kitchen	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.4.04 and PTD†
Hot Water	Low Flow Showerhead	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.4.05 and PTD†
Hot Water	Shower Timer	Each	3.71	3.71	100%	IL TRM v6.0 - Section 5.4.09 and PTD†
HVAC	Advanced Thermostat	Each	Varies	Varies	103%	IL TRM v6.0 - Section 5.3.16 and PTD†
HVAC	Gas High Efficiency Boiler - ER	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.3.06 and PTD†
HVAC	Gas High Efficiency Boiler - TOS	Each	Varies	Varies	100%	IL TRM v6.0 - Section 5.3.06 and PTD†
HVAC	Gas High Efficiency Furnace - ER	Each	Varies	Varies	108%	IL TRM v6.0 - Section 5.3.07 and PTD†
HVAC	Gas High Efficiency Furnace - TOS	Each	Varies	Varies	111%	IL TRM v6.0 - Section 5.3.07 and PTD†
HVAC	Programmable Thermostat	Each	Varies	Varies	106%	IL TRM v6.0 - Section 5.6.11 and PTD†
Shell	Air Sealing	Each	Varies	Varies	99%	IL TRM v6.0 - Section 5.6.01 and PTD†
Shell	Attic Insulation	Square Feet	Varies	Varies	100%	IL TRM v6.0 - Section 5.6.04 and PTD†
Shell	Basement Sidewall Insulation	Square Feet	Varies	Varies	100%	IL TRM v6.0 - Section 5.6.02 and PTD†
Shell	Floor Insulation	Square Feet	Varies	Varies	100%	IL TRM v6.0 - Section 5.6.03 and PTD†
Shell	Wall Insulation	Square Feet	Varies	Varies	100%	IL TRM v6.0 - Section 5.6.04 and PTD†

\* State of Illinois Technical Reference Manual version 6.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† Program Tracking Data (PTD) provided by Nicor Gas, extract dated February 5, 2019



## 5.2 IHWAP Findings and Recommendations

Our verified gross savings estimates are based on the data set “IQ Evaluation Participation Report\_2019\_02\_03\_233341.xlsx” we received from Nicor Gas on February 5<sup>th</sup>, 2019 and the supplementary data set “IQ\_ICPY2018NavigantRev.xlsx” received on May 16<sup>th</sup>, 2019. Additionally, many of the findings below refer to the program’s ComEd data set “IHWAP-SF\_2018\_EOY\_Data\_Rev0\_01302019.xlsx,” which we received on January 31<sup>th</sup>, 2019.

### Gas Water Heater

**Finding 1.** The evaluation team found that the implementer used custom values of household occupancy and water heater size to calculate gas water heater savings in Nicor Gas data but TRM-deemed default values to calculate savings in ComEd data for the same projects. This resulted in differing ex ante savings in the two data sets for the same projects. The following table shows a sample of water heater projects with this finding:

**Table 5-2. Gas Water Heater Custom Data Discrepancies**

Measure ID	Nicor Gas Data: Size of Water Heater (gallons)	Nicor Gas Data: Household Occupancy	Nicor Gas Data: Gas-Company Claimed Ex Ante Savings (therms)	ComEd Data: Gas-Company Claimed Ex Ante Savings (therms)	Nicor Gas Project Gross Realization Rate
MEA-2018.05.18-5970	38	3	34.9	29.8	100%
MEA-2018.07.17-15157	50	1	11.6	29.8	100%
MEA-2018.07.19-15230	50	1	11.6	29.8	100%
MEA-2018.08.03-17946	50	1	11.6	29.8	100%
MEA-2018.08.27-19610	50	1	11.6	29.8	100%
MEA-2018.09.12-24618	50	1	1.7	34.2	100%

Source: Nicor Gas tracking data, ComEd tracking data, and Navigant team analysis

The IL TRM allows for either default or actual values for household occupancy but recommends actual values for water heater size. We agreed with implementer’s approach for Nicor Gas and used collected data to verify savings.

**Recommendation 1.** Navigant recommends the implementer use custom values for household occupancy and water heater size to calculate gas water heater savings, if actual values are available. This recommendation was followed for Nicor Gas but not for ComEd.

### Low Flow Showerhead Finding

**Finding 2.** The evaluation team found that the implementer used actual values for household occupancy to calculate low flow showerhead savings for Nicor Gas projects, but TRM-default values to calculate ex ante savings for ComEd. This resulted in differing ex ante savings in the two data sets for the same projects. A sample of low flow showerhead projects with this finding are shown below:

**Table 5-3. Showerhead Custom Data Discrepancies**

Measure ID	Nicor Gas Data: Gas-Company Claimed Ex Ante Savings (Therms)	ComEd Data: Gas- Company Claimed Ex Ante Savings (Therms)	Nicor Gas Project Gross Realization Rate
MEA-2018.06.12-10914	6.69	5.71	100%
MEA-2018.06.14-11463	8.92	5.71	100%
MEA-2018.07.11-13975	17.84	22.84	100%
MEA-2018.07.11-13980	2.23	5.71	100%
MEA-2018.07.12-13989	93.68	34.26	100%

Source: Nicor Gas tracking data, ComEd tracking data, and Navigant team analysis

The IL TRM allows for either default or actual values for household occupancy. We agreed with implementer’s approach for Nicor Gas and used collected data to verify savings.

**Recommendation 2.** Navigant recommends the implementer use custom values for household occupancy to calculate showerhead savings, if actual values are available. This recommendation was followed for Nicor Gas but not for ComEd.

### Gas High Efficiency Boiler - TOS Finding

**Finding 3.** The evaluation team found one time-of-sale gas high efficiency boiler project with no claimed ex ante savings. The measure ID is MEA-2018.12.12-39822. The implementer informed us the unit was installed due to health and safety concerns for the customers. We found that this project did not yield energy savings because the installed unit was the same efficiency as the baseline or existing unit. Navigant confirmed this project should claim no savings.

**Recommendation 3.** Navigant recommends the implementer label boiler installations that do not yield savings as health and safety measures.

### Gas High Efficiency Furnace Finding

**Finding 4.** The gas realization rates for early replacement and time-of-sale gas high efficiency furnace are 108 and 116 percent, respectively. The evaluation team found that the implementer included gas penalties from the furnace blower motor in their calculation of ex ante gas savings. In the evaluation process, Navigant refrains from calculating gas penalties to avoid punishing gas utilities for energy efficiency measures implemented by electric utilities.

**Recommendation 4.** Navigant recommends that the implementer does not include gas penalties from furnace blower motors when estimating gas high efficiency furnace savings.

### Advanced and Programmable Thermostat Finding

**Finding 5.** The realization rate of gas advanced thermostat and programmable thermostat savings is 103 and 106 percent, respectively. This is due to the value of gas heating consumption used for projects with gas boilers. We matched data for type of gas heating from the ComEd data. The implementer used TRM-deemed values of gas heating consumption from the table in Section 5.3.11 Programmable Thermostat. However, these values are specifically for furnaces. IL TRM v6.0 footnote 396 on page 133 indicates that those TRM values came from furnace gas heating load divided by furnace efficiency. For gas boiler projects, the evaluation team estimated gas heating consumption using boiler gas heating

loads from Section 5.3.6 Gas High Efficiency Boiler divided by the projects' existing heating system efficiency. This increased the advanced thermostat and programmable thermostat gas savings realization rate by 3 and 6 percent, respectively.

**Recommendation 5.** Navigant recommends the implementer use boiler gas heating load divided by efficiency to estimate gas heating consumption for advanced and programmable thermostat projects with gas boilers.

### Air Sealing Finding

**Finding 6.** Air sealing measures had a gross realization rate of 99 percent because of one project with measure ID MEA-2018.10.03-26325. For this project, the Nicor Gas data set claimed 261 therms for ex ante savings, but the ComEd data set reported a calculation of 109 therms. Both data sets recorded the same inputs, and we consistently verified 109 therms for both utility analyses. We could not isolate the reason for the difference in ex ante savings.

**Recommendation 6.** Navigant recommends the implementer justify the increase of ex ante savings in the Nicor Gas data in comparison to the ComEd data or be consistent with savings across utilities.

### Insulation Finding

**Finding 7.** The evaluation team found that the implementer recorded different pre-install and post-install R values in the Nicor Gas data set and the ComEd data set for 13 attic insulation, 6 floor insulation, and 10 basement sidewall insulation projects. The following tables shows a sample of instances to illustrate the discrepancies:

**Table 5-4. Attic and Floor Insulation Discrepancies**

Measure	Measure ID	Nicor Gas Data: Pre-Install R Value	ComEd Data Pre-Install R Value	Nicor Gas Data: Post-Install R Value	ComEd Data Post-Install R Value	Project Gross Realization Rate
Attic Insulation	MEA-2018.05.21-5995	3	8	49	54	100%
Attic Insulation	MEA-2018.05.18-5963	3	8	49	54	100%
Attic Insulation	MEA-2018.06.05-8983	4	9	49	54	100%

Source: Nicor Gas tracking data, ComEd tracking data, and Navigant team analysis

**Table 5-5. Attic and Floor Insulation Discrepancies**

Measure	Measure ID	Nicor Gas Data: Pre-Install R Value	ComEd Data Pre-Install R Value	Nicor Gas Data: Post-Install R Value	ComEd Data Post-Install R Value	Project Gross Realization Rate
Floor Insulation	MEA-2018.05.21-5999	3	3.96	11	11	100%
Floor Insulation	MEA-2018.05.18-5966	3	3.96	11	11	100%
Floor Insulation	MEA-2018.06.05-8984	4	3.96	11	11	100%

Source: Nicor Gas tracking data, ComEd tracking data, and Navigant team analysis

**Table 5-6. Basement Sidewall Insulation Discrepancies**

Measure	Measure ID	Nicor Gas Data: Pre-Install R Value Above Ground	ComEd Data Pre-Install R Value Above Ground	Nicor Gas Data: Pre-Install R Value Below Ground	ComEd Data Pre-Install R Value Below Ground	Nicor Gas Data: Post-Install R Value	ComEd Data Post-Install R Value	Project Gross Realization Rate
Basement Sidewall Insulation	MEA-2018.06.12-10894	2	3	3	12.46	11	11	100%
Basement Sidewall Insulation	MEA-2018.07.10-13956	3	4	3	6.44	11	11	100%
Basement Sidewall Insulation	MEA-2018.11.30-36987	1	1	13.69	13.69	1	12	100%

Source: Nicor Gas tracking data, ComEd tracking data, and Navigant team analysis

In the above projects, Navigant found that the implementer used these ComEd data inputs to calculate ex ante savings for Nicor Gas, and the evaluation team did the same.

**Recommendation 7.** Navigant recommends the implementer record pre-install and post-install R values insulation projects consistently across utility data.

## 6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

Navigant followed algorithms outlined in the IL TRM v6.0 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. Navigant calculated verified net savings by multiplying verified gross savings by an NTG of 1.00 which is deemed in the IL TRM v6.0.

Table 6-1 shows the breakdown of the measure count and savings within each Kit type.

**Table 6-1. Kits Measure Counts and Savings**

Kit 1	Therms/Unit	Kits Delivered	Total Verified Therms
Low Flow Faucet Aerator - Bathroom	0.46	74	34
Low Flow Faucet Aerator - Bathroom	0.46	74	34
Low Flow Faucet Aerator - Kitchen	3.53	74	261
Low Flow Showerhead	6.77	74	501
Shower Timer	3.70	74	274
<b>Kit 1 Sub-total</b>	<b>14.93*</b>	<b>74</b>	<b>1,105</b>
Kit 2			
Low Flow Faucet Aerator - Bathroom	0.46	1,011	465
Low Flow Faucet Aerator - Bathroom	0.46	1,011	465
Low Flow Faucet Aerator - Kitchen	3.53	1,011	3,569
Low Flow Showerhead	6.98	1,011	7,057
Low Flow Showerhead	6.98	1,011	7,057
Shower Timer	3.70	1,011	3,741
<b>Kit 2 Sub-total</b>	<b>22.11</b>	<b>1,011</b>	<b>22,353</b>
<b>Total Therms from Kits</b>		<b>1,085</b>	<b>23,458</b>

\* Values do not add to subtotal due to rounding.

Source: Nicor Gas tracking data, ComEd tracking data, and Navigant team analysis

## 7. APPENDIX 2. TOTAL RESOURCE COST DETAIL

Table 7-1, the Total Resource Cost (TRC) variable table, only includes cost-effectiveness analysis inputs available at the time of finalizing the 2018 Income Qualified 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. Detail in this table (e.g., EULs), other than final 2018 savings and program data, are subject to change and are not final.

**Table 7-1. Total Resource Cost Savings Summary for Nicor Gas**

Path	End Use Type	Measure	Units	Quantity	Effective Useful Life (Years)	Ex Ante Gross Savings (Therms)	Verified Gross Savings (Therms)	Verified Net Savings (Therms)
IHWAP	Hot Water	Gas Water Heater - ER	Each	110	13	3,432	3,421	3,421
	Hot Water	Gas Water Heater - TOS	Each	11	13	125	125	125
	Hot Water	HW Pipe Insulation	Linear Feet	1,969	15	1,913	1,914	1,914
	Hot Water	Low Flow Faucet Aerator - Bathroom	Each	307	9	183	183	183
	Hot Water	Low Flow Faucet Aerator - Kitchen	Each	126	9	623	623	623
	Hot Water	Low Flow Showerhead	Each	250	10	1,936	1,936	1,936
	HVAC	Advanced Thermostat	Each	223	10	13,899	14,290	14,290
	HVAC	Gas High Efficiency Boiler - ER	Each	6	25	1,039	1,039	1,039
	HVAC	Gas High Efficiency Boiler - TOS	Each	5	25	137	137	137
	HVAC	Gas High Efficiency Furnace - ER	Each	133	20	18,086	19,494	19,494
	HVAC	Gas High Efficiency Furnace - TOS	Each	54	20	6,542	7,241	7,241
	HVAC	Programmable Thermostat	Each	31	5	1,332	1,409	1,409
	Shell	Air Sealing	Projects	232	15	16,025	15,874	15,874
	Shell	Attic Insulation	Square Feet	192,972	25	7,144	7,144	7,144
	Shell	Basement Sidewall Insulation	Square Feet	39,612	25	7,966	7,966	7,966
	Shell	Floor Insulation	Square Feet	9,376	25	443	443	443
Shell	Wall Insulation	Square Feet	46,737	25	2,926	2,926	2,926	
Kits	Hot Water	Low Flow Faucet Aerator - Bathroom	Each	2,170	9	998	998	998
	Hot Water	Low Flow Faucet Aerator - Kitchen	Each	1,085	9	3,830	3,830	3,830
	Hot Water	Low Flow Showerhead	Each	2,096	10	14,615	14,615	14,615
	Hot Water	Shower Timer	Each	1,085	2	4,015	4,015	4,015

Source: Nicor Gas tracking data and Navigant team analysis.