



# Business Energy Efficiency Rebates Impact Evaluation Report

Energy Efficiency Plan: Plan Year 6 (PY6)  
(6/1/2016-12/31/2017)

Presented to  
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## 1. INTRODUCTION

This report presents the results of the impact evaluation of the Nicor Gas PY6 Business Energy Efficiency Rebates (BEER) program. It presents a summary of the energy impacts for the total program and broken out by relevant measure and program structure details. The appendix presents the impact analysis methodology. PY6 covers June 1, 2016 through December 31, 2017.

## 2. PROGRAM DESCRIPTION

Through the BEER Program, business customers receive incentives for installing new, highly efficient space heating, water heating, pipe insulation and commercial kitchen equipment covered by the program, as well as rebates for other prescriptive cost-effective equipment and services to improve the energy efficiency of existing equipment. The program target market is business customers using 60,000 therms or more per year, with reliance on wholesale and retail trade allies and business trade associations to assist in the marketing of the program to Nicor Gas' end-use customers. In addition, the program offers free assessment and direct install measures such as efficient bathroom and kitchen faucet aerators, pre-rinse sprayers and low flow showerheads. The BEER Program is implemented by CLEARResult.

The program had 959 participants in PY6 and completed 1,296 projects as shown in the following table.

**Table 2-1. PY6 Volumetric Summary**

Participation	Direct Install	Prescriptive	Total
Participants †	41	934	959*
Installed Projects ‡	44	1,266	1,296*
Measures Types Installed	7	39	46

Source: Nicor Gas tracking data and Navigant team analysis.

Totals adjusted to avoid double counting 16 participants that installed prescriptive and direct install projects.

† Participants are defined as unique number of customer business names

‡ Installed Projects are defined as the number of unique project IDs

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

**Table 2-2. PY6 Distributed Measure Quantities**

Measure	Quantity Unit	Installed Quantity
Faucet Aerator - Bath	Each	2,271
Faucet Aerator - Kitchen	Each	24
Outdoor Pool Covers	Each	187
Pre-Rinse Spray Valves	Each	1
Showerheads	Each	870
Spray Valve (Med Sized Restaurants)	Each	5
Boiler Reset Controls	Each	6
Boiler Tune Up, Process	Each	27
Boiler Tune Up, Space Heating	Each	71
Convection Oven	Each	15
Conveyor Oven	Each	6
Direct-Fired Space Heater	Each	9
Fryer	Each	23
High Efficiency Boiler	Each	134
High Efficiency Furnace	Each	429
Infrared Charbroiler	Each	1
Infrared Heaters	Each	161
Infrared Salamander Broiler	Each	2
Modulating Dryers	Each	156
Ozone Laundry	Each	6
Pipe Insulation	Ln Ft	231,480
Small Pipe Insulation	Ln Ft	1,146
Programmable Thermostat	Each	377
Rack Oven - Single	Each	1
Rack Oven - Double	Each	1
Steam Trap	Each	4,187
Storage Water Heater	Each	8

Source: Nicor Gas tracking data and Navigant team analysis.

### 3. PROGRAM SAVINGS SUMMARY

Table 3-1 summarizes the energy savings the BEER program achieved by path in PY6.

**Table 3-1. PY6 Annual Energy Savings Summary**

Program Path	Ex Ante Gross Savings (therms)	Verified Gross RR†	Verified Gross Savings (therms)	NTGR‡	Verified Net Savings (therms)
Direct Install	68,924	77%	52,805	0.68	35,907
Prescriptive	8,302,665	101%	8,352,072	0.68	5,679,408
<b>Total</b>	<b>8,371,589</b>	<b>100%</b>	<b>8,404,877</b>	<b>0.68</b>	<b>5,715,315</b>

Source: Nicor Gas tracking data and Navigant team analysis.

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

‡ Net-to-Gross Ratio (NTGR) is the ratio of verified net savings to verified gross savings. The NTGR is a deemed value. Source: Nicor\_Gas\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the Illinois SAG web site: <http://ilsag.info/net-to-gross-framework.html>.

## 4. PROGRAM SAVINGS BY MEASURE

The program includes 27 measure types as shown in the following table. Pipe insulation and steam trap measures contributed the most savings.

**Table 4-1. PY6 Annual Energy Savings by Measure**

Research Category	Ex Ante Gross Savings (therms)	Verified Gross RR	Verified Gross Savings (therms)	NTGR	Verified Net Savings (therms)
Faucet Aerator - Bath	56,270	71%	39,743	0.68	27,026
Faucet Aerator - Kitchen	179	328%	587	0.68	399
Outdoor Pool Covers	189	100%	189	0.68	128
Pre-Rinse Spray Valves	74	100%	74	0.68	50
Showerheads	11,352	100%	11,352	0.68	7,719
Spray Valve (Med Sized Restaurants)	860	100%	860	0.68	585
Boiler Reset Controls	2,101	105%	2,508	0.68	1,705
Boiler Tune Up, Process	182,958	100%	182,958	0.68	124,412
Boiler Tune Up, Space Heating	119,769	100%	119,769	0.68	81,443
Convection Oven	4,590	100%	4,590	0.68	3,121
Conveyor Oven	7,330	100%	7,330	0.68	4,984
Direct-Fired Space Heater	32,358	100%	32,462	0.68	22,074
Fryer	25,755	100%	25,755	0.68	17,513
High Efficiency Boiler	179,745	100%	179,746	0.68	122,227
High Efficiency Furnace	111,107	100%	111,107	0.68	75,553
Infrared Charbroiler	661	100%	661	0.68	449
Infrared Heaters	72,611	100%	72,611	0.68	49,375
Infrared Salamander Broiler	479	100%	478	0.68	325
Modulating Dryers	42,025	100%	42,034	0.68	28,583
Ozone Laundry	381,389	100%	381,422	0.68	259,367
Pipe Insulation	1,830,917	102%	1,871,625	0.68	1,272,705
Small Pipe Insulation	120	96%	115	0.68	78
Programmable Thermostat	9,957	99%	9,849	0.68	6,698
Rack Oven - Double	2,064	100%	2,064	0.68	1,404
Rack Oven - Single	1,034	100%	1,034	0.68	703
Steam Trap	5,294,917	100%	5,303,176	0.68	3,606,160
Storage Water Heater	778	100%	778	0.68	529
<b>Total</b>	<b>8,371,589</b>	<b>100%</b>	<b>8,404,877</b>	<b>0.68</b>	<b>5,715,315</b>

Source: Nicor Gas tracking data and Navigant team analysis.

## 5. IMPACT ANALYSIS FINDINGS AND RECOMMENDATIONS

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.

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

Measure	Unit Basis	Ex Ante Gross (therms per unit)	Verified Gross (therms per unit)	Realization Rate	Data Source(s)
Faucet Aerator - Bath	Each	6.10	Varies	228%	IL TRM v5.0*, 4.3.2
Faucet Aerator – Bath Laminar	Each	35.43	Varies	55%	IL TRM v6.0*, 4.3.2
Faucet Aerator - Kitchen	Each	7.44	24.45	328%	IL TRM v5.0, 4.3.2
Outdoor Pool Covers	Each	1.01	1.01	100%	IL TRM v5.0, 4.3.4
Pre-Rinse Spray Valves	Each	73.68	73.68	100%	IL TRM v5.0, 4.2.11
Showerheads	Each	Varies	Varies	100%	IL TRM v5.0, 4.3.3
Spray Valve (Med Sized Restaurants)	Each	171.92	171.92	100%	IL TRM v5.0, 4.2.11
Boiler Reset Controls	Each	Varies	Varies	105%	IL TRM v5.0, 4.4.4
Boiler Tune Up, Process	Each	Varies	Varies	100%	IL TRM v5.0, 4.4.3
Boiler Tune Up, Space Heating	Each	Varies	Varies	100%	IL TRM v5.0, 4.4.2
Convection Oven	Each	306	306	100%	IL TRM v5.0, 4.2.5
Conveyor Oven	Each	733.00	733.00	100%	IL TRM v5.0, 4.2.4
Direct-Fired Space Heater †	Each	Varies	Varies	100%	CLEAResult Workpaper <sup>1</sup>
Fryer	Each	505	505	100%	IL TRM v5.0, 4.2.7
High Efficiency Boiler	Each	Varies	Varies	100%	IL TRM v5.0, 4.4.10
High Efficiency Furnace	Each	Varies	Varies	100%	IL TRM v5.0, 4.4.11
Infrared Charbroiler	Each	661.00	661.00	100%	IL TRM v5.0, 4.2.12
Infrared Heaters	Each	451.00	451.00	100%	IL TRM v5.0, 4.4.12
Infrared Salamander Broiler	Each	239.00	239.00	100%	IL TRM v5.0, 4.2.14
Modulating Dryers	Each	Varies	Varies	100%	IL TRM v5.0, 4.8.4
Ozone Laundry	Each	Varies	Varies	100%	IL TRM v5.0, 4.3.6
Pipe Insulation	Each	Varies	Varies	102%	IL TRM v5.0, 4.4.14
Small Pipe Insulation	Each	Varies	Varies	96%	IL TRM v5.0, 4.4.24
Programmable Thermostat	Each	Varies	Varies	99%	IL TRM v5.0, 4.4.18
Rack Oven - Double	Ln Ft	2,064.00	2,064.00	100%	IL TRM v5.0, 4.2.18
Rack Oven – Single ‡	Ln Ft	1,034.00	1,034.00	100%	Nicor Gas Tracking Data
Steam Trap	Each	Varies	Varies	100%	IL TRM v5.0, 4.4.16
Storage Water Heater	Each	Varies	Varies	100%	IL TRM v5.0, 4.3.1

Source: Nicor Gas tracking data and Navigant team analysis.

\* State of Illinois Technical Reference Manual version 5.0 from <http://www.ilsag.info/technical-reference-manual.html>.

† This measure is not included in version 5 of the TRM. Navigant used State of Illinois Technical Reference Manual version 6.0 from <http://www.ilsag.info/technical-reference-manual.html> to calculate verified savings.

‡ This measure does not correspond to a TRM measure. Claimed savings were reasonable.

<sup>1</sup> CLEAResult Work Paper - High Efficiency Unit Heaters\_Rev3



## Faucet Aerators

The ex ante savings for the direct install bathroom and kitchen aerators were based on the TRM (v5.0), applicable for GPY6, and assumed average 5,000 gallons water usage. The savings assumptions for bathroom laminar aerators or laminar flow restrictors (LFR) were based on a workpaper developed by CLEAResult since the measure savings were not characterized in the TRM (v5.0). That workpaper was later adopted into TRM v6.0 to characterize the measure. The verified savings are based on TRM (v6.0). In the tracking data, sometimes the building type 'Hospital – FCU' has a usage based off building type "health" and other times it is based off building type "other". Navigant determined that it is appropriate to use the building type specific usage values for consistency across the measures.

This finding was presented in the early impact memo and one that Nicor Gas already stated they plan to act on. The agreed upon recommendation is repeated below.<sup>2</sup>

**Recommendation 1:** Consider using building type specific usage values to estimate savings, or use "other" if building type is not listed in the TRM.

## Boiler Reset Controls

For boiler reset controls, there is one measure in which savings are calculated incorrectly. Navigant believes this is due to an error in the quantity. PRJ-1655094 has ex ante savings of 135.7 therms and a quantity of four boilers with 125 MBH capacity, according to the tracking database. The TRM deems savings of 135.7 therms per unit for these boilers. After checking with Nicor Gas, Navigant used the quantity of four boilers to determine that the overall savings for this measure should be 543 therms.

**Recommendation 2:** Revise the program quality assurance and quality control processes to ensure that supplemental heating load information collected from customers is consistent with the generated project savings.

## Convection and Conveyor Ovens

The ex ante savings for commercial ovens is 306 therms per unit, which is a deemed value from an example calculation in the TRM (v5.0). Navigant did not adjust the savings but observed the savings could be higher if Nicor Gas used the application-collected EffENERGYSTAR efficiency values provided in the tracking system. In calculating the  $\Delta$  Daily Cooking Energy, defined as equal to  $(LB * E_{FOOD} / Eff_{Base}) - (LB * E_{FOOD} / Eff_{ENERGYSTAR})$ , the tracking data provides the collected EffENERGYSTAR efficiency values, but defaults to a deemed value of 0.44 in the savings calculation. Navigant did not change this assumption, but we have observed that the average collected efficiency values from GPY4 to GPY6 (0.51- 0.54 range) have been higher than the deemed value and has the potential to increase the measure savings (up to eight percent more based on the data reviewed).

Also, the TRM calculation for the  $\Delta$ DailyIdleEnergy savings input was 49,286 BTU. The correct calculation is shown below which should produce 48,900 BTU. This is a minor change which could reduce the savings slightly. Navigant will recommend the IL TRM Technical Advisory Committee (TAC) update the TRM.

$$\begin{aligned}
 \Delta \text{DailyIdleEnergy} &= (\text{IdleBase} * \text{IdleBaseTime}) - (\text{IdleENERGYSTAR} * \text{IdleENERGYSTARTime}) \\
 &= (18,000 * 10.3) - (13,000 * 10.5) \\
 &= 185,400 - 136,500 \\
 &= 48,900 \text{ Btu}
 \end{aligned}$$

<sup>2</sup> Nicor Gas GPY6 BEER Tracking Database Review Interim Memo-2017-11-01.docx, sent November 1, 2017 by Kevin Grabner via email.

These findings were presented in the early impact memo. Nicor Gas previously stated they agree and plan to act on Recommendation 3 and will review Recommendation 4. These findings are presented below.

**Recommendation 3:** The measure gross savings realization rate was maintained as 100 percent. The  $\Delta$ DailyIdleEnergy input value was not changed in the savings verification with the understanding that the TRM deemed the 49,286 BTU value. We recommend, however, that when Nicor Gas finds potential errata in the TRM, it should be brought to the attention of the TAC and evaluation team in advance for recommendation.

**Recommendation 4:** Nicor Gas should provide documentation of the test conducted (utilizing ASTM Standard F1496) to measure custom or actual EffENERGYSTAR heavy load efficiency values. Verification of the custom values in the tracking system could increase the measure savings.

The program claims 1,466 therms for the double deck Conveyor Ovens (<25 in) with model number PS670, which is consistent with deemed 733 therms per unit (deck). This assumes a quantity of two for savings calculation, although the quantity field in the tracking data is one measure.

**Recommendation 5:** Provide additional notes in the tracking system for instances where, due to equipment configuration, the quantity field in the tracking database differs from the quantity used for savings estimates.

### Fryer

The ex ante savings is 505 therms per fryer. CLEARResult's approach to claiming savings on this measure was to use TRM-deemed values for efficiency and the collected number of vats as inputs to the algorithm. However, the tracking system does not provide the assumptions for the number of vats per fryer for standard width, as well as the large vat fryers. As a result, some of the line items have gross savings in multiples of 505 therms, while the quantity for each line item is only listed as one.

Also, in calculating the  $\Delta$  Daily Cooking Energy, defined as;

$$= (LB * EFOOD/ EffBase) - (LB * EFOOD/ EffENERGYSTAR),$$

The tracking data provides the collected EffENERGYSTAR efficiency values, but defaults to a deemed value of 0.50 in the savings calculation. Navigant did not change this assumption, but we have observed that the average collected efficiency values from GPY4 to GPY6 (0.59 - 0.63 range) has been higher than the deemed value, and has the potential to increase the measure savings.

**Recommendation 6:** Provide documentation of the test conducted (utilizing ASTM Standard F1361 or F2144) to measure custom or actual EffENERGYSTAR heavy load cooking energy efficiency values. Verification of the custom values in the tracking system could increase the measure savings.

Navigant requested that CLEARResult provide additional documentation of the number of vats per fryer. CLEARResult stated that "The number of vats currently resides in the "Number of Pans" field in the tracking data. CLEARResult also collects Quantity as number of fryers, this structure allows CLEARResult to collect information on multiple fryers on the same line item." However, this field was not included in the tracking data provided to Navigant. The following table lists the fields that were provided to Navigant for this measure.

**Table 5-2. Tracking Data Fields for Fryer**

Tracking Data Fields		
ICName	BaselineProductionCapacity	ASTMEnergyToFood
ProgramName	OperationHoursDay	ΔDailyIdle Energy
ProgramYear	OperationDaysYear	ΔDailyCooking Energy
VendorProjectID	Size	InstallationDate
ReportingReferenceDate	DeemedTherm Savings	PurchaseDate
MeasureName	ENERGYSTAR EquipmentNumberOfPreheats PerDay	TotalMeasureCost (Labor + Materials)
Quantity	BaselineNumberOfPreheatsPerDay	IncrementalCost
MeasureID_IC	ENERGYSTARPreheatTime	RebateUnitOfMeasure
ExternalRebateProcessorID	BaselinePreheatTime	SavingsUnitofMeasure
Manufacturer	ENERGYSTARPreheatRate	IncentiveNicor
Model	BaselinePreheatRate	GrossAnnualThermSavings
MeasureLife	ENERGYSTARIdleEnergyRate	NTGRatioMeasure
PostInstallationEfficiency	BaselineIdleEnergyRate	NetAnnualThermsMeasure
BaselineEfficiency	ENERGYSTARIdleTime	Incentive Cost
CapacityNewEquipment	BaselineIdleTime	Incentive Paid Date

Source: Navigant analysis of tracking data.

**Recommendation 7:** Provide an additional field in the tracking data with the number of pans.

## Pipe Insulation

For pipe insulation, Navigant found that some inputs required to reproduce the pipe insulation savings calculation were not in the tracking system. As shown in Table 5-3, some projects have ex ante savings based on year-round recirculation, but the tracking system did not indicate if a specific project has year-round recirculation, seasonal recirculation or non-recirculation systems. It is unclear in some cases what the basis was for the EFLH value used to calculate ex ante savings. Navigant asked the implementer to provide their basis for choosing the EFLH assumption and was told the program requires the customer to provide information on their heating recirculation type on the application. In instances where the customer omitted this detail, Nicor Gas would reach out to the customer to collect this information. At Navigant’s request for a sample, Nicor Gas provided application information demonstrating their data collection. The project application materials confirmed the recirculation system as heating season only.

In the case for ½-inch and ¾-inch pipe insulation, the therm savings per foot calculations were not consistent with the building types and climate zone information in the tracking database. Nicor Gas has indicated that changes will be made to the tracking database for the coming program year.

For Indoor HW Space Heat and DHW pipe insulation, Navigant verified the savings using the specific savings input provided in the tracking system. There was some difference in the verified savings, which appears due to rounding. Navigant presented our savings calculation approach to Nicor Gas to enable them to correct any error that may exist in the tracking system. For outdoor LPS pipe insulation (process heat), the ex ante calculation used steam trap high pressure (HP) hours of use of 8,282, but the value was not tracked. Navigant used 8,282 hours and a TRF of 1.0 for outdoor, which produced 69.58 therms/ln.ft., which is 112 percent gross realization rate.

For dry cleaner pipe insulation, the ex ante savings used a custom calculation with a 0.4 thermal regain factor (TRF), based on a weighted average of 70 percent indoor (TRF=0.15) and 30 percent indoor unconditioned space (TRF = 1) based on hours of use during heating season. This value is acceptable, but it should be documented.

**Table 5-3. Pipe Insulation Savings Input Parameters Review**

Savings Input Parameter	Ex Ante Therms/Unit	Verified Therms/Unit	RR	Evaluation Findings Recommended Value
Pipe Insulation, Indoor HW Space Heat	Varies	Varies	99%	Rounding adjustments based on using TRM deemed inputs. Navigant presented analysis approach to CR to correct tracking errors.
Pipe Insulation - Dry Cleaner	4.351	4.351	100%	Ex ante used custom 2,425 hours from steam traps TRM section, and custom TRF 0.4. Acceptable, but not documented in the tracking system.
Pipe Insulation, Indoor HPS Process Heat	26.01	26.01	100%	Ex ante used steam trap high pressure (HP) hours of 8,282. Acceptable, but not documented in the tracking system.
Pipe Insulation, Indoor LPS Space Heat	Varies	Varies	100%	Tracks only EFLH for seasonal heating projects. Does not track 8,766 hours for projects with savings based on a year-round recirculation system.
Pipe Insulation, Indoor Hot Water DHW	3.51	3.55	101%	Savings for DHW pipe was based on deemed 8,766 hours, but value was not tracked. Using TRM deemed inputs, evaluated calculated 3.55 therms/in.ft. Differences may be due to rounding.
Small Pipe Insulation, 1/2, Indoor Space Heat	Varies	Varies	100%	Ex ante therms per foot are not consistent with the building type and climate information in the tracking database. Navigant calculated deemed values for 1/2 foot pipe based on building type and climate zone provided in the tracking database.
Small Pipe Insulation, 3/4, Indoor Space Heat	0.104	0.098	94%	Ex ante therms per foot is not consistent with the building type and climate information in the tracking database. Navigant calculated deemed values for 3/4 foot pipe based on building type and climate zone provided in the tracking database.
Pipe Insulation, Outdoor LPS Process Heat	62.03	69.58	112%	Ex ante therms used steam trap high pressure (HP) hours of 8,282, but value is not tracked. It is not clear what TRF value was used although 0.7 was reported. Navigant used 8282 hours and TRF of 1.0 for outdoor.
Pipe Insulation, Indoor MPS Space Heat	4.51	4.51	100%	Savings based on year-round recirculation, but tracking system does not describe or track 8,766 hours.

Source: Navigant analysis of tracking data.

**Recommendation 8:** Update the tracking system to ensure all inputs to reproduce the pipe insulation savings calculation are tracked. Indicate when each project and heating system has year-round recirculation, seasonal recirculation, or non-recirculating configuration, and track the

associated EFLH values from the TRM. Ensure savings are consistent with building type and climate zone. Track the steam system hours of use for the LPS, MPS, and HPS pipe insulation.

**Recommendation 9:** Correct the ex ante estimates for indoor HW Space Heat and DHW pipe insulation using the verified savings per unit values, which are based on specified TRM savings inputs provided in the tracking system. Track the custom calculated 0.4 TRF for dry cleaner pipe insulation.

## Programmable Thermostat

For small commercial programmable thermostats, the fields provided did not match the variables defined in the TRM. In reviewing the fields and TRM, Navigant believes the data provided is for the variables in the TRM, but are mislabeled in the tracking data. Table 5-4 shows the tracking data field and the assumed tracking column mapping (TRM variable name). Nicor Gas also clarified that for the baseline case and efficient ("proposed") case, fan mode during the occupied period is continuous, but during the unoccupied period the baseline case is continuous, and the efficient case is intermittent.

**Table 5-4. Mapped Programmable Thermostat Variable Names**

Tracking Data Variable Name	Tracking Column Mapping (TRM Variable Name)
BaselineNumberOfPreheatsPerDay	Fan Mode Baseline (Tc)
ENERGYSTARPreheatTime	Temperature setback baseline (Th)
BaselinePreheatTime	Weekly hours baseline (Ws)
ENERGYSTARPreheatRate	Fan mode efficient (Tc)
BaselinePreheatRate	Temperature setback efficient (Th)
ENERGYSTARIdleEnergyRate	Weekly hours efficient (Ws)
BaselineIdleEnergyRate	Heating Output Capacity
ENERGYSTARIdleTime	Baseline Energy Use
Measure Notes	TRM Building Type
Energy Star Equip # of preheats/day	Climate Zone Coefficient (CZ)
BaselineIdleTime	Proposed Energy Use

Source: Navigant analysis of tracking data.

**Recommendation 10:** The thermostat data field mapping to existing data columns of other measures is confusing, although Navigant understands the marginal benefit versus cost of expanding the tracking system to accommodate the large number of variables required by some TRM measures with low rebate volume. To facilitate timely evaluations<sup>3</sup>, Nicor Gas should consider creating separate data fields for programmable thermostats.

<sup>3</sup> Where tracking data is well structured to match TRM measure calculations, Navigant can automate a measure verification check during the mid-year measure review that reduces time required for the end of year final verification.

## Steam Traps

There are inconsistencies in the steam trap ex ante savings calculations, comparing the tracking database and the TRM deemed values. Table 5-5 below outlines the tracking inputs compared to the deemed and verified inputs for the steam trap measures. Navigant recommends updating the tracking system inputs to match the claimed savings. Key recommended actions are provided below.

**Table 5-5. Steam Trap Savings Input Parameters Review**

Steam Trap Application	Savings Input Parameter	Tracking Value	Ex Ante Savings Value	TRM Deemed Value	Verified & Recommended Value
Dry Cleaner	Steam Loss Per Trap	19.05	19.10	19.10	19.10
	Boiler Efficiency (%)	0.80	0.80	0.807	Use deemed (0.807)
	Hours of Use	Custom values	Use deemed (2425)	2425	Use deemed (2425)
	Leaking & blow-thru factor	1.0	1.0	1.0 (audited)	1.0 (audited)
Commercial, HVAC	Steam Loss Per Trap	6.9	6.9	6.9	6.9
	Boiler Efficiency (%)	0.80	0.80	0.807	0.807
	Hours of Use	Custom (4040)	Custom Value	Deemed by climate zone	Use deemed by climate zone
	Leaking & blow-thru factor	0.27	1.0	0.27 (unaudited)	0.27 (unaudited)
Industrial Systems	Steam Loss Per Trap	Varies	Use deemed, but savings unclear	Deemed Varies	Use deemed
	Boiler Efficiency (%)	0.80	0.80	0.807	0.807
	Hours of Use	Custom values	Use custom or deemed	Deemed. Varies	Use custom or deemed (where custom not known)
	Leaking & blow-thru factor	1.0	1.0	1.0 (audited)	1.0 (audited)

Source: Navigant analysis of tracking data.

This finding was presented in the early impact memo<sup>4</sup> and one that Nicor Gas stated they plan to act on. The agreed upon recommendations are repeated below.

**Recommendation 11:** For dry cleaner steam traps, update the tracking system to use the deemed steam loss value of 19.1 b/hr/trap, and the deemed boiler efficiency value to 80.7 percent. Since the deemed value of 2,425 hours is used rather than the tracked custom values, Nicor Gas should indicate or track the deemed value.

**Recommendation 12:** For commercial (HVAC) steam traps, update the tracking system to use the deemed 80.7 percent boiler efficiency value. It appears the steam traps were not audited, hence the tracking 0.27 Leaking & blow-thru factor should be applied to adjust the savings. The hours of use should be based on deemed values by climate zone. The source of the custom ex ante value of 4,040 hours for all projects was a PY4 savings assumption.<sup>5</sup>

**Recommendation 13:** For industrial steam traps, provide documentation to allow evaluators to reproduce the ex ante savings. Using the same tracking input values and hours (custom or

<sup>4</sup> Nicor Gas GPY6 BEER Tracking Database Review Interim Memo-2017-11-01.docx

<sup>5</sup> Assumes commercial hours of operation determined by the regional weighted average (60% Zone 1; 30% Zone 2; and 10% Zone 3) of the Space Heating EFLH values (Source: supplemental file titled "PY4 Savings Methodology, received Nicor Gas on 6-02-2016)



deemed), the verified savings do not match ex ante savings for several projects (e.g. projects PRJ-1234977, PRJ-1235645, and PRJ-1256793).

**Recommendation 14:** Review the reliability of the collected custom hours of use values; otherwise, default to the TRM deemed 8,282 hours value. Twelve percent of the projects report HOU under 5,000 hours. As these are industrial sites, Navigant recommends reviewing the applications to ensure that large sites are not under reporting hours of use and causing a decrease in savings.

## Storage Water Heater

The tracking system did not provide the “HotWaterUse” input in gallons or the rated volume and the rated standby loss of new water heater (Btu/hr) needed to verify the ex ante savings. It was not clear which of the two choices of savings assumptions in the TRM (either consumption per usable storage tank capacity or consumption per unit area by building type) were used to estimate savings. However, Navigant used the first method and using the heating capacity and equipment model number provided in the tracking system, we were able to determine the rated volumes and consumption per usable capacity. We then calculated the natural gas savings and the standby losses (the installed storage water heaters >75,000 Btu/h can claim additional savings due to lower standby losses). We determined that the claimed savings were reasonable but recommend updates to the tracking system. This finding was presented in the early impact memo<sup>6</sup> and one that Nicor Gas stated they plan to act on for 2018. The updated recommendation is presented below.

**Recommendation 15:** Navigant acknowledges Nicor Gas is now including the rated volume in gallons of heating equipment in the tracking system to enable calculation of HotWaterUse input for the savings calculation. Navigant recommends that Nicor Gas consider including rated standby loss (Btu/hr) for a more accurate application of inputs to the savings calculation for storage water heaters.

## Strategic Energy Management Process Evaluation Finding

Navigant interviewed participants in the Nicor Gas PY6 Strategic Energy Management (SEM) Program as part of the process evaluation for that program. SEM encourages participants to participate in the utilities’ rebate programs and purchase energy efficient equipment. However, some of the participants were unable to receive rebates due to the rebate application requirements. Large manufacturing facilities have limited time to purchase and install new equipment making it difficult to receive rebate approval for the new equipment prior to purchasing. The following recommendation was drawn from a summary findings memo<sup>7</sup> Navigant produced for the PY6 SEM process evaluation:

**Recommendation 16:** Conduct a review of the BEER Program application process and requirements, and if possible, streamline it for customers participating in the SEM Program. Allowing these customers streamlined access to the rebate programs will allow Nicor Gas to capture the energy savings they influenced.

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<sup>6</sup> Nicor Gas GPY6 BEER Tracking Database Review Interim Memo-2017-11-01.docx

<sup>7</sup> ComEd and Nicor Gas EPY9/GPY6 Strategic Energy Management Process Evaluation Memo (2018-09-04).

## 6. APPENDIX 1. IMPACT ANALYSIS METHODOLOGY

### Verified Gross Program Savings Analysis Approach

Navigant determined verified gross savings for each program measure by conducting a tracking system review. Navigant used the Illinois TRM Version 5.0 methodology to calculate verified gross savings. When a measure was not included in Version 5.0 of the TRM, Navigant used the State of Illinois Technical Reference Manual version 6.0.

### Verified Net Program Savings Analysis Approach

Navigant calculated verified net energy savings by multiplying the verified gross savings estimates by a net-to-gross ratio (NTGR). In PY6, the NTGR estimates used to calculate the net verified savings were based on past evaluation research and defined by a consensus process through SAG, as documented in a spreadsheet.<sup>8</sup>

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<sup>8</sup> Source: Nicor\_Gas\_GPY6\_NTG\_Values\_2016-02-29\_Final.xlsx, which is to be found on the IL SAG web site here: <http://ilsag.info/net-to-gross-framework.html>



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

The Total Resource Cost (TRC) variable table only includes cost-effectiveness analysis inputs available at the time of finalizing this PY6 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 evaluation later. Detail in this table (e.g., EULs) other than final PY6 savings and program data are subject to change and are not final.

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

Research Category	Units	Quantity	Effective Useful Life (years)	Ex Ante Gross Savings (therms)	Verified Gross Savings (therms)	Verified Net Savings (therms)
Faucet Aerator - Bath	Each	2,271	9	56,270	39,743	27,026
Faucet Aerator - Kitchen	Each	24	9	179	587	399
Outdoor Pool Covers	Each	187	6	189	189	128
Pre-Rinse Spray Valves	Each	1	5	74	74	50
Showerheads	Each	870	10	11,352	11,352	7,719
Spray Valve (Med Sized Restaurants)	Each	5	5	860	860	585
Boiler Reset Controls	Each	6	20	2,101	2,508	1,705
Boiler Tune Up, Process	Each	27	3	182,958	182,958	124,412
Boiler Tune Up, Space Heating	Each	71	3	119,769	119,769	81,443
Convection Oven	Each	15	12	4,590	4,590	3,121
Conveyor Oven	Each	6	17	7,330	7,330	4,984
Direct-Fired Space Heater	Each	9	15	32,358	32,462	22,074
Fryer	Each	23	15	25,755	25,755	17,513
High Efficiency Boiler	Each	134	20	179,745	179,746	122,227
High Efficiency Furnace	Each	429	17	111,107	111,107	75,553
Infrared Charbroiler	Each	1	12	661	661	449
Infrared Heaters	Each	161	12	72,611	72,611	49,375
Infrared Salamander Broiler	Each	2	12	479	478	325
Modulating Dryers	Each	156	14	42,025	42,034	28,583
Ozone Laundry	Each	6	10	381,389	381,422	259,367
Pipe Insulation	Ln Ft	232,626	15	1,831,037	1,871,740	1,272,783
Programmable Thermostat	Each	377	4	9,957	9,849	6,698
Rack Oven	Each	2	12	3,098	3,098	2,107
Steam Trap	Each	4,187	6	5,294,917	5,303,176	3,606,160
Storage Water Heater	Each	8	15	778	778	529
<b>Total</b>			<b>9</b>	<b>8,371,589</b>	<b>8,404,877</b>	<b>5,715,315</b>

Source: Navigant analysis of tracking data.