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Energy Efficiency
Nicor Gas Plan Year 2
(6/1/2012-5/31/2013)

Evaluation Report:
Emerging Technologies Program

Presented to:
Nicor Gas Company

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FINAL

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E. Executive Summary

The goal of this report is to present a summary of the findings and results from the evaluation of Nicor Gas' Rider 30 2012-13 Energy Efficiency Emerging Technology Program (ETP). The ETP's objective is to "identify emerging technologies and/or practices that are new or underutilized and have the potential for energy savings and possible future integration into the Nicor Gas energy efficiency programs. ETP will achieve energy savings while being transparent, cost-effective, scalable, and developing the needed data to transition measures into" Nicor Gas's Energy Efficiency Program (EEP).[1] This evaluation report includes both a process evaluation and an impact evaluation.

E.1 Evaluation Objectives

The primary objective of the impact evaluation is to identify strengths and weaknesses of the pilot assessment therm-savings verification processes and confirm the reported therm savings. Due to the nature of this program, there are no established goals for energy savings or program participation. As such, the evaluation does not compare the energy savings achieved by the ETP to any targets, but rather focuses on the approaches and methodologies used to determine savings for each selected pilot assessment. The primary objective of the process evaluation is to determine key process-related program strengths and weaknesses and help program designers and managers improve the identification, screening, vetting and transfer of emerging technologies to programs.

E.2 Evaluation Methods

The evaluation team collected data through a comprehensive review of the ETP planning documentation (including operating manuals and tracking systems), and through in-depth interviews with the program administrator and the implementation contractors. The interviews helped put the impact evaluation data into context and were the basis for the process evaluation. In addition to prepared questions, the interviews allowed for a free-flowing conversation between the evaluation team and interviewees in order to pursue relevant issues raised during the discussion.

For the impact evaluation, Navigant evaluated gross savings by conducting an engineering desk review of the ETP's two projects that are not claimed by other EE programs and will, therefore, have ETP-attributable savings in GPY2:

- #1003 Multi-family Demand Controls for Central Domestic HW Systems (hereafter, On-Demand Controls); and
- #1001 High Efficiency Commercial Rooftop Units (RTUs) (hereafter, Condensing RTU).

Navigant reviewed both pilot assessment analyses for accuracy and completeness. The evaluation verified that the ETP used appropriate algorithms, methods, and data sets in determining both the therms saved in GPY2 as well as the projected annual savings for each technology (verified savings). These values only differ because the pilot-assessment equipment was not in place for a complete year of operation. During the review Navigant compared calculation parameters to assumptions. Aggregate

[1] ETP Project Implementation Guidelines document: "Nicor ETP Project Implementation Guidelines Final to WECC 03-29-12.docx," received via email.

savings of the individual measures comprise ETP gross savings. Navigant compared the IC's *Ex Ante* gross savings to the evaluator's research-findings gross savings to confirm whether the results matched and that the algorithm was appropriate.

Navigant's engineering desk review verified that the ETP adequately documented the:

- Basis for establishing the project's baseline;
- Engineering algorithm used to calculate gas consumption and savings relative to the baseline;
- Implemented calculations to determine GPY2 (Partial-Year) savings; and
- Implemented calculations to determine verified net savings.

E.3 Key Findings and Recommendations

Table E-1 documents the verified net therm savings for the ETP in GPY2.[2] Table E-2 documents the therm savings from the two individual pilot assessment projects: the condensing RTU and on-demand controls. See Appendix 5.1 for a discussion of terminology.

Table E-1. ETP Verified Net Therm Savings Summary

Verified Measures Installed	*Ex Ante* Gross Savings (Therms)	Realization Rate	Verified Gross Savings (Therms)	Net-to-Gross Ratio	Verified Net Savings (Therms)
4	8,734	99%	8,714	1.0	8,714

Table E-2 ETP Verified Net Therm Savings by Measure

Measure	Unit	*Ex Ante* Measures Installed	Verified Measures Installed	Ex-Ante Gross Savings (Therms)	Realization Rate	Verified Gross Savings (Therms)
Condensing RTU	System	2	2	4,597	99%	4,577
On-Demand Controls	System	2	2	4,137	100%	4,137
	Total:	4	4	8,734	100%	8,714

The evaluation team also identified the following key findings and recommendations:

- ***HDD temperature basis***
  Finding: The ETP projection for annual energy consumption for the condensing RTU was based on the annual heating degree days (HDD) using a 65°F basis. Review of a plot of gas consumption versus HDD shows that using a basis at a lower temperature may be more appropriate for this projection.

[2] The ETP assumes a net-to-gross ratio (NTG) of 1.0 for emerging technologies, thus *ex post* net savings equals *ex post* gross savings.

Recommendation: The evaluation team recommends that the ETP consider revising the condensing RTU calculations using an HDD60 basis for RTU1 and HDD63 basis for RTU2. While the impact is small in this case, adjustment of the HDD basis is an important component of any heating-measure analysis that should not be overlooked. For measures that rely on regression analysis of the HDD data, this is particularly important.

- ***Output KPIs***
  Finding: The ETP currently tracks the "Gas Savings Potential for Action Plans Presented to the Technical Review Committee in GPY2" (Output KPI 5) on a per unit basis, rather than on a territory-wide basis.
  Recommendation: The evaluation team recommends that the ETP consider adding analysis and tracking of this KPI on a territory-wide basis. Understanding the potential size of the energy savings opportunity across the entire Nicor Gas territory is one of many important factors in determining the value of the technology to Nicor Gas's portfolio. Given the ETP's scope of responsibility, the analysis can be relatively streamlined and should be based on the savings estimates for the technology, the applicable types of buildings/businesses for this technology, and basic data about quantity and size of buildings in the Nicor Gas territory. The level of available detail in Nicor Gas's customer building data should determine the level of detail in the territory-wide energy savings potential analysis. The intent is not to conduct a comprehensive energy-efficiency savings potential for each technology, but rather to provide an estimate of the size of the market opportunity for Nicor Gas.

- ***Spreadsheet quality control and documentation***
  Finding: During the engineering desk review for the on-demand controls pilot assessment, the evaluation team identified three spreadsheet errors which impacted the pilot assessment results. The evaluation team notified ETP so that they could promptly correct the errors.
  Recommendation: The evaluation team recommends that the ETP implement a simple process for detailed quality-control review of pilot assessment spreadsheets. Such a review process need not be onerous and by its very nature should encourage proliferation of best practices, thereby reducing the quality-control burden over time and improving work quality.

- ***Valuable improvements since GPY1***
  Finding: The evaluation team found valuable improvements in the ETP's technology evaluation processes. In GPY2, the ETP learned valuable lessons during implementation of their pilot assessment and technology transitioning processes. These lessons have led to process refinements that will promote continued program success in GPY3.

- ***Work paper submission deadline***
  Finding: The ETP has faced hurdles due to the submission deadline for work papers. The deadline is in January each year and falls in the middle of heating season, when gas technologies are often being field tested.
  Recommendation: The evaluation team recommends that ETP identify an optimal timeline for work paper submission and work with Nicor Gas to determine a potential pathway for changing the submission deadline. Moving this deadline will eliminate conflict with heating technology testing and coincide better with natural pilot assessment cycles.

1. Introduction to the Program

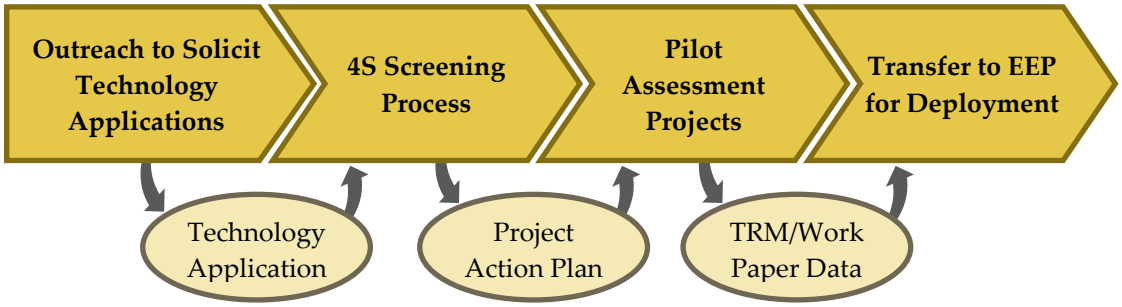
1.1 Program Description

The Nicor Gas Energy Efficiency Program's Emerging Technology Program (ETP) is designed to identify energy efficient emerging technologies or practices (i.e., measures) that Nicor Gas can incorporate into their Energy Efficiency Program (EEP) to achieve greater program savings and provide better value to their customers. The program's stated objective is to:

> "Identify emerging technologies and/or practices that are new or underutilized and have the potential for energy savings and possible future integration into the Nicor Gas energy efficiency program (EEP). ETP will achieve energy savings while being transparent, cost-effective, scalable, and developing the needed data to transition measures into the EEP."

The ETP finds potential energy-saving technologies by soliciting applications from trade allies, manufacturers, implementation contractors, and other stakeholders. Figure 1-1 shows the overall steps of the ETP process. Section 1.1.1 details each step of the process.

Figure 1-1. Overall ETP Process Steps



The ETP does not have a standardized measure list or gas savings goals as found in other EE programs. Participation in the program is tracked through the number of initial applications. The ETP measures therm savings through pilot assessment projects. Each pilot assessment project enables the ETP to conduct verification of manufacturer-claimed therm savings for each technology. The savings from pilot assessments may be attributable to the ETP if they are not claimed by another EE program. The Gas Technology Institute (GTI) manages the ETP as the implementation contractor with sub-contractor support from Livingston Energy Innovations (LEI). As detailed in the ETP Program Operations Manual, LEI provides program support for a variety of ETP activities, including: program design, development, and launch; transfer of technologies into programs; and business development with stakeholders.[3]

Gas Program Year 2 (GPY2) ran from June 1, 2012 to May 31, 2013. During this period, the ETP implemented many new processes that they had designed in GPY1. This program evaluation is focused on the newly implemented processes as well as changes made to processes implemented in GPY1 during the program's infancy.

[3] From "Nicor Gas ETP Program Operations Manual Final to WECC 03-29-12." The complete list of activities that the ETP identifies as areas in which LEI will contribute can be found on page 8.

1.1.1 Implementation Strategy

The target audience for the ETP is manufacturers and technology distributors. The program offers a channel for manufacturers to submit applications for technologies that can provide therm savings relative to baseline technologies or processes. This program provides benefits to manufacturers because it provides a pathway for manufacturers to grow their business in Nicor Gas service territory. Success in the ETP enables the inclusion of equipment in rebate programs and provides for marketing support through the EEP ICs. The ETP uses a technology screening, scoring, and selection system, referred to as *4S: Ready, Set, Go*, to identify pilot assessment projects from technology applications.

For the most promising technologies, ETP staff conducts a robust quantitative analysis of the application, and then recommends technologies for further evaluation. The Technical Review Committee (TRC) reviews the recommendations and approves select technologies for pilot assessment projects (Go Stage). Go decisions are made collaboratively and are made on an as-needed basis and coordinated with the TRC, after action plans are presented.

ETP staff then works closely with the applicant and other stakeholders to manage pilot assessment projects for those approved technologies. ETP presents project results in a presentation or project report to EEP staff for adoption into an EEP. The information is provided in a form that is easily accommodated in a Technical Reference Manual (TRM) or technical work paper. It is then the individual EEP implementation contractor's (IC) responsibility to prepare technical and marketing materials for the measure. At the end of the technology pilot assessment, the ETP presents the data collected in a format compatible with EEP work paper and TRM documentation requirements to ensure consistency and ease of information access.

1.1.2 Technologies

The ETP received 33 applications in GPY2 (see KPI results in Section 3.1). Table 1-1 and Table 1-2 list the 11 technologies for which GTI initiated field-based and non-field-based pilot assessment activities during GPY2, respectively.

Table 1-1. Active Field-Based Pilot Assessments in GPY2

Active Field-Based Pilots in Nicor Gas Emerging Technology Program		
ID	**Short Title**	**Description and Status**
1001	High Efficiency Commercial Rooftop Units (RTUs)	Like condensing furnaces in homes, condensing heating rooftop units provide more efficient space heating for low-rise commercial buildings.
1003	Multi-family Demand Controls for Central Domestic HW Systems	On-demand controls save energy by reducing unnecessary circulation of hot water throughout a multi-family building, while still quickly providing hot water when it's required.
1005	Commercial Ozone Laundry	Ozone laundry systems can be used by commercial laundries with programmable washers to reduce hot water usage and save energy.
1008	Residential Combined Space and Water Heating Systems	Combined systems are designed to provide both space heating and water heating for homes through a single piece of high efficiency gas fired equipment.
1009	Commercial and Industrial Air Barriers	Technology produces a curtain of forced air over an open passageway to allow for an open barrier without excessive heat loss from the interior spaces to the outside in industrial/commercial facilities. On hold pending budget revisions.

Active Field-Based Pilots in Nicor Gas Emerging Technology Program		
ID	**Short Title**	**Description and Status**
1011	Greffen M2G Electronic Boiler Controls	An electronic controller that adjusts the dead band of the boiler load profile to keep the standby temperature of the boiler as low as possible while still meeting system load demands in commercial/industrial applications.
1022	EcoFactor Leapfrog HEM	Wi-fi-enabled residential thermostat paired with third party proprietary software that makes thousands of micro-adjustments to the temperature setpoint over the course of a month to yield cumulative energy savings.
1033	Cypress Wireless Steam Trap Monitor	A wireless monitoring system that tracks the failure of steam traps in industrial facilities and notifies the user so they can be repaired quickly and avoid excess steam and gas use.
1036	Commercial Dryer Gas Stepping Retrofit by EZ-Efficiency	Retrofits the existing gas valve with a two stage valve to allow the commercial dryer to modulate between two stages during the drying process.

Source: Email communication from M. Sweeney of GTI on 6/21/13

Table 1-2. Active Non-Field-Based Pilot Assessments in GPY2

Active Non-Field-Based Pilots in Nicor Gas Emerging Technology Program		
ID	**Short Title**	**Description and Status**
1002	ShowerStart Low-Flow Showerhead with Thermostatic Restriction Valve	This pilot focuses on an engineering algorithm approach to developing therm and water savings values for this technology. The IL TRM currently includes deemed savings for low-flow showerheads, so that algorithm was used as the basis for the development of this modified algorithm to include the addition of the thermostatic restriction valve. ETP is working with the multi-family program IC on this pilot.
1040	Advanced Boiler Heat Recovery Workshop	This workshop was designed following the receipt of five individual applications for advanced boiler heat recovery options to the ETP. These technologies already qualify for use in the Business Custom program and their use in a wide variety of industrial and commercial/institutional settings makes them unlikely candidates for a prescriptive measure. However, the sheer number suggested it may be challenging for every IC to be fully up-to-speed on the available products. Therefore, ETP developed a training workshop for the Business Custom and Process Heating programs that detailed the range of technology options, introduced new technologies that have entered the marketplace, and outlined the end use applications that may benefit from the technology. Workshop held March 7, 2013.

Source: Email communication from M. Sweeney of GTI on 6/21/13

1.2 Evaluation Questions

The evaluation sought to answer the following key researchable questions.

1.2.1 GPY1 Evaluation Follow-Up Questions

1. What is the status of the implementation of Navigant's recommendations detailed in the team's Verification, Due Diligence and Tracking System Review memo dated August 2, 2012?
2. What is the status of the implementation of Navigant's recommendations for evaluation key performance indicators (Evaluation KPIs) detailed in Navigant's GPY1 Logic Model and Program Theory memo dated October 30, 2012? What are the tracked results for each KPI?

1.2.2 Impact Questions

1. What is the ETP-attributable gross therm savings for ETP pilot assessments (excluding therm-savings attributable to other EEP programs)?
2. What is the claimed gross therm savings for the ETP's ozone laundry pilot assessment (the only other completed pilot in GPY2) for which the savings is attributable to the Business Custom Program?

1.2.3 Process Questions

1. Focusing on the two indicated pilots targeted for the process evaluation, where have challenges arisen in the pilot assessment and transition-to-EEP phases? What are the key lessons learned and how might the ETP improve these processes in the future?
2. How effective is the pilot assessment measurement and verification process at validating savings claims?
3. Is the technology transitioning process (from ETP to the EEP) sufficiently clear to ensure successful technology deployment?
    - What pathway is defined for technologies that do not require pilot assessments and can be fast-tracked into the EEP?
    - How successful have interactions been with EEP ICs when transitioning technologies?

2. Evaluation Methods

2.1 Primary Data Collection

The evaluation team conducted in-depth interviews to help put context on the impact evaluation data and to provide the basis for the process evaluation. Telephone interviews included prepared question topics such as:

- Changes in the program structure in GPY2
- Key challenges in GPY2
- Expected/planned changes for GPY3
- ETP specific topics – Pilot assessment and ETP to EEP transition/deployment processes

In addition, the interview allowed for a free-flowing conversation between the evaluation team and participants in order to pursue relevant issues raised during the discussion. Opportunities for improvement, if noted, were identified and communicated to the program team as soon as practical.

Table 2-1, listed below, provides a summary of the principal data sources contributing to the evaluation of the ETP.

Table 2-1. Principal Data Sources Contributing to the ETP Program Evaluation

Data Type	Targeted Population	Sample Frame	Sample Design	Sample Size	Timing
Tracking Data	TrakSmart database	Data submission template	-	All	June-July 2013
Literature Review	Program Documents	Program Documents	Update/new documentation for GPY2	All	May-July 2013
Project Analysis Spreadsheets	ETP pilot assessments	Data and calculations for pilots	-	2	May-July 2013
In-Depth Telephone Interviews	ETP Nicor Gas Program Manager	Contacts from Nicor Gas	Program Manager (PM)	1	June 2013
	ETP Implementation Contractor	Contacts from Gas Technology Institute (GTI)	Program Manager and two other IC team members	3	June 2013
	BEER Program Manager	Contacts from Nicor Gas	Program Manager	1	June 2013
	BEER Implementation Contractor	Contacts from Implementation Contractor (RSG)	Program Manager, Engineering Manager	2	June 2013

2.2 Additional Research

The evaluation team did not conduct any additional research for this evaluation.

2.3 *Impact Evaluation Methods*

2.3.1 Gross Savings Approach

For the impact evaluation, Navigant evaluated gross savings by conducting an engineering desk review for the ETP's two projects that will have ETP-attributable savings in GPY2:

- #1003 Multi-family Demand Controls for Central Domestic HW Systems (hereafter, On-Demand Controls); and
- #1001 High Efficiency Commercial Rooftop Units (RTUs) (hereafter, Condensing RTU)

Navigant reviewed both pilot assessment analyses for accuracy and completeness. The evaluation team verified that the ETP used appropriate algorithms, methods, and data sets in determining both the therms saved in GPY2 as well as the projected annual savings for each technology. These values only differ because the pilot-assessment equipment was not in place for a complete year of operation. During the review Navigant compared calculation parameters to assumptions. Aggregate savings of the individual measures comprise project gross savings. Navigant compared the IC's *Ex Ante* gross savings to the evaluator's research-findings gross savings to determine whether the results matched and the algorithm was appropriate.

Navigant's engineering desk review verified that the ETP adequately documented the:

- Basis for establishing the project's baseline;
- Engineering algorithm used to calculate gas consumption and savings relative to the baseline;
- Implemented calculations to determine GPY2 (Partial-Year) savings; and
- Implemented calculations to determine verified net savings.

2.3.2 Net Savings Approach

Navigant applied the planned Net-to-Gross (NTG) ratio of 1.0. For emerging technologies it is customary to assume no measure free-ridership or spillover, since most customers are not familiar with the emerging technology, are reluctant to try something "new" and may have trouble finding an installer trained in the technology.

3. Evaluation Results

This section presents the evaluation team's findings for the Nicor Gas Emerging Technology Program (ETP). These findings address the evaluation questions presented in the ETP Evaluation Plan and in Section 1.2, above.

3.1 KPI Evaluation Results

Table 3-1 shows both the status and documented GPY2 values for each Output KPI. The ETP does not plan to track Output KPI 7, which compares the pre-pilot projected annual savings to the post-pilot results for each technology, because the Screening, Scoring, and Selection System (4S) relies on therm savings provided by the applicant. In providing updates for the KPI values, the ETP IC stated that "the ETP pilot is designed to validate this data. This metric proposes the comparison of applicant-provided data with ETP-developed data and then evaluates ETP based on how these numbers match. ETP does not feel it is appropriate to be held accountable for the quality of information provided by applicants."[4]

Table 3-1. Output KPIs for GPY2 Including Implementation Status

Key Performance Indicators for Program Evaluators – *Output KPIs*	Status of Implementation July 2013	KPI Value July 2013
Number of applications in GPY2	1. KPI is tracked	33
Number of technologies in each end-use area and sector (Application Diversity)	2. KPI is tracked	See Appendix Table 5-1 and Table 5-2
Number (and %) of applications that pass "Ready" stage (Application Quality)	3. KPI is tracked	33 (97%)
Number of (Project Action Plans (PAPs) presented to TRC in GPY2	4. KPI is tracked	18[A]
Gas savings potential for each PAP technology (Value to portfolio)	5. KPI is tracked	See Appendix Table 5-3
Number of pilot assessments completed	6. KPI is tracked	2
Pre-pilot projected annual per unit therm savings vs. post-pilot results (Accuracy of 4S screening results)	7. The KPI will not be tracked	N/A
List of rejected technology applications, including list of reasons for rejection on each (Quality of applications)	8. KPI is tracked	See Appendix Table 5-4
Average scores for completed survey questions	9. KPI is tracked	See Appendix Table 5-5
Number of ETP-demonstrated technologies transferred to EEP	10. KPI is tracked	1
Number of ETP-demonstrated technologies deployed in programs	11. KPI is tracked	1

A: These PAPs resulted from the 33 applications received in GPY2 as well as the 21 applications received in GPY1

Table 3-2 shows both the status and documented GPY2 value for each Outcome KPI. The table shows a value of "N/A" for those KPIs for which ETP has not yet, or has no plan to, implement tracking.

[4] Source: Email communication with M. Sweeney of GTI on 7/3/13

Table 3-2. Outcome KPIs for GPY2 Including Implementation Status

Key Performance Indicators for Program Evaluators – *Outcome KPIs*	Status of Implementation July 2013	KPI Value July 2013
Change over time in stakeholder awareness (qualitative)	1. KPI is not being tracked. ETP has limited GPY3 resources and does not intend to quantify or qualitatively address.	N/A
Change over time in "Ready" stage survey scores	2. Due to the fact that only 1 applicant has been rejected at the "Ready" stage, and chose not to complete a feedback survey, ETP believes there is limited value to this KPI and does not intend to track this KPI.	N/A
Change over time in "Set" stage survey scores	3. KPI is tracked	Data not yet available[A]
Change in number over time of areas of high performance (and underperformance) as identified through qualitative pilot feedback surveys	4. Tracking the KPI is in the process of being implemented	Data not yet available
Change in number over time of pilot assessment projects completed	5. Tracking the KPI is in the process of being implemented	Data not yet available
Percentage of ETP-piloted technologies transferred to EEP & deployed in programs (ETP Output Quality)	6. Tracking the KPI has not been implemented, 1st EEP deployed new measure from ETP pilot wasn't available until June 1, 2013 (GPY3).	N/A
Change over time in number of technology applications	7. KPI is tracked	57% increase 21 (GPY1) 33 (GPY2)
Change in technology performance in ETP pilot assessment compared with EEP-deployed performance	8. Tracking the KPI has not been implemented, 1st EEP deployed new measure from ETP pilot wasn't available until June 1, 2013 (PY3).	N/A
Therms saved for each deployed ETP technology	9. Tracking the KPI has not been implemented, 1st EEP deployed new measure from ETP pilot wasn't available until June 1, 2013 (PY3).	N/A

A: GPY2 survey results are recorded under Output KPI number 9 in Table 3-1. No surveys were completed in GPY1, so the year-over-year change in scores cannot yet be calculated.

3.2 VDDTSR Evaluation Results

Table 3-3 shows the status of implementation for the GPY1 VDDTSR recommendations.

Table 3-3. GPY1 VDDTSR Recommendation Implementation Status

VDDTSR Recommendation	Implementation Status – July 2013
Navigant recommends including pre-established methodologies and algorithms (and calculations, where possible), for determining scores for as many metrics as possible in 4S screening.	The recommendation is being implemented.
Navigant recommends that, as the ETP transitions to a long-term tracking solution, the ETP employ a central, detailed tracking mechanism that extends from application submission to technology transfer to EEP (or rejection from further analysis).	The recommendation is being implemented.
Navigant recommends adding and tracking additional KPIs that monitor quantifiable performance relative to ETP-specific objectives (i.e., to identify top emerging technologies).	The outcome of this recommendation is the series of KPIs in the previous two tables.

3.3 Impact Evaluation Results

3.3.1 Verification and Engineering Desk Review

The evaluation team reviewed the ETP spreadsheets associated with the two technologies under investigation and generally found well documented, accurate analysis and results. During the verification process, the evaluation team noted five areas where greater use of Microsoft Excel best practices could improve quality assurance and simplify quality control reviews by the ETP:

- **Exclude direct-use of constants in formulas** – a best-practice approach is to include the constant in its own cell with any necessary description and then reference that cell as necessary.
- **Unlabeled columns** – a best-practice approach is to label all rows and columns in data tables and any individual cells included outside of data tables to make interpreting data simple. There were unlabeled columns in the Oak Park pilot assessment spreadsheet making review more difficult.
- **Suboptimal (though accurate) use of formulas** – a best-practice approach is to use the most straightforward formula possible that will minimize potential for errors. The gas valve open-time and pump runtime in the analysis for the on-demand WH pump at Oak Park adds 10 or more cells using the addition operator (+). In this case, a "SUMIF" formula could reduce the potential for incorrectly typing formulas, and would facilitate QA/QC.
- **Excess significant figures/decimal places** – a best-practice approach is to follow significant-figure guidelines on rounding for all final results to avoid implications that greater certainty has been achieved in the results than is realistic or has actually been achieved. For example, in the Oak Park on-demand DHW pump spreadsheet, the projected annual values show greater certainty than is reasonable from the data. This applies to all the results reviewed in this impact evaluation.

The sections below document the engineering desk review of each technology.

3.3.1.1 Condensing RTU

The ETP tested two 90% thermal efficiency condensing RTUs (Unit 1 and Unit 2) at the same customer location in Aurora, IL. The baseline equipment from the same manufacturer is an 80% thermal efficiency non-condensing RTU. These units serve as dedicated outdoor air systems with 5000 cfm airflow rating and 800 MBH input heating capacity. The units provide continuous ventilation air to the building. ETP data show 98% and 100% fan runtime during the monitoring period for Unit 1 and Unit 2, respectively. Equation 3-1 shows the algorithm that ETP used to calculate annual therm savings. This approach relies on the nameplate efficiency, and in particular the difference between the baseline nameplate efficiency and the condensing unit thermal efficiency, to calculate the gas consumption and ultimately the gas savings for the energy efficient technology.

$$Daily\ Therm\ Savings[therms] = Daily\ Gas\ Use[ft^3] \times Conversion\ Factor \times \left(\frac{Baseline\ TE}{Condensing\ TE} - 1\right)$$

$$\boldsymbol{GPY2\ (Partial\_Year)\ Therm\ Savings[therms]} = \sum_{First\ Monitoring\ Day}^{Last\ Day\ in\ GPY2} Daily\ Therm\ Savings\ [therms]$$

$$\boldsymbol{Annual\ Projected\ Therm\ Savings[therms]} = GPY2\ Therm\ Savings[therms] \times \left(\frac{Total\ Annual\ HDD}{\sum_{First\ Monitoring\ Day}^{Last\ Day\ in\ GPY2} Observed\ HDD}\right)$$

Equation 3-1. Algorithm for Therm Savings Calculations for Condensing RTU

Due to a brief period of inefficient operation caused by a faulty step controller in Unit 2, ETP excluded data from the days the unit did not operate correctly when calculating the Unit 2 savings. Table 3-4 shows the inputs for the above algorithm for calculating therms savings.

Table 3-4. Inputs for Energy Savings Algorithm for Condensing RTU

Inputs	Units	Input Value	Notes
Daily Gas Use (Unit 1)	Cubic Feet	Total: 1,686,268	Daily data observed for 218 days
Daily Gas Use (Unit 2)	Cubic Feet	Total: 1,396,018	Daily data observed for 218 days – used for GPY2 therm savings only
Daily Gas Use (Unit 2)	Cubic Feet	Total: 1,280,368	Daily data observed for 192 days – used for annual projected therm savings only
Conversion Factor	Therms/ft^3	1,014/100,000	
Baseline TE	%	80%	Thermal Efficiency Rating
Condensing TE	%	90%	Thermal Efficiency Rating
Total Annual HDD	HDD65	6,859	30 year average for Aurora, IL
Observed HDD (Unit 1)	HDD65	Total: 6,121	Daily data observed for 218 days
Observed HDD (Unit 2)	HDD65	Total: 5,055	Daily data observed for 192 days

As Table 3-4 shows, the ETP used 65°F as the basis for their HDD calculations (i.e., HDD65). After reviewing the data, the evaluation team believes that it may be more appropriate to use a lower basis temperature. The flat spots (circled in red) in Figure 3-1 and Figure 3-2 for Unit 1 and Unit 2, respectively, show that no heating occurred during those days with low-single-digit HDDs.

Figure 3-1. Daily Therm Usage for Condensing RTU Unit 1 (AHU1)

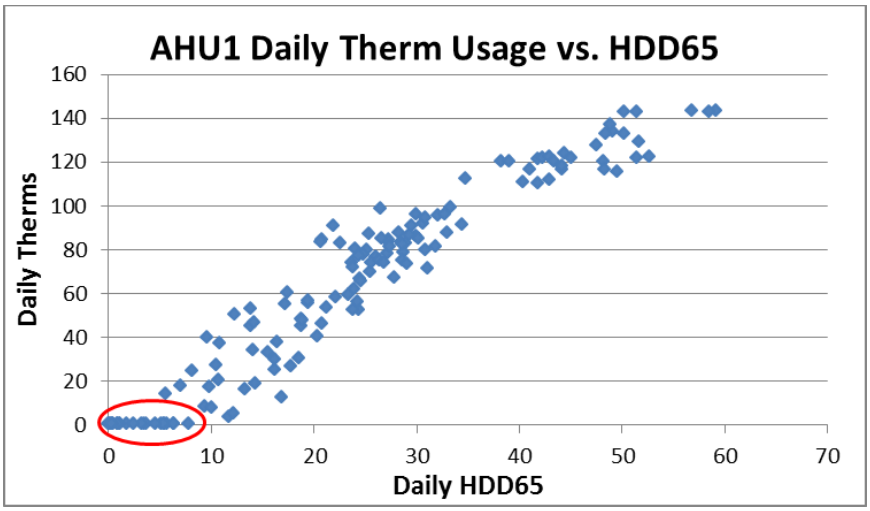
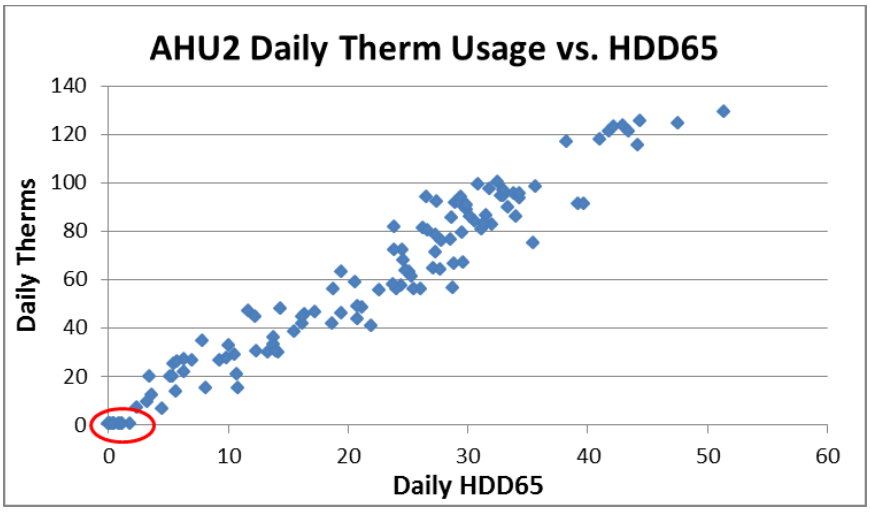


Figure 3-2. Daily Therm Usage for Condensing RTU Unit 2 (AHU2)



The evaluation team selected 60°F and 63°F as the basis for the HDD values for Unit 1 and Unit 2 respectively. In many cases it is appropriate to assume the same HDD basis for two pieces of equipment on the same building, even if the data show slight differences, as shown for Unit 1 and Unit 2. However, in this case it may be appropriate to use a different temperature basis as the internal heat load of the building may have been quite a bit different between the two locations. Knowledge of the actual temperature setpoints on the units would help inform the decision. The evaluation team used the inputs shown in Table 3-5. As Table 3-7 below shows, the overall impact on the projected annual therm savings results is 1%.

Table 3-5. Evaluation Team Recommended Inputs for Condensing RTU Algorithm

Inputs	Units	Input Value	Notes
Total Annual HDD60 (Unit 1)	HDD60	5,678	Typical meteorological year data for Aurora, IL*
Total Annual HDD63 (Unit 2)	HDD63	6,405	Typical meteorological year data for Aurora, IL*
Observed HDD60 (Unit 1)	HDD60	Total: 5,127	Daily data observed during monitoring**
Observed HDD63 (Unit 2)	HDD63	Total: 5,717	Daily data observed during monitoring**

*Available: rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/by_state_and_city.html
**Available: www.degreedays.net

3.3.1.2 On-Demand Controls

The ETP tested the on-demand controls at two different multi-family building locations: a 23-unit, three-story building in Forest Park, IL (hereafter FP), and a 51-unit, three-story building in Oak Park, IL (hereafter OP). These controls prevent the pump from running in continuous mode, 24 hours a day, by turning it off whenever possible. The ETP installed an automatic switching timer to operate the system with and without on-demand operation to compare gas consumption. Equation 3-2 shows the algorithm that ETP used to calculate therm savings.

$$Projected\ Continuous\ Mode\ Annual\ Runtime[therms] = \frac{Annual\ Scalar}{Continuous\ Mode\ Duration} \times \sum Weekly\ Continuous\ Mode\ Runtime[hr]$$

$$Projected\ Demand\ Mode\ Annual\ Runtime[therms] = \frac{Annual\ Scalar}{Demand\ Mode\ Duration} \times \sum Weekly\ Demand\ Mode\ Runtime[hr]$$

$$\boldsymbol{Annual\ Projected\ Therm\ Savings[therms]} = (Projected\ Continuous\ Mode\ Annual\ Runtime\ [hr] - Projected\ Demand\ Mode\ Annual\ Runtime\ [hr]) \times \frac{Input\ Energy[\frac{Btu}{hr}]}{Conversion\ Factor}$$

$$\boldsymbol{GPY2\ (Partial\_Year)Therm\ Savings[therms]} = Annual\ Projected\ Therm\ Savings[therms] \times \left(\frac{(Total\ Demand\ Mode\ Duration\ in\ GPY2)}{Weeks\ per\ Year}\right)$$

Equation 3-2. Algorithm for Therm Savings Calculations for On-Demand Controls

The FP installation switched back and forth on a weekly basis between continuous operation and on-demand operation. Accordingly, the calculations for that site are on a weekly basis. However, switching was inconsistent at the OP location and each interval was not necessarily a complete week, so the OP calculations are on a daily basis. The evaluation team understands that the ETP reviewed the collected daily data and determined that the inconsistent switching did not impact the results. ETP captured 18 weeks of data, six more than originally planned, to ensure valid data. Table 3-6 shows the inputs for the above algorithm for calculating therms savings.

Table 3-6. Inputs for Energy Savings Algorithm for On-Demand Controls

Inputs	Units	Input Value	Notes
Input Energy	Btu/hr	350,000	Nameplate rating for Water Heater
Conversion Factor	Btu/therm	100,000	
Weekly Continuous Mode Runtime (total)	hr	FP: 278.6 OP: 465.9	These values are the sum of all runtimes in this mode for each installation.
Weekly Demand Mode Runtime (total)	hr	FP: 268.9 OP: 247.2	These values are the sum of all runtimes in this mode for each installation.
Annual Scalar	FP: Wk/yr OP: Days/yr	FP: 52 OP: 365	
Continuous Mode Duration	FP: Weeks OP: Days	FP: 8 OP: 49	Duration of observation
Demand Mode Duration	FP: Weeks OP: Days	FP: 10 OP: 52	Duration of observation
Total Demand Mode Duration in GPY2	FP: Weeks OP: Days	FP: 17 OP: 49	Duration of observation plus additional time during GPY2 of demand operation

3.3.2 Gross Program Impact Results

Navigant found total Verified Gross Savings of 8,714 therms, including 4,577 therms from the Condensing RTU and 4,137 therms from the on-demand controls. Table 3-7 details the savings from each individual installation of the condensing RTU. The GPY2 (Partial-Year) Therm Savings (last column) are the actual therms saved during the portion of GPY2 in which the equipment was installed. This data is included for reference only as an output of the calculations in section 3.3.1.1.

See Appendix A for a discussion of terminology.

Table 3-7. Gross Therm Savings Summary for the Condensing RTU Pilot Assessment

Condensing RTU	Gross Therm Savings			GPY2 (Partial-Year) Therm Savings (Evaluation Research)
	Ex Ante Gross Savings (ETP Finding)	Realization Rate	Verified Gross Savings	
Unit 1	2,395	99%	2,367	2,137
Unit 2	2,202	~100%	2,210	1,769
	Total: 4,597 (Average: 2,299)	**99%**	**Total: 4,577**	Total: 3,906

Due to the faulty step controller in RTU2, as discussed in section 3.3.1.1, above, Unit 2 realized 90% of the expected GPY2 (Partial-Year) Therm Savings. This is based on ETP calculations that determined a projected annual therm savings for a single installation by using two methods: including the period of faulty operation (1,983 therms) versus excluding the period of faulty operation (2,202 therms – see Table 3-7, above).

Table 3-8 details the savings from each individual installation of the on-demand controls. The GPY2 (Partial-Year) Therm Savings (last column) are the actual therms saved during the portion of GPY2 in which the equipment was installed. This data is included for reference only as an output of the calculations in section 3.3.1.2.

Table 3-8. Gross Therm Savings Summary for the On-Demand Controls Pilot Assessment

On-Demand Controls	Gross Therm Savings			GPY2 (Partial-Year) Therm Savings (Evaluation Research)
	Ex Ante Gross Savings (ETP Finding)	Realization Rate	Verified Gross Savings	
Oak Park (51 Apts)	2,282	100%	2,282	632
Forest Park (23 Apts)	1,855	100%	1,855	604
	Total: 4,137 (Average: 2,069)	**100%**	**Total: 4,137**	Total: 1,236

The GPY2 (Partial-Year) Therm Savings in Table 3-8, above, represent the savings for both the monitored period, as well as for the unmonitored, normal operation period during GPY2 (after completion of monitoring) during which the energy-efficient technology continued to operate (i.e., unmonitored normal operation). GPY2 (Partial-Year) Therm Savings data for the OP installation included 52 monitored days and 49 days of unmonitored normal operation, while the FP installation included 10 monitored weeks and 7 weeks of unmonitored normal operation.

3.3.3 Non Evaluated Program Savings

Table 3-9 summarizes the savings from the ETP's ozone laundry pilot assessment testing. The ETP completed this testing in coordination with the Business Custom Program. The ETP was involved with testing at four different locations; however, they were most directly involved with testing at two of these locations. The saving for these pilot assessment tests is attributable to the Business Custom program. The ETP evaluation team did not conduct an engineering desk review or any other verification activities on these savings.

Table 3-9. Savings Summary for Ozone Laundry (Savings Attributable to Business Custom Program)

Ozone Laundry Pilot Assessment Sites	GPY2 Realized Gross Therm Savings
Warrenville hotel	3,239
Oak Brook hotel	2,622
Total GPY2 Therm Savings	5,861

No additional ETP projects produced therm savings that will be claimed for GPY2. The other active pilot-assessment projects will have claimed savings for either ETP or other EEP programs during GPY3.

3.3.4 Net Program Impact Results

Navigant applied the program-planned Net-to-Gross (NTG) ratio of 1.0 to the sum of the Verified Gross Savings in Table 3-7 (condensing RTUs) and Table 3-8 (on-demand controls), resulting in a Verified *N*et Savings of 8,714 therms.

3.4 Process Evaluation Results

Nicor Gas initiated the ETP in December 2011, halfway through GPY1, and the ETP spent much of GPY1 designing the processes necessary to implement the program. By the end of GPY1 (May 31, 2012), the ETP had implemented their technology screening processes (also known as the "4S Process"), and had identified technologies for further evaluation. It was not until early in GPY2 (June 7, 2012), that the ETP

held their first Technical Review Committee meeting to determine, in conjunction with Nicor Gas, which of those technologies to evaluate further in pilot assessments.

This process evaluation focuses on the components and processes of the ETP program that were not yet implemented in GYP1, including pilot assessment projects and transitioning of technologies to EEP. Additionally, this evaluation reviews changes made to other aspects of the program in GPY2 that differ from the original implementation in GPY1. The subsections below evaluate these topics in detail.

3.4.1 Pilot Assessments

The ETP successfully completed the two pilot assessments under scrutiny in this evaluation and at the close of GPY2 were in the process of drafting final reports for each project. The key challenges faced by the ETP for these pilot assessments, as identified by the ETP Nicor Gas program manager (PM) and ETP IC staff during in-depth interviews, included:

- **Difficulty in identifying suitable and willing host sites** – GTI states that this is their greatest challenge. However, they have developed various approaches to promote success, including:
    - *Direct engagement with the Nicor Gas Account Executives* (AE) has enabled the ETP to leverage existing relationships between Nicor Gas and their largest customers. AEs typically develop relationships with large accounts that use more than ~150k therms/yr. For technologies that are applicable to these large customers, such as the steam trap monitoring technology, AEs are a valuable resource for facilitating site selection.
    - *Early and frequent interactions with manufacturers or their local sales representatives* enable faster identification of potential sites by enabling ETP to leverage the manufacturers' existing relationships. Manufacturers have typically been willing to assist because cooperation with the ETP can facilitate market growth within the Nicor Gas territory. Leveraging this relationship aligns with recommendations from the GPY1 evaluation.
    - *Engagement with the EEP ICs* also helps ETP leverage existing relationships. Many of the ICs have years of experience in the industry and have large networks of contacts in the form of local facility managers and decision makers at a wide spectrum of commercial firms. The ICs have a vested interest in such an opportunity by furthering efforts to bring new energy efficiency measures into their programs.

- **Optimal pilot assessment scheduling –** GTI encountered challenges in scheduling pilot assessments to best fit with:
    - *Heating Season* **–** Depending on when the ETP receives a technology application, lead time can be critical. If a manufacturer submits a heating-related technology during the summer, the ETP must move rapidly in the event that they may want to test the technology in a field-based pilot assessment. In particular, the ETP must initiate a search to secure a test site so that they can install the equipment in time for heating season. Vital to this process is the ETP's knowledge of the best levers to pull to accelerate projects as necessary.
    - *Prescriptive timeframes for technical work paper submissions* exist that force ETP to schedule pilots at inopportune times. Typical submissions occur in January, though this was extended for 2013 until March. This does not always align with how pilots will run, either because of the timing of the application submission, or simply because the date falls in the middle of heating season, delaying the submission of all heating-related

technical work papers to the following January. Aligning timelines continues to be a challenge.

3.4.2 Technology Transition and Deployment

In GPY2, the ETP successfully helped transition the ozone laundry technology into EEP; the technology is currently available as a prescriptive measure in the BEER program. The ETP identified ozone laundry as a potential technology during the first round of application reviews, late in GPY1. At that time it was already a part of the Business Custom Program. However, the Business Custom program hoped to transition it to BEER as a prescriptive measure, but needed additional data from a minimum of two test sites to complete the work paper. The ETP engaged with Business Custom during the initial outreach to ICs (for the purposes of providing input on the 4S screening process), when they identified the mutual interest in the technology.

The ETP began working with RSG, the IC for both Business Custom and BEER, very early in the evaluation process, ensuring that ETP could get up to speed rapidly. The ETP engaged RSG early and often beginning in the technology screening phase and continuing throughout pilot assessment planning, execution, and wrap-up. The engagement enabled GTI to develop solid requirements for their testing and to efficiently coordinate the appropriate resources to secure test sites, both in hospitality industry.

Upon testing completion, GTI aggregated testing results and submitted them to RSG. RSG incorporated the results into a technical work paper. Due to misalignment of the pilot assessment schedule and the work paper submission deadline, RSG submitted the work paper using preliminary results and submitted an updated work paper once ETP finalized the pilot assessment results. This schedule misalignment presented a challenge during the project, and was a key decision making driver.

ETP is currently engaging with Nicor Gas staff and others to more clearly define a transition pathway for future technologies that specifies all necessary transition requirements and helps ETP to understand all the needed elements to bring a program forward with a new technology. GTI developed a "Conceptual Outline" draft document stating:

"The intent of this process is three-fold:

- Bring together ETP and EEP key decision-makers and program implementers to review the technology and ETP pilot results
- Discuss incorporation process into appropriate EEP
- Formalize the transition from ETP to EEP." [5]

GTI expects that the transition of the on-demand controls technology will be the full implementation of this new, more formalized process. Two key components to successful adoption of this process will be:

- Measure-launch webinar for all stakeholders, including Nicor Gas staff, IC staff, participating manufacturers, contractors, and key end users, including big property managers; and

[5] "ETP to EEP Transition to Program Manager: Conceptual Outline," dated June 7, 2013, sent via email by Gary Cushman on June 11, 2013.

- Six-month check-in with the recipient program's PM and IC to evaluate effectiveness and identify any problems encountered in the way the measure was implemented in order to determine if changes need to be made.

The evaluation team is eager to see the effects of the newly bolstered transition process and expects it will improve the ETP's ability to provide benefit to the EEP.

3.4.3 Key Lessons Learned

Through the in-depth interview process, the evaluation team captured seven key lessons learned that the ETP Nicor Gas PM and ETP IC staff identified during GPY2:

- **IC involvement and support is vital to technology success** - GTI recognizes that involvement of the ICs is very helpful to the ETP and in many cases can be vital to the technology's success in the EEP. From early on, ICs can help identify data needs for pilot testing and detail the specific scope of the assessment to be able to satisfy the needs of the technical work paper. As discussed in section 3.4.1, above, the IC relationships are also important in quickly securing host sites. Early and frequent IC engagement will boost the success of the ETP and provides benefits to the ICs. ETP recognized that RSG's familiarity with ozone laundry technology helped to move the project along; in future pilot assessments, when the recipient IC does not already have knowledge and experience with the technology, ETP may have to allocate more of their own resources into the transition process to ensure success.
- **Prescribed timeline for work paper submission** – As discussed in section 3.4.1, above, ETP may be forced to schedule pilots at inopportune times because typical submissions occur in January, though this was extended for 2013 until March. This does not always align with how pilots will run, either because of the timing of the application submission, or simply because the date falls in the middle of heating season, delaying the submission of all heating-related technical work papers to the following January.
- **Similarities to a product development business** – The ETP Nicor Gas PM recognizes many similarities between their needs/goals and those of a product development business. This has improved awareness of the non-technical aspects of successful program design that are required for the EEP to successfully deploy a technology and realize targeted therm savings. ETP understands the need to learn about potential markets/customers and how to get traction for new products in new markets.
- **A diverse product portfolio is valuable for ETP** – having a diverse set of products across end uses (particularly away from solely heating focused products) helps to balance the workload between seasons, ensuring that ETP does not have to rush to initiate pilot assessments at the same time of year to coincide with heating season. If a given pilot cannot be initiated in time, the pilot must be delayed until the following heating season. Further, having a diverse set of products across market sectors helps to feed new measures into a variety of EEP programs. Focusing solely on large commercial equipment, for example, would limit the value of the ETP to the residential-serving EEP programs.
- **Value of deep market understanding alongside technical understanding** - ETP developed greater recognition of the value that market knowledge plays in the potential success and impact of new technologies. For example, during the ozone laundry pilot assessment, ETP encountered resistance from the healthcare industry over public health codes that define disinfection

requirements. The equipment manufacturers were not familiar with this barrier, and the healthcare industry was not familiar with how ozone laundry technology could be utilized within the code requirements. Understanding this market factor helped reduce barriers to penetration and better prepare the EEP IC to market the technology.

- **"Emerging" technologies may not be new** – old technology can still be very valuable to the EEP portfolio, and simply because a technology has existed for many years does not imply it will not contribute to EEP savings targets. Many factors can make old products attractive and worthy of additional evaluation by the ETP, including changes in regulations, demographics, or consumer trends.
- **Periodic meetings with EEP are valuable to ETP** – such meetings help generate technology and/or process ideas, but also enable identification of expertise and connections that can benefit the ETP. The ETP Nicor Gas PM expressed potential interest in conducting periodic meetings with the EEP specifically for the purposes of updating the EEP on ETP activities and maintaining open lines of communication.

3.4.4 Additional Program Changes from GPY1

Administration and Procedures

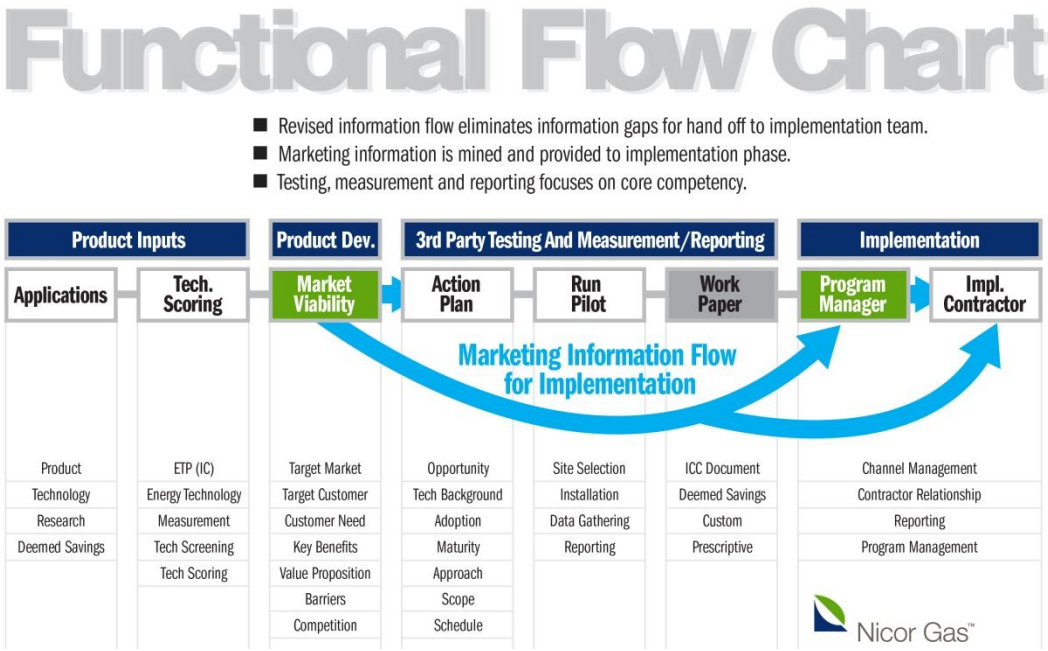
The ETP changed three noteworthy administrative and procedural components of the program during GPY2:

- **Addition of marketing via Jacobs Agency** – In GPY2, the ETP initiated marketing activities to raise visibility for the program. The focus is on placement of a few short pieces in industry news, trade journals, etc.
- **Fast-tracking process design** – the ETP began defining a process by which they can bypass the formal pilot assessment for technologies or processes that may be program-ready. This process applies in such instances where the technology has proven market viability and therm savings data are available to support work paper development. The ETP plans to fast-track one or more technologies during GPY3 using this new process. This process aligns with recommendations from the GPY1 evaluation.

Market Evaluation

During GPY2, the ETP evaluated options for incorporating evaluation of the non-technical aspects to each technology application. The change aligns with recommendations from the GPY1 evaluation. The original program plan did not include an evaluation step that would look at the market viability of a given technology or at other non-technical challenges that may prevent a technically superior measure from being successful. The ETP Nicor Gas PM felt that implementation should be distinct from the technology evaluation component of the program. Figure 3-3 shows a flow chart of the currently designed process.

Figure 3-3. Nicor Gas ETP Functional Flow Chart



The ETP Nicor Gas PM felt that the process of defining an action plan for a given technology lacked an evaluation of the market viability of the technology. In line with the GPY1 process evaluation, the PM was concerned that a project could proceed without determining if a viable market existed. In keeping with the contractual division of labor from GPY1 in which GTI has responsibility for the technical components of an evaluation, the ETP implemented a market viability analysis to be conducted by the ETP Nicor Gas PM prior to pilot assessment testing. By maintaining market analysis responsibility in the hands of the PM, the process ensures continuity of the marketing message to all relevant parties.

The market viability process includes two pieces:

- Market research through internal Nicor Gas sources or external experts; and
- Comprehensive survey for the product developer, focusing primarily on comparisons with the competition. The PM prepares a two page summary for sharing.

The findings, as Figure 3-3, above shows, play a role in three different steps of the ETP technology evaluation process:

1. The PM confers with GTI to discuss market viability findings, enabling GTI to develop a Project Action Plan from a more informed position.
2. After pilot assessment testing, the PM sits down with the PM of the recipient EEP program(s) to review the test results and market analysis to give a complete picture of the transitioning technology. The PM can then determine how he or she wants plan the implementation.
3. During transition, the ETP coordinates with the recipient IC to host a launching webinar (as discussed in section 3.4.2, above), in which GTI or the recipient IC will present technical results, and the EPT PM will share the market findings to provide a complete picture of the technology.

Data Tracking (Program Management Tool Implementation)
The EEP began rollout of a program-wide program management tool (PMT) called TrakSmart (by Nexant) late in GPY1. Per guidance from Nicor Gas, the ETP's overall approach for the PMT is to document those technologies that proceed past the 4S process to the pilot assessment stage, including all relevant project outcomes. The ETP iterated with Nexant and Nicor Gas staff to develop a structure that would best suit ETP and Nicor Gas needs with respect to pilot assessment information.

The PMT structure includes a single "Umbrella" entry for each technology and then one additional entry for each pilot test site. For example, if ETP tests a technology at 10 different customer locations, then the PMT will contain 11 entries for this technology. Appendix C lists all of the relevant fields.

The ETP plans to update the database periodically upon request by Nicor Gas. The PMT personnel at the Nicor Gas will make each update via bulk upload of new content from an Excel spreadsheet (completed by ETP). The ETP completed two such updates during GPY2, one each during March and April of 2013.

Based on in-depth interviews, GTI and Nicor Gas believe that the currently implemented approach serves the needs of the ETP and EEP well at this time. It is a good permanent repository for all final information from pilot assessments, including final reports.

For tracking those program processes that occur prior to pilot assessments, GTI continues to use individual Microsoft Excel spreadsheets for each technology. Each spreadsheet tracks each technology from initial application through pilot assessment initiation (or rejection from the program). GTI believes this is the appropriate mechanism for such tracking and the appropriate level of invested resources given the small relative volumes of applications in the program.

4. Findings and Recommendations

This section summarizes the evaluation team's findings and presents recommendations from the GPY2 evaluation of the Nicor Gas Emerging Technologies Program.

4.1 KPI Evaluation Findings and Recommendations

- ***Output KPIs***

  Finding: ETP has implemented tracking of 10 of 11 Output KPIs. ETP will not be tracking the following KPI: Pre-pilot projected annual per unit therm savings vs. post-pilot results (as an indicator of the accuracy of 4S screening results)

  Recommendation: The evaluation team finds the decision to not track this KPI for evaluation purposes reasonable given the ETP's use of applicant-supplied data in determining "pre-pilot projected annual per unit therm savings." However, outside of the evaluation process, Navigant believes that this type of metric can be helpful in understanding potential reasons why applicant therm-savings claims may not be achievable in real-world installations in the Nicor Gas Territory. Such information may be valuable in anticipating, and setting realistic expectations for the therm-savings for future applicants and pilot assessments.

  Finding: The ETP currently tracks the "Gas Savings Potential for Action Plans Presented to the Technical Review Committee in GPY2" (Output KPI 5) on a per unit basis, rather than on a territory-wide basis.

  Recommendation: The evaluation team recommends that the ETP consider adding analysis and tracking of this KPI on a territory-wide basis. Understanding the potential size of the energy savings opportunity across the entire Nicor Gas territory is one of many important factors in determining the value of the technology to Nicor Gas's portfolio. Given the ETP's scope of responsibility, the analysis can be relatively streamlined and should be based on the savings estimates for the technology, the applicable types of buildings/businesses for this technology, and basic data about quantity and size of buildings in the Nicor Gas territory. The level of available detail in Nicor Gas's customer building data should determine the level of detail in the territory-wide energy savings potential analysis. The intent is not to conduct a comprehensive energy-efficiency savings potential for each technology, but rather to provide an estimate of the size of the market opportunity for Nicor Gas.

- ***Outcome KPIs***

  Finding: ETP has not implemented tracking for three of nine Outcome KPIs because insufficient data is available at this time.

  Recommendation: None at this time. The evaluation team believes this is appropriate given that these KPIs are directly related to the impact of ETP-originated measures that have been deployed in the EEP, and the first ETP-measure was not deployed until June 1, 2013. (GPY3)

  Finding: ETP is not planning to track two of nine Outcome KPIs.

  Recommendation: None at this time. The evaluation team finds the decision to not track these KPIs appropriate at this time.

4.2 *VDDTSR Evaluation Findings and Recommendations*

- ***Verification, Due Diligence, and Tracking System memo recommendations***
  Finding: ETP is implementing all three recommendations from the GPY1 VDDTS memo.
  Recommendation: None at this time.

4.3 *Key Impact Findings and Recommendations*

Table 4-1 documents the verified net therm savings for the ETP in GPY2.[6] Table 4-2 documents the therm savings from the two individual pilot assessment projects: the condensing RTU and on-demand controls.

Table 4-1. ETP Verified Net Therm Savings Summary

Verified Measures Installed	*Ex Ante* Gross Savings (Therms)	Realization Rate	Verified Gross Savings (Therms)	Net-to-Gross Ratio	Verified Net Savings (Therms)
4	8,734	99%	8,714	1.0	8,714

Table 4-2. ETP Verified Net Therm Savings by Measure

Measure	Unit	*Ex Ante* Measures Installed	Verified Measures Installed	Ex-Ante Gross Savings (Therms)	Realization Rate	Verified Gross Savings (Therms)
Condensing RTU	System	2	2	4,597	99%	4,577
On-Demand Controls	System	2	2	4,137	100%	4,137
	Total:	4	4	8,734	100%	8,714

The evaluation team also identified the following findings and recommendations:

- ***Spreadsheet quality control and documentation***
  Finding: During the engineering desk review for the on-demand controls pilot assessment, the evaluation team identified three spreadsheet errors which impacted the pilot assessment results. The evaluation team notified ETP so that they could promptly correct the errors.
  Recommendation: The evaluation team recommends that the ETP implement a simple process for detailed quality-control review of pilot assessment spreadsheets. Such a review process need not be onerous and by its very nature should encourage proliferation of best practices, thereby reducing the quality-control burden over time and improving work quality.

[6] The ETP assumes a net-to-gross ratio (NTG) of 1.0 for emerging technologies, thus *ex post* net savings equals *ex post* gross savings.

- ***Spreadsheet documentation***
  Finding: During the engineering desk review, the evaluation team identified five questions regarding analysis inputs/calculations, the sources for which were not always clearly documented or explained.
  Recommendation: The evaluation team recommends that the ETP ensure that spreadsheets are easily interpreted by others and that the analysis could be recreated by others by requiring basic documentation for each input value. Constants should be clearly labeled, including the source, and calculations should be simple and clear to enable easy interpretation. Should an anomaly arises in the data, ETP should include a simple explanation to indicate if and how they address it.

- ***HDD temperature basis***
  Finding: The ETP projection for annual energy consumption for the condensing RTU was based on the annual heating degree days (HDD) using a 65°F basis. Review of a plot of gas consumption versus HDD shows that using a basis at a lower temperature may be more appropriate for this projection.
  Recommendation: The evaluation team recommends that the ETP consider revising the condensing RTU calculations using an HDD60 basis for RTU1 and HDD63 basis for RTU2. While the impact is small in this case, adjustment of the HDD basis is an important component of any heating-measure analysis that should not be overlooked. For measures that rely on regression analysis of the HDD data, this is particularly important.

4.4 Key Process Findings and Recommendations

- ***Valuable improvements since GPY1***
  Finding: The evaluation team found valuable improvements in the ETP's technology evaluation processes. In GPY2, the ETP learned valuable lessons during implementation of their pilot assessment and technology transitioning processes. These lessons have led to process refinements that will promote continued program success in GPY3.
  Recommendation: None at this time.

- ***Comprehensive technical and market approach to technology evaluations***
  Finding: With the integration of a market evaluation (see section 3.4.4), the ETP created a more comprehensive approach to technology evaluations that captures both the technical and market components and helps promote technology success. ETP has improved their focus on the non-technical aspects of successful program design that are required for the EEP to successfully deploy a technology and realize targeted therm savings.
  Recommendation: None at this time.

- ***Good recognition of the need for a more formalized transition process***
  Finding: ETP first began transitioning technologies in GPY2 and has recognized the value in a formalized process to promote success. They plan to integrate into the process a webinar to help launch the technology deployment by gathering key stakeholders and providing valuable education in a coordinated effort. Further, they expect greater interfacing with EEP ICs in the future, which will help promote success of ETP technologies in the EEP.
  Recommendation: None at this time. The evaluation team expects that as the ETP gains more experience with technology transitioning in GPY3, they will continue to enact improvements to the technology transition process.

- ***Work paper submission deadline***
  Finding: The ETP has faced hurdles due to the submission deadline for work papers. The deadline is in January each year and falls in the middle of heating season, when gas technologies are often being field tested.
  Recommendation: The evaluation team recommends that ETP identify an optimal timeline for work paper submission and work with Nicor Gas to determine a potential pathway for changing the submission deadline. Moving this deadline will eliminate conflict with heating technology testing and coincide better with natural pilot assessment cycles.

5. Appendix

5.1 EM&V Reporting Glossary

High Level Concepts

Program Year – GPY1, GPY2, etc. Gas Program Year where GPY1 is June 1, 2011 to May 31, 2012, GPY2 is June 1, 2012 to May 31, 2013.

Impact Evaluation Research Findings composed of

- Research Findings Gross Energy Savings
- Research Findings Gross Demand Savings
- Research Findings Net Energy Savings
- Research Findings Net Demand Savings

These are savings reflecting evaluation adjustments to any of the savings parameters (when supported by research) regardless of whether the parameter is deemed for the verified savings analysis. Parameters that are adjusted will vary by program and depend on the specifics of the research that was performed during the evaluation effort.

Application: When a program has deemed parameters then the Impact Evaluation Research Findings are to be placed in an appendix. That Appendix (or group of appendices) should be labeled Impact Evaluation Research Findings and designated as "ER" for short. When a program does not have deemed parameters (e.g., Business Custom, Retro-commissioning), the Research Findings are to be in the body of the report as the only impact findings. (However, impact findings may be summarized in the body of the report and more detailed findings put in an appendix to make the body of the report more concise.)

Program-Level Savings Estimates Terms

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used)§
1	Gross Savings	Ex-ante gross savings	Verification and Research	Savings as recorded by the program tracking system, unadjusted by realization rates, free ridership, or spillover.	Tracking system gross
2	Gross Savings	Verified gross savings	Verification	Gross program savings after applying adjustments based on evaluation findings for only those items subject to verification review for the Verification Savings analysis	Ex post gross, Evaluation adjusted gross
3	Gross Savings	Verified gross realization rate	Verification	Verified gross / tracking system gross	Realization rate
4	Gross Savings	Research Findings gross savings	Research	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
5	Gross Savings	Research Findings gross realization rate	Research	Research findings gross / ex-ante gross	Realization rate

N	Term Category	Term to Be Used in Reports‡	Application†	Definition	Otherwise Known As (terms formerly used)§
6	Gross Savings	Evaluation-Adjusted gross savings	Non-Deemed	Gross program savings after applying adjustments based on all evaluation findings	Evaluation-adjusted ex post gross savings
7	Gross Savings	Gross realization rate	Non-Deemed	Evaluation-Adjusted gross / ex-ante gross	Realization rate
1	Net Savings	Net-to-Gross Ratio (NTGR)	Verification and Research	1 – Free Ridership + Spillover	NTG, Attribution
2	Net Savings	Verified net savings	Verification	Verified gross savings times NTGR	Ex post net
3	Net Savings	Research Findings net savings	Research	Research findings gross savings times NTGR	Ex post net
4	Net Savings	Evaluation Net Savings	Non-Deemed	Evaluation-Adjusted gross savings times NTGR	Ex post net
5	Net Savings	Ex-ante net savings	Verification and Research	Savings as recorded by the program tracking system, after adjusting for realization rates, free ridership, or spillover and any other factors the program may choose to use.	Program-reported net savings

‡ "Energy" and "Demand" may be inserted in the phrase to differentiate between energy (kWh, Therms) and demand (kW) savings.
† **Verification** = Verified Savings; **Research** = Impact Evaluation Research Findings; **Non-Deemed** = impact findings for programs without deemed parameters. We anticipate that any one report will either have the first two terms or the third term, but never all three.
§ Terms in this column are not mutually exclusive and thus can cause confusion. As a result, they should not be used in the reports (unless they appear in the "Terms to be Used in Reports" column).

Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012[7].

Evaluation: Evaluation is an applied inquiry process for collecting and synthesizing evidence that culminates in conclusions about the state of affairs, accomplishments, value, merit, worth, significance, or quality of a program, product, person, policy, proposal, or plan. Impact evaluation in the energy efficiency arena is an investigation process to determine energy or demand impacts achieved through the program activities, encompassing, but not limited to: *savings verification*, *measure level research*, and *program level research*. Additionally, evaluation may occur outside of the bounds of this TRM structure to assess the design and implementation of the program.

Synonym: **Evaluation, Measurement and Verification (EM&V)**

> **Measure Level Research**: An evaluation process that takes a deeper look into measure level savings achieved through program activities driven by the goal of providing Illinois-specific

[7] IL-TRM_Policy_Document_10-31-12_Final.docx

research to facilitate updating measure specific TRM input values or algorithms. The focus of this process will primarily be driven by measures with high savings within Program Administrator portfolios, measures with high uncertainty in TRM input values or algorithms (typically informed by previous savings verification activities or program level research), or measures where the TRM is lacking Illinois-specific, current or relevant data.

Program Level Research: An evaluation process that takes an alternate look into achieved program level savings across multiple measures. This type of research may or may not be specific enough to inform future TRM updates because it is done at the program level rather than measure level. An example of such research would be a program billing analysis.

Savings Verification: An evaluation process that independently verifies program savings achieved through prescriptive measures. This process verifies that the TRM was applied correctly and consistently by the program being investigated, that the measure level inputs to the algorithm were correct, and that the quantity of measures claimed through the program are correct and in place and operating. The results of savings verification may be expressed as a program savings realization rate (verified ex post savings / ex ante savings). Savings verification may also result in recommendations for further evaluation research and/or field (metering) studies to increase the accuracy of the TRM savings estimate going forward.

Measure Type: Measures are categorized into two subcategories: custom and prescriptive.

Custom: Custom measures are not covered by the TRM and a Program Administrator's savings estimates are subject to retrospective evaluation risk (retroactive adjustments to savings based on evaluation findings). Custom measures refer to undefined measures that are site specific and not offered through energy efficiency programs in a prescriptive way with standardized rebates. Custom measures are often processed through a Program Administrator's business custom energy efficiency program. Because any efficiency technology can apply, savings calculations are generally dependent on site-specific conditions.

Prescriptive: The TRM is intended to define all prescriptive measures. Prescriptive measures refer to measures offered through a standard offering within programs. The TRM establishes energy savings algorithm and inputs that are defined within the TRM and may not be changed by the Program Administrator, except as indicated within the TRM. Two main subcategories of prescriptive measures included in the TRM:

Fully Deemed: Measures whose savings are expressed on a per unit basis in the TRM and are not subject to change or choice by the Program Administrator.

Partially Deemed: Measures whose energy savings algorithms are deemed in the TRM, with input values that may be selected to some degree by the Program Administrator, typically based on a customer-specific input.

In addition, a third category is allowed as a deviation from the prescriptive TRM in certain circumstances, as indicated in Section 3.2:

Customized basis: Measures where a prescriptive algorithm exists in the TRM but a Program Administrator chooses to use a customized basis in lieu of the partially or fully

deemed inputs. These measures reflect more customized, site-specific calculations (e.g., through a simulation model) to estimate savings, consistent with Section 3.2.

5.2 *Evaluation KPIs*

The following tables summarize the details of the ETP evaluation KPIs from GPY2. Table 5-1 and Table 5-2 detail the values for KPI 2.

Table 5-1. KPI 2 – ETP GPY2 Applications by Sector

Sector	GPY2 ETP Applications
Residential	11
Commercial	17
Industrial	4
Agricultural	1
TOTAL	**33**

Table 5-2. KPI 2 – GPY2 ETP Applications by End Use

End Use	GPY2
HVAC*	21
Water Heating	6
Process Heating	3
Laundry	2
Foodservice	0
Other	1
TOTAL	**33**

*HVAC includes space heating, controls, and gas cooling

Table 5-3 details the values for KPI 5. The ETP notes that they "track and report gas savings for this KPI on a per unit basis rather than territory-wide. There is limited market data available for the Nicor Gas service territory, which makes it inappropriate to characterize territory-wide savings potential. However, ETP's technical expertise enables reasonably accurate gas savings potential estimates on a per unit basis, such as for a commercial RTU or boiler controller."[8]

[8] Per email communication with M. Sweeney of GTI on 7/16/2013.

Table 5-3. KPI 5 – Gas Savings Potential for Action Plans Presented to the Technical Review Committee in GPY2

	ID and Title	Annual Gas Savings Potential
1	#1001 High Efficiency, Condensing Heating Rooftop Units	Up to 2,200 therms/dedicated outside air system in "big box" retail stores
2	#1002 ShowerStart Low-Flow Showerhead and Thermostatic Restriction Valve	UP to 23 therms/showerhead in multi-family applications
3	#1003 Enovative Multi-Family On-Demand WH Pump	Up to 65 therms/apartment compared to continuous pump operations
4	#1005 Commercial Ozone Laundry	Up to 5,000 therms in a medium-sized hotel
5	#1008 Combined Space and Water Heating Systems	Up to 120 therms per single family home
6	#1009 Enershield Air Barriers	Up to 4,000 therms in a typical distribution warehouse application
7	#1011 Greffen M2G Boiler Control System	Up to 15 percent therm savings in commercial boiler gas use
8	#1013 Ultramizer – Advanced Boiler Heat Recovery	Up to 8 percent therm savings in commercial and industrial boiler gas use
9	#1016 Opower-Honeywell Programmable Thermostat and Feedback	Up to 75 therms/thermostat
10	#1020 Commercial Pilotless Range	Up to 121 therms/range
11	#1022 EcoFactor Home Energy Management Thermostat	Up to 161 therms/household
12	#1024 Sidel Systems Flue Gas Condenser	Up to 17% of gas use*
13	#1026 RME Thermal Equalizer (destratification fan)	Up to 20% savings**
14	#1033 Cypress Wireless Steam Trap Monitoring System	28,225 therms/system
15	#1036 Commercial Non-Modulating Clothes Dryer Retrofit	320 therms/clothes dryer
16	#1040 Advanced Boiler Heat Recovery Workshop	N/A***
17	#1042 American Pacific Gas Water Heater Timer	32 therms/timer
18	#1044 Advanced Grain Dryer	33,930 therms/grain dryer

*Gas use varies considerably depending on the nature of the industrial facility. As such, gas savings percentages were calculated for technologies that could be applied to a wide range of light to heavy industry rather than a singular therm value.
**Available data from field testing of this technology is extremely limited. ETP relied on modeled estimates of therm savings, which is considered the best available data at the time of this scoring. An ETP pilot, of course, would provide the needed real world data.
***This workshop was developed in response to the large number of industrial boiler heat recovery applications that ETP received. To avoid incurring the high cost of implementing pilots of numerous technologies, Nicor Gas requested that ETP instead prepare an educational workshop to assist other EEP Implementation Contractors in identifying and implementing boiler heat recovery opportunities, including a review of commercially available technologies.

Table 5-4 details the values for KPI 8.

Table 5-4. KPI 8 – List of Applications Rejected in GPY2 and Reasons for Rejection

ID and Title	Reason for Rejection
1023 HTP Residential Condensing Water Heater	Nicor Gas Home Energy Efficiency Program is actively considering adjustment of their water heating rebates and instructed ETP that no pilot field testing should be undertaken while new retrofit rebate measures are under consideration.
1024 Sidel Systems Flue Gas Condenser	This technology qualifies under the Business Custom program and application-specific savings are not well suited to ETP pilot activities. In collaboration with Nicor Gas and its other EEP ICs, an advanced boiler heat recovery workshop was conducted to inform the Business Custom and other programs.
1025 Residential Solar Water Heater	This technology faces significant cost-effectiveness challenges in the Nicor Gas service territory.
1027 ZeroEnergy Waste Heat Recovery for Water Heaters	This technology faces significant cost-effectiveness challenges in the Nicor Gas service territory.
1028 Intellihot Tankless Water Heater	Nicor Gas Home Energy Efficiency Program is actively considering adjustment of their water heating rebates and instructed ETP that no pilot field testing should be undertaken while new retrofit rebate measures are under consideration.
1029 HeatSponge Boiler Heat Recovery	See #1024
1030 Rheem H2AC Rooftop Unit	This A/C condenser waste heat utilization technology faces cost-effectiveness challenges in heating dominated climates, such as Nicor Gas service territory.
1031 Pulse Check Commercial Energy Management System	This software would have to be adopted by the utility rather than the end users and therefore isn't a fit for the Nicor Gas EEP.
1032 TTU Steam Heat Reclaimers	See #1024
1034 Cypress Commercial Pneumatic Thermostat	Depending on the application, this product already qualifies under the Nicor Gas Multi-Family Home Energy Savings program or the Business Custom program.
1035 Building Steam Recapture by Maxi-Therm	See #1024
1037 Engineered Air High Efficiency RTU	ETP noted that a pilot was already underway for this technology (#1001). Additional pilot activities would not be needed as any resulting measure from the #1001 pilot would encompass the technology brought forward in this application.
1038 CR Mechanical	Applicant never fully completed application; three contact attempts by ETP went unanswered.
1039 Residential Vapor Vacuum Heating	Not fully commercially available, still in prototype stage.
1041 OMNI Chemicals for Commercial Laundry	Applicant never fully completed application; three contact attempts by ETP went unanswered.

ID and Title	Reason for Rejection
1045 A.O. Smith Tankless Water Heater	Nicor Gas Home Energy Efficiency Program is actively considering adjustment of their water heating rebates and instructed ETP that no pilot field testing should be undertaken while new retrofit rebate measures are under consideration. The applicant was notified that there may be existing opportunities for their product in the EEP Residential New Construction Program.
1046 Inspired Green Home Performance Bid Tool	Application was referred to Nicor Gas since this is an IC service that would implementation and coordination with other Nicor Gas programs. It is under direct consideration by Nicor Gas.
1047 Rayes Boilers	Technology already qualifies for rebates through the Business Energy Efficiency Rebate program and Business Custom programs, depending on size.
1052 Residential Vapor Vacuum Heating (re-application)	Not fully commercially available, still in prototype stage.

Table 5-5 details the values for KPI 9. To date, through the GTI online application system, 16 applicants selected to complete a feedback form on the process. The feedback form requests the applicant to rate their satisfaction on a scale of 1 to 5 (1 = disagree, and 5 = agree) on a number of different variables.

Table 5-5. KPI 9 – Application Feedback Survey Results (Quantitative Questions Only)

ID #	Date Submitted	Response to application was prompt	Application process clearly explained	Application process met expectations	Application questions were easy to understand	Reasons behind the final decision to the initial yes/no questionnaire were clearly explained.
#1022	6/4/2012	5	5	5	5	5
#1024	7/9/2012	No answer	5	5	5	No answer
#1026	7/12/2012	No answer	5	2	4	No answer
#1027	8/24/2012	5	4	3	3	4
#1030	10/23/2012	No answer	4	4	5	2
#1031	10/26/2012	4	4	4	5	3
#1032	10/29/2012	5	5	5	5	5
#1035	11/9/2012	3	4	4	4	3
#1037	11/29/2012	5	5	5	No answer	3
#1038	11/29/2012	5	2	4	1	3
#1041	12/31/2012	5	5	4	5	3
#1045	2/21/2013	5	5	5	5	5
#1047	3/18/2013	5	4	3	5	5
#1054	4/5/2013	5	5	5	5	5
#1059	4/29/2013	5	5	5	5	5
#1060	4/29/2013	5	5	5	5	5
Average Score		4.8	4.5	4.2	4.4	3.9

5.3 *Technology tracking in the TrakSmart PMT*

Table 5-6 lists all of the fields used by the ETP for technology tracking in the TrakSmart PMT.

Table 5-6. PMT (TrakSmart) Database Entries for ETP

Section/Topic	Database Field	Notes
Application Number	ApplicationNumber	Unique database ID
Request Payment	Request Payment	
Calculate Formula	Calculate Formula	Set to True
Project Information	Project Name	Same for every site for a given technology
	Application Received Date	
	Project ID #	
	Project Short Title	
	Description of Project	
	Estimated Project Cost (placeholder)	
	Comments	
	TRM Building Types	Select from list
	ResidentialBuildingTypes	
	Business Type	
	Upload Supporting Documents	
4S Scoring Information	Date Score Finalized	Only required for umbrella technology entry
	Cost-effectiveness Score	
	Gas Savings Score	
	Value to Nicor Portfolio Score	
	Non-energy Benefits Score	
	Support/Distribution in Nicor Gas Territory Score	
	Technological Maturity Score	
	Ease of Implementation/Market Adoption Score	
	Total Weighted Score (# out of 100)	
	Targeted EE Program Name for Potential New Measure	
Applicant Information	Applicant Company Name	
	Applicant Address 1	
	Applicant Address2	
	Applicant City	
	Applicant State	
	Applicant Postal Code	
	Contact First Name	
	Contact Last Name	
	Applicant Phone Number	
	Applicant Email	

Section/Topic	Database Field	Notes
	Company URL	
Manufacturer Information	Manufacturer Company Name	
	Manufacturer Address 1	
	Manufacturer Address2	
	Manufacturer City	
	Manufacturer State	
	Manufacturer Postal Code	
	Contact First Name	
	Contact Last Name	
	Manufacturer Phone Number	
	Manufacturer Email	
	Company URL	
Installing Contractor Information	Contractor Company Name	
	Contractor Address 1	
	Contractor Address2	
	Contractor City	
	Contractor State	
	Contractor Postal Code	
	Contact First Name	
	Contact Last Name	
	Contractor Phone Number	
	Contractor Email	
	Company URL	
Customer / Site Information	Company Name	
	First Name	
	Last Name	
	Address 1	
	Address 2	
	City	
	State	
	Postal Code	
	Contact First Name	
	Contact Last Name	
	Contact phone number	
	Contact email	
	Site Address 1	
	Site Address 2	
	Site City	
	Site State	
	Site Postal Code	

Section/Topic	Database Field	Notes
	Sector	
	Nicor Account Number	Mandatory
	Premise ID	Mandatory
Other Site Related Information	ComEd Account Number	
	Municipal Sewer Provider Name	
	Municipal Water Provider Name	
	Communication Log	
Payee	Company Name	
Emerging Technology Information	Technology Description	
	4S ID#	
	Technology Notes	
	Measure Phase	
	Date Monitoring Began	
	Date Monitoring Completed	
	Estimated Annual Sewer Savings (gallons)	
	Annual Sewer Savings (gallons)	
	Estimated Annual Water Savings (gallons)	
	Annual Water Savings (gallons)	
	Estimated Gross Annual Therm Savings	
	Gross Annual Therm Savings	
	Estimated Gross kWh Savings	
	Gross Annual kWh Savings	
	Estimated Installation Cost	
	Installation Cost	
	Estimated Maintenance Cost	
	Maintenance Cost	
	Estimated Recurring Cost	
	Recurring Cost	
	Estimated Equipment Cost	
	Total Technology Cost (Labor + Materials)	
	Estimated Simple Payback	
	Simple Payback	
	Quantity	
	NTG Ratio	Always set to 1
	Net Annual Therm Savings	Blank to start
	Incentive - Partner ($ amount)	Cumultaive amount invoiced
Application Status	Application Status	Active/Inactive
	Reporting Reference Date	Date of last invoice
Project Status	Task Status	Set to Open