

Nicor Gas
Business Custom Incentive Program
GPY4 Evaluation Report

FINAL

Energy Efficiency Plan:
Gas Plan Year 4
(6/1/2014-5/31/2015)

Presented to
Nicor Gas Company

August 25, 2016

Prepared by:

Nick Beaman
Navigant

Charles Ampong
Navigant

Robert Harrison
Navigant

www.navigant.com



Submitted to:

Nicor Gas Company
1844 Ferry Road
Naperville, IL 60563

Submitted by:

Navigant Consulting, Inc.
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606
Phone 312.583.5700
Fax 312.583.5701

Contact:

| | |
|---|---|
| Randy Gunn, Managing Director 312.938.4242 randy.gunn@navigant.com | Kevin Grabner, Associate Dir. 608.497.2236 kevin.grabner@navigant.com |
|---|---|

Acknowledgements

This report includes contributions from Chelsea Lamar and Mary Thony in addition to those individuals listed above.

Disclaimer: This report was prepared by Navigant Consulting, Inc. ("Navigant") for Nicor Gas based upon information provided by Nicor Gas and from other sources. Use of this report by any other party for whatever purpose should not, and does not, absolve such party from using due diligence in verifying the report's contents. Neither Navigant nor any of its subsidiaries or affiliates assumes any liability or duty of care to such parties, and hereby disclaims any such liability.

Table of Contents

| | | |
|-----------|---|-----------|
| E. | Executive Summary | 1 |
| E.1. | Program Savings and Results Summary | 2 |
| E.2. | Impact Estimate Parameters for Future Use..... | 3 |
| E.3. | Program Volumetric Detail..... | 3 |
| E.4. | Findings and Recommendations..... | 3 |
| 1. | Introduction | 6 |
| 1.1 | Program Description..... | 6 |
| 1.2 | Evaluation Objectives | 7 |
| 1.2.1 | Impact Questions | 7 |
| 1.2.2 | Process Questions | 7 |
| 2. | Evaluation Approach..... | 8 |
| 2.1 | Overview of Data Collection Activities..... | 8 |
| 2.2 | Verified Savings Parameters..... | 8 |
| 2.2.1 | Verified Gross Program Savings Analysis Approach..... | 8 |
| 2.2.2 | Verified Net Program Savings Analysis Approach | 9 |
| 2.3 | Process Evaluation | 10 |
| 3. | Gross Impact Evaluation | 11 |
| 3.1 | Tracking System Review | 11 |
| 3.2 | Program Volumetric Findings..... | 11 |
| 3.3 | Gross Program Impact Parameter Estimates..... | 12 |
| 3.4 | Verified Gross Program Impact Results..... | 13 |
| 4. | Net Impact Evaluation | 15 |
| 5. | Process Evaluation | 16 |
| 5.1 | GPY4 Custom Program-Related Findings | 16 |
| 5.2 | GPY5 Process Research | 17 |
| 6. | Findings and Recommendations | 18 |
| 7. | Appendix | 20 |
| 7.1 | Detailed Impact Research Findings and Approaches | 20 |
| 7.1.1 | Gross Impact Results | 20 |
| 7.2 | Summary Impact Findings for Custom and RCx Program Components | 24 |

List of Figures and Tables

Tables

| | |
|---|----|
| Table E-1. GPY4 Custom Program Total Savings | 2 |
| Table E-2. GPY4 Custom Program Savings by Project Savings Strata | 2 |
| Table E-3. GPY4 Custom Program Primary Participation Detail..... | 3 |
| Table 2-1. Primary Data Collection Activities and Samples | 8 |
| Table 2-2. Profile of GPY4 Gross Impact Sample by Strata..... | 9 |
| Table 2-3. Nicor Gas GPY4 Program NTGR Values | 10 |
| Table 3-1. GPY4 Custom Program Volumetric Findings Detail..... | 11 |
| Table 3-2. Custom Program Performance Yearly Comparison | 12 |
| Table 3-3. Gross Impact Realization Rate Results for Custom Program | 12 |
| Table 3-4. Custom Program GPY4 Verified Gross Impact Savings Estimates | 13 |
| Table 3-5. Gross Impact Realization Rate Results by Measure Type..... | 14 |
| Table 4-1. GPY4 Custom Program Verified Net Savings | 15 |
| Table 4-2. GPY4 Custom Program Savings by Project Savings Strata..... | 15 |
| Table 7-1. Profile of GPY4 Custom Gross Impact Sample | 21 |
| Table 7-2. GPY4 Summary of Sample M&V Results..... | 23 |
| Table 7-3. Gross Therms Realization Rates and Relative Precision at 90% Confidence Level..... | 24 |
| Table 7-4. GPY4 Overall Custom Program Verified Net Savings | 24 |

E. Executive Summary

This report presents a summary of the findings and results from the impact and process evaluation of gas program year 4 (GPY4)¹ of the Nicor Gas Business Custom Incentive Program (Custom Program). The Custom Program is targeted to active commercial and industrial customers of Nicor Gas. The program provides these customers with rebate incentives for the installation of cost-effective natural gas-related energy improvements that are not specified for a prescriptive rebate under the Nicor Gas Business Energy Efficiency Rebate program. The Custom Program also provides custom audits and engineering studies to assist customers in understanding their efficiency opportunities by quantifying the estimated project costs, energy savings, and forecasted incentives.

Nicor Gas' Energy Efficiency Plan (EEP) for GPY4 through GPY6 transitioned to the energySMART brand for implementation. Integration of the energySMART brand seeks to deliver consistent and targeted messaging using market data, and an emphasis on cross-promotion between offerings to ensure that each customer interaction delivers a recognized and relevant call-to-action at any point on their energy efficiency application.² As an example of this strategy, the Custom Program GPY4 offered a Retro-Commissioning (RCx) track. The RCx track presented participants the opportunity to optimize operation and improve their building efficiency by providing them with financial incentives to perform low-cost tune-ups and adjustments to the operating systems, building controls, energy management systems and HVAC of existing buildings. Evaluation results of the RCx component of the Custom Program were reported separately in the Nicor Gas and ComEd joint implementation of the Retro-Commissioning Program.³ This report covers the evaluation of the program savings realized from the custom measure component of the Custom Program. When this report refers to the "Custom Program" impacts, Navigant is excluding RCx savings. It should be noted that gross ex ante savings for Nicor Gas RCx projects accounted for approximately 2 percent of the Custom program. However, Navigant has provided the combined Custom and RCx savings in Appendix 7.2 for reference.

The GPY4 impact evaluation approach for the Custom Program involved on-site measurement and verification (M&V) and engineering desk reviews. This includes real time Parallel Path reviews of a sample of projects, and applying the necessary research to verify the reported savings. Navigant verified the GPY4 program net savings based on the 0.53 Net-to-Gross (NTG) ratio approved by Illinois Energy Efficiency Stakeholder Advisory Group (SAG) consensus. The Custom Program relies on wholesale and retail trade allies to assist in the marketing. The GPY4 process evaluation included monthly meetings with the program manager and the implementation contractor staff to discuss program performance, findings from real-time Parallel Path gross impact evaluation engineering project reviews, and the tracking system. The Custom Program was implemented in GPY4 by CLEAResult for the Nicor Gas Rider 30 Energy Efficient Portfolio period.

¹ The GPY4 program year began June 1, 2014 and ended May 31, 2015.

² Nicor Gas Energy Efficiency Plan, June 2014 - May 2017 (Revised Plan Filed Pursuant to Order Docket No. 13-0549)

³ JURCx PY7-4 Evaluation Report 2016.01.26 draft.docx

E.1. Program Savings and Results Summary

Table E-1 summarizes the natural gas savings from custom projects in the Custom Program. The Custom Program achieved a verified net savings of 1,460,372 therms in GPY4.

Table E-1. GPY4 Custom Program Total Savings

| Program | Ex Ante Gross Savings ⁴ (Therms) | Ex Ante Net Savings ⁵ (Therms) | Verified Gross RR ⁶ | Verified Gross Savings (Therms) | NTGR ⁷ | Verified Net Savings ⁸ (Therms) |
|-------------|---|---|--------------------------------|---------------------------------|-------------------|--|
| Custom GPY4 | 2,725,801 | 1,444,674 | 1.01 | 2,755,419 | 0.53 | 1,460,372 |

Source: Navigant analysis of GPY4 program tracking data and M&V Results (9-16-2015 data)

Table E-2 summarizes the program verified savings by project strata, based on gross energy savings boundaries that placed about one-third of program-total savings into each stratum. Overall, the Custom Program achieved a verified gross realization rate of 1.01, estimated at $\pm 5\%$ relative precision at 90% confidence level.

Table E-2. GPY4 Custom Program Savings by Project Savings Strata

| Savings Strata | Ex Ante Gross Savings (Therms) | Verified Gross Realization Rate [‡] | Verified Gross Savings (Therms) | NTGR | Verified Net Savings (Therms) |
|----------------|--------------------------------|--|---------------------------------|------|-------------------------------|
| 1 | 1,028,717 | 1.00 | 1,029,715 | 0.53 | 545,749 |
| 2 | 845,300 | 1.04 | 876,355 | 0.53 | 464,468 |
| 3 | 851,784 | 1.00 | 849,349 | 0.53 | 450,155 |
| Total | 2,725,801 | 1.01 | 2,755,419 | 0.53 | 1,460,372 |

Source: Navigant analysis of GPY4 program tracking data and M&V Results (9-16-2015 data)

‡ RRs are sample weighted therms realization rate values rounded to 2 digits. Direct application to the ex ante gross savings to get verified gross savings will produce rounding differences.

⁴ The term “Ex Ante” refers to the forecasted savings reported by the Program Administrator that have not been independently verified through evaluation. Savings that have been independently verified by the Evaluation Contractor are referred to as “Verified”.

⁵ GPY4 Ex Ante Gross = Values reported in the GPY4 program tracking data
 GPY4 Ex Ante Net = GPY4 Ex Ante Gross * GPY4 Deemed NTGR

⁶ Verified Gross Realization Rate (RR) = Verified Gross Savings/Ex Ante Gross Savings.
 Verified Gross Savings = RR * Ex Ante Gross Savings (Note: RRs are sample weighted therms realization rate values rounded to 2 digits. Direct application to the ex ante gross savings to get verified gross savings will produce rounding differences).

⁷ The Net-to-Gross Ratio (NTGR) used for calculating verified net savings is deemed prospectively through a consensus process managed by the Illinois Energy Efficiency Stakeholder Advisory Group (SAG). Deemed NTGRs are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

⁸ Verified Net Savings = NTGR * Verified Gross Savings

E.2. Impact Estimate Parameters for Future Use

The GPY4 evaluation did not conduct any research on net-to-gross values or impact savings parameters for deeming in future versions of the Illinois TRM. Net-to-gross research is planned for GPY5.

E.3. Program Volumetric Detail

Table E-3 below presents GPY4 program participation reported by the Program Administrator, CLEAResult. The Custom program implemented 60 custom projects from 51 participants.⁹ The GPY4 program measures varied and comprised of 21 measure types, with a majority of the savings derived from boiler replacements and upgrades, make-up air units, furnace pre-heat systems, reverse osmosis systems, controls, heat treatment equipment, insulation and regenerative thermo-oxidizer (RTOs) replacement projects.

Table E-3. GPY4 Custom Program Primary Participation Detail

| Participation | Program Total |
|--------------------|---------------|
| Participants | 51 |
| Completed Projects | 60 |
| Measure Types | 21 |

Source: Utility tracking data and Navigant analysis.

E.4. Findings and Recommendations

The following provides the key program findings and recommendations.

Program Savings Goals Attainment

Finding 1. The GPY4 Custom Program achieved verified net savings of 1,460,372 therms from custom measure projects. If the above custom results are combined with the 65,215 therms verified net savings from the RCx component (reported in the ComEd-Nicor Gas EPY7/GPY4 joint RCx evaluation report¹⁰) a total net therms of 1,525,587 are verified for the Custom Program. This total verified savings fell short by 26 percent of the targeted net savings goal of 2,049,000 therms.^{11 12}

Recommendation 1. Navigant recommends that the process research planned for GPY5 involve a joint effort with the Nicor Gas and CLEAResult teams to identify reasons and

⁹ Participants are defined by business name and contact name.

¹⁰ RCx PY7-4 Evaluation Report 2016-03-19 Final.docx

¹¹ Nicor Gas Energy Efficiency Plan, June 2014 - May 2017 (Revised Plan Filed Pursuant to Order Docket No. 13-0549). The combined verified savings is shown here for comparison purpose only. The EE plan net savings target of 2,049,000 therms is a combined value for both the Custom and RCx components. The plan does specify how much of this savings target is expected from the custom component which is the subject of this report.

¹² One of the primary reasons the Custom program did not achieve its GPY4 savings was that the program achieved very high levels of savings in GPY3, focused efforts on completing projects before the end of the program year, and depleted the pipeline projects ahead of GPY4.

barriers that prevented achieving the gas savings goal. The team should also develop associated recommendations for improvements to enable achieving the gas savings goal. The GPY5 process research is planned to include trade ally and customer interviews to assist in identifying barriers and opportunities for improvements.

Savings Verification Process

Finding 2. Navigant estimated 2,755,419 therms as the verified gross savings based on a research finding gross realization rate of 1.01 at relative precision of $\pm 5\%$ at 90% confidence level. We identified errors in the ex ante calculation methodology for make-up air units that impacted all three projects in our sample. Findings from evaluation billing analysis show lower savings for these projects lowering realization rates from 0.93 to 0.71. Most of the other M&V savings adjustments were due to using the most up to date information collected from the customers during on-site visits or through telephone conversation.

Recommendation 2. Navigant recommends that the implementation contractor develop a standardized methodology for calculating savings from make-up air units and for other measures that require weather normalization or billing analysis.

Recommendation 3: To improve the accuracy of final ex ante savings, the IC should ensure that the savings calculation workbooks for program measures are updated with the most current information from the customer before closing out the project for incentive payment.

Verified Gross Realization Rates

Finding 3. The Parallel Path process continues to benefit the implementation contractor's pre-approval savings review process and the final ex ante project savings estimates and thus minimized evaluation adjustments to savings assumptions for those projects at the end of the GPY4 evaluation cycle. The Parallel Path process also helped Navigant to minimize the number of sample points randomly selected to achieve a 90/10 precision and confidence level on the research gross realization rates. Of the 21 projects sampled, six were Parallel Path projects and five of them had realization rate of 1.00 or higher, but one had realization below 1.00. Four non-Parallel Path projects had realization from 1.00 to 1.50, while six other projects had realization rates below 1.00 down to 0.71 as a result of verification of savings using billing analysis or weather correlation of therms usage using regression analysis.

Recommendation 4: Navigant recommends continuing the Parallel Path process going forward. Navigant will work with CLEAResult and Nicor Gas to further develop the Parallel Path approach, with a focus on agreement of project specific methodology and assumptions at the early phase of a project's review.

Program Participation

Finding 4. The GPY4 Custom Program implemented 60 projects from 51 participants. Navigant also identified 40 custom pipeline projects in the tracking database with potential savings, but were not completed in GPY4. Compared with GPY3, the Custom Program had low participation in GPY4 in terms of project count and savings, although each program year had a different savings target. In spite of that, the program managed to achieve only 74 percent of its savings target in GPY4.

Recommendation 5. Navigant recommends a joint effort with the program implementer to identify ways to improve the program processes from pre-approval to completion to increase the conversion rate of pipeline projects to completion. This would include identifying barriers to converting pipeline projects to completed projects and improving the overall process timeline. The GPY5 process research activities will include interviews with the program implementer and participating customers and trade allies to identify barriers to completing projects and ways to improve the program participation.

1. Introduction

1.1 Program Description

The Custom Program is targeted to active commercial and industrial customers of Nicor Gas. It provides these customers with rebate incentives for the installation of cost-effective natural gas-related energy improvements that are not specified for a prescriptive rebate under the Nicor Gas Business Energy Efficiency Rebate program. The Custom Program provides custom audits and engineering studies to assist customers in understanding their efficiency opportunities by quantifying the estimated project costs, energy savings, and forecasted incentives. The program targets large commercial and industrial customers with more complex facilities that will benefit most from a custom offering during new equipment purchases, facility modernization and industrial process improvements. The Custom Program was implemented in GPY4 by CLEAResult for the Nicor Gas Rider 30 Energy Efficient Portfolio period.

Nicor Gas' Energy Efficiency Plan (EEP) for GPY4 through GPY6 transitioned to the energySMART brand for implementation. Integration of the energySMART brand seeks to deliver a consistent and targeted messaging using market data, and an emphasis on cross-promotion between offerings to ensure that each customer interaction delivers a recognized and relevant call-to-action at any point on their energy efficiency application.¹³ In this regard, the Custom Program GPY4 implementation offered a Retro-Commissioning (RCx) track. The RCx track presented participants the opportunity to optimize operation and improve their building efficiency by providing them with financial incentives to perform low-cost tune-ups and adjustments to the operating systems, building controls, energy management systems and HVAC of existing buildings. This evaluation report covers only the program savings realized from the custom measure component. Evaluation results for the RCx component of the Custom Program were reported separately in the Nicor Gas and ComEd joint implementation of the Retro-commissioning Program.¹⁴ It should be noted that gross ex ante savings for Nicor Gas RCx projects accounted for approximately 2 percent of the Custom program. However, Navigant has provided the combined Custom and RCx savings in Appendix 7.2 for reference.

The Custom Program staff work with both trade allies and decision-makers at larger facilities to identify and quantify efficiency opportunities at their facilities. Interested customers must first submit a letter of interest and a pre-approval application to the program. The initial application includes usage history and detailed calculations and specifications for the project. Program staff review the customer's initial reported savings and screen projects using an internal cost-benefit test. The Custom Program requires that a project's initial application be pre-approved prior to the start of the project. Prior to issuing an approval notice, pre installation inspections are performed on selected projects, especially for complex and high impact measures.

¹³ Nicor Gas Energy Efficiency Plan, June 2014 - May 2017 (Revised Plan Filed Pursuant to Order Docket No. 13-0549)

¹⁴ JURCx PY7-4 Evaluation Report 2015-12-14 draft.docx

1.2 Evaluation Objectives

The Evaluation team identified the following key researchable questions for GPY4.

1.2.1 Impact Questions

1. What are the program's verified gross savings, using field measurement and verification (M&V) and engineering research to estimate savings?
2. What are the program's verified net savings?
3. What are the results and findings from field data collection?

1.2.2 Process Questions

Although GPY4 evaluation efforts focused on impact related activities, Navigant conducted monthly meetings with key Nicor Gas and implementation staff to discuss the status of the program, any issues faced by the program staff and the program evaluation. Navigant will conduct more extensive process evaluation research during the GPY5 program year with a multiple-wave evaluation survey approach of participating customers and trade allies

2. Evaluation Approach

This section provides an overview of the data collection methods, gross and net impact evaluation approaches, and process evaluation approaches that occurred for the GPY4 evaluation.

2.1 Overview of Data Collection Activities

Table 2-1 below summarizes data collection methods, data sources, timing, and completed sample sizes to answer the evaluation research questions.

Table 2-1. Primary Data Collection Activities and Samples

| What | Who | Completes | When | Comments |
|--|---------------|-----------|-----------------------|---|
| Engineering File Reviews | GPY4 Projects | 21 | July - September 2014 | All projects underwent either on-site M&V Audit or Telephone M&V Audit. |
| On-site M&V Audit | GPY4 Projects | 10 of 21 | July – October 2015 | Data collection supporting gross impact study |
| Telephone M&V Audit and Desk File Review | GPY4 Projects | 11 of 21 | July – October 2015 | Data collection supporting gross impact study |
| Monthly Meetings with Program Staff | PM/IC Staff | N/A | Monthly | Data collection supporting limited process study |

Source: Navigant evaluation team.

2.2 Verified Savings Parameters

2.2.1 Verified Gross Program Savings Analysis Approach

Navigant conducted on-site measurement and verification (M&V) and engineering project file reviews on a random sample of projects to determine eligibility and verify the Custom Programs' gross savings and gross realization rates. Navigant sampled a total of 21 custom projects targeting a 90/10 level of confidence and relative precision for program-level verified savings from the program tracking database population of 60 paid projects. The sample included six of seven Parallel Path projects completed in GPY4.

The primary goal of the Parallel Path approach is to minimize risk and uncertainty regarding the assumed energy savings values for some of the largest projects or projects with unique baselines, such as early replacement, in the Custom Program through real time feedback and assessment. Obtaining project realization rate information prior to issuing the formal project pre-approval notice allows the implementation contractor to decide to not proceed – or come up with an alternative plan – for projects identified as high risks to the Custom Program's therm savings goals during the Parallel Path review process. This process reduces the risk to the Program and allows for faster evaluation of selected Custom Program projects.

Projects were stratified at the tracking record level using the population gross therms savings determined from program tracking data. Strata were defined by project size, based on gross energy savings boundaries that placed about one-third of program-level savings into each stratum. Stratum 1 consisted of large projects with project-level ex ante savings greater than 137,000 therms, stratum 3

consisted of small projects with ex ante gross energy savings less than 55,000 therms, and stratum 2 consisted of the medium sized projects in between. Strata size are contingent on the distribution of therms savings of the program population and may vary by program year. Table 2-2 shows a profile of the sample selection.

Table 2-2. Profile of GPY4 Gross Impact Sample by Strata

| Program | Sampling Strata | Population Summary | | | Sample | | |
|----------------|-----------------|-----------------------|--------------------------------|----------------|--------|----------------|------------------------------------|
| | | Number of Project (N) | Ex Ante Gross Savings (Therms) | Therms Weights | n | Ex Ante Therms | Sampled % of Population (% therms) |
| Custom Program | 1 | 4 | 1,028,717 | 0.377 | 4 | 1,028,717 | 100% |
| | 2 | 11 | 845,300 | 0.310 | 8 | 648,448 | 77% |
| | 3 | 45 | 851,784 | 0.312 | 9 | 304,294 | 36% |
| TOTAL | | 60 | 2,725,801 | 1.000 | 21 | 1,981,459 | 73% |

Source: Navigant analysis of GPY4 programs tracking data

The evaluation team completed 10 on-site visits out of the 21 Custom Program projects sampled and conducted desk file reviews on the remaining 11 projects. The total sample accounts for 73 percent of the ex ante gross savings from the GPY4 population. Evaluation completed on-site verification for the six sampled Parallel Path projects. The evaluation team collaborated with the program implementation contractor through emails and telephone conversations where clarifications were needed to verify the savings input assumptions of the sampled projects, including collection of trend and billing data to develop independent research finding gross estimates of energy savings or update or replace the calculation procedures that were submitted as part of the final application. The evaluation team prepared detailed, site-specific impact evaluation report for each on-site visit and documented research findings and revisions to program claimed savings.

The evaluation team extrapolated the estimated measure-level and project level realization rates to the program population, using a ratio estimation method to yield evaluation-adjusted research finding gross energy savings.

2.2.2 Verified Net Program Savings Analysis Approach

The net-to-gross (NTG) ratio estimate used to calculate the program verified net energy savings was based on past evaluation research and approved through a consensus process managed through the Illinois Energy Efficiency Stakeholders Advisory Group (SAG).¹⁵ The program verified net energy savings were calculated by multiplying the verified gross savings estimates by the deemed NTG ratio.

¹⁵ Source: Deemed NTGR values are available on the Illinois Energy Efficiency Stakeholders Advisory Group web site. http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

Table 2-3. Nicor Gas GPY4 Program NTGR Values

| Program Path | GPY4 Deemed NTG Value | NTGR Source |
|---------------------------------|-----------------------|-------------|
| Custom Program, Custom Projects | 0.53 | IL-SAG |

Source: Navigant analysis

2.3 Process Evaluation

Although GPY4 evaluation efforts focused on impact related activities, Navigant conducted monthly meetings with key Nicor Gas and implementation staff to discuss the status of the program, any issues faced by the program staff and the program evaluation. In addition to the monthly program meetings, Navigant conducted targeted interviews with program managers to identify potential areas of research during GPY5 evaluation activities. Through these interviews, Navigant, Nicor Gas and the implementation contractor identified two main areas of research:

1. General program related issues, such as customer and trade ally satisfaction, effectiveness of the incentive structure, and any additional unmet needs.
2. Specific research regarding Energy Assessments, particularly investigating instances that an Energy Assessment does not result in the installation of an energy efficiency measure (i.e. no conversion) and the barriers identified by those customers and trade allies.

Navigant will conduct more extensive process evaluation research during the GPY5 program year with a multiple-wave evaluation survey approach of participating customers and trade allies

3. Gross Impact Evaluation

This section presents the Custom Program gross impact evaluation results, including a tracking system review. Overall, the Custom Program achieved 2,755,419 therms verified gross savings, representing a gross realization rate of 1.01.

3.1 Tracking System Review

Navigant requested the GPY4 program tracking data from Nicor Gas to conduct the evaluation efforts. Navigant reviewed the tracking data and compared input fields with sample project files downloaded from Nicor Gas Evaluation SharePoint to verify the completeness and accuracy of the tracking data and identify any issues that would affect the impact evaluation of the program. We identified one pipe insulation project (NG04-012) in the tracking database with ex ante savings of 55,161 therms. Upon a review of the project documentation and savings analysis, we found 56,151 therms as the project ex ante, and subjected it to evaluation adjustment. The evaluation team concluded that overall, the tracking system gathered the necessary data for GPY4 evaluation and program performance monitoring.

In the course of GPY4, Navigant provided input to the Real Time M&V Grid developed by Nicor Gas to track program metrics and monitor key aspects of program performance at regular intervals. The information provided by Navigant elaborated on the various items we collect for M&V purposes. These included file types, sizes, savings calculation methods, savings validation sources, and quantity of files or projects, along with frequency of file requests and type of customer information needed for evaluation purposes.

3.2 Program Volumetric Findings

The GPY4 Custom Program implemented 60 projects from 51 participants. The program measures varied and comprised of 21 measure types, with a majority of the savings derived from boiler replacements and upgrades, make-up air units, furnace pre-heat systems, reverse osmosis systems, controls, heat treatment equipment, insulation and regenerative thermo-oxidizer (RTOs) replacement projects. The GPY4 volumetric findings are summarized in Table 3-1.

Table 3-1. GPY4 Custom Program Volumetric Findings Detail

| Participation | Program Total |
|----------------------------|---------------|
| Participants ¹⁶ | 51 |
| Completed Projects | 60 |
| Measure Types | 21 |

Source: Utility tracking data and Navigant analysis.

¹⁶ Participants are defined by business name and contact name.

The Custom Program did not reach its planned volume of participants in GPY4 with the program completing around half of its target. Navigant provides the year to year volumetric differences and program performance from GPY1 to GPY4 in Table 3-2.

Table 3-2. Custom Program Performance Yearly Comparison

| Program Parameters | GPY1 | GPY2 | GPY3 | GPY4 |
|-------------------------------------|-----------|-----------|-----------|-------------------|
| Ex Ante Gross Therms | 1,622,380 | 3,317,145 | 5,430,141 | 2,725,801 |
| Completed Projects | 28 | 73 | 98 | 60 |
| Businesses Participating | 28 | 62 | 89 | 51 |
| Project Participation Goal Achieved | 65% | 66% | 65% | 57% |
| Gross Therms Goal Achieved | 111% | 75% | 86% | 74% ¹⁷ |

Source: Navigant analysis of GPY4 tracking data; GPY1-GPY3 Final Evaluation Reports; Nicor Gas EE Plan 1(2011-2014); Nicor Gas EE Plan 2 (2014-2017)

The Custom Program has not achieved its savings goal year-to-year, with the exception of GPY1 where it exceeded its savings goal. Likewise, the program has only managed to achieve about two-thirds of its project participation targets year-to-year. We will work with the program implementation contractor during the GPY5 evaluation to identify the challenges and the best ways to improve the program conversion rate from pipeline to completed projects.

3.3 Gross Program Impact Parameter Estimates

Navigant determined the project-level verified savings from the results of the on-site M&V and engineering project file reviews for the sampled projects as the verified gross savings. The program verified gross realization rate was determined by calculating the ratio of the verified gross savings to the reported ex ante gross savings. Weighted realization rates by strata were calculated for the Custom Program. Results are detailed in Table 3-3.

Table 3-3. Gross Impact Realization Rate Results for Custom Program

| Program | Sample Strata | Sample-Based Ex Ante Gross Savings (Therms) | Sample-Based Verified Gross Realization Rate ¹⁸ | Sample-Based Verified Gross Savings (Therms) |
|--|---------------|---|--|--|
| Custom | 1 | 1,028,717 | 1.00 | 1,029,715 |
| | 2 | 648,448 | 1.04 | 672,271 |
| | 3 | 304,294 | 1.00 | 303,424 |
| Custom Total | | 1,981,459 | 1.01 | 2,005,410 |
| Overall Confidence Interval and Relative Precision (90/10) on RR | | | 5% | |

Source: Navigant analysis

¹⁷ GPY4 Therms goal included projected savings from Retro-commissioning projects. However, bulk of the targeted savings were attributed to the Custom Program.

¹⁸ These are sample weighted therms realization rate values rounded to 2 digits. Direct application to the ex ante gross savings (to get sample research findings gross savings) will produce rounding differences.

3.4 Verified Gross Program Impact Results

Navigant applied the sample strata verified gross realization rates to the population strata to achieve the program-level verified gross savings. As shown in Table 3-4 below, the evaluation research adjustments resulted in verified gross energy savings of 2,755,419 therms for the Nicor Gas Custom Program. This reflects the therm-weighted verified gross realization rate of 1.01 at ± 5 percent relative precision at 90 percent confidence level. The detailed calculations and discussion are presented in Appendix 7.1.1.

Table 3-4. Custom Program GPY4 Verified Gross Impact Savings Estimates

| Program Delivery | Sample | Energy Savings (Therms) | 90/10 Significance? | Confidence Level & Rel. Precision |
|--|--------|-------------------------|---------------------|-----------------------------------|
| Ex Ante Gross Savings | | 2,725,801 | | |
| Verified Gross Realization Rate \ddagger | 21 | 1.01 | Yes | $\pm 5\%$ |
| Verified Gross Savings \ddagger | | 2,755,419 | | |

Source: Navigant analysis

Out of the 21 M&V sample projects, eleven (11) had 100 percent realization rates with minor or no adjustment to the ex ante savings. Five (5) projects had their ex ante savings adjusted upwards after evaluation verification with gross realization rates between 1.01 and 1.50. For these projects the adjustments were primarily due to using trend data or weather-normalized billing analysis TMY3 data instead of actual weather data used in the energy savings model or due to site specific measurement to accurately reflect the actual site operation. Five (5) other projects had their ex ante savings adjusted below 1.00 down to 0.71 due to billing analysis or weather correlation of therms usage using regression analysis.

For the six Parallel Path projects in the sample, four had gross realization rates of 1.00, one had 1.01, and the other had a gross realization rate of 0.97 (billing analysis produced lower savings than the preliminary value). The measures that were most impacted with savings reductions were the make-up air units project due to results from billing analysis. Other projects with lower realization rates were a boiler replacement measure and tunnel washer equipment.

Table 3-5 shows a summary of the savings contribution by measure end-use from the sample projects. These results are unweighted at the strata level. Details of each measured savings adjustment are provided in Appendix Table 7-1 and Table 7-2.

Table 3-5. Gross Impact Realization Rate Results by Measure Type

| Measure Type | Measure Count | Sample-Based Ex Ante Gross Savings (Therms) | Sample-Based Verified Gross Savings (Therms) | Measure Level Verified Gross Realization Rate |
|--|---------------|---|--|---|
| Furnace Pre-Heat | 1 | 547,690 | 547,690 | 1.00 |
| Recirculation Pump | 1 | 136,872 | 136,872 | 1.00 |
| Heat Exchange/Recovery System | 4 | 334,925 | 349,836 | 1.04 |
| Reverse Osmosis Systems | 1 | 165,869 | 166,867 | 1.01 |
| Install Regenerative Thermal Oxidizers (RTO) | 2 | 176,638 | 176,638 | 1.00 |
| Make Up Air Units | 3 | 148,509 | 118,573 | 0.80 |
| Insulation | 2 | 133,229 | 133,282 | 1.00 |
| Boiler Replacement/Upgrade | 3 | 129,432 | 166,133 | 1.28 |
| Retrofit CAV to VAV boxes | 1 | 92,741 | 92,741 | 1.00 |
| Kitchen Exhaust System | 1 | 42,435 | 42,435 | 1.00 |
| Rooftop Unit (RTUs) | 1 | 18,676 | 21,388 | 1.15 |
| Tunnel Washer | 1 | 54,443 | 52,955 | 0.97 |

Source: Navigant analysis

4. Net Impact Evaluation

Navigant calculated verified net energy savings by multiplying the verified gross savings estimates by a net-to-gross ratio. As noted in Section 2, Navigant used a deemed NTGR to calculate the net verified savings for the GPY4 Custom Program.

As presented in Table 4-1, the GPY4 Custom Program had verified net savings of 1,460,372 therms.

Table 4-1. GPY4 Custom Program Verified Net Savings

| Program | Ex Ante Gross Savings ¹⁹ (Therms) | Ex Ante Net Savings ²⁰ (Therms) | Verified Gross RR ²¹ | Verified Gross Savings (Therms) | NTGR ²² | Verified Net Savings ²³ (Therms) |
|-------------|---|---|---------------------------------|------------------------------------|--------------------|--|
| Custom GPY4 | 2,725,801 | 1,444,674 | 1.01 | 2,755,419 | 0.53 | 1,460,372 |

Source: Navigant analysis

Table 4-2 summarizes the program net savings by project strata.

Table 4-2. GPY4 Custom Program Savings by Project Savings Strata

| Savings Strata | Ex Ante Gross Savings (Therms) | Verified Gross Realization Rate [‡] | Verified Gross Savings (Therms) | NTGR | Verified Net Savings (Therms) |
|----------------|--------------------------------|--|---------------------------------|------|-------------------------------|
| 1 | 1,028,717 | 1.00 | 1,029,715 | 0.53 | 545,749 |
| 2 | 845,300 | 1.04 | 876,355 | 0.53 | 464,468 |
| 3 | 851,784 | 1.00 | 849,349 | 0.53 | 450,155 |
| Total | 2,725,801 | 1.01 | 2,755,419 | 0.53 | 1,460,372 |

Source: Navigant analysis

[‡] RRs are sample weighted therms realization rate values rounded to 2 digits. Direct application to the ex ante gross savings to get verified gross savings will produce rounding differences.

¹⁹ The term “Ex Ante” refers to the forecasted savings reported by the Program Administrator that have not been independently verified through evaluation. Savings that have been independently verified by the Evaluation Contractor are referred to as “Verified”.

²⁰ GPY4 Ex Ante Gross = Values reported in the GPY4 program tracking data

GPY4 Ex Ante Net = GPY4 Ex Ante Gross * GPY4 Deemed NTGR

²¹ Verified Gross Realization Rate (RR) = Verified Gross Savings/Ex Ante Gross Savings.

Verified Gross Savings = RR * Ex Ante Gross Savings (Note: RRs are sample weighted therms realization rate values rounded to 2 digits. Direct application to the ex ante gross savings to get verified gross savings will produce rounding differences).

²² The Net-to-Gross Ratio (NTGR) used for calculating verified net savings is deemed prospectively through a consensus process managed by the Illinois Energy Efficiency Stakeholders Advisory Group (SAG). Deemed NTGRs are available at: http://ilsagfiles.org/SAG_files/NTG/2015_NTG_Meetings/Final_2015_Documents/Nicor_Gas_NTG_Summary_GPY1-5_2015-03-01_Final.pdf

²³ Verified Net Savings = NTGR * Verified Gross Savings

5. Process Evaluation

Although GPY4 evaluation effort focused on impact related activities, Navigant conducted monthly meetings with key Nicor Gas and implementation staff to discuss the status of the program, any issues faced by the program staff and the program evaluation. The following section outlines program-related findings and areas of potential research for GPY5.

5.1 GPY4 Custom Program-Related Findings

During the program staff meetings, Navigant heard several reasons that the program fell short of achieving its GPY4 goals. One of the primary reasons that the program did not achieve its GPY4 savings was that the program achieved very high levels of savings in the previous year. During the last quarter of GPY3, the program focused efforts on completing as many upcoming, or pipeline, projects as possible before the end of the program year. During this time, the program offered bonus incentives to trade allies for projects completed by the end of GPY3. While this effort led the program to achieve higher levels of savings in GPY3, the program began GPY4 without the pipeline of impending projects that it usually has in place.

Entering GPY4, the method for setting the confidence that an approved project would be completed within the program year was to assign approved projects a confidence factor of 80%. Applying these confidence factors, the program manager anticipated that the program would achieve its savings goals for GPY4 as late as the third program quarter. A large portion of the program savings were scheduled to be completed in the last part of the program year. Many of these end-of-year projects were very large and represented a significant portion of the total program savings. Unfortunately, due to the complex engineering nature, many of these projects were not completed before the end of the program year, or were only partially completed and therefore only achieved some of the planned savings. When projects are scheduled to be completed in the last program quarter and are not completed, there is very little time for the program staff to react to make up for the lost savings. However, many of the projects that were not completed in GPY4 will be completed in GPY5, which will help the program achieve its GPY5 savings goals.

After realizing that the existing method of determining the confidence factor may have been overestimating the likelihood that a project would be completed, the program manager and implementation contractor developed a new method for determining the confidence factor. Under the new method, the program asks the participant and the contractor to describe any risk factors that would decrease the likelihood on the project being completed, including budgeting, installation, and operation risks. By including these additional risk factors in determining the confidence factor, the program manager is now able to better estimate the future program savings. With this better estimate of program savings, the program manager can actively manage and react to the possibility of a shortfall, possibly by pushing some projects to be completed sooner to make up for projects that have been delayed. Additionally, the program implementers shortened the Early Action Bonus (of 30% not to exceed \$30,000) incentive from six to four months of the date of receipt of the energy assessment report. This resulted in select measures converting to completed projects sooner. These changes to the program implementation process, along with the strong pipeline of in-process projects, should help the program achieve its GPY5 and GPY6 savings goals.

5.2 GPY5 Process Research

Per the Evaluation, Measurement, and Verification Plans for Gas Program Year 4 through Year 6 compendium, Navigant will conduct a more extensive process evaluation during the GPY5 program year with a multiple-wave evaluation survey approach of participating customers and trade allies. The GPY5 evaluation will include a quality assurance and quality control due diligence review to identify opportunities for improvement of program administration and implementation. Nicor Gas and implementation staff also identified the following targeted areas of interest that will be included in GPY5 research efforts.

1. Has the program been successful in recruiting additional participants? In what ways can the program increase customer participation? Is the program meeting the needs of the customer? Would additional support from the program influence additional energy efficiency projects? The Navigant team will survey customers to determine if there are unmet needs for additional support from the program. This could include questions targeting the incentive structure and if the content of the Energy Assessments is useful and complete.
2. What barriers and challenges prevent customers from moving forward with the energy efficient measures, including those identified by reviewing the incentive structure (scaled timing and amount) with the customer? What additional support could the program provide that would influence more EE from customers?
3. What was the conversion rate per assessment? What was the therms converted from delivered assessments? What can the program do to increase the conversion rates and therms converted from delivered assessments? What barriers and challenges prevented the customer from moving forward after having an assessment completed?
4. Are trade allies satisfied with the program? In what ways can the program increase trade ally participation? Do trade allies recommend energySMART assessments to their customers? If not, why not? Would trade allies be receptive to an incentive structure that was flexible within the program year? For example, offering a higher incentive at the beginning of the program year to offset the “hockey stick” effect. Are trade allies aware of the benefits of energy assessments?
5. How can the program be improved?

6. Findings and Recommendations

This section summarizes the key evaluation findings and recommendations. This section is repeated in its entirety in the Executive Summary.

Program Savings Goals Attainment

Finding 1. The GPY4 Custom Program achieved verified net savings of 1,460,372 therms from custom measure projects. If the above custom results are combined with the 65,215 therms verified net savings from the RCx component (reported in the ComEd-Nicor Gas EPY7/GPY4 joint RCx evaluation report²⁴) a total net therms of 1,525,587 are verified for the Custom Program. This total verified savings fell short by 26 percent of the targeted net savings goal of 2,049,000 therms.^{25 26}

Recommendation 1. Navigant recommends that the process research planned for GPY5 involve a joint effort with the Nicor Gas and CLEAResult teams to identify reasons and barriers that prevented achieving the gas savings goal. The team should also develop associated recommendations for improvements to enable achieving the gas savings goal. The GPY5 process research is planned to include trade ally and customer interviews to assist in identifying barriers and opportunities for improvements.

Savings Verification Process

Finding 2. Navigant estimated 2,755,419 therms as the verified gross savings based on a research finding gross realization rate of 1.01 at relative precision of $\pm 5\%$ at 90% confidence level. We identified errors in the ex ante calculation methodology for make-up air units that impacted all three projects in our sample. Findings from evaluation billing analysis show lower savings for these projects lowering realization rates from 0.93 to 0.71. Most of the other M&V savings adjustments were due to using the most up to date information collected from the customers during on-site visits or through telephone conversation.

Recommendation 2. Navigant recommends that the implementation contractor develop a standardized methodology for calculating savings from make-up air units and for other measures that require weather normalization or billing analysis.

Recommendation 3: To improve the accuracy of final ex ante savings, the IC should ensure that the savings calculation workbooks for program measures are updated with the most current information from the customer before closing out the project for incentive payment.

²⁴ RCx PY7-4 Evaluation Report 2016-03-19 Final.docx

²⁵ Nicor Gas Energy Efficiency Plan, June 2014 - May 2017 (Revised Plan Filed Pursuant to Order Docket No. 13-0549). The combined verified savings is shown here for comparison purpose only. The EE plan net savings target of 2,049,000 therms is a combined value for both the Custom and RCx components. The plan does specify how much of this savings target is expected from the custom component which is the subject of this report.

²⁶ One of the primary reasons the Custom program did not achieve its GPY4 savings was that the program achieved very high levels of savings in GPY3, focused efforts on completing projects before the end of the program year, and depleted the pipeline projects ahead of GPY4.

Verified Gross Realization Rates

Finding 3. The Parallel Path process continues to benefit the implementation contractor’s pre-approval savings review process and the final ex ante project savings estimates and thus minimized evaluation adjustments to savings assumptions for those projects at the end of the GPY4 evaluation cycle. The Parallel Path process also helped Navigant to minimize the number of sample points randomly selected to achieve a 90/10 precision and confidence level on the research gross realization rates. Of the 21 projects sampled, six were Parallel Path projects and five of them had realization rate of 1.00 or higher, but one had realization below 1.00. Five non-Parallel Path projects had realization from 1.00 to 1.50, while five other projects had realization rates below 1.00 down to 0.71 as a result of verification of savings using billing analysis or weather correlation of therms usage using regression analysis.

Recommendation 4: Navigant recommends continuing the Parallel Path process going forward. Navigant will work with CLEAResult and Nicor Gas to further develop the Parallel Path approach, with a focus on agreement of project specific methodology and assumptions at the early phase of a project’s review.

Program Participation

Finding 4. The GPY4 Custom Program implemented 60 projects from 51 participants.

Navigant also identified 40 custom pipeline projects in the tracking database with potential savings, but were not completed in GPY4. Compared with GPY3, the Custom Program had low participation in GPY4 in terms of project count and savings, although each program year had a different savings target. In spite of that, the program managed to achieve only 74 percent of its savings target in GPY4.

Recommendation 5. Navigant recommends a joint effort with the program implementer to identify ways to improve the program processes from pre-approval to completion to increase the conversion rate of pipeline projects to completion. This would include identifying barriers to converting pipeline projects to completed projects and improving the overall process timeline. The GPY5 process research activities will include interviews with the program implementer and participating customers and trade allies to identify barriers to completing projects and ways to improve the program participation.

7. Appendix

7.1 Detailed Impact Research Findings and Approaches

7.1.1 Gross Impact Results

Gross Impact Sampling

A sample of 21 Custom Program projects was randomly selected from a stratified population of 60 projects in the Nicor Gas program tracking database to determine program-level verified gross realization rates at a target of 90/10 confidence and precision. The sample included six of the seven Parallel Path projects in GPY4 as part of the M&V sample.

A thorough engineering review of the algorithms used by the program to calculate energy savings, and the assumptions that feed into those algorithms, was conducted for all 21 sampled projects. On-site measurement and verification (M&V) was conducted for 10 out of the 21 sampled projects based on IPMVP protocols. Engineering file review was performed to verify the remaining 11 sampled projects, supported by telephone verification for some of the projects. A profile of the sample selection is shown below in Table 7-1. Navigant reviewed the sample to verify that there is an accurate representation by measure technology and business type within the overall sample.

Table 7-1. Profile of GPY4 Custom Gross Impact Sample

| Project # | Ex Ante Gross | Sample Strata | M&V | Measure Description |
|-----------|---------------|---------------|-------------|--|
| NG03-127 | 547,690 | 1 | On-site | Furnace Pre-Heat (phase I) |
| NG04-039 | 136,872 | 1 | On-site | Recirculation Pump |
| NG04-108 | 178,286 | 1 | On-site | Heat treating equipment addition |
| NG02-120 | 165,869 | 1 | On-site | Reverse Osmosis Systems |
| NG04-057 | 88,388 | 2 | File Review | replace RTO |
| NG03-142 | 59,474 | 2 | File Review | Make up air units |
| NG04-012 | 56,151 | 2 | File Review | insulation project |
| NG04-013 | 77,078 | 2 | File Review | insulation project |
| NG04-020 | 82,504 | 2 | On-site | add 400 HP boiler with economizer |
| NG04-077 | 92,741 | 2 | On-site | Retrofit CAV to VAV boxes |
| NG04-045 | 103,862 | 2 | On-site | Heat recovery exchanger, spray dryer upgrade |
| NG04-019 | 88,250 | 2 | On-site | Install RTO unit for printing company |
| NG04-051 | 39,906 | 3 | File Review | Make up air units |
| NG03-034 | 4,717 | 3 | File Review | replace boiler |
| NG04-015 | 42,211 | 3 | File Review | Boiler Replacement |
| NG02-032 | 19,344 | 3 | File Review | Recover heat from the cooling of air compressors |
| NG04-001 | 42,435 | 3 | File Review | kitchen exhaust system |
| NG03-141 | 49,129 | 3 | File Review | Make up air units |
| NG04-003 | 18,676 | 3 | File Review | RTUs |
| NG03-060 | 54,443 | 3 | On-site | Tunnel Washer |
| NG03-077 | 33,433 | 3 | On-site | HE grain dryer |

Source: Utility tracking data and project files, and Navigant analysis. Ex ante gross based on project documentation.

Engineering Review of Project Files

For each selected project, an in-depth application review is performed to assess the engineering methods, parameters and assumptions used to generate all ex ante impact estimates. For each measure in the sampled project, engineers estimated ex post gross savings based on their review of documentation and engineering analysis.

To support this review, CLEAResult provided project documentation in electronic format for each sampled project. Documentation included some or all scanned files of hardcopy application forms and supporting documentation from the applicant (invoices, measure specification sheets, and vendor proposals), pre-inspection reports and photos (when required), post inspection reports and photos (when conducted), and calculation spreadsheets.

On-Site Data Collection

On-site surveys were completed for a subset of 10 of the 21 customer applications sampled. For most projects, data collection includes interviews that are completed at the time of the on-site, visual inspection of the systems and equipment, spot measurements, and short-term monitoring (e.g., less than four weeks). An analysis plan is developed for each project selected for on-site data collection. Each plan explains the general gross impact approach used (including monitoring plans), provides an analysis of the current inputs (based on the application and other available sources at that time), and identifies sources that will be used to verify data or obtain newly identified inputs for the ex post gross impact approach.

The engineer assigned to each project first calls to set up an appointment with the customer. During the on-site audit, data identified in the analysis plan is collected, including monitoring records such as measured temperatures, data from equipment logs, equipment nameplate data, system operation sequences and operating schedules, and, of course, a careful description of site conditions that might contribute to baseline selection.

All engineers who conduct audits are trained and experienced in completing inspections for related types of projects. Each carries properly calibrated equipment required to conduct the planned activities. They check in with the site contact upon arrival at the business, and check out with that same site contact, or a designated alternate, on departure. The on-site audit consists of a combination of interviewing and taking measurements. During the interview, the engineer meets with a business representative who is knowledgeable about the facility's equipment and operation, and asks a series of questions regarding operating schedules, location of equipment, and equipment operating practices. Following this interview, the engineer makes a series of detailed observations and measurements of the business and equipment. All information is recorded and checked for completeness before leaving the site.

Site-Specific Impact Estimates

Annual energy impacts were developed for each of the 21 sampled projects based on the data gathered on-site and via telephone, supplemental monitoring data, application information, and, in some cases, billing or interval data. Energy savings calculations are accomplished using methods that may include short-term monitoring-based assessments, simulation modeling (e. g. , DOE-2), bin models, application of ASHRAE methods and algorithms, analysis of pre- and post-installation billing and interval data, and other specialized algorithms and models.

Research Findings for the Gross Impact Sample

Table 7-2 below presents a summary of the research findings for the 21 sampled projects to provide insight into the engineering review, on-site verification and telephone verification results. A total of 11 projects out of the 21 sample achieved 100 percent realization rates, while five projects received some adjustments that lowered their realization rates and five had realization above 100 percent. All three make-up air unit measures in the sample had realization rates below 100 percent due to evaluation billing analysis.

Table 7-2. GPY4 Summary of Sample M&V Results

| Project ID | Measure Description | Gross Realization Rate | Summary of Adjustment |
|------------|--|------------------------|--|
| NG03-127 | Furnace Pre-Heat (phase I) | 100% | OK |
| NG04-039 | Recirculation Pump | 100% | OK |
| NG04-108 | Heat treating equipment addition | 100% | OK |
| NG02-120 | Reverse Osmosis Systems | 101% | On-site spot measurement produced 998 therms more savings |
| NG04-057 | replace RTO | 100% | OK |
| NG03-142 | Make up air units | 71% | Billing/regression analysis produced lower savings from actual |
| NG04-012 | insulation project | 100% | OK |
| NG04-013 | insulation project | 100% | OK |
| NG04-020 | add 400 HP boiler with economizer | 150% | Analysis of trend data produced more savings |
| NG04-077 | Retrofit CAV to VAV boxes | 100% | OK |
| NG04-045 | Heat recovery exchanger, spray dryer upgrade | 100% | OK |
| NG04-019 | Install RTO unit for printing company | 100% | OK |
| NG04-051 | Make up air units | 93% | Billing/regression analysis produced lower savings from actual |
| NG03-034 | replace boiler | 105% | Used TMY3 data rather than actual |
| NG04-015 | Boiler Replacement | 89% | Billing analysis produced lower savings |
| NG02-032 | Recover heat from the cooling of air compressors | 100% | OK |
| NG04-001 | kitchen exhaust system | 100% | OK |
| NG03-141 | Make up air units | 80% | Billing/regression analysis produced lower savings from actual |
| NG04-003 | RTUs | 115% | Billing analysis produced higher savings |
| NG03-060 | Tunnel Washer | 97% | Billing analysis produced lower savings |
| NG03-077 | HE grain dryer | 145% | Billing analysis and spot measurement produced more savings |

Source: Utility tracking data and Navigant analysis.

Table 7-3 provides the relative precision at a 90% level of confidence for the sample. The mean verified gross realization rate for the Custom sample was 1.01 at a relative precision of $\pm 5\%$ at 90% confidence level.

Table 7-3. Gross Therms Realization Rates and Relative Precision at 90% Confidence Level

| | Strata | Relative Precision +or-% | Low RR | Mean RR | High RR | Std. Error |
|-------------------------|--------|-----------------------------|--------|---------|---------|------------|
| Custom | 1 | 0.0% | 1.00 | 1.00 | 1.00 | - |
| | 2 | 6.7% | 0.97 | 1.04 | 1.11 | 0.07 |
| | 3 | 10.4% | 0.89 | 1.00 | 1.10 | 0.10 |
| Custom Total RR (90/10) | | 4.6% | 0.97 | 1.01 | 1.06 | 0.05 |

Source: Navigant analysis

7.2 Summary Impact Findings for Custom and RCx Program Components

In Table 7-4, we present a summary of the overall GPY4 Custom Program verified net savings. The GPY4 Custom Program achieved verified net savings of 1,460,372 therms from custom measure projects. The RCx component of the program achieved verified net savings of 65,215 therms, making a combined verified total net therms of 1,525,587 for the Custom Program.

Table 7-4. GPY4 Overall Custom Program Verified Net Savings

| Program | Ex Ante Gross Savings (Therms) | Ex Ante Net Savings (Therms) | Verified Gross RR | Verified Gross Savings (Therms) | NTGR | Verified Net Savings (Therms) |
|----------------------|--------------------------------|------------------------------|-------------------|---------------------------------|------|-------------------------------|
| Custom GPY4 | 2,725,801 | 1,444,674 | 1.01 | 2,755,419 | 0.53 | 1,460,372 |
| RCx GPY4 | 43,807 | 44,683 | 1.46 | 63,936 | 1.02 | 65,215 |
| Custom Program Total | 2,769,608 | 1,489,357 | N/A | 2,819,355 | N/A | 1,525,587 |

Source: Navigant analysis