



**Energy Efficiency / Demand Response
Plan: Plan Year 4 (6/1/2011-5/31/2012)**

**Evaluation Report:
Northern Illinois Joint Utility
Retro-Commissioning Program**

FINAL

**Presented to
Commonwealth Edison Company
Nicor Gas
Peoples Gas & North Shore Gas**

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Prepared by:
Randy Gunn
Managing Director
Navigant Consulting
30 S. Wacker Drive, Suite 3100
Chicago, IL 60606

Phone 312.583.5700
Fax 312.583.5701

www.navigant.com





Submitted to:

ComEd Three Lincoln Centre Oakbrook Terrace, IL 60181	Nicor Gas 1844 Ferry Road Naperville, IL 60563	North Shore Gas / Peoples Gas 130 East Randolph Street Chicago, IL 60601
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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
Julianne Meurice, Associate Director
312.583.5740
julianne.meurice@navigant.com

Jeff Erickson, Director
608.497.2322
jeff.erickson@navigant.com
Kevin Grabner, Associate Director
608.497.2323
kevin.grabner@navigant.com

Prepared by:

Roger Hill, Managing Consultant
Navigant Consulting
641.23.3848
rhill@navigant.com

Sara Van de Grift, Sr. Project Manager
Opinion Dynamics Corporation
608.819.8828
SVandeGrift@opiniondynamics.com

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Table of Contents

E.	Executive Summary	1
E.1	Evaluation Objectives	1
E.2	Evaluation Methods.....	2
E.3	Key Impact Findings and Recommendations	2
E.4	Key Process Findings and Recommendations	4
1.	Introduction to the Program.....	6
1.1	Program Description.....	6
1.2	Evaluation Questions.....	8
1.2.1	Impact Questions:	8
1.2.2	Process questions:	8
2.	Evaluation Methods.....	9
2.1	Primary Data Collection.....	9
2.1.1	Gross Program Savings	9
2.1.2	Net Program Savings.....	9
2.1.3	Process Evaluation Data Sources	10
2.2	Sampling Plan.....	11
2.2.1	Impact Sampling	11
2.2.2	Process Sampling	12
2.3	Impact Evaluation Methods.....	12
2.4	Process Evaluation Methods.....	12
3.	Evaluation Results	15
3.1	Impact Evaluation Results	15
3.1.1	Verification and Due Diligence Procedure Review	15
3.1.2	Tracking System Review	16
3.1.3	Gross Program Impact Parameter Estimates	17
3.1.4	Gross Program Impact Results.....	17
3.1.5	Net Program Impact Parameter Estimates	20
3.2	Process Evaluation Results	22
3.2.1	Program Participation	23
3.2.2	Program Changes from EPY3.....	23
3.2.3	Program Processes	23
3.2.4	Retro-Commissioning Service Providers.....	25
3.2.5	Marketing and Outreach.....	25
3.2.6	Customer Satisfaction.....	26
3.2.7	Barriers to Participation	26
4.	Findings and Recommendations	28
4.1	Key Impact Findings and Recommendations	28
4.2	Key Process Findings and Recommendations	30

5.	Appendix	32
5.1	Glossary	32
5.2	Detailed impact results	36
5.2.1	Net Program Impact Results	39
5.2.2	Measure-level NTG Estimates	41
5.2.3	Channeling	43
5.3	Detailed process results	43
5.3.1	Participation Process	44
5.3.2	Program Timelines	45
5.3.3	Data Tracking	46
5.3.4	Retro-Commissioning Service Providers	46
5.3.5	RSP Performance Reviews	46
5.3.6	Training	47
5.3.7	RSP Satisfaction	48
5.3.8	Effects of Program on RSP Business Practices	48
5.3.9	Marketing and Outreach	48
5.3.10	Marketing Materials	49
5.3.11	Customer Satisfaction	49
5.3.12	Barriers to Participation	50
5.4	Data Collection Instruments	52
5.4.1	RSP Interview Guide	52
5.4.2	Participant Survey	60
5.5	VDDTSR Memo-Final version	72
5.6	Program Theory Logic Model Review	80

List of Figures and Tables

Figures:

Figure 5.1. Ex Ante Electric Savings (kWh) Project Savings Histogram	37
Figure 5.2. Ex Ante Gas Savings (Therm) Project Savings Histogram	37
Figure 5.3. Ex Ante Electric Savings (kWh) by End-Use Category	38
Figure 5.4. Ex Ante Electric Savings (kWh) by Measure Type	39
Figure 5-5. Program Logic Model.....	83

Tables:

Table E-1. EPY4 Evaluation Electric Savings Estimates	2
Table E-2. GPY1 Evaluation Natural Gas Savings Estimates	3
Table 2-1. Evaluation Data Sources.....	10
Table 2-2. Impact Evaluation Samples Engineering Review by Utility	11
Table 2-3. Impact Evaluation Samples.....	11
Table 2-4. Process Data Collection Summary	13
Table 2-5. Program Materials Reviewed for EPY4/GPY1 Process Evaluation	14
Table 3-1. Ex ante Savings Estimates	17
Table 3-2. Savings and Realization Rates by Sampled Site	18
Table 3-3. GPY1 Evaluation Natural Gas Savings Estimates	20
Table 3-4. Net-of- Free-Ridership (1-FR), Spillover and NTG Estimates	21
Table 3-5. EPY4 Evaluation Electric Savings Estimates.....	22
Table 3-6. GPY1 Evaluation Natural Gas Savings Estimates	22
Table 3-7. Level of Satisfaction with Program Elements	26
Table 4-1. EPY4 Evaluation Electric Savings Estimates.....	28
Table 4-2. GPY1 Evaluation Natural Gas Savings Estimates	29
Table 5-1. PY4 Evaluation Savings Estimates	41
Table 5-2 Ex ante Net-to-Gross Estimates	42
Table 5-3 Research Findings for Participant and Service Provider Free-ridership.....	43
Table 5-4 Research Findings for Non-Participant Spillover and NTG Ratio.....	43
Table 5-5. Preferred Method of Reaching Customers about Energy Efficiency Opportunities (Multiple Response).....	49
Table 5-6. Level of Satisfaction with Program Elements	50
Table 5-7. Quality Control and Verification Benchmarking Scores	76
Table 5-8. Reporting and Tracking Benchmarking Scores	78
Table 5-9. Program Inputs and Potential External Influences	82
Table 5-10. Business Retro-Commissioning Program Activities.....	84
Table 5-11. Program Outputs, Associated Indicators and Potential Data Sources	85
Table 5-12. Program Outcomes, Associated Indicators and Potential Data Sources.....	86

E. Executive Summary

This report presents a summary of the findings and results from the Impact and Process Evaluation of the 2011-12 (EPY4/GPY1)¹ ComEd Smart Ideas for your Business[®] Retro-Commissioning Program offered in partnership with Nicor Gas Energy Efficiency Program and Peoples Gas and North Shore Gas. The Northern Illinois Utilities Joint Retro-Commissioning Program (Retro-Commissioning Program) helps commercial and industrial customers improve the performance and reduce energy consumption of their facilities through the systematic evaluation of existing building systems. Low- and no-cost measures are targeted and implemented to improve system operation, reduce energy use and demand, and, in many cases, improve occupant comfort. The Retro-Commissioning Program aims to streamline the typical retro-commissioning process in order to facilitate implementation of projects that yield savings in the program year they are initiated.

Significant changes in the program have increased its scope and market for services. Other changes have facilitated participation and the ability of participants to complete improvements before the end of the program year:

- Natural gas savings is now addressed in the program through the joint offering with Nicor Gas and Peoples Gas and North Shore Gas. The change accompanies an increased customer spending commitment of \$5,000 or \$10,000, depending on project size.
- The Retro-Commissioning Program has “spun-off” Compressed Air and Data-Center retro-commissioning into stand-alone programs more focused on the needs of these segments.
- Multiple-building projects can now be aggregated to reach the 500 peak kW participation requirement. This change enables campuses to include smaller buildings in the program.
- Guidelines were established to allow buildings served by district energy plants to participate.
- The number of eligible commercial building Retro-commissioning Service Providers (RSPs) expanded from eight to 23 commercial building RSPs compared to EPY3.
- Efforts to standardize deliverables were established: reporting templates and standard calculators for ten common, but lower-savings (less than 75,000 kWh) measures
- Updated guidelines to verify low-savings measures.
- A new database was introduced to manage projects
- Large projects could be split over program years to facilitate timely implementation.

E.1 Evaluation Objectives

The primary objectives of the Impact Evaluation are to review reported savings for installed measures, to recommend general improvements to the savings estimation process, and to quantify gross and net savings impacts from review of the program tracking database and engineering calculations. The Process Evaluation addresses key process-related program strengths and weaknesses and identifies ways in which the program can be improved.

¹ The 2011-12 program year began June 1, 2011 and ended May 31, 2012.

E.2 Evaluation Methods

Impact evaluation activities focused on analyzing reports and data submitted in participant files, as well as on-site verification, data collection and interviews. The primary data collection activities for the process evaluation were in-depth interviews with program management and implementation staff, participating RSPs and program participants.

E.3 Key Impact Findings and Recommendations

Table E-. and Table E-. summarize the savings from the Joint Retro-Commissioning Program. *Ex Ante* estimates for electric savings assume a deemed Net-to-Gross (NTG) ratio of 0.916. There were 50 participants in the EPY4/GPY1 program representing 41 unique customer decision makers.² Three projects were participants in EPY3 with select measures completed and verified in EPY4/GPY1.

Table E-. EPY4 Evaluation Electric Savings Estimates

Research Category	Energy Savings (MWh)	Peak Demand Savings (kW)
Ex Ante Gross	29,908	800.2
Ex Ante Net ³	27,395	733.0
Research Findings Gross	27,315	384.3
Verified Net	25,021	352.0

Source: Utility tracking data and Navigant analysis.

Among the 50 participants, 21 in the program database were also gas utility participants. Evaluation research identified one additional Peoples Gas participant for a total of 22 gas participants. The gas utilities did not have a deemed NTG ratio; however, they all used 0.8 as a planning assumption, and Navigant applies this ratio to ex ante net savings. Since no NTG estimates were deemed for gas savings, Navigant applied the NTG ratio estimated by EPY4/GPY1 research below to GPY1 gas savings

² Three projects were completed at a private university and one corporation completed projects at eight properties in the ComEd service territory.

³ The program-assumed net-to-gross ratio is 0.916 for electricity savings.

Table E-. GPY1 Evaluation Natural Gas Savings Estimates

Research Category	Peoples Gas Savings (therms)	North Shore Gas Savings (therms)	Nicor Gas Savings (therms)	Total Gas Savings (therms)
Participants	14	1	7	22
Ex Ante Gross	858,657	56,775	180,345	1,095,777
Ex Ante Net ⁴	686,926	45,420	144,276	876,622
Research Findings Gross	913,820	67,908	147,838	1,129,566
Verified Net ⁵	927,535	68,927	150,057	1,146,519

Source: Utility tracking data and Navigant analysis.

- **Program Savings Goals Attainment.**

Finding. The program achieved goals for electric energy savings (26,880 MWh) and fell short of participation (63) and demand savings goals (3.8 MW). Gas savings goals were met for Peoples Gas (528,800 therms) but fell short for North Shore Gas (145,600 therms) and Nicor Gas (267,700 therms).

Recommendation. Savings is driven largely by participation and by effective trade allies. Increasing the number of active trade allies performing more projects will help gas goal achievement. Demand savings is not a contractual goal for the implementation contractor (IC), thus non-attainment is not concern. .

- **Gross Realization Rates**

Finding. The realization rate for electric energy is 91.3%. Gas savings realization rates are 106.4%, 119.6% and 82.0%, for Peoples Gas, North Shore Gas and Nicor Gas, respectively. Divergent gas realization rates are a result of the small populations and savings for the latter two utilities. The overall gas realization rate is 103%. Energy savings estimates from the RSPs are generally well-supported and calculated with a high degree of rigor. Most RSPs continue to use their own estimation spreadsheets, rather than program–provided templates for common measures. This factor complicates program implementation and evaluation efforts as the variety of methods is time-consuming and open to more errors.

Recommendation. Explore ways to encourage use of existing program-standard savings calculators, when the common measures qualify for their use, e.g. less than 75,000 kWh savings. Perhaps use incentives or fast-track program processes when standard savings calculators are used.

- **Net-to-Gross estimates:**

Finding. The research estimate for the electric NTG ratio is 1.038. The gas NTG ratio estimate is 1.015. Program incentives to fund the studies and the expertise of RSPs rank very high in importance among participants. (9.6/10) According to participants, program

⁴ The program-assumed net-to-gross ratio is 0.8for Nicor Gas savings, Peoples Gas and North Shore Gas for planning purposes.

⁵ Natural gas verified net savings is based on EPY4/GPY1 research that found a net-to-gross ratio of 1.015 for gas and 1.038 for electric savings.

influence to identify and implement measures is lower (7.4/10), a result similar to EPY3. There is only small indication of spillover among participants. Service providers credit the program with sustaining and creating a retro-commissioning market in Illinois, as a result spillover from the RSPs contributes to overall NTG estimates.

Recommendation. Update electric and gas-specific NTG ratios for planning purposes, based on research presented in this report. Apply the gas NTG retrospectively to GPY1 savings since this is the first time NTG has been researched for the gas program. .

- **Demand Savings Estimates.**

Finding. The RSPs continue to have different or no approaches for estimating peak demand savings.

Recommendation. Accurate accounting for demand savings does contribute to measure payback at the customer level and contributes to the program’s success. The program needs to establish a standard methodology for demand savings estimates and those methods must be enforced during quality assurance steps.

- **Incomplete Savings Estimates.**

Finding. Some measures are low-risk and high-reward in terms of savings, and there is a temptation to apply less rigorous calculations to quantify savings, since the RSP is certain the customer will implement the measure. While this scenario expedites the retro-commissioning process and still benefits the customer, it short-changes the program’s savings estimates.

Recommendation. During savings-calculation quality control steps, look specifically for interactive and concurrent savings with a checklist by measure type. For example, equipment scheduling saves gas for ventilation as well as fan energy; fan static pressure reduction decreases fan heating, and discharge air temperature resets can change mass-flow rates and fan power. Encouraging the use of program template calculators, which do include the concurrent and secondary effects, will improve the overall accuracy of estimates.

- **Incomplete Training Tracking.**

Finding. A condition of program participation is having at least on staff member complete Level 1 Building Operator Certification training. The program data base currently is not set up to track training participation for program compliance.

Recommendation. Add table(s) to the data base to track training for one or more individuals for each participating site. The table should link to project number for verification purposes.

E.4 Key Process Findings and Recommendations

- **RSP Participation.**

Finding. The program has 23 registered RSPs. While only nine completed projects in EPY4/GPY1 many of the others are working on projects for PY5 completion. While the effort to increase the number of participating RSPs between EPY3 and EPY4 was a success, there is lost opportunity in having RSPs listed as part of the program but not completing projects in a program year.

Recommendation. Because RSPs are the primary conduit for program participation, The IC should stress the importance of completing a project during training and be sure all RSPs clearly understand inactivity and no projects will result in rebid or removal from the program. Conduct evaluation research with inactive RSPs in EPY5/GPY2 to determine the conditions of inactivity.

- **Implementation Phase Support**

Finding. The Implementation Phase continues to be the primary source of challenges for the program. This phase is generally participant-led and the timely completion of projects is entirely dependent on the customer keeping the project moving. RSPs expressed a concern that while they are not involved in this phase, they are still held responsible, via the RSP review process for the timely completion of projects.

Recommendation. More effort is needed from Program Managers and the IC to engage the participants and keep the implementation phase moving along on a timely basis. Include implementation milestone dates in the implementation phase that will status each recommendation periodically. The milestones could be simple written status updates via email to the RSP, if projects are progressing, or the status updates could be part of a conference call or on-site meeting with the customer, RSP and utility / program representatives if the recommendations seem stalled.

- **RSP review process.**

Finding. RSPs indicated that while they think the review process is important, the process could be more transparent. Essentially, RSPs believe there should be consideration in the scoring for those parts of the project that the RSPs feel they have little to no control over. For example, the timely completion of the implementation phase may negatively affect the score; yet, they have little to no control over this part of the project.

Recommendation. The RSP role in implementation should be emphasized and clarified. RSPs should be reminded to conduct more implementation follow-up to encourage timely project completion. If this fails to spur implementation, the RSP scoring system should be reviewed to ensure it is not penalizing RSPs for aspects of the program that they have less control over (e.g., implementation timing) or program approaches should be put in place that allow RSPs to guide the participants more actively through the customer-directed phases.

- **Project timing**

Finding. Timing improved in EPY4/GPY1, but remains a challenge. In the current program year, many projects were unable to meet their originally planned completion timelines.

Timing challenges include:

- The program year, which ends in May, limits the RSP's testing season for cooling measures, creating problems in finishing projects on time.
- Lack of customer urgency to complete the various stages of the project process.
- The amount of back and forth between the RSPs and IC during the review process.

Customer timing perception varied by customer type with:

- Large corporate participants indicating that the projects could have been completed more quickly; and,
- Smaller, non-profit, or more budget constrained participants indicating that being able to spread the implementation phase out of the course of more than one fiscal year would allow them to complete more projects through the program.

Recommendation. The utilities and Nexant should stay more engaged with participants and RSPs to clear obstacles to implementation and analysis review. Set up periodic meetings with each project team to learn of obstacles before they slow down the program processes.

1. Introduction to the Program

1.1 Program Description

The ComEd Retro-Commissioning Program has been offered each of the four electric program years. Electric Program Year 4 (EPY4) also marked the first year, GPY1, where the program was offered as a joint utility program with the gas utilities with service areas overlapping ComEd's: Nicor Gas, Peoples Gas and North Shore Gas. The Retro-Commissioning Program offering is a natural fit due to the intensive investigation and analysis of heating, ventilation and air-conditioning (HVAC) systems. Individual measures frequently save both electricity and gas and analyzing one while neglecting the other would be a lost opportunity.

The program helps commercial and industrial customers improve the performance and reduce energy consumption of their facilities through the systematic evaluation of existing building systems. In general, the program pays for 100% of a detailed retro-commissioning study contingent upon a participant's commitment to spend a certain amount of their own money implementing recommendations in the study that have a payback of 18 months or fewer. Retro-commissioning recommendations typically include low-cost or no-cost HVAC measures like (1) scheduling equipment with occupancy, (2) optimizing temperature setpoints and controls to operate equipment efficiently and (3) repairing worn-out or failed components⁶ that manifest themselves as energy waste rather than affecting the ability of the whole system to maintain comfort. The measures can usually be implemented in the course of normal maintenance or through improvements to sensors or control programs with existing building automation systems, BAS.

The program is supervised by ComEd for all three utilities with a single IC, Nexant Inc. Nexant manages the day-to-day operation of the program including marketing, interacting with customers, working with program-approved retro-commissioning service providers (RSPs), and reporting progress and savings to the utilities. Gas utility ICs, WECC and Franklin Energy, monitor the program for their clients (Nicor Gas and Peoples/North Shore Gas, respectively), but do not participate in program operations.

The program is open to all customers who meet the eligibility requirements:

- Facilities must receive electricity delivery service from ComEd (regardless of energy supplier), and if participating in gas retro-commissioning, receive gas delivery from Peoples Gas, North Shore Gas or Nicor Gas.
- Have a peak demand of 500 kW or greater⁷.
- Be served under eligible ComEd rate schedules⁸
- Applicants must be part of a non-public organization⁹.

⁶ For example, broken damper linkages that permit introducing too much ventilation air in extreme weather conditions. Servicing or replacing the linkages so they perform as intended would be a retro-commissioning measure.

⁷ Peak demand requirement may be met by combining several smaller buildings in close proximity, for example a college campus

⁸ ComEd Rate schedules: A75, A76, A77, B75, B78, B95, B98, H75, H76, H77, H78, R75, R76, R77, R78.

- Facility owners must commit to spend between \$15,000 and \$30,000, (depending on the RSP fees) to implement retro-commissioning measures that result in a bundled estimated project simple payback of 18 months or fewer, based upon electric and natural gas savings.
- Applicants must agree to use a pre-approved Retro-Commissioning Service Provider.
- The facility owner must send one staff member to Building Operator Certification™ (BOC) training. Staff members must receive BOC Level I Certification.
- The facility owner must provide access to the facility and time for the facility personnel to interface with the retro-commissioning service provider (RSP) as well as assist with the reporting and collection of information pertaining to the operation of the facility during all phases of the project; and,
- The facility owner must implement Recommended Conservation Measures (RCMs) according to the scope and outlined procedures within six months of being accepted into the program.

The Program is implemented in five phases: application, planning, investigation, implementation and verification. Extensive research and analysis can accompany each phase, thus the duration of engagement for a retro-commissioning project can last 12 to 18 months between contracting and verification of energy savings. Successful retro-commissioning requires experienced service providers and cooperation and buy-in of the facility staff to implement operational changes.

Application Phase: Customers establish the proposed project meets the following indicators for a successful project:

- The facility should have no planned major system renovations or retrofits.
- The facility should be at least 5 years old and exceed 150,000 ft² in air-conditioned floor space¹⁰.
- The facility should have an existing and functional building or system energy management system (EMS) with direct digital control (DDC).
- The facility should be free of major problems requiring capital repairs or replacements and have no planned major system renovations or retrofits.
- The facility should have accessible and up-to-date building documentation and records.
- The facility should have a relatively high Energy Use Index (EUI) compared to the average EUIs of buildings of the same class and/or have a low “Energy Performance Rating” from Portfolio Manager, the Department of Energy’s rating tool for Energy Star Buildings.
- The facility owner and O&M staff should express a commitment to be actively involved in the retro-commissioning process.
 - Providing access to the facility
 - Providing time for facility personnel to interface with the Retro-Commissioning Service Provider – 60 to 100 hours over the project duration
 - Providing and assisting with the reporting, and collection of, information pertaining to the retro-commissioning of the facility

Planning Phase: The project planning activities include a kick-off meeting with the IC, ComEd representatives, and the RSP with the customer team during which expectations are described and

⁹ Public buildings such as government, municipal, and public schools are eligible for similar retro-commissioning incentives through the Illinois Department of Commerce and Economic Opportunity (DCEO).

¹⁰ Exception for groups of smaller buildings constituting an overall adequate opportunity, e.g. campuses.

roles and responsibilities are defined. The RSP completes a site assessment and data acquisition plan during this phase. The findings of this assessment are used to generate the Retro-Commissioning Plan for the project and estimate potential measures and project economics. At the completion of the Planning Phase, the facility owner enters into the formal Program Agreement, including the customer's spending commitment and project schedule.

Investigation Phase: The RSP works with the customer to research, analyze and select promising retro-commissioning measures to implement. Measures may be added or removed from the retro-commissioning plan at this time depending on research findings. The customer agrees to implement measures meeting their financial commitment and savings goals.

Implementation Phase: The Customer works with internal staff or their contractors to implement agreed upon measures. Measures can be amended, dropped or added at this time due to feasibility constraints or if implementation cost estimates from the investigation phase prove inaccurate.

Verification Phase: The RSP returns to assess implementation of planned measures. Final saving estimates are developed based on actual implementation and monitored results. Final payments for the study are made to the RSP based on completion of measures and the verification report.

1.2 Evaluation Questions

The Evaluation Team identified the following key researchable questions for EPY4 and GPY1

1.2.1 Impact Questions:

1. What is the level of gross and net annual energy (kWh) and peak demand (kW) and natural gas (therm) savings achieved by the program?
2. What is the level of free ridership associated with this program? How can it be reduced? Is spillover measureable for this program?
3. Did the program achieve its goals? Why and why not?

1.2.2 Process questions:

The process evaluation questions focused on four key areas:

1. Effectiveness of program implementation
2. Effectiveness of program design and processes
3. Has program satisfaction changed over time as program adjustments have been made to address satisfaction issues?
4. What areas could the program improve to create a more effective program for customers and/or RSPs and help increase the energy and demand impacts?

2. Evaluation Methods

This evaluation of the Retro-Commissioning Program reflects the third full-scale year¹¹ of program operation. During EPY4/GPY1, 50 facilities participated in the Retro-Commissioning Program including 41 unique commercial entities. Among the 50 sites, more than 240 retro-commissioning measures (RCMs) were implemented and verified, thus qualifying the sites for waiver of retro-commissioning service costs. The participants were shepherded through the program by nine different retro-commissioning service providers (RSPs).

2.1 Primary Data Collection

2.1.1 Gross Program Savings

The primary data for the impact evaluation came from the program administrator, Nexant, Inc. Among the data reviewed for the impact analysis:

- Program guidelines¹² that described expected savings estimation techniques and assumptions when site-specific data were not available;
- Template for standard savings calculators for common, but lower-impact measures;
- Exports from Nexant's program tracking system in spreadsheet format including project-level and measure-level descriptions and savings; and
- Electronic versions of reports, invoices, submittals and savings calculations.

Navigant supplemented these data with on-site inspections at a sample of sites and requests for supplemental data from participants and/or RSPs, as needed, to fully understand the implemented measures.

2.1.2 Net Program Savings

NTG research methods in EPY4/GPY1 combine participant and service provider survey results. Research for both groups uses a self-report method where participants and RSPs answer questions about the program. The participant survey instrument asks about awareness of the measures identified and their inclination to pursue corrective actions for those measures absent the program. The RSP survey instrument asks about the retro-commissioning market prior to and since the program and the likelihood of measure implementation without the program and as a result of the program. Navigant also explored spillover effects through the participant and service provider surveys.

2.1.2.1 Free-Ridership

The method looks at three elements of free-ridership for participants: Program Influence, Timing and Selection and No Program Score. RSPs can only speak to program influence and the no program elements of free-ridership. The program influence element considers the importance of program

¹¹ A small pilot program was conducted in EPY1 with Nexant serving as RSP and program implementer

¹² Smart Ideas for Your Business Commercial Retro-Commissioning Calculation and M&V Guidelines.

factors for the decision to undertake retro-commissioning at this time. The timing and selection element considers when the participant learned of the program, relative to the decision to retro-commission the facility and the impetus to implement measures. The no program score is self-reported estimates of what measures or savings would have been implemented without the program. The three (or two) elements of free-ridership are weighted equally for estimates for participant and RSP free-ridership, respectively. Navigant subsequently calculated savings-weighted free-ridership from individual participant and RSP values to determine overall participant and RSP free-ridership. Navigant averaged the participant and RSP estimates for fuel specific Net-of-Free-rider¹³ estimates.

2.1.2.2 Spillover

Navigant also asked participants and RSPs about the effect the program has on the Illinois retro-commissioning market outside of the program – or spillover. For participants spillover might include projects at the same facility or a facility under the same ownership or management which implemented energy savings projects as a direct result of Retro-commissioning Program, without receiving an incentive to do so. For RSPs spillover consists of additional projects completed and measures implemented, through increased awareness, marketing materials or staff capacity, as a direct result of the program. Participant and RSP spillover are considered additive, to the extent the same projects are not the basis of both estimates.

2.1.3 Process Evaluation Data Sources

The Process Evaluation included in-depth interviews with key actors in the program including ComEd, WECC (Nicor Gas) and Franklin Energy (Integrus) Program Managers; the IC, Nexant, program-approved retro-commissioning providers (RSPs) and telephone surveys of program participants. These interviews dealt with overarching satisfaction with the program and details about program operations, marketing, training, and market potential for retro-commissioning services. The process evaluation also reviewed documents related to the program such as program application forms.

Table 2-. Evaluation Data Sources

Collection Method	Subject Data	Quantity	Gross Impact	Net Impact	Process
Telephone Interviews	Program participants	25		X	X
	Program Service Providers	8		X	X
In-Depth Interviews	Program admin.& IC staff	3			X
Engineering review	EPY4/GPY1 Participants	24 electric, 14 gas	X		
On-site Verification	EPY4/GPY1 Participants	11 electric, 5 gas	X		

Source: Navigant analysis.

¹³ Net-of-Free-rider = 1 – Free-ridership

2.2 Sampling Plan

2.2.1 Impact Sampling

Impact sampling had two stages. Since all participants are ComEd customers, we first sampled for electric program participants to ensure we had an un-biased sample. We then examined the sample with respect to the gas utilities and *supplemented* the initial sample with randomly sampled gas customers to ensure an adequate sample for each of the gas utilities and achieve our confidence and precision targets. In this manner we ended up over-sampling the ComEd projects. Table 2- shows the sample sizes for each utility.

Navigant used the stratified ratio estimation method for choosing the impact sample for each utility. This method is based on the anticipated realization rate, and we stratified the population based on project *ex ante* savings to ensure that our 90/10 (confidence/precision) strategy also captures a significant proportion of program savings. The ratio estimation method tends to create a sample with a census of the largest savings customer stratum and a balanced sample between the remaining strata to achieve the desired precision. Within each stratum Navigant selected projects randomly. In our final sample, the precision is 8.5% at the 90% confidence level for electricity, and Navigant reviewed 69% of program kWh and 75% of program gas savings.

Table 2-. Impact Evaluation Samples Engineering Review by Utility

	Program Population	Sample Required for 90/10	Final Sample Size	Precision at 90% confidence
ComEd	50	22	24	8.5%
Peoples Gas	14	8	8	8.7%
North Shore Gas	1	1	1	Certainty
Nicor Gas	7	5	5	7.0%
Overall	50	22	24	NA

Source: Utility tracking data and Navigant analysis.

Table 2-. Impact Evaluation Samples

	Program Population	Population kWh savings	Sample Size	Sample kWh Savings
Stratum 1	7	12,065,680	7	12,065,680
Stratum 2	14	9,849,967	9	6,197,309
Stratum 3	29	7,991,951	8	2,464,437
Total	50	29,907,598	24	20,727,426

Source: Utility tracking data and Navigant analysis.

2.2.2 Process Sampling

The process evaluation team attempted interviews with a census of the nine active RSPs and the 41 customer contacts¹⁴ in the EPY4/GPY1 program. Statistical confidence and precision is based on the sample size relative to the population. For the process analysis, all participants were included in the sample, thus the sampling approach was a census attempt. Given that this is a census attempt, there is no sampling error and the error bounds are zero; therefore, there is no need for estimating precision levels for the sampling effort. However, it should be noted that there is a potential for non-response bias.

2.3 Impact Evaluation Methods

Navigant examined measure-level impacts for the sampled program participants. The IC, Nexant, submitted detailed data and engineering calculations for each measure for Navigant review. Navigant also conducted on-site inspections and verification of measure installations at 11 sites as well as reviewed operating parameters and some trend data from the summer of 2012.

Navigant reviewed each implemented measure and many proposed¹⁵ measures at the sampled projects for accuracy and completeness. The evaluation verified that appropriate algorithms, methods, and data sets were used. During the review Navigant compared calculation parameters to assumptions and applied prescribed parameter defaults as needed when measure calculations deviated from expected norms. Measure savings were confirmed or adjusted, as needed, for each implemented measure for each participant. Navigant analyzed gross savings at the participant level, measure end-use level, and measure-type level. Aggregate savings of the individual measures comprise project gross savings.

Within each sample strata Navigant developed realization rates for kWh, kW and therm savings from the sampled projects. Stratum-specific realization rates were applied to un-sampled projects in the strata to determine overall realization rates for the program.

2.4 Process Evaluation Methods

The process evaluation utilized interviews with key personnel at ComEd and Nexant, Inc., the program implementer. We also interviewed ICs for the joint gas utilities to determine their level of involvement with the program. The evaluation team performed interviews with program RSPs and fielded a survey of participating customers. Program design, implementation, training, and marketing materials were also reviewed.

¹⁴ Two participants had multiple project sites enrolled in EPY4.

¹⁵ Even measures that were not implemented contain key information about facility operations, setpoints and interactive effects among energy end-uses.

Table 2-. Process Data Collection Summary

Data Collection Type	Targeted Population	Sample Frame	Sample Design	Actual Sample Achieved	Timing
In-depth Telephone Interview	ComEd RCx Program Staff	Contact from ComEd	ComEd RCx Program Manager	1	April 2012
	Implementation Staff – RCx	Contacts from Utilities	Nexant Program Manager Franklin Energy and WECC Contacts	3	February and May 2012
	Retro-commissioning Service Providers	Program database	Attempted census (9)	8	October 2012
In-Depth Survey	PY4 Participants	Program database	Attempted census (50)	25	September/ October 2012

Source: Navigant analysis.

Program and Implementer Staff Interviews

We conducted two key in-depth interviews to support the process evaluation, one with the ComEd Retro-Commissioning Program Manager and one with the Nexant implementation staff. The interviews focused on program processes to better understand the goals of the program, how the program was implemented, the perceived effectiveness of the program, and the changes from PY3. The team also conducted brief interviews with ICs, WECC and Franklin Energy, supporting the program for their respective gas utility clients. Since the program is run by ComEd and Nexant, the gas utility IC interviews focused on the interaction between the program implementers and the gas utility contacts.

Review of Program Materials

As part of the evaluation process, the evaluation team reviewed program materials developed by ComEd and Nexant. These are summarized in Table 2- below.

Table 2-. Program Materials Reviewed for EPY4/GPY1 Process Evaluation

Category	Materials Reviewed
Program design and implementation	Program design document EPY4/GPY1 application form EPY4/GPY1 participant manual EPY4/GPY1 RSP manual RCx presentation (s) List of RCx service providers Examples of planning, implementation and verification reports
Program marketing	ComEd RCx strategic marketing Plan Overview brochure RCx business fact sheet
RSP training and outreach	RSP RCx brochure example RSP Workshop PowerPoint EPY4/GPY1 RSP manual RSP Scoring review materials RSP Training materials RSP Newsletters

Source: Utility tracking data and Navigant analysis.

Interviews with RSPs

The evaluation team conducted in-depth interviews with eight of the nine active PY4 RSPs. These eight RSPs implemented 47 of the 50 EPY4 projects and all GPY1 projects. Our questions focused on program awareness, program processes, the effects of the program on business practices, free-ridership and spillover, marketing and outreach, training, RSP performance review, barriers to participation, and general feedback and recommendations. The guide used for these interviews is included in Section 5.4.

Interviews with Participants

The evaluation team also completed in-depth-interviews with 25 of the 39 EPY4/GPY1 program participants (representing 29 projects) who completed all of the program phases. Our questions focused on program awareness, program participation, marketing and outreach, free-ridership and spillover, benefits and barriers to participation. The survey instrument used for these interviews is included in Section 5.

3. Evaluation Results

3.1 Impact Evaluation Results

3.1.1 Verification and Due Diligence Procedure Review

Verification and Due Diligence review for the Retro-Commissioning Program addresses several topics, among them: eligibility criteria, quality assurance and verification.

Navigant found that eligibility criteria were adhered to in most cases.

- Three projects fell below the size criterion, though they were all part of a group of projects from a single large corporate participant. The criterion is in place to ensure projects are worth the effort of contracting. Since one corporate entity supervised the contract of these many sites, the spirit of the criterion was satisfied. Furthermore, the energy use index (EUI = Btu/ft²) for these smaller sites was very high, indicating higher potential savings.
- All participants agreed to the spending commitment for measure implementation. In several cases the final spending was less than this commitment amount. Navigant reviewed files and found that lower-spending sites either implemented all no-cost and low-cost measures, as required and fulfilling the commitment, or estimated implementation costs were higher than the actual costs.
- Documentation of Building Operator Certification training is lacking. On-site verification identified two sites, of the eleven inspected, where personnel were not aware of the BOC requirement and could not name a member of the staff who attended. The IC had not tracked a complete list of trainees for program compliance.

Quality assurance and installation verification for the Retro-Commissioning Program are iterative processes that involve the customer, RSP, the IC (IC) and finally the evaluator. The customer must implement sufficient measures to gain the incentive which waives the retro-commissioning study costs. The RSP must guide the customer through implementation and check that measures are installed to get paid for services performed, and the IC reviews and approves savings estimate calculations, attends wrap-up meetings for all projects and conducts their own verification for a sample of projects. Reports follow an organized template that includes sufficient information for the participant, the utility (utilities), and the evaluators. RSP calculations show evidence of feedback from the IC to clarify inputs and calculations. The IC reports its own on-site verification efforts for six of 50 projects installed in EPY4/GPY1. In general, Navigant found that the quality assurance steps outlined in the Program Manuals¹⁶ were being implemented as intended. Navigant did identify occasional lapses in the execution of the information presented in reports:

- Building area is not consistently reported among projects. Rentable, conditioned or gross floor area might be reported for different projects.
- Annual energy consumption (gas and/or electric) and EUI is not consistently reported.

¹⁶ Smart Ideas for Your Business Commercial Retro-Commissioning *Participant Program Manual*, November 2010 and Smart Ideas for Your Business Commercial Retro-Commissioning *Retro-Commissioning Service Provider Manual*, July 2010

- Useful equipment lists are not always included. Flow rate and drive power data are not uniformly included.

Navigant’s due diligence work for savings estimates focused on quality control of data entering the tracking spreadsheets and the savings calculations for each measure. Navigant found the savings estimate calculations were accurately constructed, based on clearly measured data rather than rules-of-thumb and transparent in spreadsheet form. Data were accurately entered from reports into the tracking database. In rare instances, we found calculation errors due to erroneous inputs and omissions of relevant parameters and inconsistencies in assumptions from measure to measure on the same system. Given the number of unique and complex calculations managed in the program, Navigant does not view these few errors as systematic problems.

Finally, the Retro-Commissioning Program has a procedure for evaluating each of the participating RSPs each year. The evaluation rubric includes: project completion, savings, customer satisfaction, timely submittals and interaction with the IC.

3.1.2 Tracking System Review

In prior program years, Nexant tracked program participation and results in spreadsheets with project information and measures installed at project sites sharing a common project identification number. In EPY4/GPY1 Nexant moved to upgrade the tracking system to a relational database to better manage the increasing number of projects, measures, reporting criteria and program actors. The new relational database is called TrakSmart. At the time of the data tracking system review for this evaluation, the TrakSmart database was not ready for review. ComEd and Nexant provided Navigant with a list of fields included in the database and Navigant reviewed that list for any deficiencies.

Navigant’s review identified a logical structure for the database. In general, we find the database adequate for both managing the program and supporting evaluation activities. The few exceptions to this database’s adequacy reflect recent changes to the program:

- **Finding.** Building Operator Certification training cannot be tracked with the database fields provided. Navigant identified a cluster of fields are used for tracking customer eligibility criteria. Capacity to track Building Operator Certification (BOC) training for one or more site individuals is not supported.
Recommendation. Navigant recommends a new table in the database that can track multiple individuals from each project. Table fields should include: trainee name, title, trainee contact information, attendance records and final completion sign-off. The training table should be capable of linking to projects with project ID and the property with the premise ID. The contact information can be used to easily identify the individual class data tracked by the BOC provider.
- **Finding.** Purchased steam and chilled water (annual) cannot be tracked in the provided data fields.
Recommendation. The program recently began accommodating participants with purchased thermal services and reliable annual consumption comparison metrics should include these sources of energy, in addition to electricity and natural gas.

Early in EPY5/GPY2 Navigant will review the populated TrakSmart database to see how it is being implemented.

3.1.3 Gross Program Impact Parameter Estimates

Savings estimates are made at three different stages (planning, implementation and verification) of the retro-commissioning program process as more data are available and the scope of implemented measures become known. RSPs develop the final savings estimates during the Verification Phase based on performance data acquired after implementation. These savings estimates comprise the *ex ante* savings for the program. The participants in EPY4/GPY1 represent two aspects of the evolving retro-commissioning program.

Table 3-. *Ex ante* Savings Estimates

Research Category	Energy Savings (MWh)	Peak Demand Savings (kW)	Natural Gas Savings (thermsx1,000)
<i>Ex Ante</i> Gross	29,908	800.2	1,095.8
<i>Ex Ante</i> Net ¹⁷	27,395	733.0	876.6

Source: Utility tracking data

- Forty-nine participants are traditional commercial retro-commissioning projects with a study followed by implementation and verification. These participants represent commercial office space, high-density residential, healthcare and institutional buildings.
- One is a campus retro-commissioning project where smaller buildings that might not qualify for the program individually but are aggregated due to proximity.

3.1.4 Gross Program Impact Results

The following table presents information about the sampled sites and retro-commissioning measure impacts. Navigant examined all calculations and reviewed data submitted as part of the verification of savings from the RSPs. Our evaluation of the calculations determined that the estimates are, generally, well-developed and defensible, with some exceptions – both increasing and decreasing gross savings.

¹⁷ The program-assumed net-to-gross ratio is 0.916 for electricity savings and program planning 0.80 for natural gas savings.

Table 3-. Savings and Realization Rates by Sampled Site

	Project ft ²	Program Verification Phase		Research Findings Gross		Realization Rates	
		kWh	therms	kWh	therms	kWh	Therms
Commercial 1	1,054,000	417,125	-	327,239	-	78%	
Commercial 2	521,000	98,550	3,476	52,357	4,048	53%	116%
Commercial 3	699,000	696,014	-	417,164	-	60%	
Hospital 1	1,673,000	906,565	40,956	901,932	40,956	99%	100%
Commercial 4	394,000	307,434	27,735	291,588	24,474	95%	88%
Commercial 5	920,000	592,681	32,960	515,172	28,356	87%	86%
Commercial 6	125,000	573,763	17,066	328,655	17,066	57%	100%
Commercial 7	56,000	334,221	-	334,260	-	100%	
Commercial 8	157,000	514,628	5,225	513,519	5,225	100%	100%
Hospital 2	411,000	880,990	62,750	597,649	32,442	68%	52%
University 1	464,000	442,864	4,221	442,864	4,221	100%	100%
Commercial 9	382,000	540,870	-	565,341	-	105%	
Hospital 3	1,204,000	378,688	43,905	369,409	43,905	98%	100%
Commercial 10	1,491,000	1,613,526	-	1,587,897	-	98%	
Commercial 11	1,130,000	1,153,046	-	1,202,178	-	104%	
Commercial 12	848,000	613,085	-	353,655	-	58%	
Hospital 4	2,200,000	2,364,467	68,779	2,364,467	66,143	100%	96%
Commercial 13	716,000	878,713	-	862,681	-	98%	
Commercial 14	821,000	1,038,439	-	842,801	-	81%	
Commercial 15	1,200,000	1,193,097	-	836,413	-	70%	
University 2	549,000	270,526	56,775	290,666	67,908	107%	120%
University 3	1,300,000	215,029	25,405	210,415	24,830	98%	98%
Museum 1	585,000	1,805,601	145,891	1,834,806	144,792	102%	99%
University 4	538,000	2,897,504	290,825	3,090,948	351,473	107%	121%

	Project ft ²	Program Verification Phase		Research Findings Gross		Realization Rates	
		kWh	therms	kWh	therms	kWh	Therms
Total	19,438,000	20,727,426	825,969	19,107,493	853,540	92%	103%

Source: Navigant analysis.

Realization rates on a participant-level are reasonably close to 100% with a few notable exceptions.

- Commercial 2 savings equations mapped incorrectly in a calculation.
- Commercial 3 savings for a fan measure were based on duct pressure differences rather than fan pressure differences.
- Commercial 6 experienced a computer system crash between RSP verification and evaluator on-site verification. Several optimization sequences were not restored following the failure and savings were lost. Site personnel reported that the building owner did not plan to restore optimization sequences.
- The Hospital 2 project over-estimated saving from cycling air-handling units under mild weather conditions using rated equipment power rather than measured values.
- Commercial 12 included a night set-back measure that uses unsubstantiated rules-of-thumb to estimate savings. Navigant calculated engineering-based estimates for savings.
- Commercial 15 savings calculations are correct in assuming local controls, but global controls limit heating savings during hours when the calculation estimates savings, and heating savings from resets is claimed in some zones without heating capacity.

Similar measures recommended by the same and other RSPs did not repeat these error types, thus Navigant characterizes the overall *ex ante* savings methodology as sound. Continued IC diligence is required during review, because each RSP usually generates similar but, nonetheless, different calculation tools for each measure. Program-provided calculation templates are not widely used, thus as the number of participants and RSPs increase, the variety of calculation tools will increase.

Under-estimates of savings are a result of similar sorts of errors and include: omitting boiler or motor efficiency in the savings calculation or neglecting interactive effects among equipment. The latter type of error might be a result of occasional RSP approaches to low-cost measures. For example when turning off un-necessary equipment, the savings can be relatively high the costs are low, so the risk to the participant is low; therefore, there is no need to “sell” the idea to the customer. The RSP might not estimate every kWh or therm of savings, especially when the study budget is running low.

Demand savings is not reported by the program, but it is tracked in projects and in spreadsheets. Demand savings can contribute to measure payback; therefore it should not be ignored. Total *ex ante* savings in the verification reports is about 800 kW. Navigant’s analysis of 634 kW in the evaluation sample found a 51% realization rate for peak demand savings. Key reasons for low realization rates included demand savings claimed for winter and off-peak hours, measures that were implemented without program influence¹⁸, and scheduling measures that have uncertain impact during peak

¹⁸ A large chiller sequencing savings opportunity for a new chiller was noted in the investigation report. Site personnel reported to evaluators that the chiller operations were already being addressed through start-up commissioning on the equipment, and the savings was not a result of the program.

hours. Program adjusted gross savings are presented in Table 3- and Table 3- alongside Adjusted Net Savings.

Realization rates did vary among the gas utilities, though the small number of sample points gives undue weight to individual projects at the utility level. Measure types do not vary among the utilities. The North Shore Gas realization rate is based on a census of one participant and the Nicor Gas realization rate is driven by one of five sampled projects with a low realization rate.

Table 3-. GPY1 Evaluation Natural Gas Savings Estimates

Research Category	Peoples Gas Savings	North Shore Gas Savings	Nicor Gas Savings	Total Savings
Participants	14	1	7	22
Ex Ante Gross (Therms)	858,657	56,775	180,345	1,085,777
Impact Evaluation Sample - % of total	68%	100%	70%	75%
Research Realization Rate	106.4%	119.6%	82.0%	103.4%

3.1.5 Net Program Impact Parameter Estimates

As noted in Section 2.1.2.1 free-ridership was explored in participant and RSP surveys. Navigant calculated net-of free-ridership¹⁹ for each interview and then savings-weighted participant and RSP net-of-free-ridership for the program. Navigant tracked natural gas and electricity factors separately. The results are in Table 3- below. As might be expected, some participants felt they might have implemented some retro-commissioning measures absent the program and studies. Service providers with long experience in the market are highly skeptical that studies would be performed and measures implemented without the funded studies, commitments and, by extension, the program. Most of the RSP observations, though, are based on their experience with poorly-performing buildings. Overall program net-of-free-ridership is the straight average of the participant and RSP estimates. Spillover from both participants and RSPs is additive to the overall net-of-free-ridership to derive NTG.

¹⁹ Net-of-free rider = (1 - free-riders). Addition of spillover to the term comprises the full NTG ratio.

Table 3-. Net-of- Free-Ridership (1-FR), Spillover and NTG Estimates

	Participant		Service Provider		Overall	
	Electricity	Gas	Electricity	Gas	Electricity	Gas
Program effects	0.923	0.840	0.984	0.983		
Timing & Selection	0.762	0.782	NA	NA		
No-Program Effects	0.783	0.843	0.980	0.993		
Net-of-Free-riders	0.823	0.822	0.982	0.988	0.903	0.905
Spillover	<0.01	<0.01	0.136	0.110	0.136	0.110
Overall NTG	0.823	0.822	1.118	1.098	1.038	1.015

Source: Navigant analysis.

Sample sizes for gas net-of-free-ridership are very small and individual responses can greatly sway results. For example, overall participant net-of-free-ridership varies between 0.76 and 0.92, depending on the utility with 0.822 being the savings-weighted average for all gas participants. Service provider-derived values were more consistent. Overall the participant interviews included 46% and 53% of program electric and gas savings, respectively. RSP interviews included 91% and 100% of electric and gas savings, respectively.

Spillover was a noticeable aspect of the program for service providers, but much less so for participants. Three of 25 interviewed participants reported implementing some retro-commissioning measures at the project site or other locations in Illinois, but only one credited the program with significant influence (7 on a scale of 0 to 10). Most of the RSPs report they are growing their retro-commissioning service, partially as a result of the program. All but two RSPs say growth is only with utility programs at this point. For these two RSPs their answers to follow-up questions indicated significant spillover effects from the RSP perspective. One RSP was working with similar sized facilities, and the other was working with those that were borderline too small for the program. Spillover is shown in Table 3-.

Service providers credit the joint utility program with driving the market throughout the ComEd service territory, creating a new service offering for them to promote and providing a nice base load of work to build from. One RSP noted hiring additional staff and two said staff had shifted to retro-commissioning from slower parts of the company.

Table 3-. EPY4 Evaluation Electric Savings Estimates

Research Category	Energy Savings (MWh)	Peak Demand Savings (kW)
Ex Ante Gross	29,908	800.2
Ex Ante Net ²⁰	27,395	733.0
Research Findings Gross	27,315	384.3
Verified Net	25,021	352.0

Source: Utility tracking data and Navigant analysis.

Table 3-. GPY1 Evaluation Natural Gas Savings Estimates

Research Category	Peoples Gas Savings (therms)	North Shore Gas Savings (therms)	Nicor Gas Savings (therms)
Participants	14	1	7
Ex Ante Gross	858,657	56,775	180,345
Ex Ante Net ²¹	686,926	45,420	144,276
Research Findings Gross ²²	913,820	67,908	147,838
Verified Net ²³	925,412	68,769	149,713

Source: Utility tracking data and Navigant analysis.

3.2 Process Evaluation Results

The process component of the Retro-Commissioning Program evaluation focused on program design and implementation, program processes, marketing and outreach, RSPs, and participant satisfaction. The primary data sources for the process evaluation were review of program materials and interviews with program and implementation staff and RSPs, as well as a survey of participating customers.

²⁰ The program-assumed net-to-gross ratio is 0.916 for electricity savings.

²¹ All gas utilities assumed a net-to-gross ratio of 0.8 for planning purposes in ex ante estimates.

²² Natural gas research findings gross realization rates were 106%, 120% and 82% for Peoples Gas, North Shore Gas and Nicor Gas respectively. The weighted average among all gas projects is 103%.

²³ Natural gas verified net savings is based on GPY1 research that found a net-to-gross ratio of 1.05 for gas and 1.01 for electric savings. Due to the small sample (n=12) of gas participants interviewed for NTG versus the electric sample (n=25) and the identical program and market factors affecting both electric only and electric and gas participants, Navigant applies the electric savings NTG to gas savings as well.

3.2.1 Program Participation

In EPY4, the Retro-Commissioning program completed projects at 50 facilities. The average *ex ante electric* savings per project was 598 MWh per year, with individual projects ranging from 67 MWh to 2,897 MWh out of annual consumption between 1,097 to 47,083 MWh. Twenty-two GPY1 gas participants saved between 1,300 and 290,800 therms, averaging 49,800 therm savings. Participants represented a range of building types: office buildings, hospitals, retail, higher education properties, data centers, housing facilities, and hotels. The facility floor area ranged from 54,343 to 2,200,000 square feet.

3.2.2 Program Changes from EPY3

Changes made between EPY3 and EPY4, included ComEd’s continued emphasis on improving the timeliness of project completions. The program also recruited additional RSPs, although only one of the new RSPs completed projects in EPY4.

Key changes include:

- **Coordinated Delivery with the Natural Gas Utilities.** The program coordinated with the natural gas distribution companies, Peoples Gas and North Shore Gas and Nicor Gas, to co-deliver the Retro-Commissioning Program, allowing customers to address measures in a fuel neutral manner decreasing barriers to participation.
- **Development of a New Tracking System.** The implementation tracking was moved to a new tracking system in EPY4/GPY1. Previously the program was tracked via a detailed spreadsheet managed by the program implementer; the new TrakSmart system allows better more real time control over program tracking and allows multiple users to access the data at any given time without risking compromise to the data
- **Emphasis on timely completion of projects.** Processes were put in place to better encourage RSPs to complete projects in the program year they were started. The program administrator used the RSP scoring system which remained in place from EPY3 as one avenue to encourage timely completion and added an incentive for some customers, those at most risk of missing deadline to finish their portion of the project before the end of the program year.
- **Updated the M&V guidelines.** M&V guidelines were developed in EPY4/GPY1. These guidelines were developed to adjust the measurement requirements for smaller measures and to reduce some of the workload for RSPs for more common small measures. The guidelines also aim to address measures where the M&V might be affected by seasonal delays.
- **Discontinuation of the Performance payment pilot tested in EPY3.** In EPY3 the program piloted a performance based payment structure with a few contractors, this approach provided a reliable acquisition rate, but the program ended up spending more per kWh saved than they did for the other projects in the program.

3.2.3 Program Processes

3.2.3.1 Participation Process

RSPs were very satisfied with the participation process. Only one RSP interviewed had not previously participated in the program, but this individual and returning RSPs noted that the

participation processes were highly structured and organized making it easy to work with Nexant and customers. One RSP indicated that they participate in retro-commissioning programs all over the country including in California and Texas and this Retro-Commissioning Program is by far their favorite and “the best run”.

RSPs tended to hold varying opinions regarding the program’s planning phase. Two RSPs felt that the planning phase was too rigorous and time consuming, while another felt that putting extra effort into planning eased the selling and marketing process for their business. One RSP stated that he would prefer to bypass the planning phase or combine it with the implementation phase to shorten the entire process timeline. In this case, the RSP argued that for some customers, capital budgeting problems can arise when projects are not completed in a 12 month period of time or within a single budget year.

Most RSPs felt that the program stages are well structured without much duplication of effort among program phases. However, a few RSPs called for reduced documentation efforts and shortened turn-around times for project approvals. Another RSP urged a merging of the electric and gas components of the program into a single process to reduce paperwork and confusion among RSPs²⁴. Overall, participants were very positive about the program, with energy savings and reduced energy bills being seen as the primary benefit for participating (64%) followed by the program’s support in helping participants find fixable measures or improvements that they would not have been able to find or did not know could be fixed (both at 16%). Three of the participants noted that the independent, third-party review was a significant benefit and that the unbiased review helped them in securing internal approval for the investment in the project.

3.2.3.2 Program Timelines

The Participant Manual lists target timelines for each phase. According to the Program Manager, the emphasis placed on meeting these deadlines in EPY3 and built upon in EPY4 led to significant improvements although timing still remains an issue. Only three projects risked missing the EPY4/GPY1 completion deadline. Those three projects were offered an incentive designed to encourage timely completion (a bonus for completing the implementation phase in time for verification to occur before the close of the program year). All three projects were completed on time.

One RSP said that the program year ending in May limits the RSP’s testing season, thus creating problems in finishing projects on time. Another reason for missed timelines pertains to a lack of customer urgency to complete the various stages of the project process.

3.2.3.3 Data Tracking

The ComEd Program Manager indicated that he is satisfied with the timeliness and quality of the data he receives from the implementer. The Program Manager receives a weekly status report, which includes information on project status and identified kWh savings. The Program Manager noted that he has enough information to run any sort of analysis needed.

²⁴ Most of the program forms already appear to integrate gas and electric participation criteria, though some project files include what seem to be older forms that are solely electric-focused.

3.2.4 Retro-Commissioning Service Providers

The program had nine RSPs that completed projects in EPY4/GPY1, eight were returning and one was new from EPY3. Of these, seven completed more than one project with one completing 15 projects. Both program staff and RSPs indicated that in the fourth year the program really hit its stride, and providers fully understood the program's processes and requirements. Three RSPs worked exclusively in all-electric buildings and did not identify gas savings for the gas utilities.

3.2.4.4 RSP Performance Reviews

At the end of EPY4/GPY1, Nexant again conducted a performance review of the nine active RSPs and rated them on a series of metrics. If an RSP scores low, they may be required to re-apply in the next program year. In EPY3, six of the nine RSPs with completed projects scored high enough to continue. Of the three providers that scored low, one was removed from the program.

RSPs found the performance review to be useful, but a couple felt that the review process could be more transparent, so that the rating structure could be more easily understood by RSPs. Overall, RSPs stated that it is always beneficial to have their work reviewed by a respected third party such as Nexant. In one case, an RSP argued that an outside party provided credibility to his firm's work, especially through verifying firms' strengths and weaknesses.

Program participants were very satisfied with their RSPs. All 25 interviewed participants provided a rating of 8 or more on a scale of 0 to 10, with 0 meaning very dissatisfied with the RSP and 10 meaning very satisfied.

3.2.4.5 RSP Satisfaction

Despite their criticism of some aspects of the program, RSPs were very satisfied with the program overall in EPY4/GPY1 and found that it met or exceeded their expectations. RSPs were very satisfied with the support from ComEd and Nexant and the expansion of the program into gas measures, but less satisfied with certain elements of the program such as the amount of documentation required and the lengthy review process. Overall, RSPs found that the benefits of participating in the program outweighed the drawbacks, and their satisfaction was high.

3.2.4.6 Effects of Program on RSP Business Practices

Five of the eight interviewed RSPs stated that the ComEd retro-commissioning program had an effect on their business practices. Of the group, five are either planning or have added additional staff as a result of their participation in the retro-commissioning program. All of those interviewed felt that the program was highly important (8-10 on a scale of 0-10) to how frequently RSPs recommend and perform retro-commissioning services for their customers in northern Illinois. Most RSPs felt that the addition of gas measures did not influence the frequency of recommending the program to customers. Nevertheless, RSPs seemed to think that the expansion of the program into gas measures increased customer interest.

3.2.5 Marketing and Outreach

RSPs remain the primary promoters of the retro-commissioning program and are expected to generate leads. Participants learned about the retro-commissioning program in a variety of ways. The

program implementer and the RSPs themselves believe that the RSPs are the primary informer of the program, which is consistent with the responses of program participants. Among the 25 interviewed participants, all claim to have also heard about the program via an email from ComEd.

3.2.6 Customer Satisfaction

Overall, participants gave very high ratings to their satisfaction with all program aspects about which they were asked, including the level of financial commitment required to receive the free study, the information provided in the retro-commissioning study, the program administrator (Nexant), the Smart Ideas for Your Business Program staff, the Retro-Commissioning Program overall, and ComEd overall. The highest satisfaction among participants was with the RSPs (100%) while satisfaction with ComEd overall and program staff ranged from 75% to 79%. All but one participant rated the program a 7 to 10 on a scale of 1 – 10 where 1 is highly dissatisfied and 10 is highly satisfied (96%). Just one participant was neutral (4%).

Table 3-. Level of Satisfaction with Program Elements

	Dissatisfied (1-3)	Neutral (4-6)	Satisfied (7-10)
The level of financial commitment required to receive the free study (n=25)	0%	4%	96%
The information provided in the retro-commissioning study (n=25)	0%	4%	96%
Nexant (n=25)	0%	4%	96%
The Smart Ideas for Your Business Staff (n=19)	0%	21%	79%
Retro-commissioning Service Provider (RSP) (n=25)	0%	0%	100%
Retro-commissioning Program overall (n=25)	0%	4%	96%
ComEd overall (n=24)	8%	17%	75%

Source: Navigant research and analysis.

Participants cited many benefits of participating in the Retro-Commissioning program. The most cited benefit was the detailed retro-commissioning study.

3.2.7 Barriers to Participation

According to RSPs, the primary barrier preventing customers from performing retro-commissioning at their facilities is awareness of the program. One RSP thought that a lack of knowledge of program service and benefits kept more customers from participating in the program. Other RSPs argued that the upfront cost of the study was the biggest barrier because any potential energy savings are unknown. The lack of definite savings before the study is especially troublesome for businesses that require a certain return on investment or payback period before funding can be approved.

Another barrier to customer participation pertains to the timing of the project. One RSP said that attempting to align capital planning budgets with the program year can be very difficult, keeping

some projects from going forward, especially for larger customers with multiple locations vying for the same line of funding.

Several RSPs felt that the main barriers preventing customers from participating in the program stemmed from the size of their business. Many felt that smaller customers have more flexibility in fitting into the program's timeline, but may not have the capital to launch a project. Alternately, larger customers have the capital to complete various projects, but because of timing constraints they may not be able to align their internal budget planning with the program's timelines. Provided that a firm can find a way to overcome these obstacles, participating RSPs believe there are no major barriers to participation.

4. Findings and Recommendations

4.1 Key Impact Findings and Recommendations

The following tables summarize the electric and gas savings from the Retro-Commissioning Program.

Table 4-. EPY4 Evaluation Electric Savings Estimates

Research Category	Energy Savings (MWh)	Peak Demand Savings (kW)
Ex Ante Gross	29,908	800.2
Ex Ante Net ²⁵	27,395	733.0
Research Findings Gross	27,315	384.3
Verified Net	25,021	352.0

Source: Utility tracking data and Navigant analysis.

Among the 50 participants, 21 in the program database were also gas utility participants. Evaluation research identified one additional Peoples Gas participant for a total of 22 gas participants. The gas utilities did not have a deemed NTG ratio; however, they all used 0.8 as a planning assumption, and Navigant applies this ratio to ex ante net savings. Since no NTG estimates were deemed for gas savings, Navigant applied the NTG ratio estimated by EPY4/GPY1 research below to GPY1 gas savings retrospectively, in accordance with the NTG Framework.²⁶

²⁵ The program-assumed net-to-gross ratio is 0.916 for ex ante net and verified net electricity savings.

²⁶ "Proposed Framework for Counting Net Savings in Illinois." Memorandum March 12, 2010 from Philip Mosenthal, OEI, and Susan Hedman, OAG.

Table 4-. GPY1 Evaluation Natural Gas Savings Estimates

Research Category	Peoples Gas Savings (therms)	North Shore Gas Savings (therms)	Nicor Gas Savings (therms)
Participants	14	1	7
Ex Ante Gross	858,657	56,775	180,345
Ex Ante Net ²⁷	686,926	45,420	144,276
Research Findings Gross	913,820	67,908	147,838
Verified Net ²⁸	925,412	68,769	149,713

Source: Utility tracking data and Navigant analysis.

- **Program Savings Goals Attainment.**

Finding. The program achieved goals for electric energy savings (26,880 MWh) and fell short of participation (63) and demand savings goals (3.8 MW). Gas savings goals were met for Peoples Gas (528,800 therms) but fell short for North Shore Gas (145,600 therms) and Nicor Gas (267,700 therms)

Recommendation. Savings is driven largely by participation; thus increasing program participation is the best route to achieve program savings goals. Motivating inactive RSPs will further savings goals and market transformation for retro-commissioning services. Demand savings is difficult to predict and track with retro-commissioning and perhaps the prominence of this metric should be reduced.

- **Gross Realization Rates.**

Finding. The realization rate for electric energy is 92%. Gas savings realization rates are 106%, 120% and 82%, for Peoples Gas, North Shore Gas and Nicor Gas, respectively. Divergent gas realization rates are a result of the small populations and savings for the latter two utilities. The overall gas realization rate is 103%. Energy savings estimates from the RSPs are generally well-supported and calculated with a high degree of rigor. Most RSPs continue to use their own estimation spreadsheets, rather than program-provided templates for common measures. This factor complicates program implementation and evaluation efforts as the variety of methods is time-consuming and open to more errors.

Recommendation. Explore ways to encourage use of program-standard savings calculators – perhaps by using incentives or by fast-tracking program processes when standard savings calculators are used.

- **Net-to-Gross estimates:**

Finding. EPY4/GPY1 NTG research estimates an electric NTG ratio of 1.01. The weighted average gas NTG ratio estimate among all participating utilities is only slightly higher (1.05) than the electric NTG. Program incentives to fund the studies and the expertise of RSPs rank

²⁷ All gas utilities assumed a net-to-gross ratio of 0.8 for planning purposes in ex ante estimates.

²⁸ Natural gas verified net savings is based on GPY1 research that found a net-to-gross ratio of 1.01 for gas and electric savings. Due to the small sample (n=12) of gas participants interviewed for NTG versus the electric sample (n=25) and the identical program and market factors affecting both electric only and electric and gas participants, Navigant applies the electric savings NTG to gas as well.

very high importance among participants. (9.6/10) According to participants, program influence to identify and implement measures is lower (7.4/10), a result similar to EPY3. There is only slight indication of spillover among participants. Service providers credit the program with sustaining and creating a retro-commissioning market in Illinois.

Recommendation. Utilize a single common NTG ratio for gas and electric measures. The factors affecting NTG for gas and electric measures are mostly the same. RSPs treat both equally, participant decision-makers are the same and most measures are concurrent with the same action, i.e. changing setpoints or operating schedules.

- **Demand Savings Estimates.**

Finding. The RSPs continue to have different or no approach for estimating peak demand savings.

Recommendation. Accurate accounting for demand savings does contribute to measure payback at the customer level and contributes to the program’s success. The program needs to establish a standard methodology for demand savings estimates and those methods must be enforced during quality assurance steps.

- **Incomplete Savings Estimates.**

Finding. Some measures are low-risk and high-reward in terms of savings, and there is a temptation to apply less rigorous calculations to quantify savings, since the RSP is certain the customer will implement the measure. While this scenario expedites the retro-commissioning process, it short-changes the program’s savings estimates. The addition of gas savings adds another dimension to this problem– if electric savings alone motivate implementation, concurrent gas savings estimates might be incomplete, or *vice versa*.

Recommendation. During savings calculation quality control steps, look specifically for interactive and concurrent savings with a checklist by measure type. For example, equipment scheduling saves gas for ventilation as well as fan energy; fan static pressure reduction decreases fan heating, and discharge air temperature resets can change mass-flow rates and fan power.

4.2 Key Process Findings and Recommendations

Overall, participants and RSPs were very positive about the program and the participation process. Participants were satisfied with the energy savings and reduced energy bills and by the program’s support in helping them find fixable measures or improvements that they would not have been able to find or did not know could be fixed. Participants also noted that the independent, third-party review was a significant benefit and it helped them in securing internal approval for the investment in the project.

Participants gave very high ratings to their satisfaction with all program aspects, including the level of financial commitment required to receive the free study, the information provided in the retro-commissioning study, the program administrator (Nexant), the Smart Ideas for Your Business Program staff, the Retro-Commissioning Program overall, ComEd, and their gas utilities.

RSPs reported satisfaction with the program and noted that it met or exceeded their expectations. RSPs were very satisfied with the support from ComEd and Nexant and the expansion of the program into gas measures. Moreover, five of the eight interviewed RSPs stated that the joint utility retro-commissioning program had a positive effect on their business and business practices.

While there was general satisfaction with the program, there are four areas where there is opportunity for continued improvement as the program moves into PY5. These are:

- **RSP Participation.**

Finding. The program has 23 registered RSPs. While only nine completed projects in EPY4/GPY1, many of the others have projects in process for EPY5/GPY2 completion. The effort to increase the number of participating RSPs between EPY3 and EPY4 was a success; however there is lost opportunity in having RSPs listed as part of the program but not completing projects.

Recommendation. Because RSPs are the primary conduit for program participation, attention should be paid to getting all registered RSPs to complete at least one project within the program year.

- **Implementation Phase Support.**

Finding. The Implementation Phase continues to be the primary source of challenges for the program. This phase is generally participant-led and the timely completion of projects is entirely dependent on the customer keeping the project moving. RSPs expressed a concern that while they are not involved in this phase, they are still held responsible, via the RSP review process for the timely completion of projects.

Recommendation. More effort is needed from Program Managers and the IC to engage the participants and keep the implementation phase moving along on a timely basis.

- **RSP review process.**

Finding. RSPs indicated that while they think the review process is important, the process could be more transparent. Essentially, RSPs believe there should be consideration in the scoring for those parts of the project that the RSPs have little to no control over. For example, the timely completion of the implementation phase may negatively affect the score; yet, they have little to no control over this part of the project.

Recommendation. The RSP scoring system should be reviewed to ensure it is not penalizing RSPs for aspects of the program that they have no control over (e.g., implementation timing) or, program approaches should be put in place that allow RSPs to guide the participants more actively through the customer directed phases.

- **Project timing.**

Finding. Timing improved in EPY4/GPY1, but remains a challenge. In EPY4/GPY1, many projects were unable to meet their originally planned completion timelines. Timing challenges are the result of multiple issues including participant delays in the implementation phase, the bounds of the program year itself, and how customer budgeting and approval processes fit into the program year timing.

Recommendation. While it may not be feasible to allow projects to cross multiple program years, this option may increase the breadth of projects completed through the program. Further, the “carrot and stick” approach seems to be helping with project timing, increasing the carrot for participants who complete their implementation phase in a timely manner and/or offering more assistance for those who need it during the customer driven phases can help get more projects done on time and can help decrease penalties on RSPs for phases they have less control over.

5. Appendix

5.1 Glossary

ComEd, Nicor, Peoples Gas, and North Shore Gas EM&V Reporting Glossary. January 10, 2013

High Level Concepts

Program Year

- EPY1, EPY2, etc. Electric Program Year where EPY1 is June 1, 2008 to May 31, 2009, EPY2 is June 1, 2009 to May 31, 2010, etc.
- 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.

There are two main tracks for reporting impact evaluation results, called Verified Savings and Impact Evaluation Research Findings.

Verified Savings composed of

- Verified Gross Energy Savings
- Verified Gross Demand Savings
- Verified Net Energy Savings
- Verified Net Demand Savings

These are savings using deemed savings parameters when available and after evaluation adjustments to those parameters that are subject to retrospective adjustment for the purposes of measuring savings that will be compared to the utility's goals. Parameters that are subject to retrospective adjustment will vary by program but typically will include the quantity of measures installed. In EPY4/GPY1 ComEd's deemed parameters were defined in its filing with the ICC. The Gas utilities agreed to use the parameters defined in the TRM, which came into official force for EPY5/GPY2.

Application: When a program has deemed parameters then the Verified Savings are to be placed in the body of the report. When it does not (e.g., Business Custom, Retro-commissioning), the evaluated impact results will be the Impact Evaluation Research Findings.

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 for this concept)§
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
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).

Individual Values and Subscript Nomenclature

The calculations that compose the larger categories defined above are typically composed of individual parameter values and savings calculation results. Definitions for use in those components, particularly within tables, are as follows:

Deemed Value – a value that has been assumed to be representative of the average condition of an input parameter and documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a deemed measure shall use the superscript “D” (e.g., delta watts^D, HOU-Residential^D).

Non-Deemed Value – a value that has not been assumed to be representative of the average condition of an input parameter and has not been documented in the Illinois TRM or ComEd’s approved deemed values. Values that are based upon a non-deemed, researched measure or value shall use the superscript “E” for “evaluated” (e.g., delta watts^E, HOU-Residential^E).

Default Value – when an input to a prescriptive saving algorithm may take on a range of values, an average value may be provided as well. This value is considered the default input to the algorithm, and should be used when the other alternatives listed for the measure are not applicable. This is designated with the superscript “DV” as in X^{DV} (meaning “Default Value”).

Adjusted Value – when a deemed value is available and the utility uses some other value and the evaluation subsequently adjusts this value. This is designated with the superscript “AV” as in X^{AV}

Glossary Incorporated From the TRM

Below is the full Glossary section from the TRM Policy Document as of October 31, 2012²⁹.

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 research to facilitate updating measure specific TRM input values or algorithms. The focus of

²⁹ IL-TRM_Policy_Document_10-31-12_Final.docx

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 Detailed impact results

Program impacts are tracked through the several phases of the program with the IC giving feedback and requiring changes along the way. Thus, the evaluator’s task is to check a sample of measures verified by the RSPs and IC and ensure that measures are indeed complete and savings are accurately estimated.

The evaluators conclude that the Verification Reports and supporting data and calculations provided sufficient confirmation that the measures were installed as described. Navigant identified 11 projects within the impact sample for on-site verification.³⁰ Evaluators visited all 11 of these sites in September 2012 and verified implementation and observed actual operation of measures. In most cases measure implementation persists. In a couple cases, setpoints and schedules were modified due to comfort or occupancy requirements of the buildings. In one case the automation system used to implement measures failed and when the software was re-installed, several measures were lost from the system. The site does not plan to re-implement these measures.

For all 24 sites in the sample, Navigant reviewed measure implementation plans, assumptions and calculations in detail. In general, Navigant found the calculations accurately constructed, based on clearly measured data rather than rules-of-thumb and transparent in spreadsheet form. In rare instances, we found calculation errors due to spreadsheet equation errors, erroneous inputs, omissions of relevant impacts and inconsistencies in assumptions from measure to measure on the same system.

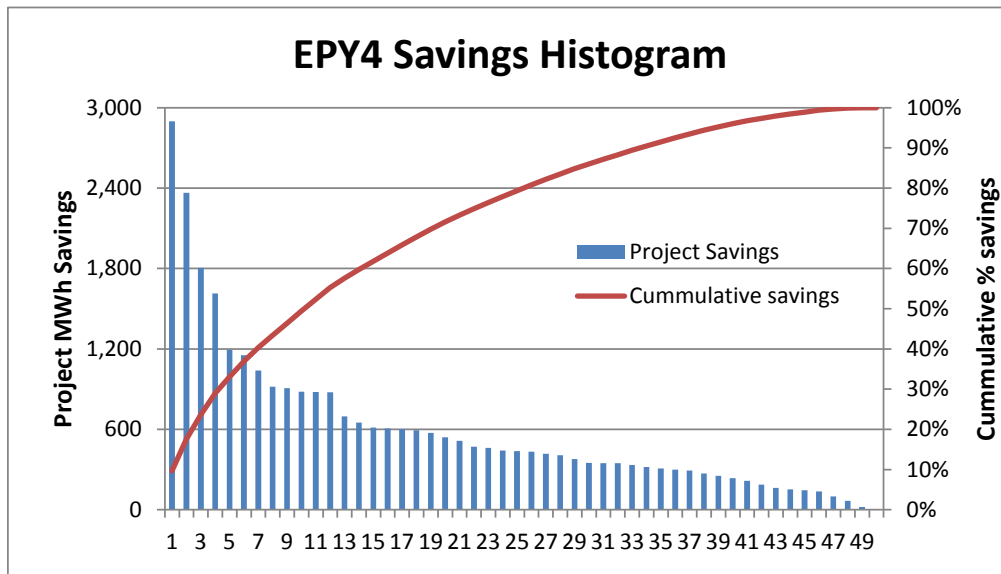
Savings estimation approaches among RSPs were mostly consistent. Most calculation spreadsheets were comprehensive, though some were excessively complex and others overly simple. Despite the range of approaches in EPY4/GPY1, there were very few lapses in engineering methods. When faced with the need to make engineering assumptions, RSPs are often more conservative than the program guidelines. A conservative approach, such as this, is common to retro-commissioning analysis. Some measures are so simple to implement and the primary effects generate sufficient savings that there is no inclination to analyze secondary and tertiary effects of an action. From the RSPs’ and customer’s perspectives this approach makes sense. Less time spent on analysis of simple cost-effective measures frees resources for analyzing more complex measures. From the perspective of the sponsoring utility, however, these additional savings are real and should be counted. Where there was no further justification for overly conservative estimates, the evaluation team restored guideline defaults and/or

³⁰ On-site verification projects were selected based on project savings size, measure type and facility type. Large projects were selected because of their impact on program goals. Projects with chilled water and cooling tower measures were selected because their full functionality would not necessarily have been verifiable before May 31. Diverse facility types were selected to capture a range of operating strategies and participant requirements (for example year-round cooling for equipment intensive sites or 24 hour operation for hospitals).

supplemented estimated savings with secondary effects of the measures as could be determined with available data.

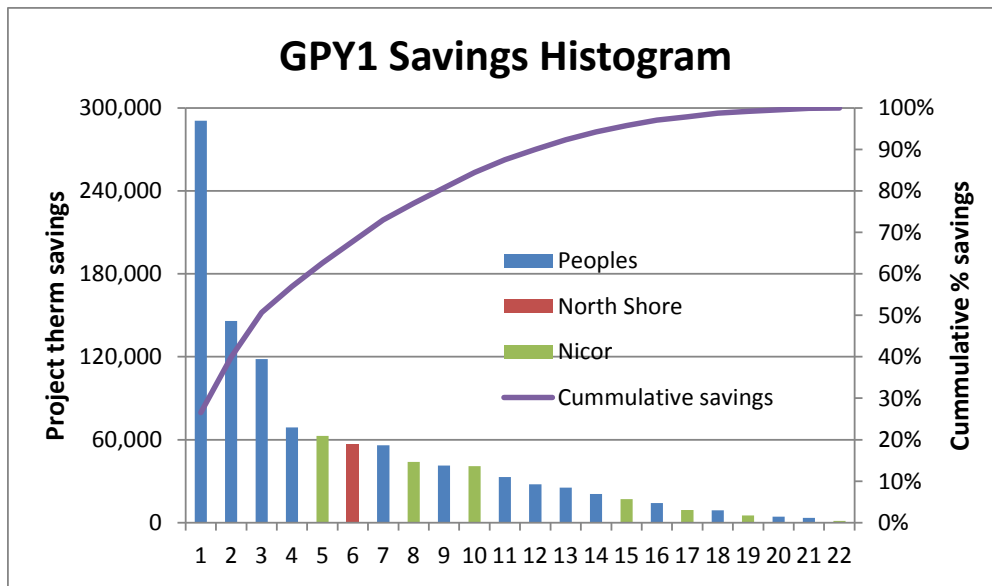
The distribution of electric and gas savings are somewhat different, as shown in Figure 5. and Figure 5.. While there were a few very large electric savings projects there is a large mid-range of savings in the distribution and eleven of 50 projects comprise 50% of program savings. For the gas utilities three projects comprise more than 50% of program savings

Figure 5.. Ex Ante Electric Savings (kWh) Project Savings Histogram



Source: Utility tracking data.

Figure 5.. Ex Ante Gas Savings (Therm) Project Savings Histogram

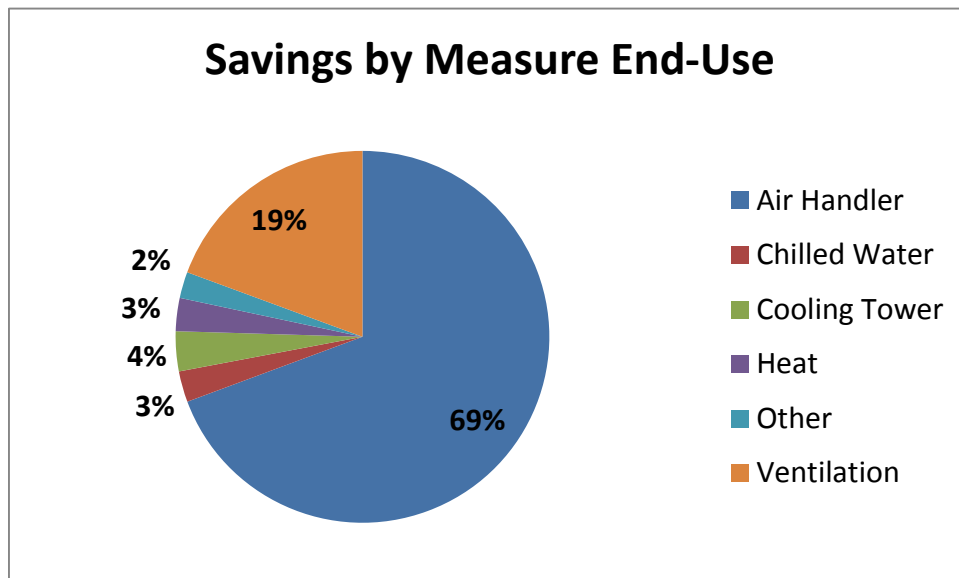


Source: Utility tracking data.

As part of the impact analysis, Navigant grouped the retro-commissioning measures into six broad end-use categories that include most types of measures included in retro-commissioning. Figure 5. shows the distribution of *ex ante* savings among measure end-uses. Secondary effects, such as heating savings from reduced ventilation when an air-handler is turned off, count in the primary end-use category.

- **Air-handler** includes measures that change the schedule of fan operation and fan control setpoints such as air temperatures, minimum airflows and/or static pressure setpoints.
- **Chiller** includes such measures as chilled water temperature reset, compressor staging, and water-side economizers.
- **Cooling tower** includes fan and cell staging and condenser water temperature control.
- **Heating** includes measures like boiler pumps or terminal box setpoints and/or control.
- **Other** measures include pumping, lighting, and domestic hot water measures.
- **Economizer and Ventilation Controls** include economizer repair and optimization and ventilation control based on CO₂ levels in return air.

Figure 5.. Ex Ante Electric Savings (kWh) by End-Use Category



Source: Utility tracking data and Navigant analysis.

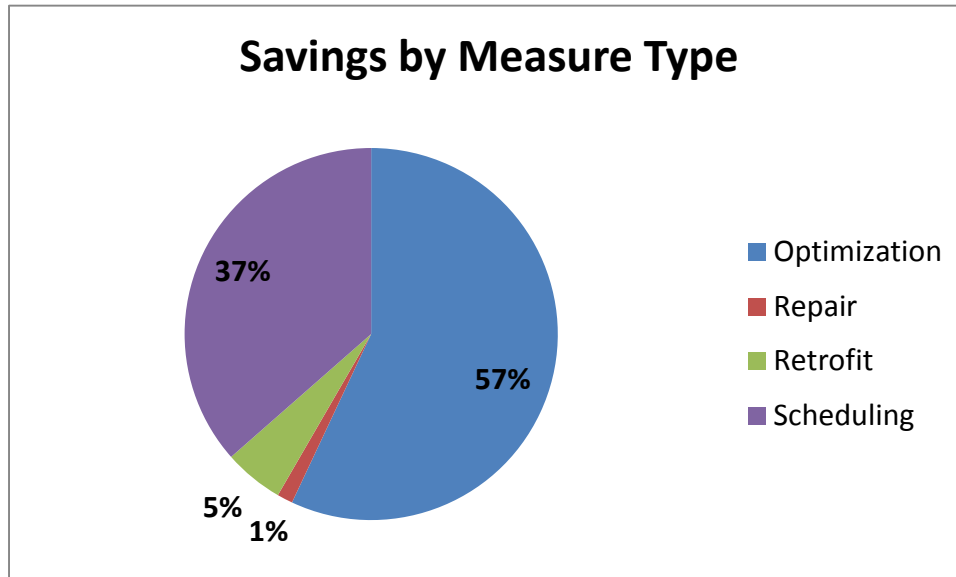
In addition to thinking of measures by end-use, Navigant grouped the measures according to their upgrade type. Figure 5. shows the distribution of *ex ante* savings among measure types.

- **Scheduling** measures are those that merely turn off equipment (HVAC and lighting) when their service is not required for occupants.
- **Optimization** includes measures that improve control algorithms, or setpoints.

- **Repairs** are measures that address broken equipment such as failed actuators or sensors.
- **Retrofit** measures in retro-commissioning are relatively few and generally fairly inexpensive for retrofit measures. In EPY4/GPY1 equipment retrofit measures included new filter media, added sensors for CO or CO2 ventilation control or wet-bulb temperature sensors for cooling tower controls.

Among the RCMs implemented at the EPY4/GPY1 sites, air handlers and economizers are the largest electric energy savers by end-use. Optimization measures dominate the savings by measure type, and most of the optimization measures involve air-handler control algorithms and set-point optimization. A relatively small portion of the identified savings relates to the cooling systems. This observation might be a result of the program timeline that makes cooling system measures difficult to investigate and observe while operating.

Figure 5.. Ex Ante Electric Savings (kWh) by Measure Type



Source: Utility tracking data and Navigant analysis.

5.2.1 Net Program Impact Results

Once gross program impacts have been estimated, net program impacts are calculated by multiplying the Research Findings gross impact estimate by the deemed NTG ratio for ComEd, which combine free-ridership (FR) and spillover (SO). Navigant included equally weighted participant and service provider NTG estimates in the final program NTG ratio

$$\begin{aligned} \text{Site NTG} &= \text{NTG}_{\text{site}} = 1 - \text{FR}_{\text{site}} + \text{SO}_{\text{site}} \\ \text{RSP NTG} &= \text{NTG}_{\text{RSP}} = 1 - \text{FR}_{\text{RSP}} + \text{SO}_{\text{RSP}} \end{aligned}$$

Among participants interviewed for the process evaluation, the Navigant Team determined site-level and RSP-weighted NTG. The overall program NTG is a saved kWh-weighted average of the NTG of the sites and RSPs interviewed.

$$NTG_{\text{overall}} = \left(\sum NTG_{\text{site}} \times kWh_{\text{site}} / \sum kWh_{\text{site}} + NTG_{\text{RSP}} \times kWh_{\text{RSP}} / \sum kWh_{\text{RSP}} \right) / 2$$

5.2.1.1 Free-Ridership

Free-ridership determination is a combination of three attributes investigated during the participant survey, combined with two parallel aspects investigated with the service provider survey. The service provider survey does not address the timing question, since that is solely participant-driven.

1. The influence of various program factors in the customer’s decision to conduct the study and commit the funding to perform retro-commissioning activities;
2. What would have been the timing for addressing those issues, absent the program ; and
3. Whether the participant would have addressed the issues identified in the retro-commissioning study of which they were aware, absent the program.

The evaluation completed interviews with 25 participants of an attempted census (39). The free-ridership questions established a participant free ridership rate of zero for ten of the projects, and a rate between 0.03 and 0.63 for the others. The sites that had the highest indications of free-ridership all had equipment deficiencies known to the appropriate people in the company. The companies stated that they would have conducted the study and implemented measures within one to two years even if the program had not been available.

Conversely, RSP estimates of free-ridership is very low – 0.05. RSPs universally estimated that participants would not have performed studies and they are relatively un-aware of savings opportunities. Participants interviewed account for 46% of electric savings and 53% of gas savings. Interviewed RSPs thought that the program played a large part in the decision making process of participants. Without the program’s study, RSPs believe that few of the participants would have implemented the retro-commissioning measures on their own. Interviewed RSPs account for 91% of electric savings and 100% of gas savings. The final PY4 free-ridership ratio is an equally weighted average of savings-weighted participant and RSP free-ridership. Overall free-ridership is 0.10 for both electric and gas savings.

5.2.1.2 Spillover

The Evaluation Team also researched the question of program spillover. Our EPY4/GPY1 participant survey asked about spillover, including any energy efficient equipment and additional retro-commissioning measures implemented at the facility that did not receive incentives through any utility or government program.

Eight interviewed participants reported that they installed energy efficient equipment that did not receive incentives, and five performed additional retro-commissioning without an incentive. However, only three of these participants cited significant influence from the ComEd Retro-Commissioning program in taking these additional actions. Follow-up revealed few quantifiable details on these actions. Given the low attribution to the program for retro-commissioning measures and other energy efficiency measures we conclude that spillover is not a major factor for participants.

RSPs were also asked about spillover, both their own activities and observations of the regional retro-commissioning market. Two RSPs reported they completed more projects without incentives than

they would have without the program. The projects were generally smaller, with one RSP saying their work was for facilities that fell below the program size guideline. Nonetheless, the *additional* retro-commissioning work was attributed to capacity and awareness built by the program. RSP spillover is calculated for each instance as the product of number *additional* projects, percent of identified savings implemented, relative size of the projects to other studies performed by the RSP. The RSP results are weighted by their projects contribution to the overall program savings. The additional savings contribute a spillover factor of 0.11. Thus,

$$\text{NTG} = 1 - \text{Free-rider} + \text{Spillover} \qquad \text{NTG} = 1 - 0.10 + 0.11 = 1.01$$

Among gas savings the NTG is only slightly higher, with a smaller participant survey sample. Due to the same market drivers, regardless of energy type or service territory, Navigant recommends a single NTG = 1.01 for both energy sources for all utilities partnering in the Retro-Commissioning Program. Net Program savings, are reported in Table 5-.

Table 5-. PY4 Evaluation Savings Estimates

Research Category	Energy Savings (MWh)	Peak Demand Savings (kW)	Natural Gas Savings (thermsx1,000)
Ex Ante Gross	29,908	800.2	1,096
Ex Ante Net ³¹	27,395	733.0	1,096
Research Findings Gross	27,315	384.3	1,133
Verified Net	25,020	352.0	1,147

Source: Navigant research and analysis.

5.2.2 Measure-level NTG Estimates

The Illinois Commerce Commission requested further detail on net-to-gross estimates, including prior NTG documentation and NTG at the measure-level in addition to program-level NTG, where possible. This appendix addresses this supplemental request for the EPY4/GPY1 Northern Illinois Joint Utilities Retro-Commissioning Program.

For ex ante savings estimates, the Retro-Commissioning Program utilized deemed NTG values for electric energy savings. The gas utilities assumed a NTG ratio for planning purposes only. Table 5- presents these data. Revised NTG ratios were determined by research in EPY4/GPY1 discussed in section 3.1.5. The gas NTG was applied for net verified savings retrospectively in GPY1.

³¹ The program deemed net-to-gross ratio for PY4 is 0.916.

Table 5- Ex ante Net-to-Gross Estimates

	Electricity	Natural Gas
NTG value	0.916	0.8
Assumption Type	Deemed	Planning
Source	EPY2 Evaluation ³²	Unknown ³³
Methodology	Self Report	Unknown
Observations	5	Unknown

Source: Navigant Analysis

The body of the report focuses on the program-level NTG for natural gas and electricity. Retro-commissioning measures are diverse in description, implementation and magnitude. To aggregate measures meaningfully, Navigant categorized each of the more than 330 implemented measures into four broad categories – Control Optimization, Equipment Scheduling, Low-Cost Retrofits and Repairs – as shown in Figure 5.. Optimization and scheduling account for more than 93% of all kWh savings and 96% of all therm savings; therefore our measure-level analysis only represents these two measure types.

Participant surveys with 25 of 39 unique contacts, examined measure-level participant knowledge and likely implementation of the three measures with the greatest savings at each surveyed site. Among the 25 surveyed participants, eleven had gas savings discussed for net-to-gross. These questions served to modify the no-program score for the participant portion of the net-to-gross estimate. Measure-level results indicate slightly lower free-ridership among participants for measure types as compared to program-level results.

Service Provider surveys with eight of nine active service providers asked whether the service providers would have identified and recommended the same measures absent the program, i.e. did the program influence the deliverable to the client. Service providers indicated no changes in the no-program effects based on measure type. Spillover was not researched on the measure level, thus the spillover effects do not change from the overall program – 0.11 for natural gas and 0.136 for electricity

³² Plan Year 2 (6/1/2009-5/31/2010), Evaluation Report: Retro-Commissioning Program, November 2010, Page 29 Table 4.4. The NTG from the EPY3 retro-commissioning evaluation report was 0.713.

³³ Ex ante savings spreadsheets

Table 5- Research Findings for Participant and Service Provider Free-ridership

	Free-Ridership- Participant Self-Response				Free-Ridership- Service Provider Feedback			
Program Overall	0.177	25	0.178	12	0.018	8; 94% of program projects	0.012	5; 100% of program projects
Optimization Measures	0.144	22	0.126	9				
Scheduling Measures	0.153	14	0.164	6				

Source: Navigant Analysis

Table 5- Research Findings for Non-Participant Spillover and NTG Ratio

	Non-Participant Spillover			NTG	
Program Overall	0.136	0.110	8; 94% of program projects	1.038	1.015
Optimization Measures				1.055	1.041
Scheduling Measures				1.050	1.022

Source: Navigant Analysis

5.2.3 Channeling

As part of the retro-commissioning study process, RSPs identify potential energy efficient equipment upgrades and list them in the study. Additionally, all RSPs promote ComEd, Nicor Gas, Peoples Gas and North Shore Gas Commercial and Industrial Prescriptive and Custom programs to participants as an opportunity to receive incentives for qualifying measures. RSPs often also continue to encourage participants to implement these measures after the retro-commissioning project concludes, although this appears to be stronger for RSPs with existing relationships with their clients. Six of the 25 interviewed participants installed additional energy efficient equipment at their facility that received incentives from ComEd or the gas utilities.

5.3 Detailed process results

Twenty-five participant and eight RSP interviews generated lots of feedback on the program processes.

5.3.1 Participation Process

RSPs were very satisfied with the participation process. Only one RSP interviewed had not previously participated in the program, but this individual and returning RSPs noted that the participation processes were highly structured and organized making it easy to work with Nexant and customers. One RSP indicated that they participate in retro-commissioning programs all over the country including in California and Texas and the ComEd program is by far their favorite and “the best run”.

RSPs tended to hold varying opinions regarding the program’s planning phase. Two RSPs felt that the planning phase was too rigorous and time consuming, while another felt that putting extra effort into planning eased the selling and marketing process for their business. One RSP stated that he would prefer to bypass the planning phase or combine it with the implementation phase to shorten the entire process timeline. In this case, the RSP argued that for some customers, capital budgeting problems can arise when projects are not completed in a 12 month period of time or within a single budget year.

Most RSPs felt that the program stages are well structured without much duplication of effort among program phases. However, a few RSPs called for reduced documentation efforts and shortened turn-around times for project approvals. Another RSP urged a merging of the electric and gas components of the program into a single process to reduce paperwork and confusion among RSPs. For several, the implementation phase or their lack of control during the customer guided phases provided concern especially as it often affected their scoring during the RSP assessment.

In EPY4/GPY1, the program was expanded to include gas measures. From an RSP perspective, nearly all felt that the program change positively affected program participation. RSPs noted an expansion in their customer base allowing RSPs to work with customers that had already completed electrical work and were interested in gas-related services or were interested in completing a variety of retro-commissioning projects in one program year. Some RSPs said:

“I think people thought it was weird that we’d walk by a boiler room and see that it is “leaking” gas [energy] and say to the customer, we can’t look at that. It was embarrassing, so it was big [for savings].”

“A lot of customers were confused why we weren’t focusing on gas in the first place. It seemed like we were overlooking opportunities.”

RSPs pointed out a number of different strengths arising from the participation process. One of the most commonly cited benefits pertained to the generation of sales opportunities for RSPs, in addition to providing customers with support in conducting retro-commissioning efforts. One RSP noted the value in program workshops as an opportunity to network with other RSPs.

Interviewed participants reported a high level of satisfaction with the program participation process overall with 96% of interviewed participants giving the program a rating of 7-10 on a 10 point scale.

When asked why they provided these ratings 30% of participants indicated a general overall satisfaction and 26% indicated that it was a “great program.” Only one participant provided the program a neutral rating and none indicated any level of dissatisfaction with the program. A few respondents were particularly satisfied with the program saying:

“It was a completely positive experience for us.”

“I think it is a great program. As an internal facilities team, it gave us some credibility. It was a great partnership from our perspective.”

“I thought it was very valuable. I thought it was well done and again it confirmed that we ran a relatively efficient building.”

Overall, participants were very positive about the program, with energy savings and reduced energy bills being seen as the primary benefit for participating (64%) followed by the program’s support in helping participants find fixable measures or improvements that they would not have been able to find or did not know could be fixed (both at 16%). Three of the participants noted that the independent, third-party review was a significant benefit and that the unbiased review helped them in securing internal approval for the investment in the project. As noted by the responses below:

“I think looking at a facility from the outside and not allowing us to say that we have always done it that way [is important]. They are bringing that extra tease to say well, other organizations have done this with these types of results and we think it will work for you.”

“You get an independent, third party to come in and look at your operations, because sometimes you are too close to how things have always been done, or your engineer has been there for 100 years. You think you are operating a good building and sometimes it is hard to see those things. Sometimes it is hard for an outsider to come in and give you ideas to do better. It is not necessarily criticism; it just might be something you hadn’t thought about yet. [Having] a relatively independent, third party looking at this was extremely helpful.”

5.3.2 Program Timelines

The Retro-Commissioning Program breaks the participation process into five phases: the application phase, the planning phase, the investigation phase, the implementation phase, and the verification phase. The Participant Manual lists target timelines for each phase. According to the Program Manager, the emphasis placed on meeting these deadlines in EPY3 and built upon in EPY4 lead to significant improvements although timing still remains an issue. Only three projects risked missing the EPY4/GPY1 completion deadline. Those three projects were offered an incentive designed to encourage timely completion (a bonus for completing the implementation phase in time for verification to occur before the close of the program year). All three projects were completed on time.

According to RSPs, projects completed in EPY4/GPY1 were unable to meet their originally planned completion timelines. One RSP said that the program year ending in May limits the RSP’s testing season, thus creating problems in finishing projects on time. Another reason for missed timelines pertains to a lack of customer urgency to complete the various stages of the project process. In particular, one RSP claimed that customers failing to continue working through aspects of the project created delays in reaching the verification phase of the project resulting in a performance penalty for the RSP. One RSP said:

“Right now, in this commercial program, the customer is completely in charge of the implementation phase and we’re charged with the verification portion of that and I know in the industrial program, the RSP has a choice on whether they want to do the verification and measure or whether they want to do the implementation. There

isn't that choice in the commercial program. Considering some of the delays and some of the issues that we've encountered after supposedly the projects have been implemented, it sure seems like we might be better off doing the implementation ourselves and letting the customer handling the M&V part of it." In fact, RSPs can provide implementation services for their projects, but they must waive the verification scope to avoid conflicts of interest.

Since EPY3, one RSP reported a more streamlined process for working with both Nexant and ComEd to complete projects, which allowed for a greater ability on the part of the RSP to meet project timelines. However, another RSP argued that the "back and forth" of the review process with the IC added unnecessarily to the project timeline.

Participants were generally satisfied with the project timing, although the type of organization seemed to influence whether they thought the program timing was too long or too short. Large corporate participants indicated that the projects could have been completed more quickly and that the many phases caused the program to take longer than they would like. Smaller, non-profit or more budget constrained participants indicated that being able to spread the implementation phase out of the course of more than one fiscal year would allow them to complete more projects through the program. This feedback was most notable in facilities where annual budgets were hard set and there was limited opportunity to go back and ask for more investment in capital improvements within the fiscal year.

"It takes way too long. There are far too many reviews by Nexant, and I understand why those are, but I mean it really slowed us down quite a bit. I have to deal with getting internal buy-ins from other staff, which is my own issue, but that also, slows things down."

"We had an issue only because when I came in, I stopped the program for a bit of time, so we could get the appropriate approvals [internally]. Then, we got really pushed hard to meet all of the deadlines."

5.3.3 Data Tracking

The ComEd Program Manager indicated that he is satisfied with the timeliness and quality of the data he receives from the implementer. The Program Manager receives a weekly status report, which includes information on project status and identified kWh savings. The Program Manager noted that he has enough information to run any sort of analysis needed.

5.3.4 Retro-Commissioning Service Providers

The program had nine RSPs that completed projects in EPY4/GPY1, eight were returning and one was new from EPY3. Of these, one completed 15 projects while two completed only one project. Both program staff and RSPs indicated that in the fourth year the program really hit its stride, and providers fully understood the program's processes and requirements. Three RSPs worked exclusively in all-electric buildings and did not identify gas savings for the gas utilities.

5.3.5 RSP Performance Reviews

At the end of EPY4/GPY1, Nexant again conducted a performance review of the nine active RSPs and rated them on a series of metrics. The ranking system is based on a 60-point scale, and the RSPs are ranked by total score. If an RSP scores fewer than 36 points, they may be required to re-apply in the next program year cycle. The performance metrics are: number of projects accepted, quality of

reports, improvements in quality of deliverables over time, meeting of deadlines, project value (dollar savings per kWh, harvest rate, energy savings per project), and customer satisfaction. RSPs that do not complete a project will receive no points in the performance review and will have to re-apply for the next program year, unless they already have an active project on track for completion in the following program year. In EPY4/GPY1, six of the nine RSPs with completed projects scored above 40. Of the three providers that scored below 40, one would have scored much higher had they completed more than one project, one was allowed to continue under a performance management plan and one, who received the lowest score of all providers in 7 of 8 categories, was removed from the program.

The Program Manager stated that RSPs are very receptive to the performance metrics. The review allows them to see how their work compares to their competition and to receive feedback on their performance.

RSPs found the performance review to be useful, but a couple felt that the review process could be more transparent, so that the rating structure could be more easily understood by RSPs. One RSP said:

“We’re being grading on a scale and when these lengthy delays come... that adds to the whole number of days in the project and that reflects poorly on us in the end and it look like it took longer than it did and we had absolutely no power to move it along more quickly. We feel like the scoring system needs to be changed as it scores the timeline.”

Overall, RSPs stated that it is always beneficial to have their work reviewed by a respected third party such as Nexant. In one case, an RSP argued that an outside party provided credibility to his firm’s work, especially through verifying firm strengths and weaknesses. Several RSPs noted that the review’s metrics may unduly penalize some firms. For example, one RSP stated that his firm was penalized for missing project timelines, which he claimed resulted from the program year not lining up with the customer’s budget year. Another indicated they were penalized because of slow downs during the customer directed Implementation Phase, a portion of the program they have little or no control over.

Program participants were very satisfied with their RSPs. All 25 interviewed participants provided a rating of 8 or more on a scale of 0 to 10, with 0 meaning very dissatisfied with the RSP and 10 meaning very satisfied.

5.3.6 Training

RSPs are required to complete up to eight hours of annual training to participate in the retro-commissioning program. Two in-person trainings took place in EPY4/GPY1. Additionally, trainings are conducted by Nexant through a webinar every two to three months. Trainings were offered on an *ad hoc* basis and included safety awareness training and several trainings aimed at preparing RSPs for EPY4/GPY1. RSPs that scored well at the end of EPY3 were not required to attend the program overview training offered at the beginning of the program year.

RSPs interviewed by the evaluation team claimed that the trainings were helpful but noted that they often just reinforced existing knowledge, especially relating to safety. Some RSPs found that the trainings provided opportunities to hear the experiences of other RSPs working in the field, which

proved to be helpful in navigating similar issues. For the most part, the RSPs did not identify any technical issues or barriers experienced in their participation in the program that could not be overcome with more specific training from Nexant. Yet, one RSP noted a need for more training regarding the document review process with particular emphasis on the types of information and data needed for project submission materials.

5.3.7 RSP Satisfaction

Despite their criticism of some aspects of the program, RSPs were very satisfied with the program overall in EPY4 and found that it met or exceeded their expectations. RSPs were very satisfied with the support from ComEd and Nexant and the expansion of the program into gas measures, but less satisfied with certain elements of the program such as the amount of documentation required and the lengthy review process. Overall, RSPs found that the benefits of participating in the program outweighed the drawbacks, and their satisfaction was high.

5.3.8 Effects of Program on RSP Business Practices

Five of the eight interviewed RSPs stated that the Retro-Commissioning Program had an effect on their business practices. Of the group, five are either planning or have added additional staff as a result of their participation in the retro-commissioning program. All of those interviewed felt that the program was highly important (8-10 on a scale of 0-10) to how frequently RSPs recommend and perform retro-commissioning services for their northern Illinois customers. Most RSPs felt that the addition of gas measures did not influence the frequency of recommending the program to customers. Nevertheless, RSPs seemed to think that the expansion of the program into gas measures increased customer interest.

5.3.9 Marketing and Outreach

RSPs remain the primary promoters of the retro-commissioning program and are expected to generate leads. Participants learned about the retro-commissioning program in a variety of ways. The program implementer and the RSPs themselves believe that the RSPs are the primary informer of the program, which is consistent with the responses of program participants. Among the 25 interviewed participants, all claim to have also heard about the program via an email from ComEd.

A majority of the participants (52%) stated that email is the best way to reach them about energy efficiency programs. This was followed by their account representative, the RSP, and face-to-face meetings.

Table 5-. Preferred Method of Reaching Customers about Energy Efficiency Opportunities (Multiple Response)

Method	Percent of Cases
E-mail	52%
Account Manager/Representative	32%
Retro-Commissioning Service Provider	16%
Trade Organizations	16%
Direct Contact with Customer (Face-to-face)	12%
Telephone	4%

Source: Navigant research and analysis.

5.3.10 Marketing Materials

The interviewed RSPs find the program’s marketing materials (case studies, sell sheet, and brochure) to be moderately effective. These materials give an overview of the program as well as specific examples in the case studies. Only one RSP noted that they did not use any materials from the program. Others found the case studies and fact sheets to be particularly helpful. Two RSPs noted that they develop internal case studies for each of their completed projects, which are deemed to be more valuable than the ComEd case studies. Several RSPs called for more advertising and marketing efforts from ComEd to promote the program, in addition to the inclusion of co-branded marketing materials.

5.3.11 Customer Satisfaction

Overall, participants gave very high ratings to their satisfaction with all program aspects about which they were asked, including the level of financial commitment required to receive the free study, the information provided in the retro-commissioning study, the program administrator (Nexant), the Smart Ideas for Your Business Program staff, the retro-commissioning program overall, and ComEd overall. The highest satisfaction among participants was with the RSPs (100%) while satisfaction with ComEd overall and program staff ranged from 75% to 79%. All but one participant rated the program a 7 to 10 on a scale of 1 – 10 where 1 is highly dissatisfied and 10 is highly satisfied (96%). Just one participant was neutral (4%).

Table 5-. Level of Satisfaction with Program Elements

	Dissatisfied (1-3)	Neutral (4-6)	Satisfied (7-10)
The level of financial commitment required to receive the free study (n=25)	0%	4%	96%
The information provided in the retro-commissioning study (n=25)	0%	4%	96%
Nexant (n=25)	0%	4%	96%
The Smart Ideas for Your Business Staff (n=19)	0%	21%	79%
Retro-commissioning Service Provider (RSP) (n=25)	0%	0%	100%
Retro-commissioning Program overall (n=25)	0%	4%	96%
ComEd overall (n=24)	8%	17%	75%

Source: Navigant research analysis.

Participants cited many benefits of participating in the Retro-Commissioning Program. The most cited benefit was the detailed retro-commissioning study.

“They did a good job of presenting information and then when we asked lots of questions trying to shoot it down and fill it with holes; they stuck to their guns and said we won’t let you hang.”

“[It was] very informative and very detailed.”

“The basics were there. It was what we needed to truly understand it, but there was a lot of extra information.”

Unprompted, 36% of the participants noted they were happy with the payback

“The main strengths for the program... the energy savings is a good thing, a very good thing.”

“The main strengths of the program would certainly be the energy savings and cost savings and their methods of determining that... they are obviously more versed and knowledgeable in those areas than we are as building managers and engineers, so they’re very helpful.”

5.3.12 Barriers to Participation

According to RSPs, the primary barrier preventing customers from performing retro-commissioning at their facilities is awareness of the program. One RSP thought that a lack of knowledge of program service and benefits kept more customers from participating in the program. Other RSPs argued that the upfront cost of the study was the biggest barrier because any potential energy savings are unknown. The program covers the cost of the study, but some of the initial barriers remain as participants are required to commit to at least \$15,000 without full knowledge of the resulting savings. The lack of definite savings before the study is especially troublesome for businesses that require a certain return on investment or payback period before funding can be approved.

Another barrier to customer participation pertains to the timing of the project. One RSP said that attempting to align capital planning budgets with the program year can be very difficult, keeping some projects from going forward, especially for larger customers with multiple locations vying for the same line of funding.

Several RSPs felt that the main barriers preventing customers from participating in the program stemmed from the size of their business. Many felt that smaller customers have more flexibility in fitting into the program's timeline, but may not have the capital to launch a project. Alternately, larger customers have the capital to complete various projects, but because of timing constraints they may not be able to align their internal budget planning with the program's timelines. Provided that a firm can find a way to overcome these obstacles, participating RSPs believe there are no major barriers to participation.

Over half of the participants indicated they saw no concerns with the program (56%), the balance of participants indicated their primary concern was that not enough measures were covered through the program (16%) followed by the timing of the program, too long, and that they wanted a more detailed understanding of upfront costs and operating savings (12% each).

5.4 Data Collection Instruments

5.4.1 RSP Interview Guide



And



ComEd C&I Retro-Commissioning Program –RSP Interview Guide October 1, 2012

Continuing RSPs PY₄

Name of Interviewee: _____ Date: _____

Title: _____ Company: _____

[Note to Reviewer] The Interview Guide is a tool to guide process evaluation interviews with utility staff and implementation contractors. The guide helps to ensure the interviews include questions concerning the most important issues being investigated in this study. Follow-up questions are a normal part of these types of interviews. Therefore, there will be sets of questions that will be more fully explored with some individuals than with others. The interviews will be audio taped.

Introduction

Hi, may I please speak with [name from list]?

My name is ___ and I'm calling from Navigant Consulting, an independent research firm, on behalf of ComEd and Nicor Gas and Peoples and North Shore Gas. We're talking to **contractors who are currently service providers** in ComEd's Smart Ideas for your Business Retro-Commissioning Program that is offered jointly by Nicor Gas and Peoples and North Shore Gas. **We may have spoken with you or someone from your firm last year as a part of the process evaluation** completed at that time.

We are interested in any feedback you may have regarding your firm's continuing involvement in this program and any feedback you have received about the program from your customers. ComEd [and *insert gas utility name if appropriate here*] plans to use this information to continue to improve the energy efficiency programs and services it offers to its business customers.

Would you be willing to speak with me for about 30 minutes? Your responses will be kept strictly confidential.

I. Program Processes

1. In general how satisfied have you been with the participation process? [*PROBE FOR: Application phase, planning phase, investigation phase, implementation phase, verification phase*] Are there aspects of the program that you think work particularly well? Please explain. Are there aspects of the program that could be improved? Please explain.
2. What are the strengths of the Service Provider participation process? [*PROBE FOR: Training, calculation templates, support with customers, RSP review process*]
3. The program was expanded to include gas measures in 2011. From your perspective, did this have any affect the program participation process? If yes what?
4. Did you have any difficulty meeting the required deliverables for each phase (*probe for timeline, required information*)? If so, please explain.

II. Effects of Program on Business Practices

4. Of the [XX] customers for whom you have performed RSP services in Program Year 4 (June 2011 to May 2012), how many did you have a prior working relationship with?
5. On a scale of 0 to 10 where 10 is very important, how important, would you say, has the program been on how frequently you recommend and perform RCx services for customers in ComEd's [and *insert gas utilities name if appropriate here*] service territory?

Did the inclusion of the gas measures affect how often you recommended the program?

6. Have you made any changes to your business as a result of your continuing participation in the RCx program? [*PROBE: hired more staff, opened up new offices, changed marketing, changed approach to retro-commissioning investigations.*]

III. Net-To-Gross

- A1. Thinking about the [XX] studies that you conducted as part of the Retro-Commissioning Program in PY4, did the projects' participation in the Retro-Commissioning Program in any way influence the type, quantity or efficiency level of the measures that you recommended to customers at those sites? [Expect a Y/N response]
- A2. Please briefly describe the most significant ways in which the Retro-Commissioning Program influenced the decision to incorporate efficient designs/practices/measures at your customer sites. **[Record verbatim]**
- A3. On a scale of 0 to 10 where 0 is NOT AT ALL IMPORTANT and 10 is EXTREMELY IMPORTANT, how important was the Retro-Commissioning Program, including program services and the customer spending commitment, in influencing your decision to work with the commercial customers to pursue retro-commissioning projects? [SCALE 0-10]

Measure-Specific Naturally Occurring Baseline and Free Ridership Questions

[Ask the following questions for each measure category below. Prior to calling, review records for the contractor in terms of the number of projects that made recommendations for each measure category, and the total expected savings for those measures. Use that to guide questions and focus interview. If respondent is only responsible for some of firm’s studies, attempt to use only those studies for these questions.]

Navigant has looked at all measures recommended and installed through the Retro-Commissioning Program and we have identified four main measure types: repairs, schedule changes, optimizations, and lower-cost retrofits that we would like to ask you some more detailed questions about.

1. **Repairs** are items that affect existing equipment that has failed in some way that needs *maintenance* to restore proper operation, for example, stuck or broken damper actuators or faulty sensors.
2. **Scheduling** items are recommendations based on *time-of-day* occupancy or operations, for example scheduling run-time with occupancy rather than 24x7 operations or programming the controls system with night-setback mode or optimal start/stop routines.
3. **Optimization** items are recommendations *utilizing existing sensors and control system* to improve system efficiency, for example chilled water or discharge air temperature reset, economizer or condenser water set-point optimization.
4. **Retrofit** measures might include new filter systems or added sensors to implement more efficient controls. [If necessary – “Retro-commissioning retrofits are generally lower-cost and less-intrusive than more traditional equipment retrofits like lighting and variable frequency drives.”]

[LOOP <MEASURE TYPE> for top 80% of savings]

B1. Prior to your involvement with the Retro-Commissioning Program, did you recommend that customers implement <MEASURE TYPE> measures as part of energy studies, when appropriate for their sites?

1. (Yes)
2. (No) – SKIP TO B6
3. (Did not conduct retro-commissioning studies prior to program participation) – SKIP TO B6
888. (Don’t Know) – SKIP TO B6
999. (Refused) – SKIP TO B6

[IF B1= “Yes”]

B2. Again, thinking about energy studies completed prior to your involvement with the program, about what percent of the time did customers choose to implement the recommended <MEASURE TYPE> measures?

RECORD PERCENTAGE

888. Don’t Know
999. Refused

[IF B1= “Yes”]

B3. Now that you are participating in the Retro-Commissioning Program, have you changed what <MEASURE TYPE> measures you recommend to customers?

1. (Yes) [CONTINUE TO B4]
2. (No) [SKIP TO B6]
888. Don’t Know [SKIP TO B6]
999. Refused [SKIP TO B6]

[IF B3= “Yes”]

B4. Please describe the changes that you've made to your <MEASURE TYPE> recommendations. [Probe for changes in types of measures recommended as well as frequency with which measures are recommended.]
 [RECORD VERBATIM]

- 888. Don't Know
- 999. Refused

[IF B3= "Yes"]

B5. On a scale of 0 to 10, with 10 being the most influential, how much influence did the Retro-Commissioning Program have on your decision to change your <MEASURE TYPE> measure recommendations?

- ENTER RATING 0 - 10
- 888. Don't Know
- 999. Refused

B6. [IF B1= "Yes", preface question with "Since your involvement with the program,"] How often do you *recommend* that customers implement <MEASURE TYPE> measures, when appropriate for the site? Would you say that you recommend these measures always, often, sometimes, rarely, or never? Please think about all your customers, *including but not limited to* the participants in the Retro-Commissioning Program.

- 1. Always
- 2. Often
- 3. Sometimes
- 4. Rarely
- 5. Never/Only in response to direct customer inquiries
- 000. Other: (verbatim)
- 888. Don't Know
- 999. Refused

B7. Since your involvement in the program, about what percent of your customers actually choose to *implement* the recommended <MEASURE TYPE> measures? Please think about all your customers, *including but not limited to* the participants in the Retro-Commissioning Program.

- RECORD PERCENTAGE
- 888. Don't Know
- 999. Refused

B8. About what percent of your customers *who are participating in the Retro-Commissioning Program* implement the recommended <MEASURE TYPE> measures?

- RECORD PERCENTAGE
- 888. Don't Know
- 999. Refused

B9. Using a 0 to 10 likelihood scale where 0 is NOT AT ALL LIKELY and 10 is EXTREMELY LIKELY, *if the program had not been available*, what is the likelihood that you would have been recommending the same <MEASURE TYPE> measures?

- ENTER RATING 0 - 10
- 888. Don't Know
- 999. Refused

B10. Using that same 0 to 10 likelihood scale where 0 is NOT AT ALL LIKELY and 10 is EXTREMELY LIKELY, *if the program had not been available*, what is the likelihood that your customers would have chosen to implement the same <MEASURE TYPE> measures?

- ENTER RATING 0 - 10
- 888. Don't Know
- 999. Refused

[Only ask of people with multiple measure categories; IF <MEASURE TYPE 2 or 3> is blank, skip to N15]
 B11. The questions I just asked focused on <MEASURE TYPE> measures, but our records indicate that you have also worked on projects involving many <MEASURE TYPE X> measures for the Retro-Commissioning Program.

[LOOP for <Measure TYPE>]

[End Loop]

Project Level Free Ridership

C1. On a scale of 0 to 10, with 10 being the most influential, how much influence do you think *your recommendation and technical assistance* have on your customers' decision to select which retro-commissioning measures to implement?

ENTER RATING 0 - 10

888. Don't Know

999. Refused

C2. On a scale of 0 to 10, with 10 being the most influential, how much influence do you think *utility retro-commissioning program incentives and implementation commitment* have on your customers' decision to implement retro-commissioning measures?

ENTER RATING 0 - 10

888. Don't Know

999. Refused

C3. Now I'd like to ask you about the total energy savings achieved in all of your projects which participated in the Retro-Commissioning Program during the most recent program year. I recognize that this is difficult to estimate, but try to think about what share of those energy savings would have been achieved in these projects even if the program and your technical assistance and required customer spending commitment did not exist. What is your best estimate of the percent of energy savings that would have been achieved, even without the program? (Enter %)

[If needed for clarification] For example, 50% means that half of the savings from the retro-commissioning measure would have been achieved anyway, even if the program did not exist.

D. OUTSIDE SPILLOVER

D1. Did your experience with the Retro-Commissioning Program in any way influence you to perform similar studies at other facilities in Illinois that did NOT participate in the Joint Utility Retro-Commissioning Program or the Ameren or DCEO Public Sector Retro-Commissioning Programs beyond what you would have done otherwise? I'm asking here strictly about facilities that did not receive any technical assistance or funding from any of these programs.

[If D1 = "no", SKIP to E1]

D2. [If D1 = “yes”]

Approximately how many of these additional retro-commissioning projects have been completed in the past year? [Enter #]
started? [Enter #]

What types of efficiency measures have you recommended as part of these projects? [Verbatim responses]

Were the measures installed, or only recommended through other retro-commissioning studies?
[Probe for knowledge of those that were recommended and installed and those that were recommended but not installed]

D3. Please briefly describe how the Retro-Commissioning Program has influenced you to retro-commission other facilities in Illinois that did NOT participate in the Retro-Commissioning Programs.

Why did these projects NOT participate in the Illinois programs? Was it something about the program processes or program offerings?

D4. On average, would you estimate the energy savings from these other non-program facilities to be less than, similar to, or more than the energy savings from the retro-commissioning measures incorporated through the average Joint Utilities Retro-Commissioning Program projects you conducted? **[Confirm percentages are based on all installed, not recommended, measures]**

[If possible review the total estimated savings from installed measures]
[e.g., if the same measures/designs were implemented in a facility twice as big, then savings would be 200%. Be sure to emphasize that this is savings “on average” not in aggregate across the many buildings that might be affected]

E. NON-PARTICIPANT SPILLOVER

E1. Do you believe that other engineering firms that are not participating in the Retro-Commissioning Program are increasing the number of implemented retro-commissioning projects and measures because of the influence of the Retro-Commissioning Program? In other words, are they doing more with retro-commissioning than they would have if the Program did not exist?

E2. [If E1 = “yes”] Please briefly describe how the Retro-Commissioning Program is influencing the market for retro-commissioning measures in Illinois.
[Probe for availability, A&E market, type of equipment, timing, quantity, and efficiency]

IV. Marketing and Outreach

11. How do customers typically learn about the Retro-Commissioning Program? *[Probe with: Do you tell them about it? Colleagues? Marketing materials from ComEd or gas utilities? Are they already aware of the program?]*

12. Do you feel the program provides sufficient support to RSPs to help them promote the program? Do you use the fact sheets and case studies that the utilities provide? If so, how effective do you think they are? How valuable is the co-branding the utilities offer?

Is there anything that the program administrator (Nexant) or the utilities could do to help you promote this program to your customers?

V. Channeling into Other C&I Programs

13. How aware are you of the requirements and offerings of ComEd's and the gas utilities' other programs for business customers (e.g., prescriptive incentives, custom incentives)? When screening potential measures for the Retro-Commissioning program, do you identify opportunities for equipment upgrades that might be eligible for incentives through these other programs? If no, why not?
14. Is your firm currently registered as a service provider or trade ally for other C&I program offerings from ComEd or the Gas utilities?

VI. RSP Training

15. Did you participate in any of the RSP training offered by the program this past year? What training did you participate in? [*Probe for implementation training, safety training.*] Was the training helpful? [*Probe by class.*] Please explain.
16. Did you make any changes in your practices as a result of the training? Did the training provide ways or resources to help you market or deliver the Retro-Commissioning program to customers? If yes, Explain.
17. Are there any technical issues or barriers that you have experienced in your participation in the program that could be overcome with more training or guidance from the program?
18. Overall, how would you rank the value of training on a scale of 0 to 10 where 0 is not at all valuable and 10 is highly valuable?

VII. RSP Performance Review/Ranking

19. This past year the RCx program continued its annual performance review of RSPs that participated in the program.
 - i. Did you find the feedback you received through the review helpful?
 - ii. Did the report identify any areas for improvement of which you were not aware?
 - iii. Did you make any changes in your business practice as a result of the review? Please explain.
 - iv. Do you have any comments about the review process?

VIII. Participation Barriers

20. What do you view as the main barriers to retro-commissioning, as a service, for your customers? Does this vary by customer type or size? Anything else? What could be done to overcome these barriers?
21. What do you view as the main barriers to customer participation in the Retro-Commissioning Program? What could be done to overcome these barriers? What do you perceive to be the demand for the services provided by the program?

IX. Program Feedback and Recommendations

22. Have you received any other feedback from customers on the participation process? If so can you please share?
23. In general, how satisfied are you with the Retro-Commissioning program? Has it met your expectations? Please explain.

24. [For prior participants] How did your experience in program year 4 compare to that in prior program years? The main differences in the program were the inclusion of gas measures and broader availability of calculation templates.
25. Has the inclusion of gas measures in the program affected customer satisfaction in the program? If yes, How?
26. Do you have any additional recommendations or feedback for the evaluation?

Thank you for taking the time to discuss the RCx program. Your insights have been very helpful.

5.4.2 Participant Survey



ComEd / Joint Utility C&I Retro-Commissioning Program

RCx Participant Survey

July 10, 2012

Introduction

Hello, this is ____ from Opinion Dynamics calling on behalf of ComEd [if natural gas = 1 "and <gas utility>] regarding your company's participation in the Retro-Commissioning Program. May I please speak with <CONTACTNAME>?

Our records show that <COMPANY> participated in Smart Ideas for Your Business Retro-Commissioning Program run by ComEd [if natural gas = 1 "and <gas utility>], and we are calling to conduct a follow-up study about your firm's participation in this program. I was told you're the person most knowledgeable and the most involved with the decision to participate in the program. Is this correct? [IF NOT, ASK TO BE TRANSFERRED TO DECISION MAKER OR SOMEONE FAMILIAR WITH THE BASIS FOR THE DECISION TO PARTICIPATE. RECORD NAME & NUMBER.]

[IF NEITHER DECISION MAKER OR SOMEONE FAMILIAR WITH THE BASIS FOR THE DECISION TO PARTICIPATE, TERMINATE AND CALL REFERRAL

This survey will take about 20 minutes. Is now a good time? [If no, schedule call-back]

(IF NEEDED: Is it possible that someone else dealt with the retro-commissioning project?)

IF TYPE=I

Just to clarify, when I ask about the retro-commissioning work you have performed, this also includes leak detection audits and related repairs.

Retro-Commissioning NTG

I would like to ask you a few questions about your company's decision to perform retro-commissioning at your facility.

- M1 First Measure
 - M1a. Cost
 - M1b. Savings kWh
 - M1c. Savings Therms
- M2 Second Measure
 - M2a. Cost

- M2b. Savings kWh
- M2c. Savings Therms
- M3 Third Measure
 - M3a. Cost
 - M3b. Savings kWh
 - M3c. Savings Therms

A1 First, according to our records, you participated in the Smart Ideas for Your Business Retro-Commissioning Program run by ComEd [if natural gas = 1 "and <gas utility>] between June 1, 2011 and May 31, 2012. [READ: the Smart Ideas for Your Business Retro-Commissioning Program, run by ComEd [if natural gas = 1 "and <gas utility>], promotes energy efficiency improvements in commercial/industrial facilities. The program offers technical assessments to help identify applicable measures, feasibility studies to analyze the energy and cost savings of recommended measures, and incentives to help cover a portion of the cost of purchasing and installing energy efficient measures.] Do you recall participating in the Smart Ideas for Your Business Retro-Commissioning Program?

- 1 Yes
- 2 No [Thank & terminate]
- 88 (Don't know) [Thank & terminate]
- 99 (Refused) [Thank & terminate]

[ASK IF A1=1]

A2 Next, I'd like to confirm the following information regarding your participation in the RCx Program. I understand that you retro-commissioned &FACILITY. The RCx study was completed in about &DATE by &CXAGENT and you implemented &NO OF MEASURES measures, including &MEASURE1, &MEASURE2, &MEASURE3.) Does that sound right?

- 1 Yes
- 2 No Thank & terminate
- 88 (Don't know) Thank & terminate
- 99 (Refused) Thank & terminate

Project Background

B1. Before I ask you specific questions about your decision, please tell me in your own words why you decided to retro-commission this facility? Were there any other reasons?

- 00. (RECORD VERBATIM)
- 98. (Don't know)
- 99. (Refused)

B2A. Before learning about the ComEd [if natural gas = 1 "and <gas utility>] Retro-commissioning Program, had you ever conducted retro-commissioning at this facility or any of your other facilities in Illinois?

- 1. Yes, at this facility
- 2. Yes, at another facility
- 3. Yes, at both this and another facility
- 4. No
- 8. (Don't know)
- 9. (Refused)

[SKIP TO B2BB IF B2A=4. SKIP to B5 if B2A= 98, 99]

B2B. Did you receive an incentive or another form of utility or government financial support for performing this previous retro-commissioning work?

1. Yes
2. No
8. (Don't know)
9. (Refused)

IF B2A=4, THEN ASK. ELSE B5.

B2BB. What were the main factors that kept you from performing retro-commissioning in prior years? [DO NOT READ]

1. (Was not aware of retro-commissioning)
2. (Did not understand the procedures and benefits of retro-commissioning)
3. (The cost of having a retro-commissioning audit and report done was too high)
4. (Had insufficient in-house staffing to carry out recommendations made in retro-commissioning report)
5. (Had inadequate in-house expertise to carry out recommendations made in retro-commissioning report)
6. (Not aware of qualified providers)
7. (Management was against having retro-commissioning done)
- oo. (Other, specify)
98. (Don't know)
99. (Refused)

B5. My next questions are about your awareness of the equipment performance issues identified through your retro-commissioning study PRIOR to conducting it. Would you say you were aware of all, some, or none of the issues before the study?

1. All
2. Some
3. None
8. (Don't know)
9. (Refused)

[SKIP TO B6ab IF B5=1, 3, 8, 9].

B6. Which of the following issues were you previously aware of? Were you aware of the issues with your... (1=Yes, 2=No, 8=Don't know, 9=Refused)

- a. Air handler [ASK IF AIRHAND=1]
- b. Boiler [ASK IF BOILER=1]
- c. Chiller [ASK IF CHILL=1]
- e. Cooling tower [ASK IF CTOWER=1]
- f. Economizer [ASK IF ECON=1]
- g. Fans [ASK IF FAN=1]
- h. Heating system [ASK IF HEAT=1]
- i. Lighting system [ASK IF LIGHT=1]
- j. Pumps [ASK IF PUMP=1]
- k. [Ask if Natural Gas = 1] Other Gas-related issues can we have a list of the most common? Or will you document verbatim?

B6ab What were the main factors that kept you from addressing the issue(s) in prior years? [DO NOT READ]

1. (Was not aware of the issue)
2. (Did not understand the procedures and benefits of fixing the issue)
3. (The cost of fixing the issue was too high)

- 4. (Had insufficient in-house staffing to fix the issue)
- 5. (Had inadequate in-house expertise to fix the issue)
- 6. (Not aware of qualified contractors)
- 7. (Management was against having the issue fixed)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

B6A. Before participating in the utility Retro-Commissioning program, did you undertake specific activities or studies in order to identify the issues you just mentioned?

- 1. Yes
- 2. No
- 8. (Refused)
- 9. (Don't know)

[SKIP TO B6b IF B6A=2, 8, 9]

B6AA. What specific activities or studies did you do?

- 00. RECORD VERBATIM
- 8. (Refused)
- 9. (Don't know)

B6B. In the past, have you hired any third parties to perform an energy audit or to perform extensive data trending in any of your buildings?

- 1. Yes
- 2. No
- 8. (Refused)
- 9. (Don't know)

[SKIP TO N2 IF B6B=3, 8, 9]

B6BB. What were these studies and when were they done?

- 00. RECORD VERBATIM
- 8. Refused
- 9. Don't know

Decision Influences

N2 Did you learn about your organization's eligibility for the Retro-Commissioning Program BEFORE or AFTER you decided to complete retro-commissioning at this facility

- 1 Before
- 2 After
- 88 (Don't know)
- 99 (Refused)

N4. Now I'm going to ask you to rate the importance of several factors that might have influenced your decision to conduct the study and commit the funding to perform retro-commissioning at your facility. On a scale from 0 to 10, where 0 means 'not at all important' and 10 means 'extremely important', how important were the following in your decision to conduct the study and commit the funding to perform the utility-sponsored retro-commissioning. [FOR N4a-e, RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused][If needed: How important in your DECISION to

conduct the study and commit the funding to perform the ComEd [if natural gas = 1 "and <gas utility>"] sponsored retro-commissioning was...]

[ROTATE N4A-N4E]

- N4A. The free retro-commissioning study
- N4B. The recommendation from the retro-commissioning service provider
- N4C. The information from the Retro-Commissioning Program
- N4D. The recommendation from your ComEd [if natural gas = 1 "or <gas utility>"] Account Manager [ASK IF ACCTM=1]
- N4E. The continued technical assistance provided by the RSP after the study phase {IF NEEDED EXPLAIN THE RSP IS THE FIRM THEY WORKED WITH ON THE RETRO-COMMISSIONING STUDY}
- N4F. Were there any other factors that we haven't discussed that were influential in your decision to perform retro-commissioning? [OPEN END; 96=Nothing else influential, 98=Don't know, 99=Refused]

[SKIP TO N9a IF N4F=96, 98, 99]

- N4FF. Using the same 0 to 10 scale, how would you rate the influence of this factor? [RECORD 0 to 10, 96=Not Applicable; 98=Don't Know; 99=Refused]

Actions Without the Program

Now we would like you to think about the action you would have taken with regard to the retro-commissioning actions you would have taken if the Program had not been available.

- N9a. If you had not received the utility sponsored Retro-commissioning study, would you have undertaken it on your own?
 - 1. Yes
 - 2. No
 - 8. (Don't know)
 - 9. (Refused)

IF N9a=1, THEN ASK.

- N9aa. Without the program, when do you think you would have conducted the Retro-commissioning study on your own?
 - 1. At the same time
 - 2. Later
 - 97. Other (RECORD VERBATIM)
 - 98. (Don't know)
 - 99. (Refused)

[ASK IF Nga=2]

Ngab. Would you say...

1. 1 to 3 months later
2. 4 to 6 months later
3. 7 to 12 months later
4. 13 to 24 months later
5. More than 2 years later
8. (Don't know)
9. (Refused)

IF Nga=1, THEN ASK.

Ngb. If the ComEd [if natural gas = 1 "and <gas utility>"] Retro-commissioning program had NOT been available, would you have taken all, some, or none of the retro-commissioning actions that were implemented as the result of the utility-sponsored study?

1. All
2. Some
3. None
98. (Don't know)
99. (Refused)

IF Ngb=2, THEN ASK.

N10. Which measures or actions would you have implemented? Would you have implemented the measures or actions related to the... (1=Yes, 2=No, 8=Don't know, 9=Refused)

- aa. MEASURE₁
- bb. MEASURE₂
- cc. MEASURE₃
- a. Air handler <AIRHAND₂> [ASK IF AIRHAND=1 AND (N8a=1 OR N7=1)]
- b. Boiler <BOILER₂> [ASK IF BOIL=1 AND (N8b=1 OR N7=1)]
- c. Chiller <CHILL₂> [ASK IF CHILL=1 AND (N8c=1 OR N7=1)]
- e. Cooling tower <CTOWER₂> [ASK IF CTOWER=1 AND (N8e=1 OR N7=1)]
- f. Economizer <ECON₂> [ASK IF ECON=1 AND (N8f=1 OR N7=1)]
- g. Fans <FAN₂> [ASK IF FAN=1 AND (N8g=1 OR N7=1)]
- h. Heating system <HEAT₂> [ASK IF HEAT=1 AND (N8h=1 OR N7=1)]
- i. Lighting system <LIGHT₂> [ASK IF LIGHT=1 AND (N8i=1 OR N7=1)]
- j. Pumps <PUMP₂> [ASK IF PUMP=1 AND (N8j=1 OR N7=1)]
- k. [Ask if natural gas = 1] Gas-related measures same comment as above

BEGIN MEASURE NTG LOOP

Thinking specifically about the three measures with the greatest savings mentioned earlier, How likely would you have identified AND implemented these measures

N10a. Now thinking about <Measure X> and using a likelihood scale from 0 to 10, where 0 is "Not at all likely" and 10 is "Extremely likely", if ComEd [if natural gas = 1 "and <gas utility>"] Retro-commissioning program had NOT been available, what is the likelihood that you would have performed <Measure X>? [RECORD 0 to 10; 96=Not Applicable; 98=Don't Know; 99=Refused]

[SKIP IF Ngb= 3, 98, 99]

N11. Without the program, when do you think you would have performed <Measure X>? Would you say... [If necessary repeat the kWh Savings, therm Savings and implementation costs from above.]

1. At the same time
2. Earlier
3. Later
4. (Never)
8. (Don't know)
9. (Refused)

[ASK IF N11=3]

N12. Would you say...

1. 1 to 3 months later
2. 4 to 6 months later
3. 7 to 12 months later
4. 13 to 24 months later
5. More than 2 years later
8. (Don't know)
9. (Refused)

[REPEAT NTG LOOP FOR MEASURES 2, 3 IF APPLICABLE]

Spillover and Channeling

CH1. Since your participation in the Retro-Commissioning program, have you done any of the following?
[1=Yes, 2=No, 8=Don't know, 9=Refused] [Multiple response]

- a. Installed any additional energy efficient equipment at this facility that were suggested in the Retro-Commissioning study and received incentives from ComEd [if natural gas = 1 "or <gas utility>"]
- aa. Installed any additional energy efficient equipment at this facility that were **not** suggested in the Retro-Commissioning study and received incentives from ComEd [if natural gas = 1 "or <gas utility>"]
- b. Installed any additional energy efficient equipment at this facility that were suggested in the Retro-Commissioning study and did NOT receive incentives through any utility or government program
- bb. Installed any additional energy efficient equipment at this facility that were not suggested in the Retro-Commissioning study and did NOT receive incentives through any utility or government program
- c. Implemented any additional retro-commissioning measures at this facility that did not receive incentives through any utility or government program
- cc. Implemented any additional retro-commissioning measures at other facilities served by [UTILITY] that did not receive incentives through any utility or government program

[ASK IF CH1a=1, ELSE SKIP TO CH5]

CH2. What type of energy efficient equipment did you install that received incentives from ComEd [if natural gas = 1 "or <gas utility>"]? Did you install... [1=Yes, 2=No, 8=Don't know, 9=Refused]

- a. Lighting
- b. Cooling
- c. Motors
- d. Refrigeration
- e. Compressed Air
- f. Fans
- g. Controls
- h. Heating
- i. Something else (specify)

[SKIP TO CH5 IF ALL CH2a-f=2, 8, 9]

CH3. On a scale of 0 to 10, where 0 means “no influence” and 10 means “greatly influenced,” how much influence did your participation in the Retro-Commissioning Program have on your decision to install additional energy efficiency measures through other utility programs? [SCALE 0-10; 98=Don’t know, 99=Refused]

[ASK IF CH3=8,9 or 10; ELSE SKIP TO CH5]

CH4. How did the Retro-Commissioning Program influence your decision to make these additional changes? [OPEN END; 98=Don’t Know; 99=Refused]

[ASK IF CH1b=1, ELSE SKIP TO CH8]

CH5. What type of energy efficient equipment did you install that did NOT receive any incentives from utilities or government programs? Did you install... [1=Yes, 2=No, 8=Don’t know, 9=Refused]

- a. Lighting
- b. Cooling
- c. Motors
- d. Refrigeration
- e. Compressed Air
- f. Fans
- g. Controls
- h. Heating
- i. Natural gas-fired equipment (specify)
- j. Something else (specify)

[SKIP TO CH8 IF ALL CH5a-f=2, 8, 9]

CH6. On a scale of 0 to 10, where 0 means “no influence” and 10 means “greatly influenced,” how much influence did your participation in the Retro-Commissioning Program have on your decision to install additional energy efficiency measures without an incentive? [SCALE 0-10; 98=Don’t know, 99=Refused]

[ASK IF CH7=8,9 or 10; ELSE SKIP TO CH8]

CH7. How did the Retro-Commissioning Program influence your decision to make these additional changes? [OPEN END; 98=Don’t Know; 99=Refused]

[ASK IF CH1c=1, ELSE SKIP TO B1]

CH8. What additional retro-commissioning measures did you implement? Did you perform... [1=Yes, 2=No, 8=Don’t know, 9=Refused]

- a. Optimization
- b. Repairs
- c. New maintenance activities
- d. Schedule changes
- e. Something else (specify) Do we want to know about any behavior changes they implemented?

[SKIP TO B1 IF ALL CH8a-f=2, 8, 9]

CH9. On a scale of 0 to 10, where 0 means “no influence” and 10 means “greatly influenced,” how much influence did your participation in the Retro-Commissioning Program have on your decision to implement the additional retro-commissioning measures without an incentive? [SCALE 0-10; 98=Don’t know, 99=Refused]

[ASK IF CH6=8,9 or 10; ELSE SKIP TO B1]

CH7. How did the Retro-Commissioning Program influence your decision to make these additional changes? [OPEN END; 98=Don't Know; 99=Refused]

Process Module

- S1. How did you first hear about the Retro-Commissioning Program?
1. (Retro-commissioning service provider, "RSP")
 2. (ComEd program representative)
 3. ([if natural gas = 1] <gas utility> "program representative")
 4. (ComEd Account manager)
 5. ([if natural gas = 1] <gas utility> "Account Manager")
 6. (ComEd Website)
 7. ([if natural gas = 1] <gas utility> "Website")
 8. (Friend/colleague/word of mouth)
 9. (Contractor)
 10. (Utility marketing material – case studies)
 11. (Nexant – the program administrator)
 00. (Other, specify)
 98. (Don't know)
 99. (Refused)

Marketing and Outreach

- MK1. Do you recall seeing or receiving any marketing materials or other information for the Retro-Commissioning Program?
1. Yes, ComEd materials
 2. [if natural gas = 1] "Yes, <gas utility> materials"
 3. Yes, both ComEd and <gas utility> materials
 2. No
 8. (Don't know)
 - 9 (Refused)

[ASK IF MK1=1, 2, 3 ELSE SKIP TO MK4]

MK1A. What types of materials do you remember? [MULTIPLE RESPONSE, UP TO 4]

1. (Presentation/workshop)
2. (Brochure)
3. (Case Study)
4. (Utility website(s))
5. (Direct Mail)
6. (Fact sheets)
7. (Program Forms)
00. (Other, please specify)
98. (Don't know)
99. (Refused)

- MK2. How useful were these materials in providing information about the program? Would you say they were...?
1. Very useful
 2. Somewhat useful

- 3. Not very useful
- 4. Not at all useful
- 8. (Don't know)
- 9. (Refused)

[ASK IF MK₂=1, 2]

MK₃. What materials were the most useful to you? [MULTIPLE RESPONSE, UP TO 3]

- 1. (Presentation/workshop)
- 2. (Brochure)
- 3. (Case Study)
- 4. (Utility website(s))
- 5. (Direct Mail)
- 6. (Fact Sheets)
- 7. (Program Forms)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

MK₅. What are the best ways of reaching companies like yours to provide information about energy efficiency opportunities? [MULTIPLE RESPONSE, UP TO 3]

- 1. (Bill inserts)
- 2. (Flyers/ads/mailings)
- 3. (E-mail)
- 4. (Telephone)
- 5. (Key Account Executive)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

Program Satisfaction

PS₃. On a scale of 0 to 10, where 0 is very dissatisfied and 10 is very satisfied, how would you rate your satisfaction with...? [SCALE 0-10; 96=not applicable, 98=Don't know, 99=Refused]

- a. The level of financial commitment required to receive the free study (if needed, note the required commitment was \$10,000 - \$30,000 depending on the project)
- b. The information provided in the retro-commissioning study
- c. Nexant (the program administrator)
- d. The Smart Ideas for Your Business Program (ComEd) staff
- e. [if natural gas = 1], <gas utility> program representative/staff
- f. Your Retro-Commissioning Service Provider
- g. The Retro-Commissioning program overall
- h. ComEd overall
- i. [if natural gas = 1], <gas utility> overall

[ASK IF PS_{3a}, b, c, d, e, f, g, h, i <4 or PS_{3a}, b, c, d, e, f, g, h, i >7]

PS_{4a}. Why did you rate it this way? [OPEN END; 98=DK; 99=REF]

Benefits and Barriers

B₁. What do you see as the main strengths of the Retro-Commissioning Program? [MULTIPLE RESPONSE, UP TO 3]

- 1. (Helps reduce the company's energy bills/save energy)

- 2. (Free study)
- 3. (Improves the performance of equipment)
- 4. (Trains facility staff on building operations)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)

- B2. What concerns do you have about the program? [MULTIPLE RESPONSE, UP TO 3]
- 1. (Paperwork too burdensome)
 - 2. (Incentives/free study not worth the effort or required commitment to implement)
 - 3. (Program is too complicated)
 - 00. (Other, specify)
 - 96. (No drawbacks)
 - 98. (Don't know)
 - 99. (Refused)

Feedback and Recommendations

- R1. Based on your experience, would you recommend the Retro-Commissioning program to your peers inside or outside of your organization?
- 1. Yes
 - 2. No
 - 3. (Maybe)
 - 8. (Don't know)
 - 9. (Refused)
- R2. Do you have any suggestions for ways to improve the program, and if so, what are they? [MULTIPLE RESPONSE, UP TO 4]
- 1. (Higher limits on study costs)
 - 2. (Reduce the required financial commitment to implement measures)
 - 3. (Greater publicity)
 - 4. (Advance payment)
 - 5. (Longer engagement with RSP to implement more measures)
 - 6. (Key Account Executives provide more information)
 - 96. (No recommendations)
 - 00. (Other, specify)
 - 98. (Don't know)
 - 99. (Refused)

Firmographics

I only have a few general questions left.

- F1. What is the business type of this facility? (PROBE, IF NECESSARY)
- 1. (College/university)
 - 2. (Heavy industry)
 - 3. (Hotel/Motel)
 - 4. (K-12 School)
 - 5. (Light industry)
 - 6. (Medical)
 - 7. (Office)

- 8. (Retail/Service)
 - 9. (Warehouse/Distribution)
 - 00. (Other, specify)
 - 98. (Don't know)
 - 99. (Refused)
- F2 Does your company own or rent this facility?
- 1 (Own)
 - 2 (Rent)
 - 00 (Other, specify)
 - 98 (Don't know)
 - 99 (Refused)
- F3. How old is this facility? (INTERVIEWER: IN YEARS) [NUMERIC OPEN END, 0 TO 150; 998=Don't know, 999=Refused]
- F4. How many employees, full plus part-time, work at this facility? [NUMERIC OPEN END, 0 TO 2000; 9998=Don't know, 9999=Refused]
- F5. Which of the following best describes your facility? This facility is...
- 1. my company's only location
 - 2. one of several locations owned by my company
 - 3. the headquarters location of a company with several locations
 - 8. (Don't know)
 - 9. (Refused)
- F6. In comparison to other companies in your industry, would you describe your company as...
- 1. A small company
 - 2. A medium-sized company
 - 3. A large company
 - 4. (Not applicable)
 - 8. (Don't know)
 - 9. (Refused)

Those are all of the questions I have. Thank you very much for your participation!

5.5 VDDTSR Memo-Final version

Introduction

This document provides the results from Navigant’s due diligence review of the program tracking, quality assurance and savings verification procedures of Joint Utilities C&I Retro-Commissioning Program during the EPY4/GPY1³⁴ program period. The main components of this task included interviews with program staff, documentation review and benchmarking to national best practices.

For the gas utilities the C&I Retro-Commissioning Program is unique among the commercial programs in that the program is managed and implemented entirely by others. The program is managed by the local *electric utility*, Commonwealth Edison (ComEd), and their implementation contractor, Nexant. Nicor Gas and/or WECC and Integrys and/or Franklin Energy representatives attend bi-weekly conference calls on the program status. The ComEd Retro-Commissioning program is in its fourth year of implementation. In prior years natural gas savings were not estimated or tracked, but in the current program year, EPY4/G PY1 (gas utilities), ComEd and gas utilities have begun cooperating to deliver the program as a single, integrated building retro-commissioning program to customers in common. Since ComEd is managing the program, much of the gas utility program information is derivative from ComEd reporting, and the relevant Operations Manual is that of Nexant working with ComEd.

Overview of Findings

Overall, the quality assurance and verification procedures in place for the Retro-Commissioning program, as outlined in the Nexant Operations Manual³⁵ and the Energy Efficiency Program Plan³⁶ document, provide a quality control framework that meets many aspects of national best practices. Specifically, the program guidelines for project eligibility, interim review of projects-in-progress and verification of completed projects generally meet or exceed expected quality assurance expectations.

The program tracking system generally captures the requisite information necessary to accurately track the program’s actions at the project level. Supplemental written reports provided necessary context and supporting information for measure savings estimates.

Purpose of the Verification and Due Diligence Review

The primary purpose of Verification and Due Diligence task is to determine:

- Whether project eligibility criteria have been properly adhered to and backed with supporting documentation;
- Whether savings were calculated correctly and project information entered in an accurate and timely manner in the program tracking system;
- If key quality assurance and verification activities were adequately implemented; and
- If any quality assurance and verification activities may be streamlined or simplified.

³⁴ GPY1 for the gas utilities runs from June 1, 2011 through May 31, 2012. GPY1 is the same as EPY4 for ComEd.

³⁵ ComEd Smart Ideas for your Business, Nicor Gas Energy Efficiency Program and Integrys Chicagoland Energy Efficiency Program: Retro-Commissioning Service and Compressed Air Program, Nexant Operations Manual, v.4.0 June 1, 2011.

³⁶ Compliance Filing: Energy Efficiency Program Plan, tk.

At this point not all documentation is available to support review of each of these points. Eligibility criteria for EPY4/GPY1 projects are not completely documented. A key eligibility criterion is prospective: completion of Building Operator Certification prior to program year-end, and the EM&V team has not yet received details on that aspect of the program. The tracking system shows 50 projects completed for ComEd in EPY4 among which seven projects were completed for the Nicor Gas; fourteen were completed for Peoples Gas and one for North Shore Gas in GPY1. The reports and supporting documentation for savings estimates are complete and have been provided to the EM&V team.

Data Collection

The Navigant evaluation, measurement and verification (EM&V) team collected data for this verification and due diligence task through interviews with key program staff (ComEd, WECC, Franklin Energy and Nexant) and a review of program documentation. Subsequently, the EM&V team compared the results of these actions to national best practices. Navigant also received information from Nexant and ComEd regarding the Nexant TrakSmart database, extracts from TrakSmart, and reports and calculation templates.

Interviews with Program Stakeholders

The EM&V team conducted telephone discussions with the key people involved in the program's day-to-day operations, including representatives from Franklin Energy, WECC, the lead program administrator (ComEd), and the implementation contractor (Nexant). The Nexant and ComEd discussions were conducted in common during a program update call. Telephone discussions included prepared question topics such as program administration, program outreach and marketing, program delivery and customer satisfaction. At the conclusion of each call, the EM&V team provided an opportunity for an open-ended discussion of any questions or additional topics.

Program Documentation Review & Benchmarking

At the request of the EM&V team, the program implementation contractor, Nexant, provided program documentation to conduct the verification and due diligence review. Reviewed documentation includes: the Nexant Operations Manual³⁷, project and measure tracking spreadsheets, the TrakSmart database structure, and project reports and measure savings calculations. The tracking database export contains the number of each measure invoiced, sum of gross and net terms savings, as well as the measure status. The calculation templates contain the assumptions and algorithms used to estimate savings for the qualifying measures. The gas company implementation contractors produce monthly Program Summary Reports or dashboards from the Nexant data system to convey realized and pipeline savings by program to the gas utilities.

The TrakSmart database, managed by Nexant, is the primary program tracking system. The EM&V team has reviewed exports from TrakSmart, but we have not reviewed the database itself. ComEd and Nexant provided documents showing that the TrakSmart database structure for managing myriad aspects of the program implementation at the project-level and measure-level. The data exports match the planned structure for the database, and Navigant concludes that all planned data

³⁷ ComEd Smart Ideas for your Business, Nicor Gas Energy Efficiency Program and Peoples and North Shore Gas Chicagoland Energy Efficiency Program: Retro-Commissioning Service and Compressed Air Program, Nexant Operations Manual, v.4.0 June 1, 2011.

are being adequately collected. At this point the gas utilities, like Navigant, do not have direct access to the TrakSmart system, though Nicor Gas will be adopting the TrakSmart platform for all programs, including retro-commissioning.

Underpinning the databases are completed applications, written reports (Planning, Investigation, Implementation and Verification) and detailed calculations describing the measure savings estimates. The applications are scanned and posted electronically. Nexant collects and reviews all savings calculations and reports and has posted them for evaluator review. Complete documentation for all 50 completed EPY4/GPY1 projects has been posted for evaluator review.

In general, Navigant has found the savings calculations well-constructed and documented. Furthermore, Nexant has developed calculation templates for common retro-commissioning measures that facilitate accuracy and review.

Review of Program Operating Procedures

The EM&V team examined the operating procedures as outlined in the *Retro-Commissioning Service: Nexant Operations Manual*. Information was verified in discussions with Franklin Energy, WECC; the Program Manager, ComEd; and the implementation contractor, Nexant. The Operations Manual includes detailed procedures and flow diagrams for the following steps in the application and participation process, summarized below.

- Application Submittal and Pre-Review
- Application Approval
- Planning Phase
- Investigation Phase
- Implementation Phase
- Verification Phase

Application Submittal and Pre-Review

Participants in the Retro-Commissioning program are generally solicited by approved, independent, retro-commissioning service providers (RSPs), marketing the program on behalf of ComEd and partner gas utilities, Nicor and Peoples and North Shore Gas. The RSP works with the customer to submit a completed application and supporting documentation to Nexant for review. Nexant staff review the application to determine customer eligibility for both the electric and natural gas portions of the program. Customer eligibility for the gas company programs is determined by verifying gas service by respective gas companies and satisfying criteria for sufficient customer size, preliminary estimates for savings potential and systems control capabilities. Program staff then check the application for completeness by verifying the customer's contact information and technical information.

Application Approval

Customers applying for gas retro-commissioning funding must complete the Gas Application Addendum to the ComEd retro-commissioning program contract. Once complete and accepted, the application is entered into the program tracking system.

Planning Phase

Following application approval, the customer and RSP establish a scope and timeline for the project. The planning phase deliverable is a retro-commissioning plan for the site that identifies preliminary retro-commissioning measures (RCMs). Nexant reviews and approves the Retro-commissioning Plan and supporting savings estimates. The customer then completes a Customer Selection Form that moves the project to the investigation phase.

Investigation Phase

The RSP works with the customer to research, analyze and select promising retro-commissioning measures to implement. Measures may be added or removed from the retro-commissioning plan at this time depending on research findings. The customer agrees to implement measures meeting their financial commitment and savings goals.

Implementation Phase

The Customer works with internal staff or their contractors to implement agreed upon measures. Measures can be amended, dropped or added at this time due to feasibility constraints or if implementation cost estimates from the investigation phase prove inaccurate. Nexant reviews and approves the Implementation Plan and supporting savings estimates. The customer is responsible for implementing the RCMs identified and agreed to during the Implementation Phase. RSPs may provide implementation services, though doing so causes them to forego the verification phase scope of work. Upon completion of the project and selected measures, the customer notifies their RSP and Nexant.

Verification Phase

During the Verification Phase the RSP revisits the site to verify the proper installation of all measures on the Customer Selection Form. Verification can include functional testing and documentation of all measures. The RSP documents actual measures installed and confirms or modifies energy savings estimates in the Verification Report. The customer submits invoices used to install measures as installation verification, and Nexant and the RSP meet with the customer to review completed work. Following completion of the Verification Report, Nexant may also conduct an inspection of installed measures. Nexant conducts project completion meeting at all project sites with involved personnel and confirms measure implementation. Upon verification of measures and customer financial expenditures, the program Administrator fulfills the obligation to fund the retro-commissioning study, in full.

Quality Control and Verification Best Practices

To conduct the best practices benchmarking assessment, we compared the Retro-Commissioning program’s practices with the *Best Practices Self-Benchmarking Tool* from the *National Energy Efficiency Best Practices Study*³⁸. While no benchmark tool is provided for a retro-commissioning program, specifically, we compare the Joint Utilities Retro-Commissioning program to criteria for best practices for a Non-Residential Comprehensive Program. Table 5- summarizes the scores as determined by the Self-Benchmarking Tool criteria in the “Quality Control and Verification” section. Best practice topics are followed by bullets of program practices.

Table 5-. Quality Control and Verification Benchmarking Scores

ID	Best Practice	Score*
1	Require <i>post</i> -inspections and commissioning for all large projects and projects with highly uncertain savings	Meets best practice.
2	Require <i>pre</i> -inspections for large projects with highly uncertain baseline conditions that significantly affect project savings	Meets best practice
3	Conduct either in-program measurement or measurement through an impact evaluation on the very largest projects and those that contribute most to uncertainty in overall program savings	Meets best practice.
4	Tailor measurement rigor, including the use of sampling, to each project’s contribution to the cumulative uncertainty in estimated savings for the program overall	Needs some improvement
5	Limit the use of multi-year, in-program measurement of savings	Needs some improvement
6	Carefully consider tradeoffs associated with in-program M&V versus ex post impact evaluation	Meets best practices
7	If in-program M&V is utilized exclusively (as opposed to independent impact evaluation), results should be periodically aggregated and summarized to produce realization rates and lessons learned	NA
8	Consider using third-party M&V contractors to oversee or conduct M&V	NA
9	Tie staff performance to independently verified results	Meets best practices

* Scores are based on the metric definitions contained in the tool.

Source: Program operations manuals and Navigant analysis.

1. Require *post*-inspections and commissioning for all large projects and projects with highly uncertain savings
 - Meets best practices
 - The Joint Utilities require service providers to conduct post-implementation inspections (verification) of all measures implemented at project sites.

³⁸ <http://www.eebestpractices.com/>

- The implementation contractor conducts its own post-implementation inspections of a sample of sites – six in EPY4/GPY1.
2. Require *pre*-inspections for large projects with highly uncertain baseline conditions that significantly affect project savings
 - Meets best practices
 - The program extensively documents the baseline as part of the program processes in the planning and investigation phases.
 3. Conduct either in-program measurement or measurement through an impact evaluation on the very largest projects and those that contribute most to uncertainty in overall program savings
 - Meets best practices
 - The retro-commissioning program conducts both in-program measurement for measures recommended and the program evaluation collects additional data on measures with uncertain impacts – mostly due to under-monitoring of chilled water measures.
 4. Tailor measurement rigor, including the use of sampling, to each project’s contribution to the cumulative uncertainty in estimated savings for the program overall
 - Needs some improvement
 - The Implementation Contractor has produced calculation templates of appropriate rigor for high-volume – lower-impact (<75,000 kWh) measures. These templates are designed to reduce the burden on the service providers.
 - Service providers measurement rigor varies somewhat. The implementation contractor has guidelines for measurement rigor, but the service providers will over- and under-monitor and analyze measures
 - Sampling criteria are generally not laid out since analysis usually covers a census of affected equipment.
 5. Limit the use of multi-year, in-program measurement of savings
 - Needs some improvement
 - The program does not use multi-year measurement of savings. Prior evaluations have surveyed prior participants about measure persistence but no measurements have been coordinated
 6. Carefully consider tradeoffs associated with in-program M&V versus ex post impact evaluation
 - Meets best practices
 - The program balances in-program and ex post impact evaluation M&V. RSPs perform self-M&V on all projects with oversight by the implementation contractor. The impact evaluation samples projects and verifies M&V veracity with checks on engineering and on-site inspections.
 8. Consider using third-party M&V contractors to oversee or conduct M&V
 - NA
 - The current level of M&V with three entities involved is adequate
 9. Tie staff performance to independently verified results

- Meets best practices
- Implementation contractor contracts are performance based.

Our findings from the verification and due diligence review process are summarized below, followed by benchmarking the Retro-Commissioning program with program best practices:

- Based on the documents reviewed, it appears that the program implementer is performing well at screening projects for program eligibility.
- The EM&V team vetted the Retro-Commissioning Program’s default parameter assumptions and calculation templates, determined RSP calculations are within generally accepted engineering standards and that program work paper references are accurate and reliable.

Reporting and Tracking System Best Practices

Table 5- summarizes the scores as determined by the Self-Benchmarking Tool criteria in the “Reporting & Tracking” section. Best practice topics are followed by bullets of program practices. The database was not ready for evaluation at the time of this research. Some benchmark items should be revisited in subsequent evaluations.

Table 5-. Reporting and Tracking Benchmarking Scores

ID	Best Practice	Score*
1	Integrate all program data, including measure-level data, into a single database	Needs some improvement
2	Integrate or link with other appropriate systems such as cross-program databases, customer information systems (CIS) and marketing or customer relationship management (CRM) systems	Needs some improvement
3	Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress	Not evaluated at this time
4	Utilize electronic workflow management and web-based communications	Not evaluated at this time
5	For programs with proactive marketing efforts, track program prospects early and drive program intervention around major equipment-related events	Needs some improvement
6	Balance the level of tracking against resource availability	Meets best practices

* Scores are based on the metric definitions contained in the tool.

Source: Program operations manuals and Navigant analysis.

1. Integrate all program data, including measure-level data, into a single database
 - Needs some improvement
 - The TrakSmart database was not available for review in its final form, though reported plans for the database would comply with this criterion.

2. Integrate or link with other appropriate systems such as cross-program databases, customer information systems (CIS) and marketing or customer relationship management (CRM) systems
 - Needs significant improvement
 - Program and CIS databases are not dynamically linked, though site identifier fields are common to both. Given the number of customer participants it is not clear that this practice is necessary for the Retro-Commissioning Program, at this time
3. Use automated or otherwise regularly scheduled notification to achieve close monitoring and management of project progress
 - Not evaluated at this time
4. Utilize electronic workflow management and web-based communications
 - Not evaluated at this time
5. For programs with proactive marketing efforts, track program prospects early and drive program intervention around major equipment-related events
 - Needs some improvement
 - The database is set up to track prospects, but not other fields pertaining to decision making and timing.
6. Balance the level of tracking against resource availability
 - Meets best practices
 - Database design appears to meet the needs of the program without being too burdensome.

Recommendations

The EM&V team has the following recommendations based on our review of the Retro-Commissioning program's documentation and interviews with the program's stakeholders.

- Each Utility should press to have the TrakSmart database available for all aspects of the retro-commissioning program rather than relying on exports in order to comprehensively monitor program progress.
- The Implementation Contractor should perform more on-site M&V of a sample of projects to put a check on any conflicts of interest. Inspections of projects from new RSPs should be a priority and would help to align expectations of the program with the need to verify savings.

Conclusion

In general, the Joint Utility Retro-Commissioning Program is effectively designed, managed and implemented. The Retro-Commissioning program's engineering algorithms and assumptions defining savings estimates and QA/QC procedures are consistent with current industry best practices

5.6 Program Theory Logic Model Review

Program Theory

Program theory is essentially a structured description of the various elements of a program's design: goals, motivating conditions/barriers, target audience, desired actions/behaviors, strategies/rationale, and messages/communications vehicles. The following subsections describe the joint Utility Retro-Commissioning program in these terms.

Program Goals

The main goal of the Nicor Gas Retro-Commissioning program is to achieve therm savings through the retro-commissioning at qualifying existing commercial buildings. This program is a jointly offered with ComEd, and thus also has the goal of achieving electric energy and demand savings. Beyond energy savings, the program aims to increase the market and capacity to perform retro-commissioning services in the ComEd and Nicor Gas service territories.

Motivating Conditions/Barriers

Retro-commissioning identifies low or no cost opportunities for energy and cost savings that can be implemented without expenditure or budget approval for capital funds. The program has identified the following barriers to program success:

- Lack of awareness of retro-commissioning;
- Lack of demand for retro-commissioning services in commercial buildings; and
- Challenges with measure implementation:
 - Aligning the retro-commissioning project with budget cycles,
 - Addressing time constraints of the building staff to implement measures, and
 - Coordinating the controls contractor, customer, and service provider to achieve successful measure implementation.

Target Audience

This program targets a wide range of market actors, including: building owners and managers, facilities staff and service providers with the know-how to provide the service to utility customers.

Desired Actions/Behaviors

The program aims to increase adoption of retro-commissioning as a standard practice for successfully operating and managing the energy operating costs of commercial buildings in the ComEd and Nicor Gas service territory.

Strategies/Rationale

The joint Retro-commissioning program leverages relationships that service providers have with the commercial real estate market segment to recruit potential participants. The program works to provide service providers with training and marketing material to enhance their retro-commissioning capabilities and market reach. The program coordinates qualified technical assistance and pays for costly research and study that is used to identify and validate savings opportunities.

In addition to paying for the study and training technical assistance, the program requires building operator training for participants. This training has the goal of savings persistence and potential spillover to additional energy savings measures at participating and affiliated buildings.

Messages/Communications Vehicles

Pre-qualified service providers perform a majority of the program marketing. The program also reaches out to professional organizations such as BOMA to promote the program. The program implementation staff meets often with participants and service providers to ensure that projects stay on track for completion.

Program Logic Model

This section presents how the Business Retro-Commissioning program activities logically lead to desired program outcomes. Figure 5- presents the Nicor Gas, Peoples Gas, North Shore Gas and ComEd Joint Business Retro-Commissioning Program model diagram showing the linkages between activities, outputs and outcomes, and identifying potential external influences. The diagram presents the key features of the program.

The remainder of this chapter presents the resources, activities, outputs, outcomes and associated measurement indicators associated with the Business Retro-Commissioning Program.

Resources

The ability of the Business Retro-Commissioning program to generate the outputs and outcomes likely to result in the program reaching its goals depends in part on the level and quality/effectiveness of inputs (resources) that go into these efforts. There are also external influences that can help or hinder achieving anticipated outcomes. Key program inputs and potential external influences are shown in Table 5-.

Activities

The purpose of the Business Retro-Commissioning program is to educate and assist target decision makers with making their existing buildings more efficient through the retro-commissioning process. Existing building projects in the Joint Utilities service territories are eligible for the program. They must be sufficiently large (greater than 500 kW peak demand) and possess a capable automation system for monitoring equipment and implementing improved operations. The facility owner must be prepared to assume costs and expenses of at least \$15,000 or \$30,000 (depending on project size) to implement agreed-upon retro-commissioning measures (RCMs) that result in a bundle with an estimated total project simple payback of one-and-a-half years or less, based upon energy savings. The program will reach potential participants through activities designed to over the longer term generate energy savings (see Table 5-). These activities are as follows:

- Recruit and train trade allies (retro-commissioning service providers, RSPs) in the program procedures and expectations.
- Coordinate among gas and electricity utilities to present an integrated program to serve customers served by both gas and electric utilities.
- Generate marketing materials and train utility staff.
- Promote retro-commissioning through publications and presentations at conferences
- Work with and support professional organizations promoting program message
- Provide financial resources to pay for technical studies for program participants

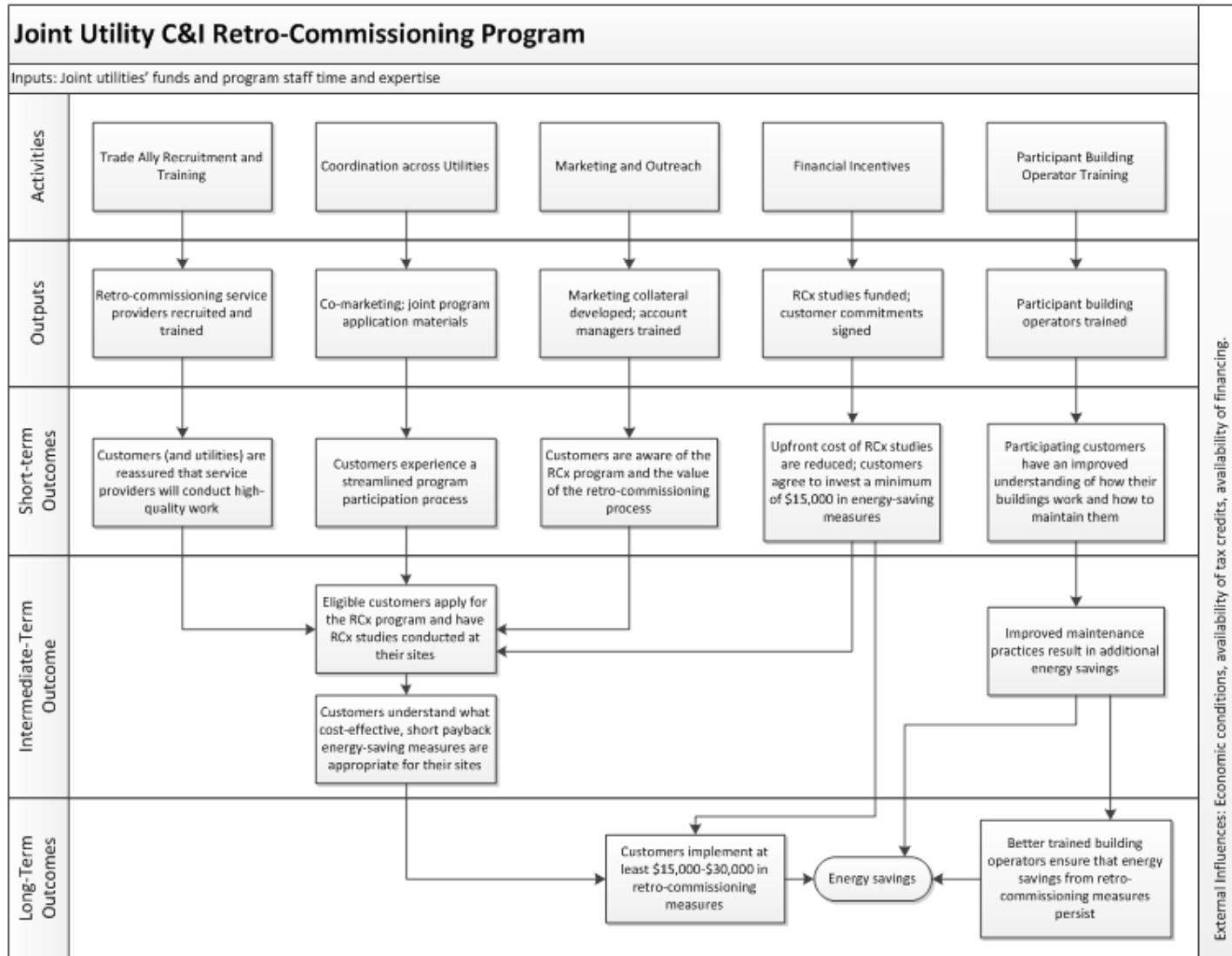
- Ensure that participant operating staff are trained to ensure savings persist and perhaps spill over to other projects and buildings

Table 5-. Program Inputs and Potential External Influences

Program Inputs
<ul style="list-style-type: none"> • Nicor Gas, Peoples Gas, North Shore Gas and ComEd ratepayer funds • Nicor Gas, Peoples Gas, North Shore Gas and ComEd staff resources • Nexant (implementation contractor) staff resources and experiences • Utility and service provider knowledge of the target market
External Influences and Other Factors
<ul style="list-style-type: none"> • Economic conditions • Energy prices • Funding available to participants

Source: Navigant analysis.

Figure 5-. Program Logic Model



Source: Program operations manuals.

Table 5-. Business Retro-Commissioning Program Activities

<p>Conduct training sessions for Service Providers</p> <ul style="list-style-type: none"> Nexant recruits retro-commissioning service providers, RSPs, with expertise in commercial building systems, including design and maintenance professionals Nexant conducts training sessions for RSPs
<p>Coordination with ComEd</p>
<ul style="list-style-type: none"> Gas Utilities and ComEd, coordinate to deliver a joint program that serves customers with a streamlined participation process A single Implementation Contractor, Nexant, runs the program for both utilities. ComEd provides leadership oversight.
<p>Promote retro-commissioning through publications and presentations at conferences</p>
<ul style="list-style-type: none"> Nexant, ComEd and gas utilities make presentations at key conferences and other events Nexant publishes marketing materials with utility co-branding.
<p>Provide financial incentives to participants</p>
<ul style="list-style-type: none"> Program pays for the retro-commissioning study, average cost of more than \$60,000, if the participant owner commits to funding implementation of measures with an aggregate simple payback of less than 1.5 years, up to \$15,000 or \$30,000 depending on the size of the project.
<p>Participant training sessions</p>
<ul style="list-style-type: none"> At least one representative from participants must complete Building Operator Certification Level 1 training in the calendar year that the project is completed

Source: Program operations manuals.

Outputs, Outcomes and Associated Measurement Indicators

It is important to distinguish between outputs and outcomes. For the purposes of this logic document, outputs are defined as the immediate results from specific program activities. These results are typically easily identified and can often be counted by reviewing program records. An example for the Business Retro-commissioning program would be the number of projects completed in the program or the number of training session attendees. Outcomes are distinguished from outputs by their less direct (and often harder to quantify) results from specific program activities. Outcomes represent anticipated impacts associated with the joint utilities’ program activities and will vary depending on the time period being assessed. An example would be energy savings. On a continuum, program activities will lead to immediate outputs that, if successful, will collectively work toward achievement of anticipated immediate, intermediate and ultimate program outcomes.

The following tables list outputs (Table 5-) and outcomes (Table 5-), taken directly from the logic model and associated measurement indicators. For each indicator, a proposed data source or collection approach is presented.

Table 5-. Program Outputs, Associated Indicators and Potential Data Sources

Outputs	Key Performance Indicators	Data Sources and Potential Collection Approaches
RSP training attendees learn about the program and retro-commissioning	Number of attendees at relevant training sessions Number of RSPs recruited	Interviews with program staff, program records of training attendance
Customers interface with a single program contact and submit a single application for both electricity and gas projects	Participant satisfaction with program processes	Participant process interviews. Utility program manager interviews.
Marketing collateral	Number of presentations given and publications released	Program records, interviews with program staff
Participants sign project contracts and complete participation	Program participation	Program tracking data, interviews with program staff
Participant Building operators trained	Certifications earned	Program tracking data, training program records

Source: Program operations manuals and Navigant analysis.

Table 5-. Program Outcomes, Associated Indicators and Potential Data Sources

Outcomes	Key Performance Indicators	Data Sources and Potential Collection Approaches
Immediate Outcomes		
Quality retro-commissioning studies are performed and measures identified	Thoroughness of reports and operations research	Impact evaluation engineering review. Utility re-qualifications results
Streamlined program delivery and participation	Participant and RSP satisfaction	Participant and RSP process interviews.
Increased number of design firms bringing new projects to program	Number of firms worked with and number of projects submitted per firm	Program tracking data
Increased program awareness	Level of awareness in non-participants	Participant process interviews
Trained operations staff	Level of awareness of improved operations opportunities	Participant process and net-to-gross interviews
Intermediate Outcomes		
Eligible Customers apply and participate in the retro-commissioning program	Participation rates.	Market data, program tracking data
Implementing of cost-effective measures	Number of measures implemented and participant implementation costs	Program tracking data
Improved maintenance practices and savings persistence	Spillover savings, channeling in other programs	Participant and RSP process and NTG interviews
Ultimate Outcomes		
Program achieves long term savings goals	Electric and gas savings achieved by program	Program tracking data

Source: Program operations manuals and Navigant analysis.