Energy Efficiency / Demand Response Plan: Plan Year 3 (6/1/2010-5/31/2011)

**Evaluation Report: Smart Ideas for Your Business Retro-Commissioning Program** 

Presented to Commonwealth Edison Company

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### Section E. Executive Summary

This report presents a summary of the findings and results from the Impact and Process Evaluation of the 2010 (PY3) Commercial & Industrial Retro-Commissioning Program.<sup>1</sup> This Program provides a platform to assist commercial and industrial customers improve performance and reduce energy consumption through the systematic evaluation of existing building and industrial 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 Smart Ideas 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. Streamlining in this manner addresses the nature of Illinois program design which measures the spending and results primarily in the year of implementation.

The program in 2010 (PY3) represents the second year of full scale implementation of the Retro-Commissioning Program. 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:

- The program schedule was expanded so that preliminary research can begin prior to the start of the program year (June 1). The longer research period gives participants and their contractors time to fully investigate measures that might have only seasonal impacts.
- The number of eligible Retro-commissioning Service Providers (RSPs) continues to expand. There were eight commercial building RSPs and three compressed air RSPs registered with the program. In PY4 the list will grow to more than 25, overall.
- Program guidelines were disseminated to Retro-commissioning Service Providers (RSPs) to help estimate savings consistently.
- Industrial retro-commissioning was introduced as a pilot program that focuses on compressed air systems. The industrial pilot completed retro-commissioning for participants with both large and small compressed air systems to investigate the market for each. Two RSPs are delivering services to large industrial customers.
- RSPs began tracking natural gas savings to fulfill analysis needs of the partnership between ComEd and regional natural gas distribution companies, Integrys and Nicor, to co-deliver the Retro-Commissioning Program to customers served both by ComEd and these gas companies.

<sup>&</sup>lt;sup>1</sup> The 2010 program year began June 1, 2010 and ended May 31, 2011.

## 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 and engineering calculations. The Process Evaluation addresses key process-related program strengths and weaknesses and identifies ways in which the program can be improved.

## E.2 Evaluation Methods

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

## E.3 Key Impact Findings and Recommendations

Program Year 3 represented the second full year of implementation for the Smart Ideas Retro-Commissioning Program. A total of 34 sites and buildings participated in the program, including 3 large industrial sites, one small industrial site and one participant in the monitoring-based retro-commissioning pilot. More than 200 measures were implemented among those sites. Program *ex ante* savings totaled 22,662 MWh. The average *ex ante* savings per project was 665 MWh per year, with individual projects ranging from 27 MWh to 3,781 MWh. Participants represented a range of building types: office buildings, hospitals, retail, industrial facilities, data centers and hotels. Office buildings and hospitals dominate the project count and overall savings, but one retail project was very large. Figures E.1 and E.2 present key summary information about participants and energy savings implemented.

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#### **Figure E.1 Distribution of Project Savings**

Figure E.2 Participation and Savings by Facility Type



The PY3 gross ex ante energy savings for this program were 22,662 MWh. The gross savings ex ante savings exceeded program goals<sup>2</sup> by about 21%. Table E-1 shows the ex ante savings by participant group and total ex ante savings. This evaluation will report therm savings to record findings, but the natural gas results have no bearing on this evaluation as a whole.

Office

Hotel

Retail

Total

<sup>&</sup>lt;sup>2</sup> Program goals based on "Revised Target Net MWh" by program in a spreadsheet supplied by ComEd, July 2011.

| Participant Type     | Count | <i>Ex ante</i> gross<br>MWh | <i>Ex ante</i> gross therms |
|----------------------|-------|-----------------------------|-----------------------------|
| Commercial rCx       | 29    | 20,995                      | 452,981                     |
| Industrial rCx       | 3     | 1,077                       | 0                           |
| Small compressed Air | 1     | 129                         | 0                           |
| Monitoring Based rCx | 1     | 462                         | 0                           |
| Total                | 34    | 22,662                      | 452,981                     |

## Table E-1. Ex Ante Program Savings

Table E-2 provides the PY3 evaluation-adjusted gross and net savings estimates for the Retro-Commissioning Program. Due to the relatively small number of projects examined to determine the estimated realization rates at 90/10 confidence precision, Navigant included the 90% confidence range in the realization rates. An attempted census of participants for the net-togross estimate, resulted in a similarly small number of completes and wide bands on the NTG estimate.

## Table E-2. Ex Post Program Savings

| Gross and Net<br>Parameter Estimates | PY3<br>ex ante | PY3<br>Evaluation<br>Adjusted | Realization<br>Rate | Net-to-<br>Gross Ratio<br>(1-FR) | PY3<br>Evaluation<br>Adjusted<br>Net |
|--------------------------------------|----------------|-------------------------------|---------------------|----------------------------------|--------------------------------------|
| Participants                         | 34             | 34                            | 100%                | NA                               | 34                                   |
| Gross MWh Savings                    | 22,662         | 21,574                        | 95% (± 5%)          |                                  | 15,382                               |
| Gross kW Savings                     | 2,527          | 1,725                         | 68% (±7%)           | 0.713                            | 1,230                                |
| Gross Therm<br>(natural gas) Savings | 452,981        | 431,134                       | 95% (± 4%)          | (± 0.25)                         | 307,399                              |

The evaluation adjusted gross saving realization rate for electric energy savings is 95%. The reasons for a realization rate less than 100% include: infrequent errors in engineering calculations and inaccurate assumptions that affect those estimates. Among these factors are:

- 1. Not systematically including ventilation savings when air handling equipment is turned off.
- 2. A single large-impact measure that was based on the average measured fan speed rather than average power at the measured fan speed.
- 3. A few measures that were implemented during the verification phase were found inoperative or disabled during the evaluation.

**Demand Savings**. Demand savings is not tracked in the Program Tracking Spreadsheet because ComEd is not claiming demand savings for this program. None-the-less, most project reports included demand savings for at least some measures. In some cases no demand savings was claimed when there would be some demand reduction. In other cases demand savings was claimed when there would be none because the measure does not affect peak hours. Navigant found little consistency in the demand savings estimates.

- **Recommendation.** If ComEd does plan to track demand savings from the Retro-Commissioning Program, the Program Administrator must enforce guidelines in the verification report calculations. Demand savings from retro-commissioning measures is highly site and measure specific.
- **Recommendation.** Even if demand savings is not a focus of the program, RSPs should continue to estimate demand for projects from the *participant* perspective as demand savings can significantly affect project payback.

**Natural Gas Savings.** The overall natural gas savings realization rate is near 100% <u>Project level</u> gas savings realization rates ranged from 73% to 103%. In future years we expect greater consistency with gas savings estimates as ComEd partners with gas distribution companies to deliver this program.

• **Recommendation.** The Program Administrator should establish guidelines and default assumptions for calculating natural gas savings for common measures: boiler efficiency by size application and/or type, distribution losses, *etc*.

Each of the items that result in a measure or project-level realization rate other than 100% represents isolated errors. In this respect they show that efforts to encourage universal defaults and methods have been generally successful. Instances of these errors are less frequent than during PY2, and in future program years we would expect these sorts of problems will diminish further. Consistent application of methods and assumptions will enhance the repeatability, consistency, and veracity of savings estimates as the program expands the number of third

party Retro-Commissioning Service Providers (RSPs) as the primary delivery and savings estimation entities.

**Persistence.** Persistence of measure installation and thus savings appears to be strong. Telephone interviews with PY2 participants found previously verified measures 100% in place. Furthermore, participants have implemented additional retro-commissioning-type measures or have improved savings of previously verified measures with tighter schedules or more aggressive setpoints.

**Free-Ridership.** Free-Ridership with this program increased substantially from PY2. The evaluation completed interviews with eight participants of an attempted census (34). The free-ridership questions established a free ridership rate of zero for four of the projects, a rate of 0.05 for one project, and 0.44-0.55 for the other three projects. The sites that had indications of free-ridership all had equipment deficiencies and solutions known to the appropriate people in the company. The companies stated that they would have taken all of the completed actions within one to two years even if the program had not been available.

Overall, five of eight interviewed participants were already aware of essentially all performance issues identified by the RCx study, and four of eight were already aware of essentially all recommended solutions. This suggests that the program may be directing its study resources towards opportunities that are already known. Not surprisingly, these participants are the ones who would have implemented the same RCx measures without the program.

• **Recommendation.** Consider free-ridership in screening of projects. Customers who were already aware of performance issues and solutions before the RCx study would often have implemented the same RCx measures without the program. While awareness of performance issues might help the program identify eligible projects, caution should be given in screening more informed participants, as their participation could result in free-ridership issues in future years.

## E.4 Key Process Findings and Recommendations

### **Program Processes**

Program staff have done a good job incorporating lessons learned from prior program years into the PY3 program design. RSPs and customers find that participation processes are clearly explained. Some RSPs expressed frustration with certain parts of the application and review processes, including duplication of inputs throughout the process and lengthy review from the program administrator. Program timelines still present problems for participants; however this

has been improving as RSPs have gained more experience with the program. That noted, overall feedback for the program was very positive.

- **Recommendation.** Re-evaluate the time requirements for each phase as most projects do not meet them and RSPs consider them too aggressive for the work required. Explore flexibility in the legislation-mandated timeline, as you have with early enrollment in PY3 and now PY4. Retro-commissioning projects typically span 1 ½ to 2 years between contract signing and measure implementation.
- **Recommendation.** Streamline the application and review process. For example, reduce duplicate information required for each phase of the project and eliminate review of documents that have already been reviewed and have not changed.

### **Participant Satisfaction**

Interviewed participants provided high satisfaction ratings for the program. Overall, participants gave very high ratings to their satisfaction with all aspects of the program about which they were asked, including the level of 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. Only one interviewed participant gave a "dissatisfied" rating to Nexant and stated that the program administrator did not push the report through in a timely fashion.

Program participants were generally very satisfied with their RSPs and found that the RSP was able to meet their needs in terms of identifying measures. All eight interviewed participants would recommend their RSP to other firms, though one participant, contacted for impact evaluation questions, was disappointed with their RSP and the scope of the measures recommended.

Based on their experience in the program, all interviewed participants stated that they would recommend the Retro-Commissioning program to their peers inside and outside of their organization. Participants' suggestions for improving the program included offering chilled plant water optimization as a measure and to further streamline the participation process.

• **Recommendation.** Maintain close PA engagement even into the implementation phase to keep projects on track and identify any participation problems early.

### **Retro-Commissioning Service Providers**

Despite their criticism of some aspects of the program, RSPs were very satisfied with the program overall in PY3 and found that it met or exceeded their expectations. RSPs were very



satisfied with the support from ComEd and Nexant, but less satisfied with certain elements of the program such as the amount of documentation required and the lengthy review process. In general, RSPs found the program's performance review process and training to be helpful, but offered some suggested improvements. Overall, RSPs found that the benefits of participating in the program outweighed the drawbacks, and their satisfaction was high.

• **Recommendations.** Try to maintain continuity of PA reviewers for each project so that settled questions at one stage do not reappear later in later phases of the program.

**Savings Calculations.** Many savings calculations are conservative in their assumptions due to inherent uncertainty around systems and operator behavior. However, Navigant was also told that some savings was not claimed in the reports because of the burdensome review process for more involved calculations (latent cooling effects, for example). In this respect the interests of the RSP, PA and ComEd are not aligned.

• **Recommendation.** An effort should be made to encourage more thorough accounting of savings without putting unreasonable burden on the RSPs. Calculation templates for common measures will help for measures with smaller savings, but complex measures will need balance thoroughness with time needs of the participants and RSPs

### Marketing and Outreach

RSPs remain the primary promoters of the retro-commissioning program and are expected to generate leads. Based on their feedback, ComEd and Nexant provide a sufficient level of support for outreach, but RSPs feel that the development of additional case studies and project leads would be welcome.

- **Recommendation.** Assist RSPs develop their *own* case studies for the Program, while maintaining a consistent message about t the Retro-Commissioning Program as a whole. This might include developing a case study template with Program boiler-plate information that can be substituted in future years as the program evolves.
- **Recommendation.** Continue to monitor the number of leads generated by RSPs and the rate of conversion into completed projects. Leads that do not turn into completed projects might become an issue, if the program has to spend resources on processing a lot of ineligible leads and might lead to dissatisfaction among customers who do not qualify for the program.
- **Recommendation.** Increase engagement of ComEd account managers in program outreach. Given that retro-commissioning is not a widely known concept, program staff and RSPs find that it is most effective to introduce the program in person. Account managers would be ideally suited to inform their large customers of the program and its opportunities.



**Program Tracking Data.** In PY3 the Program Tracking Spreadsheet is overwhelmed with 34 participants. Future growth in the program cannot be adequately tracked in a spreadsheet.

• **Recommendation.** The PA should migrate to a database as a tracking platform. The tracking database should also track measure-level savings rather than only project-level data.

**Program quality control.** Continue strong communication and feedback practices among all parties:

- Sharing of technical or process issues with RSPs and participants as soon as possible, either in the initial meetings about the project or in RSP trainings. This will help lower the learning curve for newer RSPs by relaying the lessons learned from past projects.
- Rating of RSP's performance. This is a helpful tool for the program and the RSPs to evaluate service providers and ensure that they are active in the program and deliver high quality work.
- Soliciting feedback from customers about the program as well as their RSP.

### E.5 Summary

The Retro-Commissioning Program is growing quickly within the ComEd energy efficiency portfolio. PY3 demonstrates the programs ability to reach important building segments beyond those targeted in the first two years of the program. Hospitals, institutions, commercial high-rises and industry will all be important segments served by this program in the future. Feedback from participants indicates general satisfaction with the program and willingness to recommend the program to others inside and outside of their organizations. The RSPs are faithfully delivering the program with generally high quality for the customer participants and for the ComEd portfolio.

As the profile of retro-commissioning increases in the ComEd portfolio, it is also increasing in the eyes of program participants. Several years ago the concept of retro-commissioning was novel. Now commercial customers are aware of the process and the program. While this greater visibility helps with participation it may contribute more to free-ridership and lower net-to-gross ratios.

Impact estimates submitted by RSPs and reviewed by the program administrator are mostly reliable and accurate. Most *ex post* savings estimate reductions are a result of short-term measure persistence. Some measures do not perform as well as planned or might be disabled.



The short timeline for the program makes follow-up difficult for measures that are installed less than 2 months before the end on the program or those with cooling season impacts. Longer engagement by RSPs and the PA to implement or troubleshoot more measures might be beneficial for participants, but does not satisfy mandated reporting timelines.

## E.6 Cost-Effectiveness Summary

ComEd uses DSMore<sup>™</sup> software for the calculation of the Illinois TRC test<sup>3</sup>. Table E-3 summarizes the unique inputs used in the DSMore model to assess the TRC ratio for the Retro-Commissioning program in PY3. Most of the unique inputs come directly from the evaluation results presented previously in this report. Measure life estimates and program costs come directly from ComEd. All other inputs to the model, such as avoided costs, come from ComEd and are the same for this program and all programs in the ComEd portfolio.

#### Table E-3. Inputs to DSMore Model for Retro-Commissioning Program

| Item                                            | Value Used  |
|-------------------------------------------------|-------------|
| Measure Life                                    | 3           |
| Utility Administration and Implementation Costs | \$1,096,815 |
| Utility Incentive Costs                         | \$2,344,638 |
| Net Participant Costs                           | \$2,271,813 |

Based on these inputs, the Illinois societal TRC for this program is 0.7 and the program does not pass the Illinois TRC test.

<sup>&</sup>lt;sup>3</sup> Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.

## Section 1. Introduction to the Program

## 1.1 Program Description

The *Smart Ideas* Retro-Commissioning (RCx) Program provides a platform to assist commercial and industrial customers to improve performance and reduce energy consumption through the systematic evaluation of existing building and industrial systems. Low- cost 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 Smart Ideas Retro-Commissioning Program aims to speed the typical retro-commissioning process in order to facilitate timely turnaround projects that yield savings in the year they are initiated.

### 1.1.1 Implementation Strategy

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

- Receipt of electric service over ComEd wires regardless of the electric supplier;
- Peak demand greater than 500kW OR Compressed air plant greater than 500 HP installed compressor capacity ; and
- Execution of a Program Agreement with the customer that they will spend the additional financial resources to implement retro-commissioning measures with a simple payback of 18 months or less.
- The facility must operate under one of the following ComEd Rate schedules: A75, A76, A77, B75, B78, B95, B98, H75, H76, H77, H78, R75, R76, R77, R78.
- The facility owner must express a willingness to commit funding for participating in the process, completing the project plan, and implementing measures. The owner must be prepared to assume costs and expenses outlined in Table 1-1 below.

| Size of Retro-<br>Commissioning Study | Implementation<br>Commitment |
|---------------------------------------|------------------------------|
| Standard                              | \$10,000                     |
| Large Scale Studies                   | \$20,000                     |

## Table 1-1. Size of Retro-Commissioning Study

- The facility owner must send one staff member to Building Operator Certification TM (BOC) training. Staff member must receive BOC Level I Certification.<sup>4</sup>
- The facility owner must implement Recommended Conservation Measures (RCMs) by an agreed-upon Required Implementation Date, which is typically set at 120 days following execution of the Customer Agreement.

In addition, when reviewing program applications, the program looks for evidence that costeffective retro-commissioning opportunities may exist at the facility and may consider the following when approving the 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 ft<sup>2</sup> in air-conditioned floor space.
- 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. Active involvement will include:
  - Providing access to the facility
  - Providing time for facility personnel to interface with the Retro-Commissioning Service Provider
  - Providing and assisting with the reporting, and collection of, information pertaining to the retro-commissioning of the facility

The estimated time commitment from the customer to support the retro-commissioning effort is likely to total 60 to 100 hours of a senior facility manager over the 10- to 12-month project duration. Completion of these requirements qualifies the participant for 100% reimbursement of the retro-commissioning service fees.

Unlike Prescriptive or Custom Programs that focus on new efficient equipment, the Retro-Commissioning Program focuses on using existing equipment more efficiently to save energy while still delivering the required services to support the building occupants. Successful retrocommissioning requires experienced service providers and cooperation and buy-in of the

<sup>&</sup>lt;sup>4</sup> Participants in the Industrial Retro-commissioning program are not required to complete BOC training



facility staff to implement operational changes. The Smart Ideas for Your Business Retro-Commissioning Program accomplishes this by assembling two teams. The "program team" is assembled for each project to provide oversight, technical support, and the program-related retro-commissioning services to the customer. The program team will consist of a ComEd Account Manager (where applicable), a ComEd Program Manager, the assigned Retrocommissioning Service Provider (RSP), and a member for the Program Administrator (PA) contractor: in this case, Nexant. The "customer team" generally consists of the building owner (or owner's representative), the facility engineers/managers, and their mechanical, electrical, and/or controls contractors.

#### **Roles of the Program Administrator**

Day-to-day administration of the Retro-commissioning Program is performed by a third-party program administrator (PA), Nexant, Inc. The PA is responsible for all aspects of the program including participant coordination, technical resources, RSP recruitment and training, logistical support, and technical review at each phase of the program.

#### **Program Timeline**

Meeting program timelines continues to be a challenge for the program. Based on the program data, over 30% of the projects in PY3 did not meet their originally set implementation deadline. Slippage in meeting the implementation deadline ranged from 12 days to nearly four months.<sup>5</sup> The program is delivered in five main phases.

- 1. Application Phase
- 2. Planning Phase
- 3. Investigation Phase<sup>6</sup>
- 4. Implementation Phase
- 5. Verification Phase

The phases are described with original planning expectations for timing of the phases. In practice the timing benchmarks are difficult to attain in a 12-month timeframe.

**Application Phase**. The facility owner or representative completes the application material and submits paperwork to the Program Administrator. Based on the application material and some follow-up with the site, the PA selects sites that have the highest likely savings opportunities.

<sup>&</sup>lt;sup>5</sup> Dates extracted from the PY3 program tracking spreadsheet provided to the evaluation team.

<sup>&</sup>lt;sup>6</sup> The Implementation phase was broken out into two distinct phases during PY3. PY3 manuals still reflect the program as being made up of four phases.

After accepting a project for the Program, an RSP is assigned, if necessary.<sup>7,8</sup> Projects that are screened out are given detailed reasons for non-acceptance. If other Smart Ideas programs are more appropriate, the customer is directed to applicable programs. *This phase lasts about one to two weeks.* 

**Planning Phase**. The project planning phase commences after the customer and RSP complete the application. Activities include a kick-off meeting with the PA, ComEd representatives, and the RSP with the customer team during which expectations are described and roles and responsibilities are defined. A site assessment and data acquisition plan is also completed by the RSP during this phase. The findings of this plan are used to generate the Retro-Commissioning Plan for the project and assess potential measures and project economics. The Retro-Commissioning Plan establishes the framework and direction for the Implementation Phase. Upon completion of the retro-commissioning plan, another meeting is held with the owner representative and engineering staff to review the scope of the plan and the impacts and economics of the identified potential measures. At the completion of the Planning Phase, the facility owner enters into the formal Program Agreement.

- The Program Agreement includes several components that define the roles and responsibilities of each party. The primary goal is gaining the customer's spending commitment \$10,000 or \$20,000, depending on the magnitude of the retro-commissioning study for agreed-upon retro-commissioning measures that result in a bundled estimated simple payback of 1.5 years or less.
- These measures must be installed within 120 days of the signing of the program Participation Agreement. For projects that are not completed within 120 days, the customer will be expected to refund the cost of the retro-commissioning study. Additionally, the agreement acts as a decision point at which the customer selects measures from the Planning report that they wish to pursue for further investigation in the next phase.

*The planning phase takes about 1.5 to two months to complete* 

**Investigation Phase**. This phase takes the consensus decisions from the Planning Phase and builds on them. Additional field data is gathered to better define, augment, add to, or discard measures presented in the Plan.

<sup>&</sup>lt;sup>7</sup> In most cases, the RSP generated the lead: and therefore, is the default RSP. Assignment only occurs when the customer is not yet working with an RSP.

<sup>&</sup>lt;sup>8</sup> Retro-Commissioning Service Providers are qualified through the Program by ComEd staff and the Program Administrator. RSP training conducted by the PA and ComEd must be completed prior to participation with the program.

**Implementation Phase**. After additional investigation is completed, the RSP and customer's team members work together to implement the measures in the Plan. This may involve coordination of multiple contractors to ensure that the Plan measures are executed to save energy.

*The project investigation and implementation takes eight to 17 weeks and must be completed within 120 days of the signing of the Participation Agreement (an outcome of the Planning Phase).* 

**Verification Phase**. After measures are implemented, the RSP evaluates data from the facility to determine that measures are operating as intended to save energy. These data might be observations of installed and/or repaired equipment, trend data from an automation system, or data from data loggers installed after the measure was implemented. The RSP prepares a report describing the status of implementation and revised savings estimates based on observations and measurements. The verification report can be researched by the PA as well. *Verification can take three to eight weeks depending on the measures implemented and the desirability of seasonal data to verify proper operation.* 

An important change during PY3 was moving away from an approach where only projects that could be completed in the current program year were allowed to enter the program during that year. Instead, projects are able to come in on a rolling basis with those completing implementation within the program counting in that year, and those not, rolling into the next year. Consistency in program offerings from one year to the next, and avoiding starts and stops in program offerings within program years gives programs more stability in the market and helps aid market transformation goals. Despite the number of projects that miss meeting the deadlines at each phase, it remains important to continue with the still tight timeframe in order to maintain engagement with the customer to see the measures implemented. In addition, limiting the length of the retro-commissioning cycle can mitigate common barriers to Program success, such as personnel turn-over, lack of focus, and changing customer priorities. Keeping to the Program schedule helps ensure accountability of all parties and tracks measures through implementation.

### Program Delivery Mechanisms and Marketing Strategy

The program is marketed primarily through one-on-one marketing to candidate facilities by the Program's qualified RSPs. ComEd program staff and the PA, as well as ComEd Account Managers contribute to program promotion. The PA and ComEd collaborated to produce marketing materials, and the PA conducts marketing training with ComEd support.

### **Retro-Commissioning Service Provider (RSP) Participation**

A total of nine RSPs participated in the program in PY3. Seven RSPs participated in retrocommissioning in 30 commercial facilities. Additionally, two RSPs, who specialize in



compressed air systems, completed three large compressed air studies and one compressed air equipment vendor worked with the program administrator for the "small" compressed air pilot project. The list of approved commercial building and compressed air RSPs will expand again in PY4. RSPs are approved from one year to the next pending satisfactory performance reviews and interviews conducted by ComEd.

### 1.1.2 Measures and Incentives

### **1.2** Evaluation Questions

The Evaluation Team identified the following key researchable questions for PY3 <u>Impact Questions:</u>

- 1. What is the level of gross and net annual energy (kWh) and peak demand (kW) savings induced by the program?
- 2. What is the level of free ridership associated with this program? How can it be reduced? Is spillover an effect for this program?
- 3. Did the program achieve its goals? Why and why not?
- 4. Do savings persist from one year to the next?

#### Process questions:

The process evaluation questions focused on six key areas:

- 1. Has the program, as implemented, changed from Program Year 2? If so, how, why, and was this an advantageous change?
- 2. What challenges have occurred in Program implementation and how were they handled?
- 3. How effectively is the program being administered? What methods could be implemented to improve the efficacy of program delivery?
- 4. Are the program processes effective for smoothly providing incentives to customers and motivating RSPs to participate?
- 5. What are key barriers to participation for eligible ComEd customers? How can they be addressed by the program?



6. How did customers become aware of the program? How did eligible RSPs become aware of the program? What marketing strategies could be used to boost program awareness and participation, if needed?

The full list of researchable questions can be found in the Evaluation Plan.

## Section 2. Evaluation Methods

This evaluation of the Smart Ideas Retro-Commissioning (RCx) Program reflects the second fullscale year of the program. During program year 2010 (PY3), which ran from June 1, 2010 – May 31, 2011, thirty-four facilities participated in the Retro-Commissioning Program. Among those 34 sites, more than 200 retro-commissioning measures (RCMs) were implemented and verified, thus qualifying the sites for waiver of retro-commissioning service costs. The 34 program participants were shepherded through the program by nine different retro-commissioning service providers (RSPs). Three projects were cancelled during the program year and they are excluded from all summary information/

## 2.1 Analytical Methods

Measures implemented through this program are diverse and not applicable to prescriptive or deemed savings estimates due to the unique circumstances of each participant and measure. The Process evaluation utilized surveys with key personnel at ComEd and Nexant, Inc., the Program Administrator, third-party RSPs, and program participants. Program planning and marketing materials were also analyzed.

## 2.1.1 Impact Evaluation Methods

Measure impacts were each examined individually for a sample of program participants. RSPs submitted detailed data and engineering calculations for each measure and Navigant reviewed the calculations for accuracy and completeness. In most cases when there was climate dependency in the savings estimates, measure savings were estimated with temperature bin calculations and typical meteorological year data. Navigant also conducted on-site inspection and verification of measure installation at nine sites as well as review operating parameters and some trend data from the summer of 2011.

### **Gross Program Savings**

Each implemented measure and many proposed<sup>9</sup> measures at the sampled projects were individually reviewed. The evaluation verified that appropriate algorithms, methods, and data sets were used. During the review Navigant compared calculation parameters to realistic assumptions and applied prescribed parameter defaults as needed when measure calculations deviated from expect norms. Measure savings were verified and/or adjusted, as needed, for each implemented measure for each participant. Gross savings were examined on a participant

<sup>&</sup>lt;sup>9</sup> Even measures that were not implemented contain key information about facility operations, setpoints and interactive effects among energy end-uses.

level, measure end-use level, and measure-type level. Aggregate savings of the individual measures comprise the program gross savings.

Navigant conducted measure persistence research via telephone interviews with prior year participants. Navigant discussed critical aspects of measures with key participant personnel to determine whether measures remain in place with on-going savings.

### **Net Program Savings**

Net-to-gross (NTG) savings research is based on self-report methods where participants answer questions about their awareness of the measures identified and their inclination to pursue corrective actions for those measures. Navigant applied installation-specific NTG ratios where our research found free-rider influence. The evaluation team attempted interviews with a census of program participants. Participant interviews also probed for evidence of spill-over, though spill-over was not quantified.

### 2.1.2 Process Evaluation Methods

The process evaluation utilized interviews with key personnel at ComEd and Nexant, Inc., the program implementer. In addition, we performed interviews with program RSPs and fielded a survey of participating customers. Program design, implementation, training, and marketing materials were also reviewed.

### 2.2 Data Sources

| Data<br>Collection<br>Type | Targeted<br>Population                          | Sample<br>Frame       | Sample<br>Design             | Sample<br>Size | Timing                     |
|----------------------------|-------------------------------------------------|-----------------------|------------------------------|----------------|----------------------------|
|                            | ComEd RCx<br>Program Staff                      | Contact<br>from ComEd | ComEd RCx<br>Program Manager | 1              | September<br>2011          |
| In-depth<br>Telephone      | Implementation<br>Staff – rCx                   | Contact<br>from ComEd | Nexant Program<br>Manager    | 2              | September<br>2011          |
| Interview                  | Retro-<br>commissioning<br>Service<br>Providers | Program<br>database   | Attempted census<br>(9)      | 5              | September/<br>October 2011 |
| CATI<br>survey             | PY3<br>Participants                             | Program<br>database   | Attempted census (34)        | 8              | September/<br>October 2011 |

## Table 2-1. Principal Data Sources Contributing to the PY3 Evaluation

### **Program and Implementer Staff Interviews**

We conducted two in-depth interviews to support the process evaluation, one with the ComEd Retro-Commissioning Program Manager and one with two members of 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 PY2.

### **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 2-2.

| Category                  | Materials Reviewed                                            |  |  |  |  |
|---------------------------|---------------------------------------------------------------|--|--|--|--|
|                           | Program design document                                       |  |  |  |  |
|                           | PY3 application                                               |  |  |  |  |
|                           | PY3 participant manual                                        |  |  |  |  |
|                           | PY3 RSP manual                                                |  |  |  |  |
| Program design and        | Program calculation and MV guidelines                         |  |  |  |  |
| implementation            | Industrial & Commercial Plan Template                         |  |  |  |  |
|                           | RCx Kick-off presentation                                     |  |  |  |  |
|                           | List of RCx service providers                                 |  |  |  |  |
|                           | Examples of planning, implementation and verification reports |  |  |  |  |
|                           | ComEd RCx overview brochure                                   |  |  |  |  |
|                           | RCx fact sheet                                                |  |  |  |  |
| Program marketing         | 55 West Monroe case study                                     |  |  |  |  |
|                           | Good Samaritan case study                                     |  |  |  |  |
|                           | Compressed Air case study                                     |  |  |  |  |
| RSP training and outreach | RSP RCx brochure example                                      |  |  |  |  |

### Table 2-2. Program Materials Reviewed for PY3 Process Evaluation

#### Interviews with RSPs

The evaluation team conducted in-depth interviews with five of the nine PY3 RSPs. These five RSPs implemented 27 of the 34 PY3 projects. Our questions focused on program awareness, program processes, the effects of the program on business practices, free-ridership, 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.

### **Interviews with Participants**

The evaluation team also completed a Computer Assisted Telephone Interview (CATI) survey with 8 of the 34 PY3 program participants who completed all of the program phases. Our questions focused on program awareness, program participation, marketing and outreach, freeridership and spillover, benefits and barriers to participation. The survey instrument used for these interviews is included in Section 5.

## 2.3 Sampling Plan

## 2.3.1 Impact Sampling

For the impact evaluation, Navigant sampled projects with the stratified ratio estimation method. 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. In our final sample the precision is 8.8% at the 90% confidence level and we reviewed 77% of program savings.

|           | Targeted<br>Population | Population<br>MWh savings | Sample<br>Size | Sample<br>MWh Savings |
|-----------|------------------------|---------------------------|----------------|-----------------------|
| Stratum A | 4                      | 9,112                     | 4              | 9,112                 |
| Stratum B | 10                     | 7,410                     | 7              | 5,321                 |
| Stratum C | 20                     | 6,141                     | 7              | 3,072                 |
| Total     | 34                     | 22,662                    | 18             | 17,505                |

## **Table 2-3 Impact Evaluation Samples**



Within each stratum Navigant selected sites to capture diverse facility types and at least one site from each RSP overall.

### 2.3.2 Process Sampling

The process evaluation team attempted interviews with a census of the nine RSPs and 34 participant customers in the PY3 program. Although the participant interviews were completed via survey, no sampling plan was necessary for the process evaluation because an attempt was made to reach all participants.

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. Given the small population and resulting number of completed interviews, it is best to consider these results to be primarily qualitative.

## Section 3. Program Level Results

### 3.1 Impact Results

The program impact evaluation has several different levels of review. Measure Verification and Due Diligence looks at the methods used to estimate savings, review of the program tracking database to ensure all key data are captured and recorded accurately.

### 3.1.1 Verification and Due Diligence

Measure installation verification for the Retro-Commissioning (RCx) Program is an iterative process that involves the customer, RSP, PA 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 PA must verify savings for ComEd. The evaluator's task is, thus, simplified to spot check measures verified by previous parties and ensure that measures are indeed complete and savings are accurately estimated.

In general, the evaluators concluded that the Verification Report and supporting data and calculations provided sufficient confirmation that the measures were installed as described. Navigant identified nine projects within the impact sample for on-site verification, 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 data centers or 24 hour operation for hospitals). Evaluators visited all nine of these sites in September 2011 and verified installation and planned operation of measures for energy savings. While on-site, Navigant also verified other measures installed at those sites

Due diligence work for this evaluation focused on the savings calculations for each measure. Navigant performed detailed reviews of all calculations and assumptions. 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 erroneous inputs and omissions of relevant impacts and inconsistencies in assumptions from measure to measure on the same system.

Consistency of savings estimation approaches among RSPs was somewhat erratic. Calculation spreadsheets varied from comprehensive to fairly simple, and content and inputs were not



always consistent. For PY3 the PA, with input from ComEd and the evaluators, developed guidelines for analysis approaches and inputs. For PY4 guidelines will be supplemented with calculation templates for common measures. Benefits of the guidelines and templates include:

- Standardized weather data sets. Different data sets can provide different results. ComEd, the evaluator and PA have agreed that TMY2 data will be used in PY3 and the standard will be TMY3<sup>10</sup> data in subsequent years. These resources include sufficient data for determining psychrometric parameters like enthalpy, humidity ratio, dew point temperature, and wet bulb temperature. Some RSPs used alternative data sets in PY3 that were neither TMY2 or TMY3
- The templates include default values for key engineering parameters when measured values are not available, for example: motor loading; motor, fan, and pump efficiency (by size); VFD efficiency; chiller efficiency (by age and/or type); and the "adjusted cube-law exponent" for measures that include VFDs. The RSP Manual states that "Calculations based solely on rules of thumb or unsupported assumptions are not acceptable." In some cases, an RSP must make assumptions for some of these parameters when measured data is not available. The guidelines state a clear priority in input parameters for calculations: (1) measured data; (2) estimates from manuals, nameplates and equipment schedules; and (3) default values.
- Inclusion of latent cooling estimates, where appropriate.

Despite the range of approaches in PY3, there were very few lapses in engineering methods. Frequently, RSPs made assumptions that were 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 costeffective measures frees resources for analyzing more complex measures<sup>11</sup>. From the perspective

<sup>&</sup>lt;sup>10</sup> The TMY3s are data sets of hourly values of solar radiation and meteorological elements derived from a 1976-2005 period or record for a 1-year period. Their intended use is for computer simulations of solar energy conversion systems and building systems to facilitate performance comparisons of different system types, configurations, and locations in the United States and its territories. ... Wilcox, S. and W. Marion. User's Manual for TMY3 Data Sets, NREL/TP-581-43156. April, 2008. Golden, Colorado: National Renewable Energy Laboratory (www.wikepedia.com) <sup>11</sup> During the file review, Navigant called one RSP to ask about the exclusion of secondary cooling and heating savings as a result of turn off air handlers. The RSP reported he had tried to include those savings in earlier phases, but the review process with the PA was taking too much project time; so the RSP simply dropped the secondary effects from their final estimated savings. The evaluator added savings of this sort into the final *ex post* estimates, when there was sufficient supporting information.



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

### 3.1.2 Tracking System Review

Because of the unique nature of retro-commissioning measures, Retro-Commissioning Program participants are not tracked within the overall *Smart Ideas* commercial program tracking database. The PY3 tracking instrument is a modified version of the spreadsheet used in prior program years of the Retro-Commissioning. The spreadsheet tracks project level data such as contacts and milestone dates. This simple spreadsheet was adequate for the PY3 program with relatively low participation, but as the program expands, it will be useful to have a more comprehensive and sortable tracking system such as a relational database format or a more sophisticated spreadsheet. The evaluation found several instances where tracked project-level savings did not match the sum of measure-level savings for the same projects. Measure-level tracking was dropped from the PY3 tracking spreadsheet. The evaluator would like to see this level of detail restored to the tracking spreadsheet or database.

#### 3.1.3 Measure and Savings Persistence

Navigant attempted interviewing a census of PY2 participants about the persistence of key, high-impact measures at each participant site. We focused our questions on control-based measures that normally would be easy to reverse or revise. We were able to interview four PY2participants. Several measures, generally control-based or control/equipment combinations, were reviewed with the sites. Navigant confirmed specific data about measures, applicable (e.g., set-points, schedules). All of the sites confirmed the implemented measures were unchanged and have been working as expected. Typically the project owners are very pleased with the results of the implementation, and there have not been occupant complaints resulting from the measures. The sites routinely monitor the control changes and any new equipment. All but one interviewed site has implemented additional retro-commissioning measures, and in most cases the ComEd-sponsored project was referenced as the catalyst for the later measures.

#### 3.1.4 Gross Program Impact Parameter Estimates

Savings estimates are made at three different stages of the retro-commissioning program process. In the Planning Phase, the RSP estimates saving for all RCMs indentified based on the limited information of the site survey and interviews with facility staff. These estimates provide an input to the decision whether or not the project will proceed to the Program Agreement with the customer and implementation of selected measures.



Savings estimates are repeated during the Implementation Phase based on new data developed through research that might cause differences in how the measures are implemented versus how they were planned. The final savings estimates are developed during the Verification Phase based on performance data acquired after implementation. The final set of savings estimates are the *ex ante* savings for the program. The participants in PY3 represent 4 aspects of the evolving retro-commissioning program.

- Twenty-nine participants are traditional commercial retro-commissioning projects with a study followed by implementation.
- One is a monitoring-based retro-commissioning project at a commercial building. Less reporting is required, but savings must be documented and updated with data captured from the building's automation system. Implementation and verification of measures occurs on a rolling basis
- Three projects are large industrial compressed air projects with compressed air capacity greater than 500HP. The compressed air retro-commissioning projects are planned to become a separate program in future years.
- One is a small-industrial compressed air pilot project to investigate how retrocommissioning can be delivered to this customer group.

| Participant Type     | Count | Average floor<br>area | <i>Ex ante</i> gross<br>MWh | <i>Ex ante</i> gross therms |
|----------------------|-------|-----------------------|-----------------------------|-----------------------------|
| Commercial rCx       | 29    | 667,000               | 20,995                      | 452,981                     |
| Industrial rCx       | 3     | NA                    | 1,077                       | 0                           |
| Small compressed Air | 1     | NA                    | 129                         | 0                           |
| Monitoring Based rCx | 1     | 1,400,000             | 462                         | 0                           |
| Total                | 34    | NA                    | 22,662                      | 452,981                     |

## Table 3-1. *Ex ante* Electric Savings Estimates

### 3.1.5 Gross Program Impact Results

The following figures and tables present information about the sites and RCM impacts. Navigant examined all calculations and reviewed data submitted as part of the verification of savings from the RSP. Our due diligence on the calculations determined that the estimates are, generally, well-developed and defensible, with modest changes – some increasing and some decreasing gross savings.

|               | Verification Phase |         | Evaluation |         | <b>Realization Rates</b> |        |
|---------------|--------------------|---------|------------|---------|--------------------------|--------|
|               | kWh                | therms  | kWh        | therms  | kWh                      | Therms |
| Office Bldg 1 | 2,232,189          |         | 2,356,696  |         | 106%                     | NA     |
| Office Bldg 2 | 461,791            |         | 461,791    |         | 100%                     | NA     |
| Office Bldg 3 | 1,664,000          |         | 1,605,200  |         | 96%                      | NA     |
| Hospital 1    | 907,358            | 32,110  | 834,471    | 29,025  | 92%                      | 90%    |
| Hospital 2    | 733,332            | 39,870  | 819,955    | 28,988  | 112%                     | 73%    |
| Hospital 3    | 566,146            | 43,533  | 618,363    | 44,752  | 109%                     | 103%   |
| Hospital 4    | 288,646            | 36,827  | 288,645    | 36,544  | 100%                     | 99%    |
| Office Bldg 4 | 1,066,890          | 99,742  | 1,022,985  | 99,742  | 96%                      | 100%   |
| Data Center 1 | 730,210            | 11,705  | 736,019    | 11,110  | 101%                     | 95%    |
| Data Center 2 | 677,143            |         | 703,612    |         | 104%                     | NA     |
| Retail        | 3,781,005          |         | 3,033,369  |         | 80%                      | NA     |
| Hospital 5    | 674,246            |         | 677,369    |         | 100%                     | NA     |
| Hospital 6    | 467,881            |         | 227,048    |         | 49%                      | NA     |
| Industrial 1  | 518,956            |         | 518,956    |         | 100%                     | NA     |
| Office Bldg 5 | 1,434,474          |         | 1,500,892  |         | 105%                     | NA     |
| Office Bldg 6 | 476,294            | 18,763  | 479,517    | 18,763  | 101%                     | 100%   |
| Industrial 2  | 543,937            |         | 449,399    |         | 83%                      | NA     |
| Industrial 3  | 128,617            |         | 128,617    |         | 100%                     | NA     |
| Total         | 17,353,115         | 282,550 | 16,462,902 | 268,293 | 94.8%                    | 95.2%  |

## Table 3-2. Savings and Realization Rates by Sampled Site

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

- A large fan control measure estimated savings based on average speed across many fans rather than calculating the power for each fan and averaging the power reduction.
- One site had several measures that were no longer functional and deferred maintenance directives would delay any repairs or follow-up.
- An RSP and customers at two sites found savings from simplified calculations persuasive enough to implement measures, but some aspects of the project savings were not quantified. The RSP reported that the simplifications were a result of program administrative burden to approve more comprehensive calculations.

Other smaller errors were discovered *infrequently* during the evaluation that had lesser impact on overall savings. The types of errors included:

- Not including latent cooling savings
- Not calculating *any* demand savings for measures with peak summer impacts.
- Inappropriate demand savings estimation methods.

None of the errors Navigant discovered through the evaluation process were systematic. Additional diligence by the PA will be needed in the future as the Program grows. Furthermore, calculation templates should reduce these errors.

Navigant grouped the retro-commissioning measures into six broad end-use categories that include most types of measures included in retro-commissioning. Figure 3.1shows the distribution of *ex post* savings among measure end-uses.

- **Chillers** 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.
- Economizer and Ventilation Control includes economizer repair and optimization and ventilation control based on CO<sub>2</sub> levels in return air.
- **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.

- **Heating** are measures that include boiler pumps or terminal box setpoints and/or control.
- **Pump** measures that include primary-secondary pumping controls, variable primary pumping, impeller trimming and proper pump speed control based on feed-back parameters.
- **Compressed Air** measures can include leak detection and repair, compressed air plant optimization through staging or reducing system pressures or low-cost end-use modification such as using engineered nozzles rather than open orifices.

In addition to thinking of measures by end-use, Navigant grouped the measures according to their upgrade type. Figure 3.2 shows the distribution of *ex post* savings among measure types.

- **Scheduling** measures are those that merely turn off equipment (HVAC, compressed air 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.
- **Replacement** measures are relatively few and generally fairly inexpensive for retrocommissioning measures. In PY3 equipment measures included new filter media, damper actuators and air separation drains.

Among the RCMs implemented at the PY3 sites, air handlers and fans are the largest energy savers by end-use. Optimization measures dominate the savings by measure type, and most of the optimization involves chillers and 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 observe while operating.



#### Figure 3.1. Program Evaluated Savings (kWh) by End-Use Category

### Figure 3.2. Program Evaluated Savings (kWh) by Measure Type



#### 3.1.6 Net Program Impact Results

Once gross program impacts have been estimated, net program impacts are calculated by multiplying the gross impact estimate by the Net-to-Gross (NTG) ratios.

NTG Ratio = 1 – Free-ridership + Spillover

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

## $NTG_{overall} = \sum NTG_{site} x kWh_{site} / \sum kWh_{site}$

### Free-Ridership

Free-ridership determination is a combination of three attributes investigated during the participant survey.

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

The evaluation completed interviews with eight participants of an attempted census (34). The free-ridership questions established a free ridership rate of zero for four of the projects, a rate of 0.05 for one project, and 0.44-0.55 for the other three projects. The sites that had indications of free-ridership all had equipment deficiencies and solutions known to the appropriate people in the company. The companies stated that they would have taken all of the completed actions within one to two years even if the program had not been available.

Overall, five of eight interviewed participants were already aware of essentially all performance issues identified by the RCx study, and four of eight were already aware of essentially all recommended solutions. This suggests that the program may be directing its study resources towards opportunities that are already known. Not surprisingly, these participants are the ones who would have implemented the same RCx measures without the program. While awareness of performance issues might help the program identify eligible projects, caution should be given in screening more informed participants, as their participation could result in free-ridership issues in future years.

Interviewed RSPs thought that the program played a large part in the decision making process of participants. They noted that participants often have a general awareness of their equipment performance issues but had little specific knowledge of how to rectify the issues. Without the program's study, RSPs believe that few of the participants would have implemented the retrocommissioning measures on their own.

### **Spillover**

The Evaluation Team researched the question of program spillover. Our PY3 participant survey asked about spillover, including any energy efficient equipment and additional retrocommissioning measures implemented at the facility that did not receive incentives through any utility or government program.

Five interviewed participants reported that they installed energy efficient equipment that did not receive incentives, and two performed additional retro-commissioning without an incentive. However, only one of these participants cited significant influence from the ComEd Retro-Commissioning program in taking these additional actions. This participant installed energy efficient cooling equipment and motors that did not receive utility or government incentives. The participant stated that their participation in the RCx program made them aware of the opportunity, and they made the improvement, despite not being a part of an incentive program. 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 this program.

Net Program savings, are reported in Table 3-3. Due to the relatively small number of projects examined to determine the estimated realization rates at 90/10 confidence precision, Navigant includes the 90% confidence range in the realization rates. An attempted census of participants for the net-to-gross estimate, resulted in a similarly small number of completes and wide bands on the NTG estimate. The confidence interval was estimated with a stratified ratio estimator with a finite population correction factor.

| Gross and Net<br>Parameter Estimates | PY3<br>ex ante | PY3<br>Evaluation<br>Adjusted | Realization<br>Rate | Net-to-<br>Gross Ratio<br>(1-FR) | PY3<br>Evaluation<br>Adjusted<br>Net |
|--------------------------------------|----------------|-------------------------------|---------------------|----------------------------------|--------------------------------------|
| Participants                         | 34             | 34                            | 100%                | NA                               | 34                                   |
| Gross MWh Savings                    | 22,662         | 21,574                        | 95% (± 5%)          |                                  | 15,382                               |
| Gross kW Savings                     | 2,527          | 1,725                         | 68% (±7%)           | 0.713                            | 1,230                                |
| Gross Therm<br>(natural gas) Savings | 452,981        | 431,134                       | 95% (± 4%)          | (± 0.25)                         | 307,399                              |

## Table 3-3. Net Program Savings
### 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's C&I 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.

Three of the eight participants installed additional energy efficient equipment at their facility that received incentives from ComEd. One participant installed energy efficient lighting, cooling, and motors, the second installed efficient lighting, motors, and VFDs, and the third installed efficient motors. However, only one of the participants (with lighting, cooling, and motor installations) stated that their decision to install these measures was greatly influenced by the Retro-Commissioning program; the other two reported neutral influence.

# 3.2 Process Evaluation Results

The process component of the Smart Ideas for Your Business 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.

### 3.2.1 Program Participation

In PY3, the RCx program completed projects at 34 facilities. The average *ex ante* savings per project was 665 MWh per year, with individual projects ranging from 27 MWh to 3,781 MWh. Participants represented a range of building types: office buildings, hospitals, retail, industrial facilities, data centers and hotels. Office buildings and hospitals dominate the project count and overall savings, but one retail project was very large. Figure 3.4 and Figure 3.4 present key summary information about participants and energy savings implemented.



#### **Figure 3.3 Distribution of Project Savings**



| Building Type | Count | % Savings |
|---------------|-------|-----------|
| Office        | 11    | 41%       |
| Industrial    | 4     | 5%        |
| Data Center   | 2     | 6%        |
| Hotel         | 2     | 2%        |
| Retail        | 1     | 17%       |
| Education     | 1     | 0%        |
| Hospital      | 12    | 28%       |
| Religion      | 1     | 1%        |
| Total         | 34    |           |



The facility floor area ranged from 43,000 to 2,016,000 square feet, and annual energy usage ranged from 1,097,000 to 47,083,019 kWh.

#### 3.2.2 Program Changes from PY2

Changes made between PY2 and PY3, included ComEd clarifying what is expected during each phase, redefining implementation deadlines to improve the timeliness of project completions, and piloting two alternative approaches to program delivery. The program also hired additional implementation staff and put in place a new program manager located in Wheaton, Illinois.

Key changes include:

- Adjusting project completion deadlines to align with the project start date. In PY2, the customer implementation deadline was April 1<sup>st</sup> regardless of when during the calendar year the project came into the program. This deadline caused challenges for projects coming in later in the program year, providing less time for later applicants. In PY3, the implementation deadline was shifted to 120 days from the signing of the Participation Agreement.
- Separation of the industrial program offering from the commercial program offering. In PY3, the decision was made to separate out the industrial activities from the commercial activities to accommodate the differences in the types of measures, service providers, and services. The Program Administrator has indicated that further changes will be made in the industrial offer in PY4.
- **Piloted a performance contracting approach.** In PY3, the team piloted a pay for performance approach. Under this approach, providers were paid a per kWh fee based on the verified project savings. 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. In PY4, the pilot has been suspended due to the cost effectiveness and the inclusion of gas in the program in PY4.
- Separated the Implementation Phase into two distinct phases. In PY3, the Implementation Phase was divided into two distinct phases, the Investigation Phase and the Implementation Phase. This change aimed to ease customers through the participation process, making it clear what was expected in each distinct step.

### 3.2.3 Program Processes

### **Participation Process**

RSPs were generally satisfied with the participation process. RSPs new to the program found that the program and its processes were, for the most part, clearly explained by ComEd and Nexant staff. Those RSPs that also participated in PY2 noted that the participation processes improved from PY2 as both the program and RSPs learned how best to implement the program.

Several RSPs noted issues with the program's planning phase. These RSPs noted that, due to the requirements of the program and retro-commissioning in general, they spend a disproportionate amount of time and effort in the planning phase compared to the fee they receive for this phase. RSPs find that about 40% to 60% of the total work occurs in the planning



phase, but they are only compensated for 25% of the total project cost. RSPs believe this difference is due to the program's desire to mitigate risk if the participant leaves the program before completion and question if it is fair to place the financial risk on the RSP. One RSP's suggestion to limit this risk is to hold the participant accountable for a portion of the cost if they abort the project early.

RSPs also raised questions about the similar tasks and level of rigor in the planning and investigation phases. These RSPs believe that the program needs to clarify the difference between the two phases because, as currently designed, the work performed and documentation required is duplicative.

RSPs provided disparate opinions on the change from four phases to five. Most interviewed RSPs thought that the change has little effect on how they implement the program but that the change sometimes resulted in participant confusion. One RSP felt that the change made it easier to explain the program processes to customers.

As was the case in PY2, RSPs highlighted the detailed documentation and review required by the program. RSPs noted that there is a large amount of redundancy in the paperwork and that they are often completing the same information for multiple phases. One RSP with experience in multiple jurisdictions noted that the ComEd Retro-Commissioning program required more documentation compared to other utility programs they work with. In general, RSPs recognize that the paperwork and review processes are necessary but thought that they could be streamlined.

Interviewed participants reported general satisfaction with the participation process. Seven of the eight did not experience any problems during any phase of the project. The one participant who experienced a problem did so in the application phase when it took a long time to get the proper information. Interviewed participants stated that they found the application process to be easy. Seven of the eight interviewed participants completed at least some of the application themselves and found that the application form clearly explained the program requirements and how to participate.

### **Program Timelines**

The ComEd 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, progress was made in more closely meeting these deadlines in PY3 (when compared to PY2). However, there were still some challenges especially in the Implementation Phase where project slippage ranged from two to sixteen weeks over the



expected time. Delays are often the result of customer-oriented staffing issues and delays in the availability of equipment needed for the project. Customer-oriented delays, included waiting on information or data from customers, staff turnover, disengaged staff assigned to the project on the site, and challenges in trying to schedule meetings. The program manager noted that as the program has gained traction in PY3 and RSPs gain experience with the program, the slippages in schedule have decreased (but they are still present).

According to RSPs, projects were unable to meet their intended timelines for three main reasons. First, some delays were caused by lack of resources of the RSPs. One service provider noted that some of their project work was not completed on time because of lack of manpower and resources, but that internal changes fixed that for future program years. Second, several RSPs reported programmatic delays including long delays for review, duplicative documentation, and extensive back and forth communication with Nexant regarding the calculations used in the studies. RSPs with previous experience in the program year progressed the review time at the beginning of PY3 improved from PY2 but as the program year progressed the review time became longer again. Finally, some delays to project schedules resulted from project-related issues, ranging from needing to wait for scheduled down time or the inherent difficulty with implementing measures for customers such as a hospital with complex systems and required 24/7 operation.

One RSP described delays caused by both the project and the program as an example of the difficulty in meeting set timelines. This service provider explained that due to an unseasonably cool spring in Chicago, they and other RSPs were unable to perform the verification phase for HVAC work which requires a certain base temperature. This caused the RSPs to delay submitting the verification for this work until much later than planned. According to the RSP, this issue affected multiple RSPs and projects and, as a result, Nexant received many verification reports at once. In order to meet this demand, new engineers were assigned to review the project documentation and posed clarifying questions to the RSP that had already been answered for the previous engineer `. Although this example is not common, it illustrates how timelines can slip for projects with the level of complexity found in retro-commissioning.

### **Program Drop-Outs**

According to the program manager, there are two main reasons potential participating customers drop out of the program. The first reason is if the project does not qualify during the application phase, e.g., when the benchmark data do not show enough energy savings opportunities, the facility lacks certain control capabilities, or major equipment retrofits are planned for the next year or two.<sup>12</sup> The second common reason is due to changes in the building

<sup>&</sup>lt;sup>12</sup> Applicants who require equipment retrofits are channeled into the prescriptive and custom programs. This is the case in approximately 10% of applications.



ownership or company management during the course of the project. There were no projects that dropped out of the program after the application phase in PY3, though a couple were moved to the PY4 implementation cycle.

### 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 a more detailed tracker with deadlines, information on project costs, what stages each project is in, and the identified kWh savings. The program manager noted that he has enough information to run any sort of analysis needed and that the only upgrade that will be needed will be the addition of the therm savings that will be included in PY4.

#### 3.2.4 Retro-Commissioning Service Providers

The program had nine RSPs that completed projects in PY3. Of these, one completed 10 projects while three completed only one project. Both program staff and RSPs indicated that the third year of the program was more seamless because providers more fully understood the program's processes and requirements. The more projects a RSP performs, the better they become at understanding, explaining, and performing retro-commissioning services. ComEd and Nexant both noted an increase in the quality and a decrease in delivery issues in PY3 as RSPs learned the nuances of the program.

#### **RSP** Performance Reviews

At the end of PY3, 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 less than 40 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 who do not complete a project will receive no points in the performance review and will have to re-apply for the next program year. In PY3, 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 stated that the review did not identify any areas of improvement of which they were unaware. Overall, RSPs stated that it is always beneficial to have their work reviewed by a respected third party such as Nexant. Several RSPs noted that the review's metrics may unduly penalize some firms. For example, the review bases 25% of the rating on the number of projects, so new entrants to the program or smaller firms that can not sufficiently support many projects are derated. The RSP that participated in the Performance Tracking Pilot Program, claimed that their score was adversely impacted because of the set savings per kWh value negotiated for the pilot. RSPs found that the review was also helpful to highlight what the program valued from its service providers to help them meet those expectations in the future.

Program participants were generally very satisfied with their RSPs. Six of the eight interviewed participants found that the RSP was able to meet their needs in terms of identifying measures and provided a rating of 8 or more on a scale of 0 to 10, with 0 meaning not at all able to meet needs and 10 meaning completely able to meet needs. The remaining two participants provided ratings of 4 and 0. Despite this, all eight interviewed participants would recommend their RSP to other firms.

### **Performance Tracking Pilot Program**

One RSP participated in the Performance Tracking Pilot Program in PY3. This RSP found the pilot to work well because it provided an incentive for the RSP to identify more energy savings opportunities. The program set the performance base at 12 cents per kWh. This incentive may have prompted the RSP to perform the most retro-commissioning projects (10) of all RSPs in PY3. However, the mean kWh savings for projects completed by this RSP were lower than all but one commercial RSP and the cost per kWh was highest. Despite the pilot's success in terms of number of projects and acquisition rate, it was ultimately suspended because it was more costly on a per kWh basis than the standard program model.

#### Training

RSPs are required to complete up to 8 hours of annual training to participate in the retrocommissioning program. The trainings are conducted by Nexant through a webinar and take place every two to three months. During PY3, trainings were offered on an *ad hoc* basis and included safety awareness training and several trainings aimed at preparing RPSs for PY4. RSPs that scored well at the end of PY2 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 training on Nexant's calculation templates was not applicable for them due to the kWh



limits of the templates. 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.

### **RSP** Satisfaction

Despite their criticism of some aspects of the program, RSPs were very satisfied with the program overall in PY3 and found that it met or exceeded their expectations. RSPs were very satisfied with the support from ComEd and Nexant, 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.

#### **Effects of Program on RSP Business Practices**

Four of the five interviewed RSPs stated that the ComEd retro-commissioning program had an effect on their business practices. One of those four did not operate in ComEd's service territory before participating. Three of those four added staff as a result of their participation in the retro-commissioning program. One RSP that did not add staff noted that retro-commissioning has helped the firm and allowed it to maintain its current staffing levels in a poor economic climate.

#### 3.2.5 Marketing and Outreach

RSPs remain the primary promoters of the retro-commissioning program and are expected to generate leads. The leads come from a mix of existing and new customers, largely depending on the prior level of activity of the RSP in ComEd's service territory.

Participants learned about the retro-commissioning program in a variety of ways. Although RSPs believe that they are the primary informer of the program, this was contradicted by the responses of program participants. Among the eight interviewed participants, three claim to have first heard about the program through colleagues or word of mouth and two learned about it through the ComEd website. The remaining three respondents cited a ComEd representative, a consultant, and a trade organization as how they first heard about the program. This discrepancy of how participants first learned about the program reveals that customers may hear about the program in many ways but learn about the details from the RSP. Before participating, two of the eight customers spoke or met with a ComEd program representative, not including their account manager or RSP, to learn more about the program. These two participants found the representative to be helpful in explaining the program requirements and incentives.

Five of the eight interviewed participants recalled seeing marketing materials or information from the Retro-Commissioning program. Of those, two recalled the ComEd website, two received emails, and one recalled a brochure. Participants found these materials to be useful in providing information about the program. Program participants identified email as the best way of reaching companies like theirs to provide them with information about energy efficiency opportunities. Flyers/ads/mailings, telephone contact, events, and contact through third party organizations or consultants were also identified as good ways of reaching potential participants.

### **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. One RSP noted that they did not use any materials from the program. Others found the case studies to be particularly helpful, but only if the case study referenced one of their projects. One RSP noted that they develop internal case studies for each of their completed projects and suggested that the program do the same. RSPs and program staff find the marketing collateral to be most effective as a leave-behind. They find that it is best to introduce and explain the program and process in person and then provide the materials as a method for the customer to explain the program internally to others.

### 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 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. Only one participant gave a "dissatisfied" rating to Nexant and stated that the program administrator did not push the report through in a timely fashion.

Participants cited many benefits of participating in the Retro-Commissioning program. The most cited benefit was the free retro-commissioning study that would likely not have been done without the incentive. Other named benefits included proper calibrating equipment and making participants act on some of the performance issues sooner than they might have otherwise, as well as making them aware of other, unknown performance issues. The only identified drawback to participation was having the manpower to assist with the retro-commissioning process.

Based on their experience in the program, all interviewed participants stated that they would recommend the Retro-Commissioning program to their peers inside and outside of their organization. Participants' suggestions for improving the program included offering chilled



plant water optimization as a measure, to further streamline the participation process, and to format the reports similar to LEED reports.

### 3.2.7 Barriers to Participation

According to RSPs and some of the interviewed customers, the primary barrier preventing customers from performing retro-commissioning at their facilities is the upfront cost of the study because any potential energy savings are unknown. The program covers the cost of the study, but some of the initial barrier remains as participants are required to commit to at least \$10,000 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. One RSP also identified participating firms' legal review as a barrier to participation in the program. According to this RSP, some larger companies have to complete an extensive legal review process before making changes to their facilities. Despite the program staff's efforts to encourage the review to begin as soon as possible, the length of time for legal review remains an issue.

RSPs identified two primary barriers that prevent more firms from working with the program: (1) a lack of expertise in retro-commissioning and (2) a lack of presence in ComEd's service territory (for firms who do have retro-commissioning experience). Provided that a firm can overcome these obstacles, participating RSPs believe there are no major barriers to participation.

According to participants, the primary reason that companies do not participate in the Retro-Commissioning program is lack of awareness of the program. Other suggested reasons include that the incentive is enough to justify the time, and having a good engineering staff that could do the work in-house.

# 3.3 Cost Effectiveness Review

This section addresses the cost effectiveness of the Retro-Commissioning Program. Cost effectiveness is assessed through the use of the Illinois Total Resource Cost (TRC) test. The Illinois TRC test is defined in the Illinois Power Agency Act SB1592 as follows:

Total resource cost test' or 'TRC test' means a standard that is met if, for an investment in energy efficiency or demand-response measures, the benefit-cost ratio is greater than one. The benefit-cost ratio is the ratio of the net present value of the total benefits of the program to the net present value of the total costs as calculated over the lifetime of the measures. A total resource cost test compares the sum of avoided electric utility costs, representing the benefits that accrue to

the system and the participant in the delivery of those efficiency measures, to the sum of all incremental costs of end-use measures that are implemented due to the program (including both utility and participant contributions), plus costs to administer, deliver, and evaluate each demand-side program, to quantify the net savings obtained by substituting the demand-side program for supply resources. In calculating avoided costs of power and energy that an electric utility would otherwise have had to acquire, reasonable estimates shall be included of financial costs likely to be imposed by future regulations and legislation on emissions of greenhouse gases.<sup>13</sup>

ComEd uses DSMore<sup>™</sup> software for the calculation of the Illinois TRC test.<sup>14</sup> The DSMore model accepts information on program parameters such as number of participants, gross savings, free ridership, program costs and CO<sub>2</sub> reductions. It then calculates a TRC that fits the requirements of the Illinois Legislation.

One important feature of the DSMore model is that it performs a probabilistic estimation of future avoided energy costs. It looks at the historical relationship between weather, electric use and prices in the PJM Northern Illinois region and forecasts a range of potential future electric energy prices. The range of future prices is correlated to the range of weather conditions that could occur, and the range of weather is based on weather patterns seen over the historical record. This method captures the impact that extreme weather has on electricity prices. Extreme weather generally results in electricity price spikes and creates a skewed price distribution. High prices are going to be much higher than the average price while low prices are going to be only moderately lower than the average. DSMore is able to quantify the weighted benefits of avoiding energy use across years which have this skewed price distribution.

### Results

Table 3-4 summarizes the unique inputs used in the DSMore model to assess the TRC ratio for the Retro-Commissioning program in PY3. Most of the unique inputs come directly from the evaluation results presented previously in this report. Measure life estimates and program costs come directly from ComEd. All other inputs to the model, such as avoided costs, come from ComEd and are the same for this program and all programs in the ComEd portfolio.

<sup>&</sup>lt;sup>13</sup> Illinois Power Agency Act SB1592, pages 7-8.

<sup>&</sup>lt;sup>14</sup> Demand Side Management Option Risk Evaluator (DSMore) software is developed by Integral Analytics.

| Item                                            | Value Used  |
|-------------------------------------------------|-------------|
| Measure Life                                    | 3           |
| Utility Administration and Implementation Costs | \$1,096,815 |
| Utility Incentive Costs                         | \$2,344,638 |
| Net Participant Costs                           | \$2,271,813 |

# Table 3-4. Inputs to DSMore Model for Retro-Commissioning Program

Based on these inputs, the Illinois societal TRC for this program is 0.7 and the program does not pass the Illinois TRC test.

### Section 4. Conclusions and Recommendations

The Retro-Commissioning Program completed its third year of implementation. It continues to evolve to serve ComEd's commercial and industrial market. The program included twenty-nine traditional projects in commercial buildings, but also expanded program offerings to large and small industrial customers with compressed air retro-commissioning. Finally, one monitoring-based retro-commissioning project has been implemented in a commercial office building. Each of these modes of program delivery has varying degrees of promise and must be evaluated for cost-effectiveness

### 4.1 Program Impacts

### 4.1.1 Ex ante Results

The Retro-Commissioning Program implemented savings at 34 participants and achieved *ex ante* energy savings of 22,662 MWh per year, plus significant electric demand reduction and natural gas savings. The latter two metrics are not tracked by the Smart Ideas Retro-Commissioning Program, but they are calculated for the benefit of customers and partnering natural gas distribution companies that co-fund retro-commissioning projects with gas savings potential. Ex ante results for each participant group is shown in Table 4-1.

| Participant Type     | Count | <i>Ex ante</i> gross<br>MWh | <i>Ex ante</i> gross therms |
|----------------------|-------|-----------------------------|-----------------------------|
| Commercial rCx       | 29    | 20,995                      | 452,981                     |
| Industrial rCx       | 3     | 1,077                       | 0                           |
| Small compressed Air | 1     | 129                         | 0                           |
| Monitoring-Based rCx | 1     | 462                         | 0                           |
| Total                | 34    | 22,6662                     | 452,981                     |

Table 4-1*Ex Ante* Program Savings

In most cases the program tracking systems accurately recorded savings detailed in the program Verification Phase. The tracking system does not track savings at the measure level.

### 4.1.2 Ex post Gross Savings Results

The evaluation determined gross savings are based on detailed reviews of project documents and on-site inspection of a sample of program participant sites and measures. In general, we found all but a few measures implemented as described in the reports. The few exceptions involved equipment failure without out repair to prior operating condition. The evaluation found that Service Providers and the Program Administrator are accurately calculating and presenting measure savings to customers and ComEd. Minor details in calculations were adjusted during the evaluation, but they seldom represented significant changes, and they did not represent systematic problems with judgment or estimation techniques. Use of Program Administer-developed calculation templates for PY4 will standardize and simplify savings calculations for common, small-impact (less than 75,000 kWh) measures.

Telephone interviews with PY2 participants indicate strong measure persistence plus the potential for some program spillover as some participants adjust schedules and setpoints to achieve even greater savings. Any spillover was not quantified and savings estimates were not adjusted for spillover. Evaluation gross results are presented in Table 4-2.

### 4.1.3 Freeridership

Overall, five of eight interviewed participants were already aware of essentially all performance issues identified by the retro-commissioning study, and four of eight were already aware of essentially all recommended solutions. This suggests that the program may be directing its study resources towards opportunities that are already known. Not surprisingly, these participants are the ones who would have implemented the same retro-commissioning measures without the program. Having the external feedback of a retro-commissioning study may have caused earlier and more thorough implementation of retro-commissioning measures.

# NAVIGANT

|                                      | lable 4-2      | Ex Post and                   | i Net Program       | Savings                          |                                      |
|--------------------------------------|----------------|-------------------------------|---------------------|----------------------------------|--------------------------------------|
| Gross and Net<br>Parameter Estimates | PY3<br>ex ante | PY3<br>Evaluation<br>Adjusted | Realization<br>Rate | Net-to-<br>Gross Ratio<br>(1-FR) | PY3<br>Evaluation<br>Adjusted<br>Net |
| Participants                         | 34             | 34                            | 100%                | NA                               | 34                                   |
| Gross MWh Savings                    | 22,662         | 21,574                        | 95% (± 5%)          |                                  | 15,382                               |
| Gross kW Savings                     | 2,527          | 1,725                         | 68% (±7%)           | 0.713                            | 1,230                                |
| Gross Therm<br>(natural gas) Savings | 452,981        | 431,134                       | 95% (± 4%)          | (± 0.25)                         | 307,399                              |

# 

#### 4.2 Impact Evaluation Conclusions and Recommendations

Navigant submits the following conclusions about program impacts and recommendations for improvements to future impact analyses.

Savings Calculations. Many savings calculations are conservative in their assumptions due to inherent uncertainty around systems and operator behavior. However, Navigant was also told that some savings was not claimed in the reports because of the burdensome review process for more involved calculations. In this respect the interests of the RSP, PA and ComEd are not aligned. Furthermore, PY4 will have many more qualified RSP firms with varying methods and degree of expertise. Verification and evaluation of savings will become more difficult without clear guidelines.

• Recommendation. An effort should be made to encourage more thorough accounting of savings without putting unreasonable burden on the RSPs. Calculation templates for common measures will help for measures with smaller savings, but complex measures will need balance thoroughness with time needs of the participants and RSPs.

**Demand Savings.** Demand savings is not tracked in the Program Tracking Spreadsheet because ComEd is not claiming demand savings for this program. Navigant found little consistency in the demand savings estimates.

Recommendation. If ComEd does plan to track demand savings from the Retro-Commissioning Program, the Program Administrator must enforce guidelines in the



verification report calculations. Demand savings from retro-commissioning measures is highly site and measure specific.

• **Recommendation.** Even if demand savings is not a focus of the program, RSPs should continue to estimate demand for projects from the *participant* perspective as demand savings can significantly affect project payback.

**Natural Gas Savings.** Gas savings estimates were inconsistently applied and calculated. <u>Project</u> <u>level</u> gas savings realization rates ranged from 9% to 103% plus one site with previously unquantified savings. In future years we expect greater consistency with gas savings estimates as ComEd partners with gas distribution companies to deliver this program.

• **Recommendation.** The Program Administrator should establish guidelines and default assumptions for calculating natural gas savings for common measures: boiler efficiency by size application and/or type, distribution losses, *etc*.

**Persistence.** Persistence of measure installation and thus savings appears to be strong. Telephone interviews with PY2 participants found previously verified measures 100% in place. Furthermore, participants have implemented additional retro-commissioning-type measures or have improved savings of previously verified measures with tighter schedules or more aggressive setpoints. Persistence does not appear to be a problem at this time.

**Free-Ridership.** Free-Ridership with this program increased substantially from PY2. The sites that had indications of free-ridership all had equipment deficiencies and solutions known to the appropriate people in the company. The companies stated that they would have taken all of the completed actions within one to two years even if the program had not been available.

• **Recommendation.** Consider free-ridership in screening of projects. Customers who were already aware of performance issues and solutions before the RCx study would often have implemented the same RCx measures without the program. While awareness of performance issues might help the program identify eligible projects, caution should be given in screening more informed participants, as their participation could result in free-ridership issues in future years.

# 4.3 Process Evaluation Conclusions and Recommendations

Despite the number of projects that miss meeting the deadlines at each phase, it remains important to continue to push to keep customers completing projects within the tight timeframe in order to maintain engagement and to see measures implemented. Continued attention to the program timelines on the Program Administrator, RSP, and customer sides can mitigate



common barriers to program success, such as personnel turn-over, lack of focus, and changing customer priorities. Keeping to the program schedule helps ensure accountability of all parties through implementation.

#### **Program Processes**

Program staff have done a good job incorporating lessons learned from prior program years into the PY3 program design. RSPs and customers find that participation processes are clearly explained. Some RSPs expressed frustration with certain parts of the application and review processes, including duplication of inputs throughout the process and lengthy review from the program administrator. Program timelines still present problems for participants; however this has been improving as RSPs have gained more experience with the program. That noted, overall feedback for the program was very positive.

- **Recommendation.** Re-evaluate the time requirements for each phase as most projects do not meet them and RSPs consider them too aggressive for the work required. Explore flexibility in the legislation-mandated timeline, as you have with early enrollment in PY3 and now PY4. Retro-commissioning projects typically span 1 ½ to 2 years between contract signing and measure implementation.
- **Recommendation.** Streamline the application and review process. For example, reduce duplicate information required for each phase of the project and eliminate review of documents that have already been reviewed and have not changed. Repeated requests for information leads to delays in moving projects forward.

#### **Participant Satisfaction**

Interviewed participants provided high satisfaction ratings for the program. Overall, participants gave very high ratings to their satisfaction with all aspects of the program about which they were asked, including the level of 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. Only one interviewed participant gave a "dissatisfied" rating to Nexant and stated that the program administrator did not push the report through in a timely fashion.

Program participants were generally very satisfied with their RSPs and found that the RSP was able to meet their needs in terms of identifying measures. All eight interviewed participants would recommend their RSP to other firms, though one participant, contacted for impact evaluation questions, was disappointed with their RSP and the scope of the measures recommended.

Based on their experience in the program, all interviewed participants stated that they would recommend the Retro-Commissioning program to their peers inside and outside of their organization. Participants' suggestions for improving the program included offering chilled plant water optimization as a measure and to further streamline the participation process.

• **Recommendation.** Maintain close PA engagement even into the implementation phase to keep projects on track and identify any participation problems early.

### **Retro-Commissioning Service Providers**

Despite their criticism of some aspects of the program, RSPs were very satisfied with the program overall in PY3 and found that it met or exceeded their expectations. RSPs were very satisfied with the support from ComEd and Nexant, but less satisfied with certain elements of the program such as the amount of documentation required and the lengthy review process. In general, RSPs found the program's performance review process and training to be helpful, but offered some suggested improvements. Overall, RSPs found that the benefits of participating in the program outweighed the drawbacks, and their satisfaction was high.

• **Recommendations.** Try to maintain continuity of PA reviewers for each project so that settled questions at one stage do not reappear later in later phases of the program.

# Marketing and Outreach

RSPs remain the primary promoters of the retro-commissioning program and are expected to generate leads. Based on their feedback, ComEd and Nexant provide a sufficient level of support for outreach, but RSPs feel that the development of additional case studies and project leads would be welcome.

- **Recommendation.** Assist RSPs develop their *own* case studies for the Program, while maintaining a consistent message about t the Retro-Commissioning Program as a whole. This might include developing a case study template with Program boiler-plate information that can be substituted in future years as the program evolves.
- **Recommendation.** Continue to monitor the number of leads generated by RSPs and the rate of conversion into completed projects. Leads that do not turn into completed projects might become an issue, if the program has to spend resources on processing a lot of ineligible leads and might lead to dissatisfaction among customers who do not qualify for the program.
- **Recommendation.** Increase engagement of ComEd account managers in program outreach. Given that retro-commissioning is not a widely known concept, program staff and RSPs find that it is most effective to introduce the program in person. Account managers would be ideally suited to inform their large customers of the program and its opportunities.

**Program Tracking Data.** In PY3 the Program Tracking Spreadsheet is overwhelmed with 34 participants. Future growth in the program cannot be adequately tracked in a spreadsheet.

• **Recommendation.** The PA should migrate to a database as a tracking platform. The tracking database should also track measure-level savings rather than only project-level data.

**Program quality control.** Continue strong communication and feedback practices among all parties, but do not penalize firms unnecessarily on some performance metrics:

- Sharing of technical or process issues with RSPs and participants as soon as possible, either in the initial meetings about the project or in RSP trainings. This will help lower the learning curve for newer RSPs by relaying the lessons learned from past projects.
- Rating of RSP's performance. This is a helpful tool for the program and the RSPs to evaluate service providers and ensure that they are active in the program and deliver high quality work.
- Soliciting feedback from customers about the program as well as their RSP.
- **Recommendation.** Review the RSP scoring criteria to ensure that smaller firms who cannot produce the same number of completed projects as larger firms are not unfairly penalized because of their inability to scale up. Consider setting individual RSP goals at the start of a contract year, based on RSP size, and scoring based on accomplishment towards that goal.



Section 5. Appendices

5.1 Data Collection Instruments



# ComEd C&I Retro-Commissioning Program

# RCx Participant Survey

# September 20, 2011

# Introduction

Hello, this is \_\_\_\_\_ from Opinion Dynamics calling on behalf of ComEd regarding your company's participation in the Retro-Commissioning program. May I please speak with <CONTACTNAME>?

Our records show that <COMPANY> participated in ComEd's Smart Ideas for Businesses Retro-Commissioning Program, 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 about this project. Is this correct? [IF NOT, ASK TO BE TRANSFERRED TO MOST KNOWLEDGABLE PERSON OR RECORD NAME & NUMBER.]

This survey will take about 15 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.

### I. Process Module

- S1. How did you first hear about the Retro-Commissioning Program?
  - 1. (Retro-commissioning service provider, "RSP")
  - 2. (ComEd representative/staff)
  - 3. (ComEd Website)
  - 4. (Friend/colleague/word of mouth)
  - 5. (Contractor)
  - 00. (Other, specify)
  - 98. (Don't know)
  - 99. (Refused)

S1A. Before deciding to participate in the program, did you speak or meet with a ComEd

OPINION DYNAMICS

program representative about the Retro-Commissioning Program, not including your account manager or retro-commissioning service provider (RSP) ?

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

[ASK IF S1A=1]

- S1B. On a scale of 0 to 10, where 0 is "not at all helpful" and 10 is "very helpful", how helpful was the program representative in explaining program requirements and incentives? [Record 0-10; 98=Don't know; 99=Refused]
- S1C. Before participating in the Retro-Commissioning Program, did you have a prior working relationship with your retro-commissioning service provider whom I will refer to as your RSP throughout this survey?
  - 1. Yes
  - 2. No
  - 8. (Don't know)
  - 9. (Refused)
- S2. How would you rate your RSP's ability to meet your needs in terms of identifying measures and facilitating their implementation? Please use a scale from 0 to 10, where 0 is "not at all able to meet needs" and 10 is "completely able to meet needs". [SCALE 0-10; 98=Don't know, 99=Refused]
- S3. Would you recommend the RSP you worked with to other people or companies?
  - 1. Yes
  - 2. No
  - 8. (Don't know)
  - 9. (Refused)

[ASK IF S3=2]

- S3A. Why not? [OPEN END; 98=Don't know, 99=Refused]
- S4. Did YOU fill out all or some of the program application forms for the project?
  - 1. Yes, all of it
  - 2. Yes, some of it
  - 3. No
  - 8. (Don't know)
  - 9. (Refused)

[ASK IF S4=1, 2 ELSE SKIP TO S4d]

S4A. Did the application form clearly explain the program requirements and how to participate?

- 1. Yes
- 2. No
- 3. (Somewhat)

- 8. (Don't know)
- 9. (Refused)
- S4B. How would you rate the application process overall? Please use a scale of 0 to 10 where 0 is "extremely difficult" and 10 is "extremely easy". [SCALE 0-10; 98=Don't know, 99=Refused]

[ASK IF S4B<4]

S4C. Why did you rate it that way? [MULTIPLE RESPONSE, UP TO 3]

(Difficult to understand)
 (Long process)
 (Other, specify)
 (Don't know)

99. (Refused)

[ASK IF S4=3]

S4D. Who filled out the application for the project?

1. (Someone else at the facility)

2. (Someone else at the company)

3. (Retro-commissioning Service Provider, RSP)

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
  - 2. No

8. (Don't know)

9 (Refused)

# [ASK IF MK1=1, 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. (ComEd website)
- 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=3, 4]

MK3. What would have made the materials more useful to you? [MULTIPLE RESPONSE, UP TO 3]

- (More detailed information)
   (Where to get additional information)
- 00. (Other, specify)
- 98. (Don't know)
- 99. (Refused)
- MK4. 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**

- PS1. Thinking about your experience with the program, did you experience any problems during any of the phases of the participation process?
  - 1. Yes
  - 2. No
  - 8. (Don't know)
  - 9. (Refused)

[SKIP TO PS3 IF PS1=2,8,9]

PS2a. In what phase did you experience problems? [Multiple Response, up to 5]

- 1. (Application phase)
- 2. (Planning phase)
- 3. (Investigation phase)
- 4. (Implementation phase)
- 5. (Verification phase)
- 8, (Don't know)
- 9. (Refused)

PS2b. What problems did you experience? [OPEN END; 98=Don't know, 99=Refused]

- 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 commitment required to receive the free study
  - 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. the Retro-Commissioning program overall
  - f. ComEd overall

# [ASK IF PS3a<4]

PS4a. You indicated some dissatisfaction with the level of commitment required to receive the free study, why did you rate it this way? [MULTIPLE RESPONSE, UP TO 3] [OPEN END; 98=DK; 99=REF]

# [ASK IF PS3b<4]

PS4c. You indicated some dissatisfaction with the information provided in the retrocommissioning study, why did you rate it this way? [MULTIPLE RESPONSE, UP TO 3] [OPEN END; 98=DK; 99=REF]

# [ASK IF PS3c<4]

- PS4c. You indicated some dissatisfaction with the program administrator's staff (Nexant), why did you rate it this way? [MULTIPLE RESPONSE, UP TO 3]
  - 1. (Provided inconsistent information)
  - 2. (Didn't understand the question)
  - 3. (Hard to reach the right person/person with the answer)
  - 00. (Other, specify)
  - 98. (Don't know)
  - 99. (Refused)

[ASK IF PS3c<4]

- PS4d. You indicated some dissatisfaction with the Smart Ideas for your Business Program staff (Nexant), why did you rate it this way? [MULTIPLE RESPONSE, UP TO 3]
  - 1. (Provided inconsistent information)
  - 2. (Didn't understand the question)
  - 3. (Hard to reach the right person/person with the answer)
  - 00. (Other, specify)
  - 98. (Don't know)
  - 99. (Refused)

[ASK IF PS3d<4]

PS4e. You indicated some dissatisfaction with the Retro-Commissioning program overall, why did you rate it this way? [OPEN END; 98=Don't know, 99=Refused]

# [ASK IF PS3e<4]

PS4f. You indicated some dissatisfaction with ComEd, why did you rate it this way? [MULTIPLE RESPONSE, UP TO 3]
1. (Rates are too high)
2. (Poor customer service)
3. (Poor power supply/service)
00. (Other, specify)
98. (Don't know)
99. (Refused)

# **Retro-Commissioning NTG**

I would now like to ask you a few questions about your company's decision to perform retrocommissioning at your facility.

- N1. What was the main factor that prompted you to start thinking about performing retrocommissioning at your facility? [OPEN END; DK=98; REF=99]
- N2a. Before learning about the ComEd Retro-commissioning Program, had you ever conducted retro-commissioning at this facility or any of your other facilities?
  - 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 N3 IF N2a=4, 98, 99]

- N2b. Did you receive an incentive or another form of financial support for performing this previous retro-commissioning work?
  - 1. Yes
  - 2. No
  - 8. (Don't know)
  - 9. (Refused)

# [SKIP N3 IF N2a=1,3]

- N3. And before learning about the ComEd Retro-commissioning Program, had you ever considered performing retro-commissioning at this particular facility?
  - 1. Yes
  - 2. No
  - 8. (Don't know)
  - 9. (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 ComEd 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 sponsored retrocommissioning 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 Account Manager [ASK IF ACCTM=1]
- N4e. The continued technical assistance provided by the RSP after the study phase
- 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 N5 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]
- N5. 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 N9 IF N5=3, 8, 9]

[SKIP TO N7 IF N5=1]

- N6. 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]
  - d. Compressed air system [ASK IF COMPRESS=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]
- N7. My next questions are about your awareness of the recommended measures and/or

actions to rectify the issues identified in the study. Would you say you were aware of all, some, or none of the recommended measures before the study?

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

# [SKIP TO N9 IF N7=1, 3, 98, 99]

- N8. Which measures or actions were you aware of? Were you aware of the measures or actions related to the... (1=Yes, 2=No, 8=Don't know, 9=Refused)
  - a. Air handler <AIRHAND2> [ASK IF AIRHAND=1 AND (N6a=1 OR N5=1)]
  - b. Boiler <BOILER2> [ASK IF BOIL=1 AND (N6b=1 OR N5=1)]
  - c. Chiller <CHILL2>[ASK IF CHILL=1 AND (N6c=1 OR N5=1)]
  - Compressed air system <COMPRESS2> [ASK IF COMPRESS=1 AND (N6d=1 OR N5=1)]
  - e. Cooling tower <CTOWER2> [ASK IF CTOWER=1 AND (N6e=1 OR N5=1)]
  - f. Economizer <ECON2> [ASK IF ECON=1 AND (N6f=1 OR N5=1)]
  - g. Fans <FAN2> [ASK IF FAN=1 AND (N6g=1 OR N5=1)]
  - h. Heating system <HEAT2> [ASK IF HEAT=1 AND (N6h=1 OR N5=1)]
  - i. Lighting system <LIGHT2>[ASK IF LIGHT=1 AND (N6i=1 OR N5=1)]
  - j. Pumps <PUMP2>[ASK IF PUMP=1 AND (N6j=1 OR N5=1)]
- N9. And if the ComEd 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 ComEd-sponsored study?
  - 1. All
  - 2. Some
  - 3. None
  - 8. (Don't know)
  - 9. (Refused)

# [SKIP IF N9=1, 3, 98, 99]

- 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)
  - 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)]
  - d. Compressed air system <COMPRESS2> [ASK IF COMPRESS=1 AND (N8d=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)]

[SKIP IF N9=3,8,9]

- N11. Without the program, when do you think you would have performed these actions? Would you say...
  - 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. Less than 1 year later
- 2. 1 year later
- 3. 2 years later
- 4. 3 years later
- 5. 4 or more years later
- 8. (Don't know)
- 9. (Refused)

# [ASK IF MULTIPLE FACILITIES=1, ELSE SKIP TO CH1]

N13. Our records indicate that your company completed [#PROJECTS] projects through the program. Was your decision to participate in the program the same for each project?

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

# 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 received incentives from ComEd
  - b Installed any additional energy efficient equipment at this facility that 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

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

- CH2. What type of energy efficient equipment did you install that received incentives from ComEd? 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 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 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
  - f Something else (specify)

[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]

# **Benefits and Barriers**

- B1. What do you see as the main benefits to participating in 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)
  - 00. (Other, specify)
  - 98. (Don't know)
  - 99. (Refused)
- B2. What do you see as the drawbacks to participating in 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)
- B3. What do you think are the reasons companies like yours do not participate in this program? [MULTIPLE RESPONSE, UP TO 3]
  - 1. (Lack of awareness of the program)
  - 2. (Not aware of savings/don't realize the savings)
  - 3. (Time consuming application process)
  - 4. (No time)

00. (Other, specify) 96. (None) 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. How could the Retro-Commissioning Program be improved? [MULTIPLE RESPONSE, UP TO 4]
  - 1. (Higher incentives)
  - 2. (More 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 factility? (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, are employed 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!

### ComEd C&I Retro-Commissioning Program – RSP Interview Guide September 13, 2011

#### New RSPs PY3

| 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 Opinion Dynamics, an independent research firm, on behalf of ComEd. We're talking to contractors who are currently service providers in ComEd's Smart Ideas for your Business Retro-Commissioning Program.

We are interested in your experience with the program and any feedback you may have received about the program from your customers. ComEd plans to use this information 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 Awareness

- 1. How did you learn about the Retro-Commissioning Program? [PROBE FOR: RFQ from ComEd, previous work with C&I program, conference/event, from customer, program staff, etc.]
- 2. How do your customers typically learn about the Retro-Commissioning Program? [Probe with: Do you tell them about it? Colleagues? Marketing materials from ComEd? Are they already aware of the program?]

### II. Program Processes

3. How satisfied have you been with the participation process? [PROBE FOR: Application phase, planning phase, investigation phase, implementation phase, verification phase] Did you have any difficulty meeting the required deliverables for each phase (probe for timeline, required information)? If so, please explain.

- 4. Did you have any (other) difficulties with the participation process? Are there aspects of the program that you think could be improved to make this process work better? Please explain.
- 5. Do you think that ComEd adequately explains the program processes and requirements to participating service providers? What about to their customers? Please explain. If not adequate, what could be done to more effectively communicate this information?
- 6. Have you received any feedback from customers about the participation process? [PROBE: What is it like from the customers' point of view to participate in the program in terms of the application process, incentive levels, payment processing?]

### III. Effects of Program on Business Practices

- 7. Why did you become an RSP with the ComEd Retro-Commissioning program? Did you provide these services before becoming a program RSP?
- 8. Of the [XX] customers for whom you have performed RSP services in Program Year 3 (June 2010 to May 2011), how many did you have a prior working relationship with?
- 9. How important, would you say, has the program been on how frequently you recommend and perform RCx services for customers in ComEd's service territory?
- 10. Before participating in the program...
  - a. how often did you perform RCx services in ComEd's service territory? (Number of projects? Percent of business volume?)
  - b. in what percent of sales situations did you recommend retrocommissioning to eligible customers?
- 11. How about now that you have worked with the ComEd RCx program?
  - a. how often do you perform RCx services in ComEd's service territory? (Number of projects? Percent of business volume?)
  - b. in what percent of sales situations do you recommend retrocommissioning to eligible customers?
- 12. Is there a difference in how you promote or perform retro-commissioning inside and outside of the ComEd service territory?
- 13. Have you made any changes to your business as a result of participating in the RCx program? [PROBE: hired more staff, opened up new offices, changed marketing.]

### IV. General Attribution

I have a few questions about the retro-commissioning projects your firm completed through the program in PY3.

- 14. How likely is it that your customers would have had the same retrocommissioning services performed if the program had not been available? (Very, somewhat, not very, not at all likely. If necessary, probe by project.)
- 15. In general, how aware were these customers of the equipment performance issues identified through the retro-commissioning study PRIOR to conducting the study? (*Very, somewhat, not very, not at all aware.*) Are there any issues that customers are typically more/less aware of? Does awareness vary by type of customer, size of the facility, anything else?
- 16. In general, how aware were your customers of the measures and/or upgrades recommended to them prior to the retro-commissioning study? (*Very, somewhat, not very, not at all aware.*) Are there any measures and/or upgrades that customers are typically more/less aware of? Does awareness vary by type of customer, size of the facility, anything else?

# V. Marketing and Outreach

- 17. In PY3, the RCx program did not do a lot of outreach or promotion directly to customers. Do you think more outreach by ComEd is needed? What types of outreach do you think would be most successful?
- 18.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 ComEd provides? If so, how effective do you think they are? How valuable is the cobranding ComEd offers? Is there anything that the program or ComEd could do to help you be more effective in promoting this program to your customers?

# VI. Channeling into Other C&I Programs

19. How aware are you of the requirements and offerings of ComEd's other programs for business customers (e.g., prescriptive incentives, custom incentives)? Have you participated in these programs? When screening potential projects for participation in the RCx program, do you identify opportunities for equipment upgrades that might be eligible for incentives through these programs? If no, why not?

# VII. RSP Training

20. Have you participated in the RSP trainings offered by ComEd? What classes have you taken? [Probe for implementation training, safety training.] Was the training helpful? [Probe by class.] Please explain.
- 21. 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 the Retro-Commissioning program to customers?
- 22. 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 Nexant/ComEd?

#### VIII. RSP Performance Review/Ranking

- 23. The RCx program conducts a performance review and ranking of all RSPs that participate in the program. Did you find this review to be a useful and fair process? Do you think the performance criteria are appropriate? Please explain.
- 24. Did you find the feedback you received through the review helpful? Did the report identify any areas for improvement of which you were not aware? Did you disagree with any of the findings? Please explain.
- 25. Do you have any suggestions of how to make this review process more useful?

#### IX. Barriers to Participation

- 26. 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?
- 27. 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?
- 28. What do you see as the main barriers preventing firms like yours from participating or participating more in the program?

#### X. Program Feedback and Recommendations

- 29. In general, how satisfied are you with the ComEd Retro-Commissioning program? Has it met your expectations? Please explain.
- 30.Do you have any recommendations on how to improve the program or the role that service providers play in the program?

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



### ComEd C&I Retro-Commissioning Program –RSP Interview Guide September 7, 2011

Continuing RSPs PY3 (Sieben, Airometrix, Hill, Gumman-Butkus)

| 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 Opinion Dynamics, an independent research firm, on behalf of ComEd. We're talking to contractors who are currently service providers in ComEd's Smart Ideas for your Business Retro-Commissioning Program. We spoke with you/somebody 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 the second year of your firm's involvement in this program and any feedback you have received about the program from your customers. ComEd 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 could be improved? Please explain.
- 2. We were told that the program is now being described as a five phase program [Application phase, planning phase, investigation phase, implementation phase, verification phase]. Has this change affected you as the RSP or the customer? How? Has it facilitated the participation process for either you or the customer? Have you received any other feedback from customers on the participation process?
- 3. Did you have any difficulty meeting the required deliverables for each phase (probe for timeline, required information)? [Probe to see how the new 120 day requirement for implementation compares to the previous April 1<sup>st</sup> deadline.] If so, please explain.
- 4. Are there aspects of the program that you think could be improved? Please explain.

# II. Effects of Program on Business Practices

- 4. Of the [XX] customers for whom you have performed RSP services in Program Year 3 (June 2010 to May 2011), how many did you have a prior working relationship with?
- 5. How important, would you say, has the program been on how frequently you recommend and perform RCx services for customers in ComEd's service territory?
- 6. Have you made any changes to your business as a result of participating in the second year of the RCx program? [PROBE: hired more staff, opened up new offices, changed marketing.]

# III. Performance Contracting Pilot [ASK OF SIEBEN ONLY]

7. Our records indicate that you participated in a Performance Contracting pilot during PY3 [paid based on the kilowatt hours that were verified through the verification process]. Can you please describe how this worked? What worked well about this approach, what improvements could have been made?

# IV. General Attribution

I have a few questions about the retro-commissioning projects your firm completed through the program in PY3.

- 8. How likely is it that your customers would have had the same retrocommissioning services performed if the program had not been available? (Very, somewhat, not very, not at all likely. If necessary, probe by project.)
- 9. In general, how aware were these customers of the equipment performance issues identified through the retro-commissioning study PRIOR to conducting the study? (*Very, somewhat, not very, not at all aware.*) Are there any issues that customers are typically more/less aware of? Does awareness vary by type of customer, size of the facility, anything else?
- 10. In general, how aware were your customers of the measures and/or upgrades recommended to them prior to the retro-commissioning study? (*Very, somewhat, not very, not at all aware.*) Are there any measures and/or upgrades that customers are typically more/less aware of? Does awareness vary by type of customer, size of the facility, anything else?

# V. Marketing and Outreach

- 11. In PY3, the RCx program did not do a lot of outreach or promotion directly to customers. Do you think more outreach by ComEd is needed? What types of outreach do you think would be most successful? How do customers typically learn about the Retro-Commissioning Program? [Probe with: Do you tell them about it? Colleagues? Marketing materials from ComEd? 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 ComEd provides? If so, how effective do you think they are? How valuable is the cobranding ComEd offers? Is there anything that the program or ComEd could do to help you be more effective in promoting this program to your customers?

# VI. Channeling into Other C&I Programs

13. How aware are you of the requirements and offerings of ComEd's other programs for business customers (e.g., prescriptive incentives, custom incentives)? Have you participated in these programs? When screening potential projects for participation in the RCx program, do you identify opportunities for equipment upgrades that might be eligible for incentives through these programs? If no, why not?

#### VII. RSP Training

- 14. In PY3, did you participate in the RSP training offered by ComEd? What classes did you take? [*Probe for implementation training, safety training.*] Was the training helpful? [*Probe by class.*] Please explain.
- 15. 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 the Retro-Commissioning program to customers?
- 16.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 Nexant/ComEd?

### VIII. RSP Performance Review/Ranking

In PY3, the RCx program continued its annual performance review of RSPs that participated in the program.

- 17. Did you find the feedback you received through the review helpful? Did the report identify any areas for improvement of which you were not aware? Did you disagree with any of the findings? Please explain.
- 18.Do you have any comments about the review process or suggestions for how to make it more useful?

# IX. Program Feedback and Recommendations

- 19. Have you received any other feedback from customers on the participation process?
- 20. In general, how satisfied are you with the ComEd Retro-Commissioning program? Has it met your expectations? Please explain.
- 21. How did your experience in PY3 compare to that in PY2?
- 22.Do you have any recommendations on how to improve the program or the role that service providers play in the program?

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