

2010 Retrocommissioning Program

a BGE Smart Energy Savers ProgramSM



Full RCx Services Process Manual

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Section 1: Introduction

1.1 Program Overview

Buildings frequently undergo operational and occupancy changes that impact the electrical, mechanical and controls systems, hindering optimal performance. In today's complex buildings, systems are highly interactive. The increased need for system integration, due to the presence of sophisticated control systems, results in a trickle-down effect on building operations—small problems have big effects on performance. Retrocommissioning (RCx) helps ensure that building equipment and systems are integrated so they perform together effectively, efficiently and meet the building owner's current operating requirements and expectations.

One of the primary objectives of BGE's Smart Energy Savers ProgramSM is to offer its customers every opportunity to manage their energy expenses. The Retrocommissioning Program (RCx Program) is suited to fit within BGE's existing energy efficiency programs by offering energy engineering services and incentives for low-cost and no-cost measures. The RCx Program is designed to achieve electric demand and energy savings in industrial and commercial (I&C) facilities through improvements in how facilities systems are operated and maintained. Savings generated from RCx projects are realized through the systematic evaluation of facility systems and implementation of cost-effective measures targeted to improve facility operation that, in many cases, also improve occupant comfort.

Program participants are BGE I&C customers on service rates GL and P who have demonstrated a commitment to spend \$15,000 to implement identified RCx measures with an estimated simple payback of 1.5 years or less based on electric savings.

Eligible sites include existing commercial, industrial, government and institutional facilities with significant energy-saving opportunities related to facility or process operations and maintenance (O&M). In addition, program participants should have no major renovation or large capital investments pending, relatively high energy use index (EUI) compared to EUIs of similar buildings, and facility owner and operating staff commitments for active involvement in the process.

BGE will provide project-by-project funding incentives that cover up to 75 percent of the study and implementation costs, with a per project funding cap of \$15,000. BGE may also provide incentives, through other efficiency program offerings, to the building owner to offset implementation costs for recommended, low-cost measures if the estimated simple payback exceeds 1.5 years. For projects that have estimated simple payback periods of less than 1.5 years, no additional incentives are available.

To accommodate the needs of various sized customers, BGE's RCx Program offers two distinct levels of services:

- **Enhanced O&M Services:** Enhanced O&M Services targets commercial facilities with less than 75,000 square feet and not operationally complex, and industrial process systems. This service offering is designed to have a streamlined approach that focuses primarily on RCx measures expected to yield the quickest return on investment. Elements typical in the Enhanced O&M Services Program include (but are not limited to): calibration of building systems and controls, replacing equipment filters, cleaning evaporator and condenser coils, sealing air and water leaks, re-balancing air handling systems and education of facility personnel. The intent is to make the calibrations and operational changes identified in the Action Plan to capture the projected energy savings.
- **Full RCx Services:** Full RCx Services is targeted at BGE's large I&C customers and is more comprehensive in nature than the Enhanced O&M Services with respect to the elements contained in the investigation phase and implementation recommendations. Full RCx Services are available to facilities that are typically greater than 75,000 square feet, have an energy management system with comprehensive direct digital control, and complex HVAC systems. Elements in Full RCx Services typically include (but are not limited to): HVAC calibrations, diagnostic and function tests of major systems and equipment, air and water systems balancing, calibration of energy management and control, and O&M tune ups and education.

1.2 Retrocommissioning Process

Retrocommissioning is a systematic assessment process for optimizing the performance of an existing building by identifying and implementing relatively low-cost operational and maintenance improvements. Each RCx project's focus, goals, and level of execution depend on the needs of the owner and occupants, the budget, and the condition of the facility and equipment.

Retrocommissioning is used to:

- Reduce energy and demand costs
- Bring equipment to its proper operational state
- Reduce occupant complaints
- Improve indoor environmental quality
- Reduce pre-mature equipment failures
- Improve facility operation and maintenance procedures
- Reduce staff time spent on emergency or complaint calls

There is no one-size-fits-all approach for retrocommissioning since each building is unique. BGE recognizes that within the commissioning marketplace, there are many variations and interpretations of what constitutes a retrocommissioning process. The process delivers a more in-depth analysis than a simple energy audit or building tune up. The process identifies equipment, system, and operational improvements and provides customers with the guidance and training on how to optimally operate and maintain their facilities. This Process Manual is intended to define the requirements of BGE's Full RCx Services process. For consistency and to promote best practices, BGE has adopted many of the recommendations made by the Building Commissioning Association's (BCA) Best Practices in Existing Building Commissioning. Processes adopted from the BCA guide are indicated with a ^{BP} sign. More information on commissioning guidance and sample commissioning documents are provided in the attached appendices.

1.3 Process Manual Audience and Intended Use

This RCx Process Manual is specifically designed for use by Retrocommissioning Service Providers (RSPs) working with BGE customers that are interested in pursuing Full RCx Services. It is not intended for project pursuing the Enhanced O&M Services. It is intended to serve as a means to educate, and communicate program processes to implement high quality retrocommissioning services. This manual provides information about the roles and responsibilities of RSPs in the program and the RCx team members. It is intended to supplement the general program information provided in the Participant Manual.

Section 2: Full RCx Services Overview

2.1 Full RCx Services Description

BGE's RCx program provides expert building analysis at a reduced cost to help customers optimize the performance of their existing buildings. Financial incentives are available to participants to reduce the cost of this analysis and to offset implementation costs for recommended, low-cost measures if the estimated simple payback exceeds 1.5 years. Engineering support or incentives are not available for capital equipment measures or for new construction projects. However, these opportunities may be eligible for incentives through the Energy Solutions for Business Program.

Full RCx Services are primarily targeted to BGE customers (existing buildings only) with an unusually high energy use, persistent failure of equipment and controls, tenant complaints or indoor air quality problems. Full RCx Services review and assess all energy equipment with a primary focus on HVAC, lighting controls, ventilation, and automated building controls. Full RCx Services consists of six distinct phases for each project:

- | | |
|-----------------------|------------------------|
| 1 Application Phase | 4 Implementation Phase |
| 2 Planning Phase | 5 Hand-Off Phase |
| 3 Investigation Phase | 6 Verification Phase |

The following table provides an overview of the key activities associated with each phase of the process.

RCx Process Overview		
Phase	Activity	
Application Phase	<ul style="list-style-type: none"> ▪ Building owners submit program application including proposal for development of preliminary scope of services document ▪ BGE reviews application and makes decision 	<ul style="list-style-type: none"> ▪ Letter of Intent for preliminary scoping services signed between BGE and customer
Planning Phase	<ul style="list-style-type: none"> ▪ Select the project ▪ Assemble the RCx team ▪ Hold a project kick-off meeting ▪ Set project objectives and obtain support ▪ Perform an initial site walk-through ▪ Benchmark using Portfolio Manager™ 	<ul style="list-style-type: none"> ▪ Develop the preliminary scope of services document ▪ Full RCx Services Building Owner's Agreement signed between BGE and customer ▪ Document the current operating requirements ▪ Develop the RCx plan
Investigation Phase	<ul style="list-style-type: none"> ▪ Review facility documentation ▪ Perform diagnostic monitoring ▪ Perform functional tests ▪ Perform simple repairs 	<ul style="list-style-type: none"> ▪ Develop Master List of Findings ▪ Prioritize and select operational improvements
Implementation Phase	<ul style="list-style-type: none"> ▪ Develop implementation plan ▪ Implement selected operational improvements 	<ul style="list-style-type: none"> ▪ Verify results
Hand-Off Phase	<ul style="list-style-type: none"> ▪ Develop final report ▪ Compile a systems manual ▪ Develop recommissioning plan 	<ul style="list-style-type: none"> ▪ Provide training ▪ Hold close-out meeting ▪ Implement persistence strategies
Verification Phase	<ul style="list-style-type: none"> ▪ Re-test and monitor ▪ Explain performance variances from expectations ▪ Update energy savings estimates as necessary 	<ul style="list-style-type: none"> ▪ BGE verification of RCx measures ▪ Incentive processed

Detailed information for each of the six phases is presented in Section 4 of this manual.

2.2 Eligibility

Customers must meet the following minimum eligibility requirements to be considered for the RCx Program:

- The facility must be a commercial, industrial, institutional, school or government building receiving distribution services from BGE on service rate GL or P and typically have a minimum of 75,000 square feet of conditioned space.
- The facility must have an existing building or energy management system (EMS) with direct digital control (DDC) of major facility HVAC systems.
- The facility must have accessible and up-to-date building documentation and records.
- The facility must be free of major maintenance problems requiring costly repairs or replacements and have no planned major system renovations or retrofits.
- A commitment by the owner and the facility staff to be actively involved in the entire retrocommissioning process. This includes:
 - Providing access to the facility
 - Providing time for facility personnel to interface with the RSP
 - Providing and assisting with the reporting and collection of pertinent facility information
 - Participating in training
 - Performing ongoing O&M after the formal RCx process
- The facility owner must express a willingness to commit at least \$15,000 funding and staff resources for completing the project plan and implementing approved RCx measures with an estimated simple payback of 1.5 years or less.
- Plans to implement identified and approved measures within 6 months of BGE's approval of the final report. These measures must be installed within 6 months of BGE's approval of the final report or no incentive will be paid.

Customers must complete and submit a Full RCX Services application and receive written approval from BGE prior to initiating an RCx project. In reviewing program applications, BGE will select applicant buildings that meet the above criteria and program goals for cost effectiveness, energy savings, and verifiability. Facilities with high normalized demand (peak kW/ft²) and annual energy costs and/or have a low ENERGY STAR® rating from Portfolio Manager™ are good candidates for program participation. BGE's decision regarding selection of program applicants for the RCx Program will be final and binding for all parties.

2.3 Costs and Benefits

RCx projects typically identify energy-saving opportunities that can be expensed in the customer's accounting processes and when implemented can typically yield a simple payback of fewer than 1.5 years. Variables affecting both cost and payback include (but are not limited to):

- Scope of the project
- Number and complexity of systems
- Size of the facility
- Equipment condition
- Commissioning service provider rates
- Level of on-site staff working on the project

RCx can have both direct and indirect benefits. Direct benefits, such as energy savings can be derived through calculation or monitoring systems. Indirect benefits derived from RCx may include extended equipment life, improved worker productivity, and reduced O&M costs.

2.4 Incentives

The RCx Program is a “service-incentive” program. This means the RCx analysis and implementation assistance is itself the incentive to the customer and is partially funded by BGE. BGE will provide project-by-project incentives that cover up to 75 percent of the RCx study and implementation costs, with a per project funding cap of \$15,000. In return, participants must make a commitment to fund a minimum of \$15,000 for approved RCx measures with a simple payback of 1.5 years or less. Implementation of identified and approved measures must occur no later than 6 months from the date of BGE approval of the final report. Should the identified measures not be implemented within this timeframe, the customer will be in default of the project contract and may be responsible for the full cost of the RCx services provided to date.

BGE recognizes that an initial investment is typically required at the beginning of the process to determine the possible opportunities. Therefore, BGE will pay for services associated with the development of a preliminary scope of services and preliminary savings estimates as part of the Planning Phase. Incentives for the scope of services development will be based on \$0.025/square foot of building conditioned space up to a maximum of \$3,000 and will be paid directly to the service provider upon commencement of the planning phase; however, BGE may consider higher incentives on a case-by-case basis. Any preliminary scoping services incentives are subject to the 75% maximum BGE co-funding and will be counted as part of the \$15,000 per project maximum incentive

For measures that have an estimated simple payback of fewer than 1.5 years, no implementation incentives will typically be available. To help offset the cost of identified low-cost measures that have an estimated payback of greater than 1.5 years; incentives may be available by submitting a Custom application. Additional information on Custom projects is available at BGESmartEnergy.com.

2.5 Facility Improvement Measures (FIM)

The focus of this program is the identification and implementation of no-cost and low-cost FIMs that save electrical energy. Capital improvements are addressed by other programs. Below are measures that are typically reviewed and considered for a Full RCx Services project:

- Reduce minimum outside air flow
- Correct economizer operation
- Eliminate simultaneous heating and cooling
- Repair compressed air leaks
- Reduce supply air static pressure set points
- Eliminate chilled water short-circuiting
- Improve chiller and/or other equipment sequencing
- Correct refrigerant charge
- Improve equipment scheduling
- Reduce air flow in constant volume air handling systems
- Improve refrigeration system controls
- Improve process controls

This is an illustrative, non-exhaustive list of potential RCx measures. Measures that are *in-eligible* for RCx consideration include fuel switching, measures that adversely affect occupant comfort, major equipment replacement, and measures necessary for core facility operations.

2.6 *Retrocommissioning Service Providers (RSPs)*

Activities and services available through Full RCx Services will primarily be delivered through pre-approved RSPs. The role of an RSP is to collaboratively work with the customer through the application process, and upon acceptance into the Program, provide the Full RCx Services analyses and reporting. If the customer has not already selected an RSP when applying to the program, BGE will provide a list of pre-approved RSPs eligible to provide Full RCx Services.

After acceptance into the program, the customer will contract directly with an RSP for their project. The customer contracts with RSPs for Full RCx Services in one of three ways:

- 1 The customer will, through their own evaluative process, contact, select and contract with an RSP from the list of pre-approved RSPs.
- 2 The customer solicits for RCx services outside of the pre-approved RSP list provided by BGE.
- 3 The customer contracts directly with an RSP with whom a pre-existing relationship exists.

In each scenario, prior to the customer contracting with an RSP, BGE will have the final authority to approve or reject the customer's selected RSP depending upon its assessed match of experience to the project's defined goals and scope.

The contract should delineate costs for different phases of the project—planning, investigation, implementation (if the customer desires the implementation to be performed by the RSP), etc. BGE encourages customers to execute contracts that explicitly require the RSP to provide the RCx services as described in the BGE RCx Process Manual. Capital improvement investigations should not be included in the scope of the RCx services performed and no incentives will be paid for studies that include investigation of capital improvement projects (e.g., major retrofit projects with an estimated simple payback greater than 4 years).

RSPs may be removed from the program (and/or from a project) at BGE's discretion. Examples of activities that will lead to RSP removal include:

- Failure to meet project timelines
- Poor quality of deliverables
- False representation or marketing of the program to BGE customers

When a customer is in the process of selecting an RSP, the following should be key considerations:

- Is RCx a core or a secondary business component of the firm?
- Does the company have any work samples (e.g., final retrocommissioning reports) available for review?
- Is the firm a full member of the Building Commissioning Association (or another nationally recognized building commissioning organization)?

The customer will only receive incentives from BGE if: (1) the RSP follows the processes outlined in this manual; and (2) a customer's RCx application had been formally accepted by BGE. (The application process is the vehicle by which this evaluation takes place.) No incentives will be paid for any measures implemented prior to a formal acceptance into the program by BGE.

Because not all Full RCx Services applications will be accepted into the program, BGE encourages the RSP to understand and convey the full portfolio of energy efficiency program offerings to the customer and assist in the determination of which program(s) is best-suited to a customer's needs.

Section 3: Application Phase

3.1 Application Phase Overview

A Full RCx Services project is initiated in the Application Phase. The facility owner or designated RSP completes the project application form (Refer to Appendix A - RCx Application Form) and a proposal for the development of a preliminary scope of services document and submits both for approval. The customer is responsible for any costs incurred during the Application Phase and holds the final responsibility for ensuring delivery of a completed application to BGE. BGE will then perform a review of submitted applications and proposals and identify those projects that meet minimum eligibility criteria, and have viable energy savings potential. When an application is formally accepted by BGE, the customer will be notified in writing and the facility owner must sign a Letter of Intent.

Deliverables:

- Completed RCx Application Form submitted to BGE by the owner or owner's representative
- Proposal for development of the preliminary scope of services document
- Letter of Intent signed between BGE and customer
- Project contract between building owner and RSP authorizing commencement of RCx work

Section 4: Planning Phase

4.1 *Planning Phase Overview*

Initial planning activities are critical to the success of any RCx project as they set the objectives and lay the foundation for the project team to move forward. To plan for an RCx project, the building owner or owner's representative must determine if the building is a good candidate for RCx, develop the internal goals, and obtain support for the project.

After a project is accepted, the building owner or owner's representative must establish the project scope, goals, timeline, and assemble a team that will guide the project through to successful completion. The Planning Phase, however, first must demonstrate that opportunities for RCx performance improvements exist prior to investing in a full RCx assessment. The Planning Phase focuses on understanding the current building operations, major electricity end use (lighting, HVAC, process), HVAC controls, previous energy conservation opportunities, the owner's understanding of RCx and opportunities that they feel may exist, and benchmark the facility's overall efficiency rating using ENERGY STAR Portfolio Manager or equivalent. The plan must identify significant energy and demand savings potential for the project to continue to the Investigation Phase. If the RSP is not able to demonstrate project feasibility, the project may be dropped from the program. In this case, BGE will pay the RSP for Planning Phase services only. No additional work will be performed or payments made. The Planning Phase typically takes 4–8 weeks to complete.

4.2 *Preferred RCx Building Characteristics*

The following identifies important building characteristics that the RSP and building owner should consider during the Planning Phase of an RCx project. These characteristics are not meant to deter buildings from going through the RCx process. Rather, identifying these characteristics may help to improve the effectiveness of an RCx project by providing the implementing team with a more robust understanding of the elements of their undertaking. For owners with a portfolio of buildings, understanding these characteristics can help prioritize buildings for RCx.

- Mechanical equipment age and condition
- Financial considerations
- Building staff participation
- Buildings with energy management controls
- Up-to-date building documentation
- Owner support and the in-house champion
- Future building projects and changes

Refer to Appendix C for a detailed list of preferred RCx building characteristics.

4.3 *Planning Phase Execution*

Integral to the Planning Phase, the RSP will accomplish the following: (1) complete the preliminary site assessment; (2) identify the current facility requirements, (3) develop the preliminary scope of services document and (4) develop the RCx Plan. The RCx Plan is a critical element that serves as the guiding document throughout the project. The project may not move to the Investigation Phase without approval of the Planning Phase by BGE. The Planning Phase requires the key activities below.

4.4 Key Activities

4.4.1 Kick-Off Meeting

After a project is accepted, the RSP should initiate and facilitate the initial kick-off meeting. Meeting attendees should include those individuals critical to the project's success and will typically include: the facility owner (or owner representative), facility staff, the RSP, and BGE. The RSP will communicate:

- Project goals and objectives
- Specifics of the Planning Phase activities
- Facility access requirements and rules for the facility team
- Timelines and deadlines to ensure full understanding of deliverable dates for the Planning Phase, investigation report, and implementation of identified FIMs.

The kick-off meeting should also outline the contractually agreed upon deliverables that will result from completion of the project. Generally, the number and type of deliverables will depend upon project scope, budget, and the needs of the building. Deliverables for a Full RCx Services project typically include:

- RCx Plan
- Progress Reports and Meeting Minutes
- Investigation Report
- Final Report

To ensure a satisfactory Full RCx Services project outcome, building owners and their appointed RCx teams should clearly articulate expectations (from a building operations/performance perspective and deliverables perspective) to the RSP at the kick-off meeting. In addition, the RSP should plan to interview each of the building's facility personnel.

- Interview Key O&M Personnel^{BP}- Interviewing personnel allows RSP to learn from their extensive knowledge and experiences from working in the building on a daily basis. Often deficiencies or FIMs can be identified by the personnel.

4.4.2 Site Audit

After the kick-off meeting, the RSP will conduct a site audit of the facility to obtain an understanding of key facility systems, their conditions, and schedules. A typical site visit may include:

- Preliminary Energy Audit^{BP} – Perform a cursory walk through of all major spaces to gain understanding of the types of spaces, condition of spaces, occupancy levels, lighting, controls and prevalence of information technology related infrastructure and equipment. The RSP will use a Site Assessment form to gather information on potential measures and assess initial project economics.
- Documentation Survey^{BP} – The RSP should review all building documentation, such as building plans and specifications, O&M Manuals, maintenance documentation records, Energy Management Control Systems (EMCS), original design intent documents, equipment lists, and Test, Adjust, and Balance (TAB) reports. This review helps to increase understanding of the building, but the primary focus is to determine the availability of documentation for the Investigation Phase. Record what documentation is available, where the documentation is kept, who is responsible for the documentation and any deficiencies.
- Equipment Inventory – The RSP will inventory key equipment and major energy users. At a minimum, inventory data collection should include name plate data and design criteria from building documentation.

Deliverable #1:

- Site Assessment Form
- Documentation Summary
- Equipment Inventory

4.4.3 Preliminary Analysis

The site audit information must be sufficient to perform a preliminary analysis:

- **Develop Current Facility Requirements^{BP} (CFR)** – This process starts with a review of, and if required, an update to the CFR which defines the current operational needs and requirements of the building. For buildings that under took the new building commissioning process the CFR is an evolution of the Owner’s Project Requirement (OPR) established during the original commissioning process. If the building has had its usage changed from the original design, or if the CFR doesn’t exist, the RPS with the assistance of the Owner Representative -should develop a detailed CFR. Items such as temperature, humidity, operating hours, filtration, sound, vibration and/or special needs must be discussed and agreed upon in the CFR. The CFR should note any integrated requirements such as controls, fire and safety, personnel training warranty review service contract review, security systems, etc.
- **Develop Initial Master List of Findings** – After the energy audit and development of the CFR (above), the RSP will generate a Master List of Findings. These findings will provide estimated demand (kW), usage (kWh), and therm savings by implementing identified RCx measures. While the Planning Phase calculations are not as rigorous as those performed in the Investigation Phase, they must be supported by field observations of actual equipment specifications, and operating conditions. BGE will not accept calculations based on rules of thumb or unsupported assumptions. The list of findings should be followed by descriptions for each measure in narrative form, including technical feasibility, likely owner buy-in, and potential savings.
- **Benchmark** – Benchmark the building’s overall performance using the U.S. Environmental Protection Agency’s ENERGY STAR Portfolio Manager or equivalent for spaces not included within Portfolio Manager. Portfolio Manager is an interactive energy management tool that allows users to track and assess energy and water consumption within individual buildings and across an entire portfolio of buildings.
- **Preliminary Scope of Services Document** – Provide a preliminary list of measures including estimated savings and costs of implementation.

Deliverable #2:

- CFR
- Preliminary Master List of Findings
- Portfolio Manager™ Statement of Performance
- Preliminary Scope of Services Document
- Completed Building Owner Agreement

4.4.4 Project Planning

- **RCx Plan** – Based on the data gathered from the site audit and the preliminary analysis, the RSP creates a scope of work (RCx Plan) to be included in the Investigation Phase of the project. Since this step defines the scope of work for the project, it is reasonable to quote fees separately for the Planning Phase when the application is submitted and for the Investigating Phase at this time. BGE will not permit a project to move beyond the Planning Phase without a clearly defined RCx Plan for the Investigation Phase. The planning documentation to develop the scope of work for the Investigation Phase may include:

^{BP} Best Practices in Commissioning Existing Buildings, Building Commissioning Association.

- Systems-Level RCx– Most of the Investigation Phase activities in RCx are to verify that the evaluated systems meet the CFR.
- FIM Testing and Diagnostics – For each deficiency identified, the RSP shall develop a testing and diagnostics plan to determine the savings potential of the related FIM. Valid data techniques include data logging, EMS trending and spot measurements. Level of effort should be in line with the potential savings realized with its implementation
- Project Timeline Documentation^{BP} – A detailed schedule of activities is developed to ensure project completion in a timely manner.
- RCx Project Roles and Responsibilities – The RSP will formalize and document roles and responsibilities of all individuals involved in the RCx process. This is a critical step to ensure responsibility ownership and avoidance of role-confusion.

Deliverable #3:

- System-Level RCx Plan
- FIM Testing and Diagnostics Plans
- Roles and Responsibilities Documentation
- Project Timeline

4.4.5 Plan Presentation

If the RCx Plan is in an acceptable form, and the project has satisfactory energy savings potential, BGE will approve the project to move forward to the Investigation Phase. Once this has occurred, the RSP can hold a meeting to present results.

4.4.6 Planning Phase Deliverables

The Planning Phase has a number of deliverables that are the responsibility of the RSP. For administrative ease, BGE highly recommends that the RSP deliver these reports in the format in which they will be delivered in the final RCx report. The target timeline for completing the Planning Phase is approximately 4 weeks for a typical project.

^{BP} Best Practices in Commissioning Existing Buildings, Building Commissioning Association.

Section 5: Investigation Phase

5.1 Investigation Phase Overview

During the Investigation Phase, the RCx team conducts a systematic analysis of the building's performance through observation, review of building documents and O&M practices, and trending and testing of building systems.

The Investigation Phase builds upon the Planning Phase to include activities such as conducting detailed site assessments, diagnostic testing, and trending analyses to evaluate current facility operating procedures, equipment functionality, and to verify planning phase assumptions. This phase involves detailed investigation of the FIMs identified in the RCx Plan and additional investigation to identify other FIMs.

Other operations-validation tasks may include interviewing management and building personnel, and reviewing current O&M practices and service contracts. The goals of the Investigation Phase are to: (1) understand how the building systems are currently operated and maintained; (2) identify operational and system issues and their potential improvements; and (3) select the most cost-effective "fixes" for RCx implementation. The target timeline for completing the Investigation Phase is approximately 12 weeks for a typical project, but is dependent upon the time of year (i.e., affected systems must be operational).

5.2 Investigation Phase Execution

Tasks during this phase may include interviewing management and building personnel, reviewing current O&M practices and service contracts, spot-testing equipment and controls, and trending or electronic data-logging of pressures, temperatures, power, air and water flows, and lighting levels and use. It is important that the facility engineering staff learn with the RSP so they can monitor and maintain the building's systems and operations after the RCx process is complete.

5.3 Key Activities

5.3.1 Operations Review

This review takes place to: (1) assess how the building is operated; and (2) identify operational deficiencies and corresponding FIMs.

- Documentation Review^{BP} – Review building drawings and documentation to understand the building energy usage, initial basis of design and evaluate the system integration. The review process includes the evaluation of all old and new drawings, specifications, test and balance reports, O&M manuals (typically related to mechanical, electrical, and controls).
- Facility Performance Analysis^{BP} – Collect and analyze available energy, non-energy and other systems performance data to establish baseline benchmarks for facility performance. Available facility performance data may include utility billing data, sub-metering data, work orders, comfort complaint logs, indoor air quality parameters, occupant satisfaction survey results, trend data and/or stand alone logger data.
- In-Depth Site Assessment – An in-depth site assessment builds upon the general site audit developed in the Planning Phase. The site assessment should uncover the best opportunities for optimizing energy-using systems and improving O&M practices. Depending on the project scope, the detailed site assessment can take up to several days to complete.

^{BP} Best Practices in Commissioning Existing Buildings, Building Commissioning Association.

The in-depth site assessment should address the following major issues:

- Overall building energy use and demand
- Areas of highest energy use and demand
- Current design and operational intent, and actual control sequences for relevant equipment
- Equipment nameplate information and maintenance issues (e.g., broken dampers, dirty coils, etc.)
- Current schedules (e.g., set-point, time-of-day, holiday, lighting, etc.)
- The most severe control and operational problems
- Location of comfort problems or trouble spots in the building
- Current O&M practices

5.3.2 System-Level RCx

The results of the detailed site assessment should indicate the areas where further investigation is needed. In these instances, the RSP should develop the appropriate diagnostic, monitoring, and testing plans, or system-level RCx.

Diagnostic monitoring and testing allows the RSP to observe building temperatures and critical flows, pressures, speeds, and electrical currents of the system components under normal operating conditions. By analyzing this information, the RSP is able to determine whether the systems are operating correctly and in the most efficient manner. Three typical diagnostic methods are energy management control system trend logging, stand-alone portable data-logging, and manual functional testing. RSPs often use a combination of these methods.

Deliverable #1:

- Facility Performance Analysis
- In-Depth Site Assessment
- System-Level RCx Data Sheets

5.3.3 FIM Testing and Diagnostics

The RSP will develop diagnostic monitoring and testing plans for the FIMs identified in the Investigation Phase. Valid data collection includes data logging, EMS trending, and spot measurements. The level of testing needs to be in alignment with savings potential. The FIM testing and diagnostics should—in graphical and narrative format—compare the results of actual system operations to expected operation. The RSP will summarize the potential energy savings calculations and narratives for the FIMs on the Master List of Findings.

5.3.4 Update Master List of Findings^{BP}

Update the Master list of Findings with the current energy savings calculation according to guidelines presented in 5.3.2 based upon actual values measured during the Investigation phase. The list of findings should be followed by descriptions for each measure in narrative form including technical feasibility, likely owner buy-in, and savings persistence.

In preparing estimates of FIM implementation costs and payback estimates, market costs based on professional experience on an accepted cost-estimating source should be used.

For each of the recommended FIMs in the Master List of Findings, the RSP is required to develop a Verification Plan designed to verify that the implementation was done correctly and the energy savings will take place as estimated. Verification may consist of data trending, spot measurements, visual checks, and/or interviews with the party responsible for implementation. To ensure an appropriate level of effort to verify FIM savings estimates, consider the (1) estimated peak period demand savings; (2) FIM complexity; and (3) FIM cost.

Deliverable #2:

- Master List of Findings
- Detailed Calculations
- FIM Narratives
- Verification Plans

5.4 FIM Calculations

BGE pays service incentives for this program to the customer on the basis of the costs and savings estimates provided in the Investigation Report. Bearing this, it is essential that complete and accurate assumptions and data used to support the FIM calculations are also detailed in the Investigation Report. Calculations must be done in spreadsheet format and be clearly presented for review.

5.5 Investigation Report and Implementation Plan

Once the Investigation Report is finalized and delivered to the owner, the facility representatives, RSP, and BGE should meet to review the recommendations. All parties must agree upon the FIMs to be implemented, taking into consideration energy savings, comfort, technical complexity and payback.

5.6 Investigation Phase Deliverables

The Investigation Phase has a number of deliverables identified throughout this section that are the responsibility of the RSP.

^{BP} Best Practices in Commissioning Existing Buildings, Building Commissioning Association.

Section 6: Implementation Phase

6.1 *Implementation Phase Overview*

The way implementation is carried out varies greatly among projects. Each building will require different types of measures, each owner is faced with unique budgetary and administrative situations, and each building staff will have different capabilities and contractor relationships.

The Implementation Plan organizes and defines the work needed to obtain the required results. While the Investigation Phase provides important information about improving building performance, unless it is actually implemented, the RCx process remains incomplete. Primarily, the Implementation Plan includes a scope of work for addressing each issue or improvement that the owner has selected requirements for verification. The Implementation Plan also recommends methods for calculating energy savings and verifying the performance of the measure after implementation. As with all phases of Full RCx Services, implementation can take place only after formal review and written approval from BGE.

Upon implementation completion, the customer will notify BGE that the measures have been installed by completing the Retrocommissioning Implementation Summary Report.

6.2 *Implementation Phase Execution*

The customer has the sole discretion and responsibility to complete the Implementation Phase of the Full RCx Services project. After the deliverables of the Investigation Phase have been finalized, the RSP's contractual commitment to the customer to perform the RCx project has concluded. The customer, however, may opt to directly contract with the RSP to implement approved RCx measures. Even though the building's facility team should now have intimate knowledge of the building systems and needed improvements, having the RSP oversee the implementation may ultimately save time and reduce costs.

6.3 *Selection of Implementation Approach*

There are three primary approaches to implementing FIMs as part of an RCx project. Choosing an approach largely depends upon the in-house building staff's experience and availability (and the owner's willingness) to manage the implementation activities. The approaches are:

- **Turn-Key Implementation**
 - Use RSP to perform most—if not all—implementation activities.
 - Building owner holds only one contract; RSP is responsible for sub-contractors.
 - Reduces owner's time spent coordinating and managing implementation activities.
- **In-House Staff Implementation with RSP Guidance**
 - Skilled in-house staff provides majority—if not all—of implementation activities.
 - RSP can have either a defined role or act in a consulting or as-needed basis.
- **Owner-Led Implementation**
 - Owner implements all agreed-upon FIM recommendations without assistance from RSP.
 - Requires highly-capable in-house engineer and facilities team.
 - Attractive option to building owners who have strong, established relationships with service contractors.

6.4 Implementation Phase Deliverables

The RSP shall submit the RCx report for review and approval during the Implementation Phase. The customer will submit the Implementation Form upon completion of all measures.

Section 7: Hand-Off Phase

7.1 *Hand-Off Phase Overview*

To ensure the building owner and operators have the knowledge they need to monitor and maintain implemented measures, a thorough project hand-off is essential.

7.2 *Elements of the Final RCx Report*

The Final RCx Report is delivered to the customer at the close-out meeting. The report is a resource for current and future operators and should be made part of the permanent record of recommended O&M plan and practices for the building. While the customer specifies the information that is to be included, ideally the Final RCx Report will contain:

- Executive summary
- Project background
- RCx Plan
- Master List of Findings (including a description of the improvements implemented)
- A cost/benefit analysis (including the estimates of savings and the actual improvement costs for each improvement implemented)
- Building, systems and operations descriptions
- Diagnostic measurement and verification and logger trend results
- A list of capital improvements recommended for further investigation
- The EMCS trending plan and logger diagnostic/monitoring plan and summarized results
- All completed functional tests and results
- Recommended frequency for RCx by equipment type with reference to tests conducted during initial RCx
- Complete documentation of revised or new strategies adopted to optimize systems operation and the rationale
- Training agenda
- Supporting documentation
- Contact information

7.3 *Persistence Planning Assistance*

The RSP may include assistance with developing and executing a persistence plan for the customer in the cost of services. The customer is required to submit a plan that includes on-going training of existing and future maintenance staff on improved operation of the facility in accordance with the results of the RCx study, including all changes made as a result of the study. The plan must also include a strategy for routine energy benchmarks and an action plan to resolve any drift from the performance levels. The plan may include a 6-month follow-up with the RSP.

Ideally, training for building staff should occur throughout the project. Early involvement provides staff the best opportunity to learn how to find and resolve issues. However, project hand-off is the ideal time to provide any additional training staff may need. Formats vary, but could be classroom training with hands-on demonstrations in the facility. Videotaping the training for future use increases the persistence of the RCx benefits.

7.4 Close-Out Meeting

At this point, the RCx process is nearing completion. The RSP will produce a Final RCx Report documenting the process and its findings, and hold a project-close-out meeting with the full RCx team. This meeting is valuable for discussing lessons learned, recognizing individual successes, celebrating the overall project, and discussing next steps.

The customer should request any additional tasks of the RSP at the close-out meeting. These tasks, to the extent possible, should be communicated as early as possible in the RCx process to ensure ample development-time and to review the potential for incentive funding by BGE.

Some additional tasks may include:

- Systems Manual - A systems manual is a document that serves as a guide for facility operators. This manual documents the design intent, CFR, an overview of all major systems, the current sequence of operations, and a history of changes to the facility. A systems manual is helpful in continuous and recommissioning efforts, and is asset for the building owner. It can include:
 - Final RCx Report
 - Master list of building documentation
 - General building description and facility objectives
 - A list of pertinent contact references
 - Energy performance trends for each system and recommended techniques for verifying performance or troubleshooting problems
 - Systems diagram
 - As-built drawings
 - Building and equipment schedules and operating procedures
 - Equipment lists with descriptions and maintenance schedules
 - Sequence of Operations
 - Controls and alarms set-points
 - O&M Plan
 - Measurement and verification Plan
 - Information on ongoing diagnostics
 - Available monitoring points and trending capabilities

7.5 Deliverables

- Final RCx Report
- Other Reports (per customer's contractual arrangement with RSP)

Section 8: Verification Phase

8.1 Verification Phase Overview

Once an improvement is completed, it is important to re-test the equipment or systems over time to ensure that the improvements are working as expected. Re-testing can be done using EMCS trending, data-logging, functional testing, simple observation, or a combination of these methods. To confirm that each improvement and the combination of improvements are integrated and have the desired effect, the post-implementation data needs to be compared to the original, baseline data. This final verification data can also be used to update the energy savings estimates, if needed.

The data gathered as a result of the verification activities and the updated energy cost savings information is compiled into the Implementation Summary Report. During the Verification Phase, BGE will visit the site to verify that measures have been properly installed, new control strategies are in place, repairs have been made, etc. Upon full verification by BGE, incentives payments will be processed and paid to the RSP.

8.2 Verification Phase Execution

Responsibility for completion of the Verification Phase is the sole responsibility of BGE.

8.3 Deliverables

There are no specific RSP deliverables associated with the Verification Phase.

Section 9: Participant's Responsibilities

9.1 Overview

This section explains the specific roles and responsibilities of the players in a Full RCx Services project. The makeup of an RCx team is largely dependant upon project scope, budget, and needs of the building. For the sake of cost effectiveness, the RCx team should fit the complexity of the project. The building owner should consult with the RSP about the make-up of the team. An RCx team will include some or all of the following people:

- Owner or owner's representative
- Building operator/O&M staff
- RSP
- Equipment contractor or manufacturer's representative

9.2 Summary of Roles and Responsibilities

9.2.1 Owner or Owner's Representative

The owner's most significant role is to support the RSP's efforts. Other responsibilities include:

- Determining the project's budget, schedule, and operating requirements
- Commitment and follow through with \$15,000 financial responsibilities
- Determining the objectives of the budget and communicating them to the team members
- Hiring an RSP and other members of the project team
- Assigning appropriate in-house staff to the project
- Defining the building protocols
- Defining lines of communication among the team members
- Working with the RSP to establish the final RCx work plan and streamlining project costs
- Supporting the RSP by facilitating communication between project team members
- Informing the building occupants of the intended RCx work
- Requiring and reviewing progress reports and meeting notes
- Attending training sessions and meetings

9.2.2 Building Operator/O&M Staff

Building operators should be engaged with the hands-on and process elements of the RCx project as much as possible. This will improve their understanding of their building's operations, equipment, and control strategies. This enhanced knowledge will enable building operators to re-test or recommission systems periodically as part of their on-going O&M program. The following identifies tasks typically associated with building operators and dependant upon skill level:

- Gathering building documentation
- Providing detailed input to the initial assessment and investigation process
- Performing appropriate preventative measures prior to any diagnostic or functional testing
- Installing and removing short-term diagnostic monitoring equipment
- Gathering trending information from the EMS
- Assisting with the performance of manual functional testing
- Attending project meetings and trainings

9.2.3 RSP

The role and responsibility of the RSP is dependant upon RCx project scope, budget, needs of the building and the skill level of the building's O&M staff. Typical duties of an RSP include:

- Identifying the documentation, drawings, data and other information necessary for the RCx project
- Developing a Preliminary Scope of Services document
- Developing a building-specific RCx Plan
- Developing agendas and facilitating meetings
- Writing and submitting progress reports and meeting notes to the project manager and facility manager as determined by the building owner
- Performing detailed building assessments of current operating strategies and maintenance practices and noting all findings and improvement opportunities
- Reviewing all equipment warranties, and service contracts and leveraging these findings into making the project as cost-effective as possible
- Developing monitoring and testing plans
- Performing short-term diagnostic monitoring using EMCS trend logging where appropriate
- Developing, performing and overseeing the documentation of functional test procedures Developing a Master List of Findings
- Identifying all system and capital improvements for further investigation
- Prioritizing the most cost-effective RCx improvements for implementation
- Performing pre- and post-installation monitoring
- Calculating potential energy savings based on documented analyses
- Assisting in operators training
- Submitting a Final RCx Report and all other owner-specified deliverables

9.2.4 Equipment Contractor or Manufacturer Representatives

If equipment is still under warranty or covered under a service contract, it is important that the party responsible for the maintenance of this equipment be brought into the RCx process in a timely manner. The RSP should understand the details of the warranties and service contract so it does not (1) forego an opportunity for servicing under the contract; and (2) void a warranty by performing work unauthorized by the contract. Contractors may also be responsible for fixing any problems or operational deficiencies found during the RCx process. In many cases, especially on more complex equipment and systems, the contractor or manufacturer's representative may be the most knowledgeable party to address RCx related tasks. The costs and benefits of employing such assistance outside of a warranty or service contract, however, need to be considered.

Appendix A

Full RCx Services Application Form

Full RCx Services Application Form

a BGE Smart Energy Savers ProgramSM



We're on it.SM

INTRODUCTION

BGE's Retrocommissioning (RCx) Program is available to qualifying commercial customers within the BGE service territory. The goal of this program is to help you identify opportunities to improve the efficiency of major electrical systems in your building and reduce energy costs without adversely affecting facility or system operations.

The RCx Program may offer financial incentives to buy-down implementation costs for qualified and accepted measures. For complete information about program terms and conditions, please review the RCx Process Manual or visit BGESmartEnergy.com. You may also contact the Program Administrator at 410.290.1202 or Business@BGESmartEnergy.com.

I. PRE-APPLICATION CHECKLIST

Please confirm that you meet the following minimum eligibility requirements prior to submitting an application to participate in BGE's RCx Program.

- Yes**
- Do you have a combined conditioned area of 75,000 square feet or larger served by a central system?
 - Are you a BGE delivery service customer, regardless of which electric supplier you have chosen?
 - Do you have an existing building automation system or energy management system (EMS) with direct digital control (DDC)?
 - Are you free from planned major system renovations or retrofits?
 - Are you able to complete the installation of identified retrocommissioning measures within 6 months of receiving the Final RCx Report?
 - Do you understand that approved measures are to be implemented no later than 6 months after BGE's approval of the Final Report? (Incentives may be foregone and/or the Full RCx Services cost incurred to date may be imposed on the customer for non-implementation of measures).
 - Are you willing to commit the necessary time and personnel resources to fully support the RCx process?

If selected for participation in the program, will you accept the following responsibilities?

- Are you willing to commit up to \$15,000 for Full RCx Services measures identified with an estimated simple payback of fewer than 1.5 years?
- Provide access to the facility and time for facility personnel to interface with the retrocommissioning provider?
- Provide and assist with the reporting and collection of information pertaining to the retrocommissioning of the facility?
- Implement in a timely manner the mutually accepted retrocommissioning measures according to the scope and procedures outlined by BGE?

II. NEXT STEPS

If you answered yes to the above questions, please complete this application and submit to BGE for consideration. In reviewing your application, BGE will be reviewing evidence that cost-effective retrocommissioning opportunities exist at your facility. BGE's decision regarding selection of program applicants into the RCx Program will be final and binding for all parties.

III. CUSTOMER INFORMATION

Company Name	Facility Name (if different)	Federal Tax ID #
Street Address (Facility)		Electric Acct #
City	State	ZIP
Mailing Address (if different)		
City	State	ZIP

For more information about the program, go to BGESmartEnergy.com.
 Please submit for review via one of the following: Fax to 410-290-0861, email to Business@BGESmartEnergy.com or
 mail to BGE Smart Energy Savers ProgramSM, c/o ICF International, 7125 Thomas Edison Drive, Suite 100, Columbia, MD 21046

IV. FACILITY OWNER REPRESENTATIVE INFORMATION

Contact Name		Contact Title			
Street Address					
City	State	ZIP	Contact Telephone ()	Contact Fax ()	Email

V. RCX SERVICE PROVIDER INFORMATION

Company Name					
Contact Name		Contact Title			
Street Address					
City	State	ZIP	Contact Telephone ()	Contact Fax ()	Email

VI. PAYMENT INFORMATION

Payee Company or Corporate Tax ID (9 digits required. Do not include tax-exempt number.)		
Business Classification for Payee: <input type="checkbox"/> Corporation <input type="checkbox"/> Partnership <input type="checkbox"/> Sole Proprietorship <input type="checkbox"/> Ltd. Partnership <input type="checkbox"/> Non-Profit <input type="checkbox"/> Other		
Make incentive checks payable to: <input type="checkbox"/> Customer <input type="checkbox"/> RCx Service Provider		
Company/Corp./Owner's Legal Name		
Street Address		
City	State	ZIP

VII. FACILITY INFORMATION

Year of Construction	Number of Floors
Total Floor Area (sq. ft.)	Total Conditioned Area (sq. ft.)
Electric Account Number(s)	Natural Gas Utility
Annual kWh Usage	Natural Gas Account Number(s)
Peak kW and Month Occurring	Annual Therm Usage

VIII. HVAC SYSTEMS

Check all of the HVAC system(s) in the facility.

Cooling Systems

- Chiller Air Cooled
- Chiller Water Cooled
- Water Source Heat Pump
- Condenser
- Other

Heating Systems

- Boiler, Hot Water
- Boiler Steam
- Rooftop Furnace
- Electric Baseboard
- Other

Ventilation & Distribution

- Central AHU
- VAV and Reheat
- Dual Duct
- Economizers
- Other

IX. FACILITY CONTROL SYSTEMS

Age of Energy Management Control System (EMCS)

Capable of trending and storing multiple points?

Components and systems controlled by digital direct controls (DDC)

Components controlled (not just actuated by pneumatics)

X. CUSTOMER ACCEPTANCE OF APPLICATION TERMS

By signing below, I certify that: (1) the information contained in this application is accurate and complete to the best of my knowledge; (2) I have read and understood the obligations of program participants, including the commitment of the minimum of \$15,000 to implement identified and approved RCx measures; (3) I will put forth a good faith effort to comply with all of the RCx Program requirements if selected for participation in the program.

Customer Name/Title

Customer Signature

Date

ADMINISTRATIVE USE ONLY

Project ID Number

Program Rep.

Date Received

Date Input

Inspection Required

Program Manager Approval

Date Approved

Appendix B

Building Owner Agreement Form

Baltimore Gas and Electric Company
**Full RCx Services Building Owner
 Agreement Form**



a BGE Smart Energy Savers ProgramSM

I. PROJECT INFORMATION

Company Name		Facility Name	
Street Address (Facility)			Electric Acct #
City		State	ZIP
Mailing Address			
City		State	ZIP
Facility Contact Name		Facility Contact Title	
Telephone ()	Fax ()	Email	
Building Owner's Retrocommissioning Service Provider		RSP Contact Name	
Telephone ()	Fax ()	Email	

The BGE Retrocommissioning (RCx) Program (Program) helps building owners improve the efficiency of their building operations by offering incentives and technical assistance for RCx services. The Program funding is offered on a first-come, first-served basis and is effective until funding is expended or the Program is discontinued by BGE.

Program pre-screening has determined that opportunities for cost-effective retrocommissioning measures exist in this facility. By signing the Building Owner Agreement Form (Form) _____ (Owner) commits to proceeding with the Program and confirms his/her agreement to and understanding of the Program process, and the following obligations and responsibilities.

II. BGE RESPONSIBILITIES

1. BGE will assign a Program Representative to be the Owner's (or Owner's designated Building Contact's) point of contact for the project. The Program Representative will assist the Owner with the project, attend meetings as necessary, and work closely with the Owner to select measures for implementation that best meet the Owner's needs and budget cycles, as well as the Program's energy savings goals.
2. BGE will provide a list of pre-qualified retrocommissioning service providers (RSP) to perform in-depth RCx investigations and follow-up services.
3. Incentives will be paid, as described below, approximately 4-6 weeks after all the appropriate documentation is submitted. Incentive payment is contingent upon meeting all requirements of the Program.

III. OWNER RESPONSIBILITIES

1. Owner will assign a designated staff member to be BGE's point of contact. This point of contact will be responsible for working with BGE and ensuring that all Program requirements are being met in a timely fashion.
2. Owner agrees to reimburse BGE for the RCx costs incurred to date should the Owner fail to implement all the required, reasonable, and eligible RCx measures within 6 months of the signatory date of this agreement.
3. Owner agrees to designate appropriate facility staff and staff hours to participate in the RCx process and project meetings, including assistance to the RSP during its RCx work, access to pertinent facility areas and systems, and training given by the RSP at the project end. Costs associated with the Owner's facilities staff shall be at the Owner's expense.
4. Owner agrees to pay for any ancillary expenses that may be incurred during the course of the Program, including copying of plans or building documentation, access to equipment, security access, and documentation of contractor work (e.g., programming changes) for implemented measures, etc.
5. Owner understands that, to optimize the RCx services, scheduled preventative maintenance and repair tasks, such as cleaning coils, changing filters, tightening belts, and calibrating strategic sensors, must be completed prior to the RCx investigation.

6. Upon completion of the investigation phase, BGE, Owner, and RSP will review the findings and select measures for implementation. The Owner is encouraged to implement reasonable and eligible RCx measures that pay back in 1.5 years or less.
The Program will offer an incentive to assist with implementing RCx measures that exceed a 1.5 year payback based upon each measure's cost effectiveness with regards to the Program's energy goals. The customer may elect to implement non-approved RCx measures at his/her own expense. Major retrofit measures identified by the Program may not be eligible for RCx Program funding. In these cases, BGE will assist the owner in determining whether other potential BGE programs provide funding for these measures and if the facility and/or the Owner are eligible for those programs/incentive/funding.
The approved BGE Incentive for the RCx Study will be: \$ _____.
The implementation incentive offer will be finalized by BGE and Owner once measures are selected for implementation.
For implementing selected measures, Owner's investment responsibility will not exceed: \$ _____.
7. The Owner shall be responsible for all aspects of implementing the agreed upon measures. This includes, but is not limited to, getting bids, negotiating scope of work, paying for materials and labor and approving the completed product. BGE will assist in this process, but the ultimate responsibility for proper implementation shall lie with the Owner.
8. Owner agrees to give BGE and its contractors, and project-approved RSPs access to his/her facility in order to perform work for this Program and evaluate building operations both before and after measure implementation.
9. Owner further understands and agrees that BGE makes no warranty or representation of any kind nor is it liable for any of the work provided by RSPs or its contractors and vendors.

IV. BGE PROGRAM REPRESENTATIVE SIGNATURE

Authorized Program Representative (print name)	Title
Signature	Date

V. BUILDING OWNER REPRESENTATIVE SIGNATURE

By signing this Building Owner Agreement Form, Owner represents and warrants that it has read, understands, and agrees to the terms and conditions of this Agreement.

Owner or Authorized Representative (print name)	Title
Signature	Date

VI. TERMS & CONDITIONS

- | | |
|--|---|
| <ol style="list-style-type: none"> 1. Incentives: Owner confirms they have not received incentives or services for the same services from another utility, state, or local program. Owner agrees not to apply or receive incentives for the same services from another utility, state, or local program. 2. Eligibility: Incentives are available to industrial and commercial electric service customers of BGE (service rates GL & P) that are in good standing with BGE. 3. Safety and Building Codes: Owner represents that all equipment installed and work performed complies with all federal, state, and local safety, building, and environmental codes, and any manufacturer instructions. 4. Property Rights: Owner represents that it has the right to perform the energy-saving measures on the property on which those measures are performed and that any necessary consents have been obtained. 5. Indemnification: Owner shall, at its own cost, defend, indemnify and hold harmless BGE and its Affiliates and all officers, agents, employees, assigns, and successors in interest of BGE, from and against any and all liability, damages, losses, claims, demands, actions, causes of action, costs, including attorney's fees (which shall include allocable costs of in-house counsel) and expenses or any of them, resulting or arising from any (i) negligent or wrongful acts or omissions of the Owner or of its officers, employees, agents, representatives, subcontractors, or affiliates, (ii) breach by the Owner of its officers, employees, agents, representatives, subcontractors, or affiliates of this Agreement, or (iii) any willful or negligent conduct of the Owner, its officers, employees, agents, representatives, and affiliates, arising out of the performance of the Owner's obligation under this Agreement. 6. Information Release: Owner agrees that the Program or BGE may include Owner's name, program services and resulting energy savings in reports or other documentation submitted to BGE. BGE will treat all other information gathered in evaluations as confidential and report it only in the event that Owner agrees to release such information. 7. Governing Law AND Venue: This Agreement shall be interpreted, governed, and construed under the laws of the State of Maryland as if executed and to be performed wholly within the State of Maryland. 8. Termination: The term of this Agreement shall not exceed the term of the Program, or the availability of funds provided by BGE to pay for the services or incentive payments provided by the Program. Either the Owner or BGE may terminate this Agreement at any time by providing the other party with 30 days advance written notification, provided however, that if the Owner terminates participation, they agree to reimburse BGE for the project costs BGE incurred to date in full. 9. Payment Disqualification: Owner understands that implementation incentives paid are based on providing related energy benefits for five (5) years. I agree that if (a) Owner knowingly takes actions to decrease savings and does not provide BGE with 100% of the related energy benefits specified in the Investigation Report for a period of five (5) years from receipt of implementation incentive, or (b) Owner ceases to be a customer of BGE during said time period, Owner shall refund a prorated amount of implementation incentive dollars to BGE based on the actual period of time for which Owner provided the related energy benefits as an electric customer of BGE. | <p>Owner shall repay any amounts due to BGE within thirty (30) calendar days of notification by BGE that repayment is required in accordance with the provision above. BGE shall be entitled to offset against payments owed to Owner any amount due to BGE that remains unpaid forty (40) calendar days after BGE's written demand for payment.</p> <ol style="list-style-type: none"> 10. Disputes: The Parties shall attempt in good faith to resolve any dispute arising out of or relating to this Agreement promptly by negotiations between the Parties' authorized representatives. The disputing Party shall give the other Parties written notice of any dispute. Within twenty (20) days after delivery of such notice, the authorized representatives shall meet at a mutually acceptable time and place, and thereafter as often as they reasonably deem necessary to exchange information and to attempt to resolve the dispute. If the matter has not been resolved within thirty (30) days of the first meeting, any Party may initiate a mediation of the dispute. The mediation shall be facilitated by a mediator that is acceptable to all Parties and shall conclude within sixty (60) days of its commencement, unless the Parties agree to extend the mediation process beyond such deadline. Upon agreeing on a mediator, the Parties shall enter into a written agreement for the mediation services with each Party paying a prorated share of the mediator's fee, if any. The mediation shall be conducted in accordance with the Commercial Mediation Rules of the American Arbitration Association; provided, however, that no consequential damages shall be awarded in any such proceeding and each Party shall bear its own legal fees and expenses. 11. Force Majeure: Failure of a Party to perform its obligations under this Agreement by reason of any of the following shall not constitute an event of default or breach of this Agreement: strikes, picket lines, boycott efforts, earthquakes, fires, floods, war (whether or not declared), revolution, riots, insurrections, acts of God, acts of government (including, without limitation, any agency or department of the United States of America), acts of terrorism, acts of the public enemy, scarcity or rationing of gasoline or other fuel or vital products, inability to obtain materials or labor, or other causes which are reasonably beyond the control of such Party. 12. Miscellaneous: Neither Party may assign its rights under this Agreement without the prior written consent of the other. Any assignment of such rights hereunder without such consent shall be deemed void. No waiver, consent, or modification of any other provisions of this Agreement shall be binding unless in writing and signed by duly authorized representatives of all Parties, and no waiver by any Party of any default of the other shall be deemed to be a waiver by such Party of any other default. Each Party represents and warrants to the other Party that it is duly authorized to execute, deliver, and perform its respective obligations under this Agreement. 13. Facsimile/Scanned Signatures: Facsimile transmission of any signed original document, and the retransmission of any signed facsimile transmission, shall be the same as delivery of the original signed document. Scanned original documents transmitted to BGE as an attachment via electronic mail shall be the same as delivery of the original signed document. 14. Taxes: Owner is required to submit a completed W9 for tax purposes. Please consult your tax advisor concerning the taxability of incentives. |
|--|---|

Appendix C

List of Preferred RCx Building Characteristics



Preferred RCx Building Characteristics

The following identifies important building characteristics that should be considered during the Planning Phase (when the retrocommissioning service provider, RSP, and owner are developing the project scope and budget) of a retrocommissioning (RCx) project. These characteristics are not meant to eliminate buildings from going through the RCx process. Rather, the identification of these characteristics may help to improve the effectiveness of an RCx project by virtue of the implementing team having a more robust understanding of the elements it is undertaking. For owners with a portfolio of buildings, understanding these characteristics can help prioritize which buildings to retrocommission first.

1. Mechanical Equipment Age and Condition

As RCx projects generally consist of activities intent on improving an existing building's performance via *operational* improvements, the cost effectiveness of a project depends in large part on the age of the energy using equipment, systems, and controls. Buildings with broken equipment (or equipment in need of major upgrades) generally do not make good candidates for RCx projects. As long as most of the equipment and systems are fewer than 12 years old or are several years from the end of their useful life (well maintained equipment can often last well beyond the typical 15 year replacement life cycle), the RCx process is, generally speaking, appropriate. As part of the initial walkthrough of the building, an RSP may perform a quick conditions assessment of the mechanical and electrical systems to get a feel for how well the facility is maintained and operated.

2. Financial Considerations

Early in the Planning Phase, the RSP needs a full understanding of the owner's criteria for project cost limits, and simple payback times to develop and implement a successful RCx strategy. Further, it is important to realize how the owner intends to obtain funds to finance the RCx project (e.g., capital budget, operating budget, outside financing, etc). These criteria, along with budget cycle information, can help the RSP and building owner determine how to prioritize the work during the RCx process and how to develop implementation strategies that fit within the financial criteria. The BGE project incentives need also to be integral to these initial project discussions.

3. Building Staff Participation

The overall cost of an RCx project will be reduced when the owner is willing to engage the facility team in getting the maintenance items and simple repairs (coil cleaning, filter changes, belt tightening, broken linkages, and damper blades) completed before the more in-depth RCx Investigation Phase begins. In turn, this will enable the RSP to more efficiently and effectively proceed through the Investigation Phase without continuous interruption for simple maintenance and repair issues. To the extent that the facility's maintenance staff has the know-how, RCx project costs can further be reduced by helping to set-up the trend logs, and implementing some of the less complicated, yet necessary, measures. At a minimum, it is important for building staff to be available to provide the RSP with as much information about the building's operating strategies, maintenance procedures, and perceived problems as possible.

4. Building with Energy Management Control Systems

Buildings with computerized energy management control systems (EMCS) are preferable RCx candidates to those with purely pneumatic systems. This is primarily due to three factors:

- An EMCS can be used as a data acquisition tool during RCx; a purely pneumatic system cannot.
- Operational improvements are generally easier and less costly to implement through an EMCS compared to making physical changes to individual pneumatic controllers.
- Pneumatic controls tend to drift out of calibration much more frequently than electronic-based controls. Subsequently, the energy saving may not be long lasting. (Therefore, the increased maintenance cost associated with sensor calibration should be considered to ensure the energy savings identified in the RCx project persist over time.)

Some of the more sophisticated EMCS systems also have additional benefits, such as:

- Ability to trend and store large amounts of data at short frequencies (2 minutes or less) for long periods of time without slowing down the normal control functions of the system.
- Internet-based systems enable the RSP to look at building data from a Web connection at any time, thereby reducing the need (and cost) of portable monitoring equipment.

5. Up-to-Date Building Documentation

Clear, complete, up-to-date documentation expedites the Investigation Phase of a project. Buildings that lack good documentation (especially as it relates to mechanical and control systems) can drive costs up if the RSP has to spend time gathering and re-creating critical information in order to assess system operation. Below is a *non-exhaustive list* of building documents to have on-hand and up-to-date prior to the start of an RCx project:

- As-built mechanical and electrical drawings including piping and riser diagrams
- An equipment list with nameplate information and dates of installation
- As-built control system documentation
 - Points list
 - Sequences of operation
 - User’s manual
 - Control drawings with as-built sensor locations
- Testing, adjusting, and balancing reports
- Operation and maintenance manuals
- Pump and fan curves
- Copy of current service contracts
- Equipment warranties still in effect

6. Owner Support and the In-house Champion

An involved, supportive building owner coupled with a technical savvy facility staff is critically important to the success of an RCx project. Absent this combination, the RCx project will not be as successful as it could be, regardless of how well the RSP performs its job. Therefore, a critical element for a project’s success is an in-house champion (e.g., energy manager, facility manager, or property manager) to work closely with the RSP and help to gather materials, documents, or other information as required in an efficient and timely manner.

7. Future Building Projects and Changes

When developing an RCx project scope, it is wise for the RSP to understand the building owner’s future plans. For example, if an owner is considering doing some retrofit projects or major tenant improvements in the near future (within the next year or two), it may be advantageous to wait for these activities to occur before going forward with a full RCx project. On the other hand, depending on the planned improvements, the RCx project may be designed to have a commissioning component to ensure that new installations are specified, installed, operate as intended, and integrate completely with the existing systems in the building. Further, it may be beneficial to retrocommission some of the systems before a major retrofit in cases where reducing loads may lead to downsizing equipment included in the retrofit. Another consideration is how the operations and maintenance will be accomplished in the future. Questions about plans for outsourcing the maintenance and staff turnover can affect the training and documentation scope for the project.